

**ENVIRONMENTAL ASSESSMENT**

Volume 1 **Main Volume**

**MUNMORAH**  
GAS TURBINE FACILITY



# ***Munmorah Gas Turbine Facility***

## ***Environmental Assessment***

December 2005

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Technical Paper No.2	Heritage Assessment
Technical Paper No.3	Noise Assessment
Technical Paper No.4	Air Quality Impact Assessment
Technical Paper No 5	Photochemical Pollution Assessment
Technical Paper No 6	Preliminary Hazard Analysis

## SUMMARY



# Summary

## Introduction

*Delta Electricity is seeking planning approval to construct and operate a gas turbine facility within the grounds of Munmorah Power Station for the purposes of a peak-load power station.*

*An environmental assessment which satisfies the requirements under Part 3A of the Environmental Planning and Assessment Act 1979 has been prepared to support the development application to the Department of Planning. The environmental assessment quantifies and assesses potential impacts, and documents the likely benefits of the proposal. It also outlines the environmental management measures proposed to be implemented to reduce potential adverse impacts.*

*This summary provides a brief description of the key issues and findings detailed in the respective environmental assessment chapters.*

## The Proponent

*Delta Electricity is a state-owned corporation which produces around 12 per cent of the electricity consumed by customers in South Australia, Queensland, New South Wales, Victoria and the Australian Capital Territory. Most of Delta Electricity's electricity generation occurs at four NSW power stations: Mt Piper and Wallerawang near Lithgow, and Vales Point and Munmorah on the Central Coast. These stations have a combined generating capacity of 4,240 megawatts. Small amounts of renewable energy are also produced from mini-hydro facilities located at Mt Piper near Lithgow, Chichester Dam in the upper Hunter Valley and Dungog wastewater treatment plant, bio-mass co-firing at Vales Point and Wallerawang power stations, and a number of sugar mill cogeneration projects in northern NSW.*

## Proposal Objectives

*The key objectives of the proposal are to:*

- *provide electricity at relatively short notice during periods of peak demand*
- *provide black start capability to improve system security, stabilisation and emergency response*
- *provide electricity using best available technology and low greenhouse gas emissions*
- *establish electricity supply that is market-competitive and consistent with current trends and future energy demands*
- *produce socially acceptable environmental outcomes.*

## Need for the Project

*In 2004, the NSW Government released the Energy Directions Green Paper (Green Paper), which described the current and future trends in energy demand in NSW. The Green Paper clearly states that peak energy demand in NSW is growing at a faster rate than average demand. This diverging trend between average or base load and peak load demand profiles can generally be attributed to the sustained period of strong economic growth and prosperity that has been occurring in Australia over the past 10 to 15 years.*

*This trend has resulted in an increasing demand for electrical services across all sectors of the economy, but in particular the residential sector, where increased affordability and affluence are expected to continue to drive demand for electrical goods such as air conditioning units, which are considered to be one of the major contributors to the increasing peak demand loads being experienced during hot summer days.*

*The Statement of Opportunities (2004) report produced by the National Electricity Market Management Company (NEMMCO) confirms the trends depicted in the Green Paper and forecasts that NSW is likely to experience a summer peak deficit or shortfall below the low reserve condition by 2008/09, unless additional generation capacity is provided to cater for this deficit.*

*Based on the forecasts provided in the Statement of Opportunities (2004) report and Delta Electricity's own analysis of current market conditions and potential future demand scenarios, Delta Electricity has identified the need to provide additional generating capacity to meet the likely short to medium-term shortfall in electrical supply during peak demand periods.*

*Peak-load or peaking plants can supply electricity to the grid at relatively short notice during these relatively short but high intensity peak demand periods. The Green Paper identified the use of these types of plants as one of the most effective short-term measures that could be implemented to avoid supply shortfalls during these peak demand periods, until new base-load generation is able to meet the demand.*

*Delta Electricity commissioned TransGrid to assess the potential system reliability issues during a severe system failure or black out in the NSW electricity network. The assessment determined that there was a lack of adequate network re-start or black-start resources in the northern part of NSW to cater for such an event and concluded that the provision of a quick-start 600 megawatt gas turbine facility with black-start capability at Munmorah Power Station would provide a number of significant system security benefits in the event of a state-wide system shutdown.*

*The proposed gas turbine facility, which is based on open-cycle gas turbine technology, provides the most sound and effective way of addressing the projected peak demand requirements and system security issues.*

## **Proposal Description**

*The proposal entails the construction of an open-cycle gas turbine facility and lateral gas pipeline connecting the gas turbine facility to the Sydney-Newcastle natural gas pipeline. A concept design which specifies how the gas turbine facility and gas pipeline would be constructed and operated has been the basis of the proposal description provided in Chapter 4 of this document.*

*The gas turbine facility would be located within the grounds of the existing Munmorah Power Station and would be operated as a peak-load power station, supplying electricity at short notice during periods of peak power demand.*

*The gas turbine facility would comprise four gas turbines with a combined power output of about 600 megawatts. The gas turbines would be capable of running on natural gas (primary fuel) and distillate fuel (back-up fuel) in the case of an interruption to the natural gas supply. The gas turbine facility would also include other ancillary plant items, such as a black-start generator, distillate fuel and demineralised water storages, a gas compressor and an evaporative inlet air cooling unit.*

*Although the proposed gas turbine facility could operate 24 hours per day and 365 days per year (the assessment of potential environmental impacts has been based on continuous operation), the gas turbine facility is likely to operate for about 500 hours per year, which is based on an approximate estimate of the projected annual cumulative peak power demand period. The gas turbine facility would also be required to respond to electrical system emergency and security situations, which would be in addition to the estimated annual cumulative peak power demand period.*

*Power from the gas turbine facility would enter the grid via a new dedicated bay to be constructed adjacent to the existing switchyard located north-west of the proposed gas turbine facility. The existing overhead high-voltage transmission lines would be used to export the electricity generated by the gas turbine facility to the electricity network.*

*Natural gas would be supplied via a new underground pipeline connecting the facility to the existing Sydney-Newcastle pipeline located approximately seven kilometres west of the facility and adjacent to the F3 Freeway.*

*The proposal also includes the proposed subdivision of the land to be occupied by the gas turbine facility from the existing power station site to create a separate site boundary and facilitate the establishment of a separate Environment Protection Licence for the facility, as it would operate independently from existing coal-fired operations.*

### **Statutory Considerations**

*Planning approval is required for the proposed gas turbine facility under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). In accordance with s75B(1a) of the EP&A Act, the proposed development would be considered a 'Major Infrastructure Project'. The proposed development would also be considered a 'Major Infrastructure Project' under State Environmental Planning Policy (Major Projects) 2005, constituting an electricity-generating facility with a capital investment greater than \$30 million. The Minister for Planning would therefore be the consent authority for this proposal.*

*Under the EP&A Act Model Provisions 1980 (as adopted by the Wyong Shire Council Local Environment Plan), the gas supply pipeline would meet the definition of a 'public utility undertaking' and not require development consent. However, the Department of Planning has advised that the pipeline is considered to be part of the 'Major Project' and should be assessed and included in the planning approval process.*

### **Evaluation of Alternatives to the Proposal**

*The range of alternatives and options that were considered during the development of the proposal presented in this environmental assessment included peak demand supply options, plant location options, gas pipeline route options, gas supply options, gas turbine design options and water supply options. The 'do nothing' option was also considered and assessed.*

*The development of alternative options generally involved a two-stage process. The first stage entailed the examination of a broad range of options during the concept design phase leading to the selection of the preferred set of options. The second stage involved the refinement of the preferred options by examining each option in greater detail to ensure the proposal objectives are achieved.*

*The conclusion of the option selection process resulted in a proposal that satisfies the project needs and objectives.*

*The 'do nothing' option was examined and found to be unacceptable. Without additional peak power generation facilities, electricity shortages and black outs are likely to result when peak electricity demand extends beyond the available supply. Supply-demand projections indicate that this scenario is likely to occur over the next three to five years. For these reasons, the 'do nothing' option was not considered feasible.*

## **Consultation**

*Key community and government stakeholders were consulted during the preparation of this environmental assessment to identify and address the key issues of concern. Community, local environmental groups and government agencies were contacted following selection of the preferred technology and pipeline routes options, and during the environmental assessment process.*

*The approach to consultation taken in the preparation of this environmental assessment has focused on the ongoing liaison and involvement of the community via a series of consultative forums, newsletters and direct discussions and a formal statutory consultation process with relevant government authorities. This consultative process will continue during the project approval phase.*

## **Key Environmental Issues**

### **Air Quality**

*Potential impacts during construction relate to the generation of dust from excavation works and emissions from construction of the proposal. These impacts are minor and of short duration, and would be addressed through mitigation measures listed in this document and implemented through the construction environmental management plan for the project.*

*An assessment of the potential air quality impacts of the proposed gas turbine facility on the local airshed was undertaken using the CALPUFF computer-based dispersion model under a range of operating scenarios and meteorological conditions. The modelling assumed that the gas turbine facility would be operating continuously over the modelled year, which for the purpose of this assessment was selected to be 2003.*

*The modelled results indicate that the proposed gas turbine facility would have a minor effect on the existing ambient air quality levels and would readily comply with the relevant air quality goals set by the Department of Environment and Conservation. A range of mitigation measures have been proposed to ensure the modelled predictions and conclusions of this assessment remain valid during the commissioning and operational phases of the project.*

*An assessment of the potential impact of the proposal on photochemical smog levels in the Sydney basin and surrounding areas has been investigated using the prognostic meteorological and chemical transport model TAPM-CTM. The assessment concluded that emissions from the proposed gas turbine facility would result in no exceedances of air quality goals and standards and no adverse effects on concentrations of nitrogen dioxide and ozone in the Sydney basin region.*

*Although the proposal would be a net generator of greenhouse gas emissions, the proposed gas turbine facility would emit greenhouse gases at an average rate of 0.58 tCO<sub>2</sub>-e per megawatt hour, which is significantly lower than the NSW pool coefficient set for 2005 (0.913 tCO<sub>2</sub>-e per megawatt*

hour) and 2006 (0.928 tCO<sub>2</sub>-e per megawatt hour), and the greenhouse intensity factor for the National Electricity Market, which averages just above 1 tCO<sub>2</sub>-e per megawatt hour.

*The proposal has the potential to have a positive impact, although limited due to low capacity factor, on the NSW pool coefficient. This is considered to have important State-wide significance, as it would help to reduce greenhouse gas emissions per unit of output in NSW and achieve the ultimate goal of 7.27 tCO<sub>2</sub>-e per capita by the year 2012 set by the NSW Greenhouse Gas Benchmark Scheme.*

## **Noise**

*Construction noise associated with the proposed gas turbine facility is predicted to meet the criteria at all residences. However during construction of the proposed pipeline some exceedances may occur when activities are within 100 to 150 metres from any residence. The severity of this noise is expected to be relatively minor and any short-term impacts would be adequately mitigated by the implementation of the proposed mitigation measures.*

*Although the gas turbine facility would generally operate intermittently at any time during a given year, particularly during hot summer days, it is possible that the facility would be required to operate during the night. Under neutral weather conditions the predicted noise levels would meet the criteria at all residences. Under typical adverse conditions, however, a marginal exceedance of 1 dBA was predicted at one residential area to the east of the site.*

*A detailed assessment of more extreme adverse (worse-case) meteorological conditions indicates exceedances of up to 4 dBA are possible at a number of residential areas, located to the east and south-east from the proposed gas turbine facility. Although the concurrence of night time operation and adverse weather is likely to be rare, historical meteorological data was used to assess the proportion of time the criteria may be exceeded. When allowing for the generally intermittent operation of the gas turbine facility, the exceedance would occur less than 5 per cent of the time. On this basis, negligible impacts would be expected.*

*Based on the results of the noise impact assessment, and with consideration of the proposed mitigation measures to be implemented during the construction and operation of the proposal, it is concluded that the proposal is unlikely to result in adverse noise impacts.*

## **Soils and Geology**

*The construction of the proposal may disturb potential acid sulphate soils and be subject to reactive subsurface conditions. Excavations during earthworks may also expose highly erosive soils which may lead to sediment runoff and siltation of nearby water bodies. The proposed pipeline and inlet facility would also be located on a potential mine subsidence zone.*

*It is proposed that an acid sulfate soil management plan would be developed and implemented during the construction phase of the proposal to identify and manage these types of soils in an appropriate manner. An erosion and sediment control plan would also be developed by the construction contractor to manage potential soil erosion during and for a period after construction has been completed. Consultation with and approval from the Mine Subsidence Board would be sought during the detailed design phase to ensure the final design has the necessary design contingencies and tolerances to minimise the risks associated with mine subsidence.*

*It is concluded that by adopting these mitigation measures there would be no significant adverse impacts on the local geology and soils due to the construction of the proposal.*

## **Surface Water**

*The construction of the proposed gas turbine facility and pipeline has the potential to expose and mobilise sediment, fuels, chemicals and other materials to local drainage lines. This would result in potential impacts on the water quality in the local drainage systems.*

*The majority of major excavation works are to occur within the grounds of the Munmorah Power Station which contains a well established and robust surface water management system that would effectively capture and treat any runoff that leaves the construction site. Earthworks during the construction of the pipeline would predominantly be surrounded by vegetated terrain and away from watercourses or drainage lines, except where the particular pipeline needs to cross a creek or drainage line. At these locations, appropriate construction techniques and mitigation measures would be implemented to ensure minimal impacts are noted.*

*The construction contractor would be required to prepare and implement detailed erosion and sediment control and acid sulfate soils management plans to ensure adequate controls and procedures are implemented at all construction sites. Spills and leaks would also be controlled by routine inspections, and the storage, transport and handling of dangerous goods and hazardous materials would be conducted in accordance with relevant standards and guidelines.*

*The potential impacts associated with the operation of the proposed gas turbine facility are considered low, as the entire stormwater system within the facility would be fitted with a sluice valve which would effectively isolate the facility's stormwater system from the rest of the power station during a major distillate spill or in the event that a fire at the facility generates large volumes of potentially contaminated fire water.*

*The distillate storage tank and tanker unloading facilities would also be bunded to meet the requirements of Australian Standard AS1940 and isolated from the rest of the site. Any spills that may be caused during the unloading of distillate or due to a failure in the diesel transfer system would be contained within the confines of the bunded area and collected at a later date for appropriate disposal.*

*The potential surface water impacts that are generally associated with the handling and disposal of contaminated water are considered low due to the relatively small volumes of wastewater that would be generated during the compressor cleaning process. There would also be no storage or handling activities conducted at the facility, as all wastewater would be passed through an on-site oil/water separator and transferred directly to the existing wastewater treatment plant at Munmorah Power Station for treatment and disposal to the ash dam. Small quantities of waste oils would be stored in drums and collected by a licensed liquid waste contractor for appropriate off-site disposal.*

## **Terrestrial Ecology**

*A detailed assessment of the potential impacts of the proposal on threatened species has been undertaken. The assessment included site surveys, database searches, habitat assessments and impact assessments for species which were recorded in the assessment area and may be affected by the Proposal.*

*Impacts to the ecological integrity of the assessment area have been largely avoided through the pipeline route selection process and proposed mitigation measures. Impact assessments were completed for terrestrial species and communities with the potential to be affected by the proposal.*

*The assessments concluded that the proposal is unlikely to have a significant impact on the threatened species, populations or communities found in the assessment area.*

### **Aboriginal Heritage**

*The Aboriginal heritage assessment comprised a desk-top assessment, consultation with the Department of Environment and Conservation and the local Aboriginal community, and field surveys of the proposed pipeline route and gas turbine facility location. The database search and field surveys identified two previously listed Aboriginal sites within the assessment area. Three artefact scatter sites were also identified and recorded during the survey.*

*The construction of the proposal would involve numerous excavations and earthworks and has the potential to interact with both listed and previously undiscovered items of Aboriginal heritage value. It is possible that a number of permits would be required prior to the commencement of these types of work.*

*The assessment concluded that the proposed implementation of a sub-surface testing/monitoring program for areas of known or suspected medium to high Aboriginal archaeological potential and sensitivity, together with ongoing monitoring of all excavations, would prevent, avoid, and/or minimise the extent and severity of any potential impacts on the cultural heritage values of the assessment area.*

### **Visual**

*The height of the proposed stacks (35 metres) is similar to a number of the existing buildings at Munmorah Power Station, and well below the existing main stacks (150 m). The stacks would therefore not protrude above the existing buildings and would not be as visually dominant as the two existing stacks.*

*The main visual impact would be a small increase in the overall visual bulk of the existing power station when viewed from surrounding residential areas, Lake Munmorah and other lakeside reserves and land uses. The closest views would be from about 1 kilometre away, at a small number of houses to the north-west, and a short section of the Pacific Highway at Doyalson. Visual changes associated with the proposal from these locations would be barely noticeable. While the stacks and buildings may be intermittently visible at greater distances, it is not likely to have a significant impact on the visual landscape.*

### **Land Use**

*Potential impacts on surrounding land uses are noise, air quality, visual amenity and traffic. These are described in detail in this document and have been assessed as being minor. Disturbance to landowners during pipeline construction may include dust and noise and would be mitigated through a construction environmental management plan.*

*The proposed gas turbine facility and inlet facility would be located within the existing Munmorah Power Station and would be consistent with the zoning and land uses of the station.*

*The proposed inlet facility would be located near the Sydney-Newcastle pipeline and F3 Freeway on land that would either be purchased or leased for the purpose of the facility. The final footprint and location of the facility would be determined during the detailed design phase and would be such that it minimises the impact on the land owner to utilise surrounding land.*

*The proposed establishment of a 20 meter wide gas pipeline easement within the southern edge of the existing electricity transmission easement would prevent further severance of land and would not have an adverse effect on the development potential of adjoining lands. Although restrictions to access and development within the pipeline easement would be applicable, these would be consistent with the restrictions currently imposed by TransGrid along the entire length of the electricity transmission easement.*

*Based on the results of the preliminary hazard analysis, the potential requirement of a 30 metre buffer distance from the pipeline centreline toward the north and south of the pipeline may apply to potential future sensitive land use developments along the entire length of the proposed pipeline route. This is not considered a major constraint to development, as this buffer area would readily be contained within the area covered by the existing electricity transmission easement to the north and along public road reserves to the south for most of its length.*

*It is important to note that less sensitive developments, such as commercial and industrial developments, would not be constrained by this separation distance and could theoretically be constructed at the edge of the proposed pipeline easement. In this case, potential development restrictions imposed by TransGrid would need to be considered and addressed by any such developments.*

### **Socio-Economic**

*The construction of the proposal has the potential to increase economic activity in the vicinity of Munmorah Power Station. Indicative average workforce numbers at any time during construction would be in the order of 50 employees for the construction of the proposed gas turbine facility and 40 to 50 employees for the construction of the gas pipelines and ancillary infrastructure.*

*It is expected that economic benefits would flow throughout the local communities during the two year construction period. It is anticipated that a number of local businesses would also benefit from increased expenditure associated with construction activities. It is, therefore, anticipated that the overall economic effect of the construction phase would be beneficial to the local area.*

*Currently, and in the absence of adequate peak supply, the costs of electricity rise significantly during peak periods. The proposal would likely have the effect of stabilising electricity pricing in the near future. It is also probable that the increased electricity supply capacity would facilitate state-wide economic growth through the improved reliability and reduced cost of supply. The 'black start' capability of the proposal would further enhance the security of the NSW electricity network in the event of major failure or disaster, as the proposed gas turbine facility would be able to maintain electricity supply which would be of direct benefit to emergency and/or critical users such as hospitals and rail operators and large industrial facilities located in the central and northern regions of NSW.*

### **Hazard and Risk**

*The proposal was assessed under State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33), as the nature of the activities associated with the proposed gas turbine facility and pipeline are generally considered to be 'potentially hazardous'. Consequently, a preliminary hazard analysis was prepared for the proposal in accordance with the Department of Planning's Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis (HIPAP 6).*



*Based on the results of the preliminary hazard assessment, the proposal meets the land use safety criteria defined by Department of Planning for all land uses on the basis that the proposed mitigation measures are implemented during the construction, commissioning and operation phases of the proposal.*

### **Traffic and Transport**

*It is expected that potential traffic impacts would primarily occur during the construction phase of the proposal. Construction employee traffic and truck movements for plant and materials deliveries would be accommodated on the current roads network. Some disruptions are anticipated however, including temporary road closures and diversions, construction vehicles parked along the road and temporary road width restrictions.*

*A traffic management plan would be prepared and incorporated into the construction environmental management plan to address potential traffic impacts during construction. Operational traffic levels would comprise employee vehicles, and the occasional fuel transport and materials deliveries. These traffic volumes would remain low and similar to existing levels.*

### **Cumulative Effects**

*Potential cumulative impacts in relation to air quality have been assessed through regional airshed modelling. The modelling indicates that emissions from the gas turbine would lead to only minor increases in nitrogen dioxide (up to 0.2 parts per billion) and negligible changes in ozone ground level concentrations within the regional airshed.*

*Potential cumulative impacts in relation to noise have been assessed for nearby receptors as the noise assessment incorporates existing background noise levels determined by ambient monitoring. The noise assessment predicts a marginal exceedance of 1 dBA at one residential area to the east under adverse meteorological conditions and up to 4 dBA at residential areas to the east and south east of the facility under extreme adverse meteorological conditions. A statistical analysis of these potential exceedances, however, demonstrated that the likely impacts associated with these exceedances were low and within acceptable limits.*

### **Justification**

*The proposal is justified based on the above considerations, as it clearly represents the best solution in terms of environmental, social and economic outcomes and meets the requirements and expectations of Delta Electricity, the NSW government and the community to deliver a reliable and effective electricity generation proposal which can adequately meet the peak energy demands that are expected to occur in NSW over the next three to five year period.*

## INTRODUCTION AND BACKGROUND

1

# **1. Introduction and background**

## **1.1 Project overview**

### **1.1.1 Background**

Parsons Brinckerhoff Australia Pty Ltd (PB) has prepared this environmental assessment on behalf of Delta Electricity for the proposed development of a gas turbine power generation facility at the existing Munmorah Power Station on the New South Wales Central Coast (see Figure 1.1).

This environmental assessment has been prepared to determine the potential impacts of constructing and operating the proposed gas turbine facility and to identify the measures which would be implemented to mitigate and manage these impacts.

### **1.1.2 The proponent**

Delta Electricity is a state-owned corporation which produces around 12 per cent of the electricity consumed by customers in South Australia, Queensland, New South Wales, Victoria and the Australian Capital Territory. Most of Delta Electricity's electricity generation occurs at four NSW power stations: Mt Piper and Wallerawang near Lithgow, and Vales Point and Munmorah on the Central Coast. These stations have a combined generating capacity of 4,240 megawatts. Small amounts of renewable energy are produced from mini-hydro facilities located at Mt Piper near Lithgow, Chichester Dam in the upper Hunter Valley and Dungog wastewater treatment plant, bio-mass co-firing at Vales Point and Wallerawang power stations, and a number of sugar mill cogeneration projects in northern NSW.

### **1.1.3 Project location**

The proposal is located within the existing Munmorah Power Station site off Scenic Drive, Munmorah (see Figure 1.1).

The power station site comprising nearly 940 hectares consists of a number of different land use parcels. Much of the site is undeveloped and comprises 'buffer' lands separating the surrounding residential areas from the power station. As well as the power station itself, there are two collieries on the site: the Munmorah Colliery to the west of the power station (in the process of being decommissioned); and the Endeavour Colliery to the south-east (decommissioned).

The residential suburbs of Halekulani, Budgewoi, Buff Point, San Remo, Blue Haven, Doyalson and Lake Munmorah surround the site.



Figure 1.1 Location of site

#### **1.1.4 Overview of the proposal**

The proposal entails the construction of an open-cycle gas turbine facility and lateral gas pipeline connecting the gas turbine facility to the Sydney-Newcastle natural gas pipeline.

A concept design which specifies how the gas turbine facility and gas pipeline would be constructed and operated has been prepared for this proposal and has been the basis of the proposal description provided in Chapter 4 of this document.

The gas turbine facility would be located within the grounds of the existing Munmorah Power Station and would be operated as a peak-load power station, supplying electricity at short notice during periods of peak power demand.

The gas turbine facility would comprise four gas turbines with a combined power output of about 600 megawatts. The gas turbines would be capable of running on natural gas (primary fuel) and distillate fuel (back-up fuel) in the case of an interruption to the natural gas supply. The gas turbine facility would also include other ancillary plant items, such as a black-start generator, distillate fuel and demineralised water storages, a gas compressor and an evaporative inlet air cooling unit.

Although the proposed gas turbine facility could operate 24 hours per day and 365 days per year (the assessment of potential environmental impacts has been based on continuous operation), the gas turbine facility is likely to operate for about 500 hours per year, which is based on an approximate estimate of the projected cumulative annual peak power demand period. The gas turbine facility would also be required to respond to electrical system emergency and security situations, which would be in addition to the estimated annual cumulative peak power demand period.

Power from the gas turbine facility would enter the grid via a new dedicated bay to be constructed adjacent to the existing switchyard located north-west of the proposed gas turbine facility site. The existing overhead high-voltage transmission lines would be used to export the electricity generated by the gas turbine facility to the electricity network.

Natural gas would be supplied via a new underground pipeline connecting the facility to the existing Sydney-Newcastle pipeline located approximately seven kilometres west of the facility and adjacent to the F3 Freeway.

The proposal also includes the proposed subdivision of the land to be occupied by the gas turbine facility from the existing power station site to create a separate site boundary and facilitate the establishment of a separate Environment Protection Licence for the facility, as it would operate independently from the existing coal-fired operations.

#### **1.1.5 Proposal objectives**

The key objectives of the proposal are to:

- provide electricity at relatively short notice during periods of peak demand

- provide black start capability to improve system security, stabilisation and emergency response
- provide electricity using best available technology and low greenhouse gas emissions
- establish electricity supply that is market-competitive and consistent with current trends and future energy demands
- produce socially acceptable environmental outcomes.

## **1.2 Planning approvals**

### **1.2.1 Development approval**

Planning approval is required for the proposed gas turbine facility under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). In accordance with s75B(1a) of the EP&A Act, the proposed development would be considered a 'Major Infrastructure Project'. The proposed development would also be considered a 'Major Infrastructure Project' under State Environmental Planning Policy (Major Projects) 2005, constituting an electricity-generating facility with a capital investment greater than \$30 million. The Minister for Planning would therefore be the consent authority for this proposal.

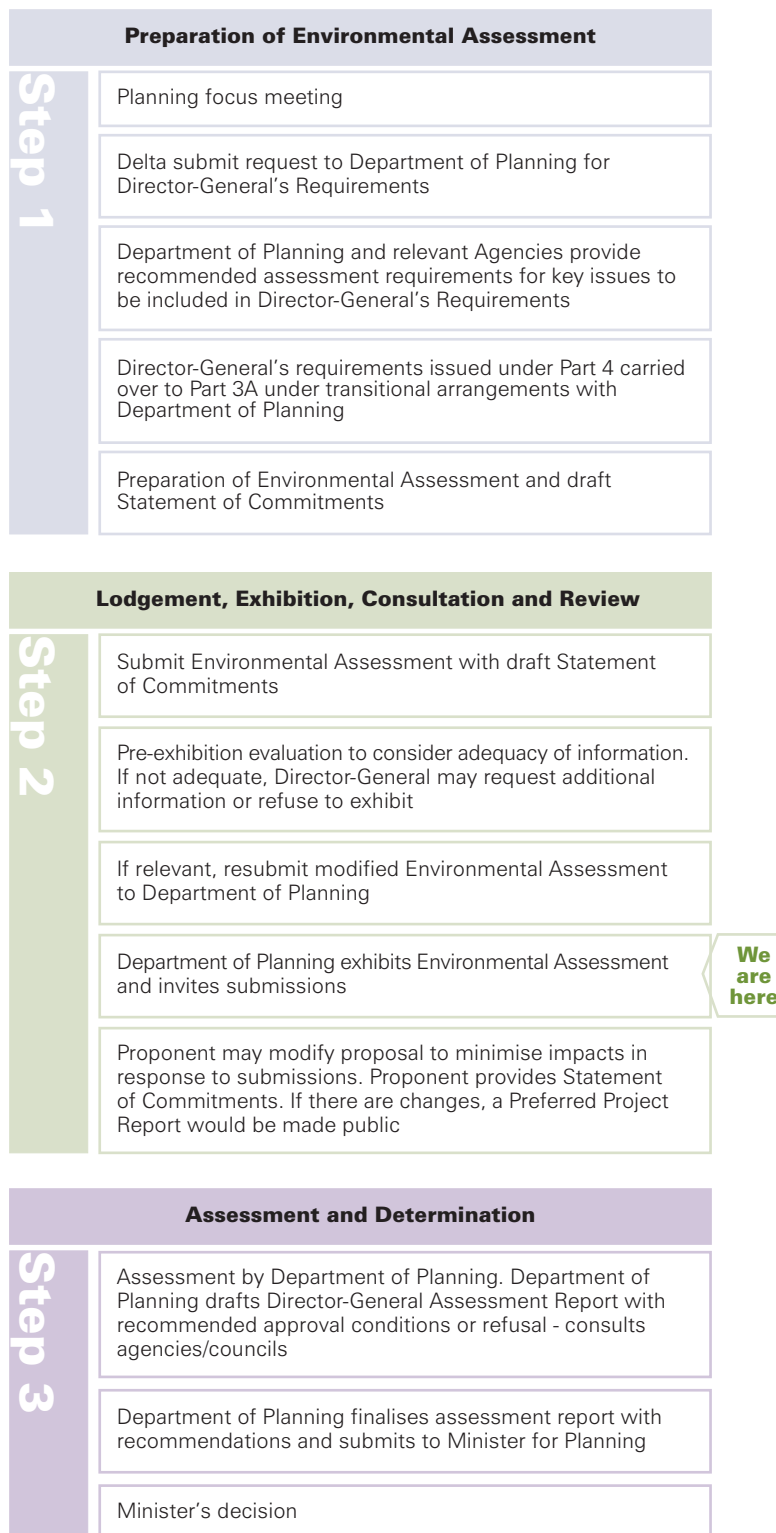
Under the EP&A Act Model Provisions 1980 (as adopted by the Wyong Shire Council Local Environment Plan), the gas supply pipeline would meet the definition of a 'public utility undertaking' and not require development consent. However, the Department of Planning has advised that the pipeline is considered to be part of the 'Major Project' and should be assessed and included in the planning approval process. The planning approval process for the proposal is summarised in Figure 1.2.

### **1.2.2 Other approvals**

It is likely that additional approvals are required for the proposal under the following Acts:

- *Protection of the Environment Operations Act 1997*
- *Dangerous Goods Act 1974*
- *Mine Subsidence Act 1961*
- *Threatened Species Conservation Act 1995*
- *Roads Act 1993*
- *Crown Lands Act 1989*
- *Civil Aviation Safety Regulation 1998*
- *Electricity Supply Act 1995.*

Chapter 5 provides further details on other approvals that would apply to this proposal.



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Figure 1.2 Planning Approval Process

## **1.3 Approach to the environmental assessment**

### **1.3.1 Purpose**

The NSW environmental assessment process requires that all relevant environmental matters be examined and that all relevant community and government stakeholders be involved. The process enables stakeholders to convey their views on the proposal to the proponent and the NSW State Government.

The environmental assessment quantifies and assesses potential impacts, and documents the likely benefits of the proposal. It also outlines the types of environmental management measures proposed to be implemented to reduce potential adverse impacts. The environmental assessment also provides baseline data for use in future monitoring of the proposal's environmental performance.

### **1.3.2 Environmental assessment requirements**

The Director-General of the Department of Planning has defined the key issues that must be considered in this environmental assessment (see Appendix A); these issues form the basis of the assessment of the proposal. The *Draft Environmental Impact Assessment Guidelines for Network Electricity Systems and Related Facilities* has also been referred to in the preparation of this document.

Issues and concerns raised by representatives from relevant local and state government agencies during the Planning Focus Meeting have also been considered. Chapter 6 summarises these and the issues raised by the community.

Whilst specific issues have been raised by government and community stakeholders, the EP&A Act and its Regulation place a broader obligation on the proponent to consider all potential environmental issues in relation to the proposal.

### **1.3.3 Structure of the environmental assessment**

This environmental assessment addresses the requirements of all relevant legislation and guidelines and has been prepared to assist the community and decision makers to understand the proposal, its likely environmental consequences and the mitigation measures to be taken to minimise or avoid any effects on the environment.

It is not practical or possible to consider every environmental issue in the same level of detail. Therefore, with guidance provided by the Director-General, the outcomes of the community consultation process and the results of detailed studies, the environmental assessment identifies and analyses the key issues. This analysis is supported by the five technical papers included in Volume 2 of this assessment.

The environmental assessment is presented in two volumes:

- Volume 1 — Environmental Assessment
- Volume 2 — Technical Papers.



Volume 1 consists of following key chapters:

- *Chapter 1: Introduction and background* provides an overview of the proposal, its objectives and the determination process. It also summarises the consultation process.
- *Chapter 2: The need for the proposal* outlines why the proposal is required, describes the growing demand for additional electricity generation during peak demand periods, and outlines relevant government programs and initiatives.
- *Chapter 3: Alternatives to the proposal* describes the various options assessed before the preferred option was identified; it includes the site selection process, the gas pipeline route selection process and the consequences of not proceeding with the proposal.
- *Chapter 4: Project description* provides a detailed description of the proposal design, its operation and maintenance requirements, an overview of the construction program and descriptions of other infrastructure requirements.
- *Chapter 5: Legislative context* describes the legislative requirements that need to be satisfied for the project to proceed. These include state and federal legislation, policies, guidelines and codes of practice, and international conventions.
- *Chapter 6: Stakeholder consultation* describes the methods used to involve government and community stakeholders in the consultation processes.
- *Chapters 7 to 18* discuss the impacts of the proposal on the environment with respect to landscape and visual impacts, noise and vibration, flora and fauna, heritage, traffic and transport, land use and property impacts, soils and water, air quality, hazards and risks, waste, social and economic impacts, and cumulative impacts. Each chapter includes a description of the mitigation measures proposed to address the impacts discussed.
- *Chapter 19: Justification and conclusion* summarises the justification of the proposal in relation to its objectives and the principles of ecologically sustainable development.

The following documents are included in the Appendices:

- *Appendix A — Adopted Director-General's requirements*
- *Appendix B — Government Authority Correspondence*
- *Appendix C — Consultation Materials*
- *Appendix D — Statement of Commitments*
- *Appendix E — Declaration*
- *Appendix F — Proposed Sub-division Plans*

Volume 2 includes reports from the detailed technical investigations carried out to support the findings of the environmental assessment. These are:

- *Technical Paper No.1      Flora and Fauna Assessment*
- *Technical Paper No.2      Heritage Assessment*
- *Technical Paper No.3      Noise and Vibration Assessment*
- *Technical Paper No.4      Air Quality Impact Assessment*
- *Technical Paper No 5      Photochemical Smog Assessment*
- *Technical Paper No 6      Preliminary Hazard Analysis*

## THE NEED FOR THE PROPOSAL

2

## **2. The need for the proposal**

### **2.1 Overview**

In 2004, the NSW Government released the *Energy Directions Green Paper* (Green Paper), which described the current and future trends in energy demand in NSW. The Green Paper aimed at generating discussion and debate within relevant NSW Government agencies, energy generators, retailers and distributors, and the general community about potential energy supply strategies.

These energy supply strategies could then be implemented to address the pending shortfalls in reserve energy capacity that are predicted to occur in the not too distant future unless new generation and demand management strategies are developed and implemented, particularly during peak demand periods (NSW Government 2004).

The Green Paper clearly states that peak energy demand in NSW is growing at a faster rate than average demand. This diverging trend between average or base load and peak load demand profiles can generally be attributed to the sustained period of strong economic growth and prosperity that has been occurring in Australia over the past 10 to 15 years.

This trend has resulted in an increasing demand for electrical services across all sectors of the economy, but in particular the residential sector, where increased affordability and affluence are expected to continue to drive demand for electrical goods such as air conditioning units, which are considered to be one of the major contributors to the increasing peak demand loads being experienced during hot summer days.

The Statement of Opportunities (2004) report produced by the National Electricity Market Management Company (NEMMCO) confirms the trends depicted in the Green Paper and forecasts that NSW is likely to experience a summer peak deficit or shortfall below the low reserve condition by 2008/09, unless additional generation capacity is provided to cater for this deficit.

Based on the forecasts provided in the Statement of Opportunities (2004) report and Delta Electricity's own analysis of current market conditions and potential future demand scenarios, Delta Electricity has identified the need to provide additional generating capacity to meet the likely short to medium-term shortfall in electrical supply during peak demand periods.

Peak-load or peaking plants can supply electricity to the grid at relatively short notice during these relatively short but high intensity peak demand periods. The Green Paper identified the use of these types of plants as one of the most effective short-term measures that could be implemented to avoid supply shortfalls during these peak demand periods, until new base-load generation is able to meet the demand. The gas turbine facility being proposed by Delta Electricity has been based on an open-cycle gas turbine configuration, which is well suited for peak-load operation.

As part of Delta Electricity's periodic review of its black start system procedures, TransGrid was asked to assess the potential system reliability issues during a severe system failure or black out in the NSW electricity network. The assessment determined that there was a lack of adequate network re-start or black-start resources in the northern part of NSW to cater for such an event and concluded that the provision of a quick start 600 megawatt gas turbine facility with black-start capability at Munmorah Power Station would provide a number of significant system security benefits in the event of a state-wide system shutdown. See Section 2.4 for further details.

The following sections outline the strategic context within which the proposed gas turbine facility is set and discusses the following key factors:

- current and future demand for electricity and the increasing demand for power during peak demand periods
- the need to improve the security of supply and black start resources, particularly to the northern sector of the NSW electricity network
- the economic and environmental benefits that would be gained by the establishment of the proposal.

## **2.2 Peak energy demand**

NSW contributes approximately 43 per cent of the installed generating capacity of the National Electricity Market, which pools electricity output on Australia's eastern seaboard to meet the market's demand for electricity. There are two types of electricity demand: average demand and peak demand.

Average demand is a measure of the demand that occurs most of the time and is normally referred to as base-load demand. Peak demand generally occurs when a large number of users demand energy at the same time, such as the widespread use of air conditioning or heating units by homes during times of very high or very low temperatures. These peak demand periods tend to be of relatively short duration (3 to 4 hours) but with significantly higher loads than average demand periods.

Current trends indicate that peak demand is growing at a much faster rate than average demand. In NSW, summer peak demand has grown by 3.8 per cent or 500 megawatts per year for the last five years, whereas average demand growth has been significantly slower at around 2.8 per cent. This demand growth is predicted to continue for a number of years and is expected to reach a critical point in 2008/09, when demand forecasts indicate that there is likely to be a shortfall in reserve capacity of approximately 157 megawatts during the summer (NEMMCO 2004).

A failure to address the predicted supply-demand shortfall would have significant social and economic impacts to the NSW economy due to the increased unreliability of the electricity supply network during these critical periods resulting in more frequent black outs and increased costs to electricity retailers and consumers.

## 2.3 Options for meeting peak demand

The Green Paper and the Statement of Opportunities (2004) report indicate that current base load power generation capacity is likely to be sufficient until 2012. However, if the level of peak demand continues to increase at the current rate (currently at about 4 % per year), then there are likely to be electricity supply constraints in NSW during peak demand periods by 2008/09. The consequences of such a growth in energy demand include reduced residual network capacity and system stability and rising costs for the network operators as well as the consumers.

The Green Paper highlights the increasing rate of peak demand growth and the negative cost implications for NSW consumers, the need for alternative types of power generation facilities to address the trend towards ‘peakier’ demand in an economical way and the need for additional supply capacity to meet peak demand.

Traditionally, NSW has been able to meet its peak energy supply requirements by relying on the spare capacity afforded by the Snowy River hydro-electric scheme and a number of old coal-fired plants that no longer operate economically for base-load operation. However, access to this spare capacity is progressively being eroded by the increasing peak demand in NSW and in Victoria, where similar and perhaps more severe peak demand trends and potential shortfalls in available reserve capacity are being projected to occur as early as 2006/07 (NEMMCO 2004).

Although a range of demand management measures are currently being developed and implemented by most energy retailers and network operators to reduce the severity of these peak demand periods, the demand reductions that are expected as a result of these measures have already been considered in the demand projections produced by NEMMCO and are not expected to avoid or delay the shortfalls in supply capacity that are being projected to occur in 2008/09.

At present, the key technology options that can provide the scale of generation capacity (greater than 150 megawatts) that is required to meet the projected peak power demands at relatively short notice and without relying on any excess capacity from existing base-load coal-fired power stations are hydro-electric and open-cycle gas turbine power stations (NSW Government 2004).

Developing additional hydro-electric capacity is not a viable option due to the lack of suitable generation sites and the likely need to build new dams to store the water necessary for hydro-electric generation. Implementing this technology to the scale that is necessary to meet future peak demands would require a high capital investment and long lead-time to construct, would generally be limited in scale and subject to the availability of water, and result in environmental impacts that would be unacceptable to the community and environmental regulators (NSW Government 2004).

Open-cycle gas turbine power stations are also effective in meeting the future peak demand requirements but can be built for a relatively low capital cost in a relatively short time frame and provide significant environmental benefits over other forms of power generation, including hydro-electric and coal-fired power stations, due to the relatively small footprint of the station and the significant reduction in greenhouse gas emissions per unit of power output.

Section 3.1 provides further details on the relative advantages of open-cycle gas turbine power stations over other forms of power generation to meet peak demand requirements.

## **2.4 System reliability and re-start capacity**

In accordance with Delta Electricity's periodic review of its black start system procedures, Delta Electricity asked TransGrid to undertake a comprehensive review of the current power system restart capability in NSW and assess the likely improvements that would be provided to the current system by the addition of the proposed 600 megawatt Munmorah gas turbine facility.

The review determined that there are insufficient black start sources in northern NSW, which include the major load centres of the Newcastle region, and the northern power stations at Liddell, Bayswater, Eraring, Vales Point and Munmorah. At least two thermal units are required to be in service to provide secure voltage control in the northern part of the NSW network. The existing black start source located in the Hunter Valley has the capability to re-start only one thermal unit at either Liddell or Bayswater Power Stations. However, in order to re-start the second thermal unit, supply from Snowy Queensland would be required but may not be available for at least several hours depending on the severity or extent of the black out.

The assessment concluded that the establishment of a quick start 600 megawatt gas turbine power station with black start capability at Munmorah Power Station would allow the early restoration of the northern area loads following a state-wide shutdown.

A concise summary of the relative re-start benefits that would be provided by the proposed Munmorah gas turbine facility is provided below:

- advancement of re-start sequence for Vales Point and Munmorah Power Stations (if previously in service) by about two hours
- early re-instatement of 600 megawatts of load in the Newcastle area, including power station auxiliaries
- advancement in the restoration of 3,900 megawatts of load in NSW (typically representative of 40 to 45 % of NSW demand) by about two hours
- possible advanced re-instatement of high priority loads in the Newcastle area (i.e. smelters) by four hours.

## **2.5 Delta Electricity's proposal**

Delta Electricity's proposal to address the projected peak power demands described in the Statement of Opportunities (2004) report entails the construction of a dual-fuel open-cycle gas turbine facility, which would use natural gas as the primary fuel, and distillate fuel as a back-up emergency fuel in the event of an interruption to the natural gas supply.

Open-cycle gas turbine power stations are well suited to supply energy during peak demand periods due to their ability to generate electricity at full load within 30 minutes of starting. They also provide significantly better environmental performance than other more conventional forms of power generation (i.e. 0.7 tCO<sub>2</sub>-e/MWh compared to 0.8 tCO<sub>2</sub>-e/MWh for the new best practice coal-fired power stations). The proposal also addresses the system reliability issues raised by TransGrid in their assessment of system re-start capabilities discussed in Section 2.4 by providing the proposed facility with black start capability, which means that it would be able to start at short notice during a complete system black out.

The proposed open-cycle gas turbine power station would be designed in a manner that can be converted to operate in combined-cycle mode in the future, which would deliver higher generating capacity and improved greenhouse gas emission and fuel efficiency. Although Delta Electricity is seeking development approval for the open-cycle gas turbine described in this document, Delta Electricity would consider converting the open-cycle gas turbine facility to a combined-cycle power station if gas supply costs and market conditions were favourable. This conversion would be subject to additional environmental assessments and approvals from the relevant planning authorities.

## **2.6 Project benefits**

Implementing the proposal would benefit the local and regional community on a number of levels. Potential benefits include:

- increased reliability of supply during peak demand periods
- improved security of electricity supply during system emergency or black outs
- improved environmental outcomes due to lower greenhouse gas emissions per unit of output compared to conventional power generation technologies
- provides social and economic benefits associated with the ability of the NSW supply network to meet peak energy demands

## **2.7 Conclusion**

With continued economic growth, the demand for electricity continues to rise. Australia's socioeconomic profile coupled with an increasing desire for 'climate control' is contributing to the increased purchase and use of domestic heating and cooling systems. This demand for heating and cooling is creating an increasingly significant peak demand on the electricity supply network that cannot be efficiently or economically met by conventional coal-fired power generation or base-load supply in the short to medium term. Although demand management is an important and essential component of the strategy to manage this peak demand, the provision of additional generation capacity is necessary to cater for this peak demand and maintain system reliability within acceptable levels. The proposed gas turbine facility provides a sound and economical solution that meets this demand with minimal environmental impact.



## ALTERNATIVES TO THE PROPOSAL

3

## **3. Alternatives to the proposal**

The range of alternatives and options that were considered during the development of the proposal presented in this environmental assessment included peak demand supply options, plant location options, gas pipeline route options, gas supply options, gas turbine design options and water supply options. The option of 'do nothing' was also considered and assessed.

### **3.1 Alternative peak demand supply options**

A number of options were considered during the selection of the proposed peak demand supply option. These included demand management, renewable energy (including hydro-electric and wind power generation), and coal-fired and gas-fired generation options. A brief discussion of each option is provided in the following sections.

#### **3.1.1 Demand management**

An alternative to increasing peak electricity supply is reducing the demand for energy during peak periods, known as electricity demand management. Electricity demand management includes a wide range of options, including:

- actions taken on the customer side of the electricity meter (the 'demand side'), such as energy efficiency measures and power factor correction
- arrangements for reducing loads on request, such as interruptibility and direct load control
- fuel switching, such as a change from electricity to gas for water heating
- distributed generation, such as the use of stand-by generators in office buildings or solar panels on rooftops.

The NSW Government acknowledged in its Green Paper that "Gains from demand management can postpone the need for new generation by several years. However, it is simply not feasible to meet all future demand through energy efficiency and demand management", (NSW Government 2004). This statement is further supported by the NSW Statement of System Opportunities (NSW Government 2001) and has already been accounted for in the supply-demand scenarios provided in the Statement of Opportunities produced by the National Electricity Market Management Company (2004).

The NSW Government acknowledges that the long-term potential for curbing the rate of demand growth is significant, and it is important that government policies and strategies continue to pursue this potential. However, as the demand for energy increases with an increase in the NSW population, the implementation of demand management strategies can only defer the need for new supply infrastructure; they cannot address NSW's medium- to long-term energy demands.

### **3.1.2 Hydro-electric power stations**

A number of hydro-electric power stations currently operate in NSW, providing peak-load supply to the National Electricity Market. These plants include a 240 megawatt facility at Shoalhaven which is owned and operated by Eraring Energy and mini hydro-electric plants at Mount Piper (350 kilowatts), Hunter Water's Chichester Dam (130 kilowatts) and at Dungog wastewater treatment plant (130 kilowatts), which are owned and operated by Delta Electricity. Delta Electricity has further plans to build up to two additional mini hydro-electric systems of similar capacity in the near future.

Based on the currently installed capacity, substantial new hydro-electric capacity would be required to meet NSW's projected peak demand. As discussed in Chapter 2, there are no viable hydro-electric generation sites within NSW or other parts of Australia that could provide sufficient capacity to meet the projected peak demand requirements. The long lead-time required and potential environmental implications associated with such a proposal also make this technology difficult to implement. For these reasons, hydro-electric generation is not considered a viable option to meet NSW's short to medium term peak energy demand requirements.

### **3.1.3 Wind turbines**

Delta Electricity has obtained planning approval for a 62 megawatt wind farm at Gunning in NSW and is currently investigating the feasibility of other wind turbine sites in NSW. While wind energy provides an effective renewable energy supply with zero emissions, the inherent limitations in finding suitable wind generation sites and the intermittent nature of wind generated electricity, makes it unsuitable for on-demand peak supply. The absence of viable technologies to store excess generation capacity produced by the wind turbines also makes this type of technology unsuitable for meeting the rapid increase in supply needed during peak demand periods.

### **3.1.4 Coal-fired power stations**

Coal-fired power stations are widely used to provide base-load generation capacity. They are not, however, generally suitable for peak load generation, particularly as they require around 2 days to start up. Coal-fired plants also require substantially more capital expenditure, infrastructure and environmental controls.

Although existing coal-fired power stations could possibly be used to service peak demand periods, the use of this type of technology in this way would result in significantly higher greenhouse gas emissions per unit of output, when compared to other forms of power generation. This is not desirable and would be inconsistent with the objectives of the proposal as stated in Chapter 1.

### **3.1.5 Open-cycle gas turbine power stations**

Open-cycle gas turbine power stations comprise one or more gas turbine units and generally represent the best practice technology option for peak load operations due to their relatively small footprint, quick start-up times (less than 30 minutes) and improved environmental performance over coal-fired power stations. These types of stations

generally use natural gas as the primary fuel and liquid fuel, such as distillate, as a back-up fuel in the event of an interruption to the natural gas supply.

A further benefit of an open-cycle power station is that in the event that intermediate or base-load operation becomes commercially viable in the future, the station can be easily converted to a combined-cycle gas turbine power station to increase the generating capacity, as well as the thermal efficiency and environmental performance of the station.

### **3.1.6 Combined-cycle gas turbine power stations**

Combined-cycle gas turbine power stations comprise one or more gas turbine units coupled to a heat-recovery steam generator and steam turbine system. They provide the added benefits of increased capacity for intermediate or base-load production, improved thermal efficiency and environmental performance over an equivalent open-cycle gas turbine power station.

Combined-cycle gas turbine facilities are better suited for intermediate and base-load generation, since they require longer start-up and shut-down periods (about 2 hours) than open-cycle gas turbine facilities (less than 30 minutes). The longer start-up and shut-down periods mean combined-cycle gas turbine power stations are unable to provide the quick response necessary to generate electricity during peak demand periods.

### **3.1.7 Selected option**

The proposed open-cycle gas turbine facility has been selected as it represents the most appropriate and economical solution to meet the projected short to medium-term peak load demands described in Chapter 2. The proposal also has the necessary flexibility to be converted to a combined-cycle gas turbine facility in the future if intermediate or base-load generation becomes commercially viable at this site.

## **3.2 Plant location options**

### **3.2.1 Overview**

Delta Electricity has undertaken a comprehensive review of possible peak power generation sites that would satisfy the following key criteria:

- proximity to a suitable and reliable gas supply
- proximity to existing electrical transmission infrastructure
- access to easements for gas pipeline and electricity transmission, if required
- minimise environmental impacts during construction and operation.

A number of gas-fired generation proposals have already been identified and approvals obtained by others. Examples include at Tallawarra, Tomago and, more recently, Wagga Wagga. These proposals were based on developing primarily green field sites. Delta

Electricity is also in the process of investigating a number of alternative green field sites at Nowra and Goulburn in NSW.

Delta Electricity identified that there would be an advantage in establishing the proposed gas turbine facility within an existing power generation (brown field) site, as it would streamline the feasibility assessment and concept development process, minimise financial outlay and risk, and provide a better environmental outcome — as the construction of significant ancillary items, such as roads and electrical transmission infrastructure, would not be required. Two power station sites were selected through this process: Vales Point and Munmorah Power Stations.

### **3.2.2 Site selection process**

Delta Electricity conducted a broad comparative assessment to determine which of the two Central Coast power station sites (Munmorah or Vales Point) would be better suited to incorporate the proposed gas turbine facility. The assessment considered physical space constraints, potential interruptibility to existing operations, existing network connection constraints and benefits, accessibility to existing gas supplies and potential environmental concerns, such as visual amenity and noise emissions.

The assessment concluded that Munmorah Power Station was the best location for the proposed gas turbine facility due to the following key factors:

- *Distance to sensitive receptors* — The facility would be located further away from sensitive residential receptors, thus minimising potential visual and noise amenity issues.
- *Proximity to gas and electrical transmission infrastructure* — The facility would be located relatively close to the Sydney–Newcastle natural gas main and existing high-voltage electrical transmission infrastructure (although there is only a minor difference between the two power station sites).
- *Physical space* — The facility would require a footprint of approximately 120 metres by 260 metres. Compared to the Vales Point Power Station site, the Munmorah Power Station site has ample physical space for the facility and ancillary infrastructure for use during its construction and operation.
- *Use of existing infrastructure* — Significant cost savings would be achieved through the use of existing roads and staff amenities. Connection to the TransGrid switchyard would be possible without major disruption to existing operations. This would not be the case at the Vales Point Power Station site. In addition, there would be no need to move or relocate infrastructure at the Munmorah site to accommodate the new facility, whereas at Vales Point Power Station, some infrastructure would need to be relocated to accommodate the new facility.

### 3.2.3 Site options within the Munmorah Power Station site

A comprehensive investigation of potential sites within the Munmorah Power Station site was undertaken to select the preferred site. Each site option was subjected to a qualitative assessment of potential engineering, environmental and social constraints, and associated benefits.

The following plant location options were investigated during the concept development phase:

- Site A: Existing helipad site
- Site B: Behind the disused steam turbine machine hall
- Site C: Inside the disused steam turbine machine hall
- Site D: East of the existing TransGrid switchyard
- Site E: East of the existing power station.

Figure 3.1 identifies the location of the site options considered.

An options assessment matrix was developed to assess each site option. The helipad site (Site A) was selected as the reference site against which all other plant location options were compared in terms of relative impacts and/or benefits. The issues considered in the assessment are listed in Table 3.1.

**Table 3.1 Site selection issues considered**

Constraint	Issues considered
Engineering	<ul style="list-style-type: none"> <li>▪ Physical space (support proposed facility with some room for future expansion)</li> <li>▪ Civil works (demolition, underground services, geotechnical constraints)</li> <li>▪ Gas supply (construction/operational risks with pipeline location, cost implications)</li> <li>▪ Electrical transmission infrastructure (difficulty in accessing, cost implications)</li> <li>▪ Ancillary services (access to distillate fuel, demineralised water etc., cost implications)</li> </ul>
Environmental /Social	<ul style="list-style-type: none"> <li>▪ Flora and fauna (impact of required clearing, proximity to sensitive areas)</li> <li>▪ Environmental risks (flooding)</li> <li>▪ Noise (distance to nearest sensitive receptor, likely requirement for controls)</li> <li>▪ Visual (visibility, likely requirements for mitigation)</li> </ul>



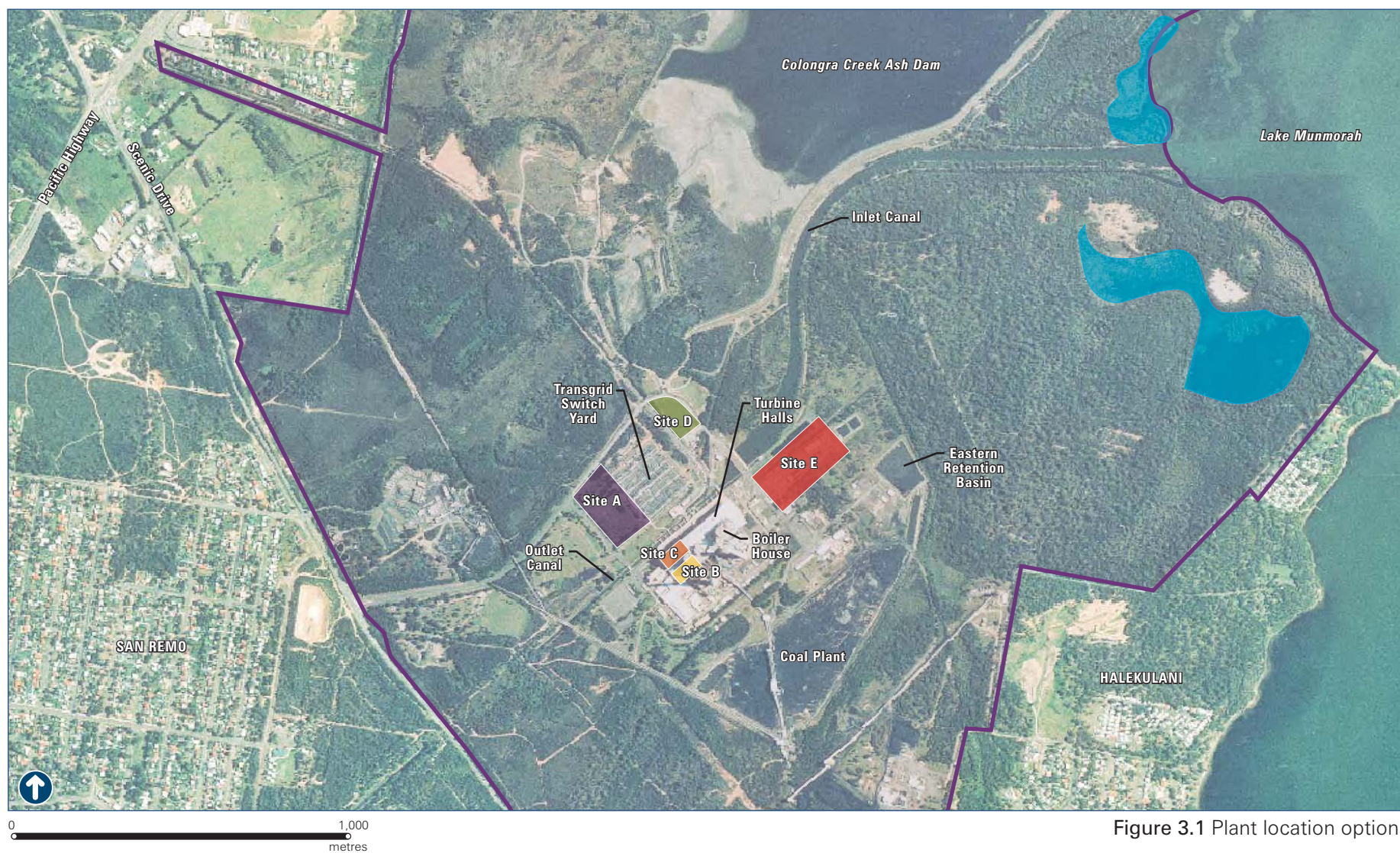


Figure 3.1 Plant location options

 Land owned by Delta Electricity

Although the estimated capital costs to place the proposed gas turbine facility at Site E were higher than for Site A, Site E was identified as having fewer potential environmental impacts and constraints on existing operations at Munmorah Power Station. Site E was selected as the preferred site option for the following key reasons:

- Compared to the other options, the gas turbine facility would be located at a greater distance from the nearest residential centres, thereby minimising potential environmental/social impacts particularly associated with noise and visual amenity
- Site E would pose significantly less constraints than the other options on the operation of Munmorah Power Station, as it would be located at the rear of the power station site and would not interfere with current access routes to the existing power station.

### **3.3 Pipeline route options**

Development of a gas turbine facility at Munmorah would require construction of an underground pipeline connecting the existing Sydney–Newcastle gas pipeline to the proposed gas turbine facility. Pipeline route options were developed during the concept development phase considering particular engineering, environmental and social constraints.

Some of the key factors considered in the route selection process were the need to:

- minimise the number of bends and length of the pipeline
- maximise the distance between the pipeline and residential or other sensitive receptors
- minimise potential land use impacts by maximising the use of existing easements and minimising the number of properties affected by the pipeline.

Based on the above considerations, two pipeline route options were considered in detail, as follows (see Figure 3.2):

- *Option A* — This option ran due west from the proposed facility location, following an existing electricity transmission easement owned by TransGrid before connecting with the Sydney–Newcastle gas pipeline near the F3 Freeway

*Option B* — This option ran due north-west, following an existing pipeline corridor as far as the Pacific Highway, before following Wyee Road and Bushells Ridge Road adjacent to the road easement. It then connected with the Sydney–Newcastle gas pipeline near the F3 Freeway.





Figure 3.2 Pipeline Route Options

- Pipeline route option A
- Pipeline route option B
- - - Sydney to Newcastle gas pipeline
- + + + Rail line
- Land owned by Delta Electricity
- Swamp
- SEPP14 - Wetland Area

### **3.3.1 Route option assessment**

Preliminary field and desk-top assessments were undertaken to identify the specific constraints of each route option. The preferred pipeline route option was determined based on the following assessment criteria:

- potential environmental impacts (in particular the size and significance of any vegetation clearing)
- geotechnical constraints (mine subsidence, acid sulfate soils, slips)
- land use constraints (easement acquisition, severance, infrastructure, maximal use of Delta Electricity land, access)
- statutory planning issues (zoning, legislation)
- preliminary capital and operating costs.

### **3.3.2 Selected option**

The selected pipeline route option was Option A, as it would not cause the severance or sterilisation of the subject land as utility services would be maintained within an existing and established 60-metre wide corridor.

Although Option B would primarily be located along existing road reserves, concerns were raised by Wyong Shire Council and the NSW Roads and Traffic Authority regarding likely land use conflicts due to the potential expansion of these roads in the future. Placing the pipeline outside these road reserves may have an adverse impact on current and future land uses in the area, and may not be feasible.

Option A was also considered an acceptable adjoining land use to the potential future industrial/commercial land uses in the area identified during the consultation phase of the project. The pipeline would not prevent the development of these lands for such a purpose. Access and development restrictions in particular areas along the pipeline route would apply, but this is not considered to be a major land use constraint. See Chapter 15 for further details. The same outcomes may not apply to Option B, as the predominant land uses near the route for this option are currently residential and are likely to remain so in the future.

Option A was considered to have fewer potential environmental impacts during the construction phase. It would be a more practical and cost-effective option in terms of minimising the number of bends in the pipeline and the pipeline length compared to Option B.

Option A would represent less of an operating risk than Option B, as the underground pipeline would be contained within an existing and established electricity transmission easement, in which access is currently controlled by TransGrid. Also, the types of activities permissible within the corridor are strictly limited and monitored by TransGrid. For Option B, although permits from relevant authorities would be required to carry out certain activities such as excavation works, access to these reserves would not be

monitored or supervised on a regular basis. Consequently, the operating risks associated with Option B were considered to be significantly higher than for Option A.

Option A is also located further away from residences and other sensitive receptors than Option B. While a hazard assessment undertaken for the proposal (see Chapter 16) indicated a low risk to adjoining properties, a due diligence approach generally encourages maximising buffer separation distances between potentially hazardous facilities or processes and sensitive receptors.

## **3.4 Gas supply options**

The pipeline that would supply natural gas to the proposed gas turbine facility would comprise a lateral extension of the existing Sydney-Newcastle pipeline. The Sydney-Newcastle pipeline can receive gas from three possible sources:

- the Moomba area of South Australia (via the Moomba-Sydney pipeline)
- Victorian gas reservoirs in Bass Strait (Gippsland) and the Otway Basin (south-western Victoria) connected to the Moomba-Wilton pipeline via the Albury-Wagga Wagga pipeline
- Bass Strait and the East Gippsland gas reserves, and the Otway Basin reservoirs (Eastern Gas Pipeline).

Although the existing gas transportation infrastructure is capable of delivering significantly greater gas volumes than required by the proposed gas turbine facility, modelling conducted during the concept development phase showed that the operating pressure in the Sydney-Newcastle pipeline needs to be raised to meet the demands of the proposed gas turbine facility without affecting the stability of the gas supply network downstream from the proposed off-take point.

### **3.4.1 Potential gas supply options**

Three gas supply options were considered during the concept development phase:

- *Option 1* — Increase the pressure in the Moomba-Horsley Park-Hexham pipelines when required by the proposed gas turbine facility, by using existing compression on the Moomba-Wilton pipeline
- *Option 2* — Increase the pressure in the Sydney-Newcastle pipeline by installing additional compression at Horsley Park
- *Option 3* — Install a dedicated compressor station and large diameter lateral pipeline connecting the Sydney-Newcastle pipeline to the gas turbine facility site.

Option 1 would require an increase in the pressure of the Moomba-Wilton pipeline by raising the output of the existing compressor stations. A detailed analysis of the future operating profile and discussions with pipeline operators would be needed to determine the extent to which this would meet the peaking plant's needs.

A significant problem with Option 1 would be the time lag between a demand imposed by the gas turbine facility and the arrival of additional gas transported from Moomba (or from Longford, in the case of the Eastern Gas Pipeline). To avoid this lag, pipeline

compression would need to be increased several days in advance of the peaking plant demand, which may not be practical as the demand peaks are generally not easy to predict and the gas supply would need to be available instantaneously.

Option 2 would require the installation of a new compressor station at Horsley Park to increase pressure in the Sydney–Newcastle pipeline to meet demands from the peaking plant without affecting other potential gas users downstream from the off-take point.

Although this option would potentially improve the overall reliability of the gas supply system in the Sydney–Newcastle corridor, the capital investment required to implement such an option could have an adverse effect on the financial viability of the proposed gas turbine facility. This is unless other commercial arrangements between the pipeline operator (which in the case of the Sydney–Newcastle pipeline would be AGL Gas Networks), and other potential gas users downstream from the proposed off-take point, were established to share the costs of providing additional compression capacity in the system.

Discussions about alternate gas supply arrangements are likely to be held between AGL Gas Networks and other potential gas consumers in the Central Coast and Hunter regions, which may affect the financial viability of this option in the future.

Option 3 would entail the installation of a small compressor station at the off-take point from the Sydney–Newcastle pipeline. The compressor station would withdraw gas from the Sydney–Newcastle pipeline at a constant flow rate and transfer the gas to an oversized lateral pipeline that connects to the gas turbine facility.

A significant benefit of Option 3 is that, because gas demand on the Sydney–Newcastle pipeline would essentially be steady, the operation of the proposal would not affect the ability of the Sydney–Newcastle pipeline to deliver gas to other gas users that may be downstream from the proposed off-take point. The capital costs associated with the installation of the compressor station and ancillary equipment would also be significantly less than for Option 2.

### **3.4.2 Selected option**

The proposed gas supply option was based on Option 3, as this option would provide Delta Electricity with the assurance that the gas turbine facility would be able to operate using natural gas without significantly affecting the performance of the existing gas supply network to supply gas to existing (and future) customers located downstream of the proposed off-take point. The gas supply would also be available instantaneously.

## **3.5 Gas turbine options**

During the concept development phase, the following gas turbine options were considered:

- rigid frame (E-class and F-class) and aero-derivative gas turbines
- single-fuel versus dual-fuel gas turbine facility.

These options are outlined in the following sections.



### **3.5.1 Gas turbine type**

For an open-cycle gas turbine peaking plant, selecting the right gas turbine is critical due to the large stresses experienced by the plant resulting from the intermittent operation and relatively high number of starts and stops compared to a base-load plant. Two types of gas turbines were considered during the concept development phase — heavy frame (E-class and F-class) gas turbines and aero-derivative gas turbines.

F-class gas turbines are generally employed for base-load applications, as the maintenance costs per unit of power generated for these types of gas turbines can increase considerably when they operate in a peak load application, making them less economically and technically suitable for peaking plant operations. In addition, the black-start power requirements for an F-class gas turbine are significantly higher than for an E-class gas turbine.

Aero-derivative gas turbines are generally derived from aircraft applications. In simple terms they comprise an aircraft engine adapted for use in small-scale power generation applications. The power generation capacity of these units is typically in the order of 10 to 50 megawatts; although, larger units (up to 100 megawatts) are currently being developed. Although these larger turbine units present some advantages over the more traditional heavy frame units (as they can start-up and reach full load in a shorter time-frame and operate at higher efficiencies), they are currently not commercially viable when compared to the alternate technology options being considered.

### **3.5.2 Single-fuel versus dual-fuel gas turbine facility**

The choice between a single-fuel or dual-fuel gas turbine facility is primarily a commercial decision that could not be determined at the concept development phase, as it would depend on the gas supply options available to the plant and the commercial constraints and/or energy supply arrangements of the project.

Although single-fuel gas turbines are generally less costly to build and maintain, the concept design was based on dual-fuel gas turbine generators. This approach was taken to address potential uncertainties in the gas supply options available at the time of writing, and the requirement to ensure the proposed facility continues to operate should the natural gas supply be interrupted. The process of switching the facility's firing mode from gas to distillate would be automatic, which is particularly important during system emergency conditions, where the ability to provide electrical power to the grid is critical.

### **3.5.3 Selected option**

Although all three gas turbine options would be able to meet the requirements necessary for peaking plant operation, E-class gas turbines have been selected for assessment in this proposal, as they currently represent the most commercially viable and proven technology suited for a peaking plant operation. These turbines are also capable of firing on gas and distillate fuel, providing the necessary flexibility and security of supply when electricity demand is at a peak or critical point, and the gas supply is unavailable to meet demand.

## 3.6 Water supply options

Water conservation and consumption are important issues that are particularly relevant to the Central Coast region, where drought conditions have led to water restrictions for domestic and commercial uses such as nurseries, bowling greens, golf courses and sporting facilities.

Although these restrictions have not been applied to industrial water users, local water authorities and the community expect industrial users to develop and implement water conservation measures to minimise pressure on potable water supplies.

### 3.6.1 Existing operations regional water consumption

Delta Electricity's Central Coast operations use potable water for a range of applications. The major consumption of potable water at the Vales Point and Munmorah Power Stations is for supply to the steam boilers. Water consumption to supply boiler water can vary from year to year depending on the level of electricity generation from the power stations. Other uses of water by Delta Electricity include fire services, bearing cooling water for large pumps, boiler wash-down and domestic services. The historical range of total potable water consumption at the Vales Point and Munmorah Power Stations is 800 to 1300 megalitres per annum.

### 3.6.2 Proposed gas facility water requirements

The proposed gas turbine facility would require water, predominately for nitrogen oxide (NOx) suppression during periods when the facility is required to operate using distillate fuel. Demineralised water would also be required for air intake evaporative cooling and compressor washing. The breakdown of water consumption for the proposed gas turbine facility is provided in Table 3.2.

**Table 3.2 Estimated demineralised water consumption rates**

Purpose	Units	Natural gas firing mode	Distillate fuel <sup>3</sup> firing mode
Water injection for NOx suppression during distillate-fuel firing mode	Megalitres per year	0	12.0
Evaporative cooling	Megalitres per year	5.6 <sup>(1)</sup> 6.5 <sup>(2)</sup>	0.98
Gas compressor washing	Megalitres per year	0.012	0.012
Total	Megalitres per year	5.61 <sup>(1)</sup> 6.51 <sup>(2)</sup>	12.99

Notes	1	Calculated based on gas turbine facility operating 425 hours per year using natural gas
	2	Calculated based on gas turbine facility operating 500 hours per year using natural gas
	3	Calculated based on gas turbine facility operating 75 hours per year using distillate fuel

The demineralised water consumption rates provided in Table 3.2 clearly indicate that water injection is the largest consumer of demineralised water and would only occur when the gas supply is unavailable. Based on a nominal operating profile of 500 hours per year, of which up to 75 hours could be operated using distillate fuel, the annual

demineralised water consumption rate would be approximately 18.6 megalitres. It is expected, however, that the annual demineralised water consumption rate would be less than 6.51 megalitres per year, which corresponds to about 500 hours of operation using natural gas only.

### **3.6.3 Water conservation initiatives by Delta Electricity**

Delta Electricity is continually reviewing its water consumption at the Vales Point and Munmorah Power Stations and is currently developing water conservation and re-use strategies to minimise potable water consumption rates. These strategies would be extended to cover the proposed gas turbine facility to avoid an increase in water use by Delta Electricity due to this proposal.

### **3.6.4 Preliminary investigation of water supply options**

Alternative water supply options for the proposed gas turbine facility were investigated to determine the feasibility of using water sourced from other than potable water supplies.

Options investigated comprised:

- reclaimed effluent from a proposed effluent polishing plant at the Mannering Park Sewage Treatment Plant
- brackish water from the Munmorah ash dam and Lake Munmorah
- condensate produced by an electric chiller unit
- reclaimed effluent from a recently commissioned effluent polishing plant at the Toukley Sewage Treatment Plant.

These options were assessed in terms of cost of construction and operation, operability, consistency with local water conservation initiatives and improved environmental outcomes.

### **3.6.5 Selected option**

The assessment concluded that the proposed gas turbine facility should be supplied via the current water supply network at Munmorah Power Station. Delta Electricity is committed, however, to undertaking water conservation initiatives to off-set the demand of the facility.

Although the options described in Section 3.6.4 would provide sufficient water with no net increases in potable water consumption as a result of this proposal, the benefit would be outweighed by the significant energy and resource costs incurred to supply reclaimed water to the facility. These costs would be particularly significant because the facility would generally be operated infrequently (about 500 hours per year).

Delta Electricity intends to continue to develop water usage reduction strategies and policies and would review these and other options for future implementation of water conservation measures at both the Vales Point and Munmorah Power Stations.

### **3.7 The ‘Do nothing’ option**

The NSW Government has demonstrated a need for additional electricity generation capacity to meet peak demand requirements in NSW in the short to medium term. The Statement of Opportunities produced by the National Electricity Market Management Company in 2004 provides further evidence that additional generation peak load generation capacity will be required by the year 2008/09, based on current and potential future energy demand trends.

As one of the three existing major base-load power generators in NSW, Delta Electricity is ideally placed to develop a facility to assist the NSW Government in meeting the peak demand needs described in Chapter 2. Without additional peak power generation facilities, electricity shortages are likely to result when peak electricity demand exceeds available supply reserves as a result of the estimated supply-demand projections that are likely to occur over the next three to five years. For these reasons, the ‘do nothing’ option was not considered feasible.

### **3.8 Conclusion**

An open-cycle gas-fired power station within the grounds of the existing Munmorah Power Station site has been selected as the preferred option to supply electricity to the National Electricity Market during peak demand conditions. This technology offers considerable advantages over other forms of power generation in terms of operational flexibility, reliability and the ability to start-up at short notice. Using natural gas as the primary fuel source would also minimise greenhouse gas emissions and have other environmental advantages compared with other alternatives. The proposed site would also satisfy the need for proximity to a natural gas supply and electrical transmission infrastructure. A gas-fired power station at the proposed site was, therefore, selected as the most suitable option to meet NSW’s future peak electricity demands while minimising potential environmental impacts associated with increased generation capacity.



## PROJECT DESCRIPTION

4

## **4. Project description**

### **4.1 Overview**

The proposal would be located within the grounds of the existing Munmorah Power Station. It would operate as a peaking plant, supplying electricity at short notice during periods of peak demand or system emergency situations. The gas turbine facility would operate independently of the existing coal-fired power station at the site.

Power from the proposal would enter the electricity grid via a new connection bay adjacent to the existing TransGrid switchyard located within the Munmorah Power Station site. The existing overhead transmission powerlines currently used by the existing power station would be used to transport the additional power generated by the proposed gas turbine facility.

The proposed gas turbine facility would comprise four gas turbines with a combined output of about 600 megawatts. The gas turbines would be capable of running on natural gas (as the primary fuel) and distillate fuel (as the back-up fuel for use during a major interruption to the natural gas supply). The facility includes other ancillary plant items, such as distillate fuel and demineralised water storages, a gas booster compressor and an evaporative-inlet air-cooling unit. The facility would also have ‘black start’ capability; that is, it would be possible to start the gas turbines during a black out.

Natural gas would be supplied to the proposal via a new underground pipeline connecting the facility to the existing Sydney–Newcastle pipeline, which is located approximately seven kilometres west of the facility, and adjacent to the F3 Freeway.

Figures 4.1 to 4.4 provide an overview of the proposed gas turbine facility (the proposal).

A detailed design phase would proceed if the proposal is approved and may result in minor changes to the concept design being proposed. The detailed design phase would consider environmental issues, mitigating measures and any other matters raised during the project approval process. This may result in further adjustments to the design as a condition of the proposal proceeding and in consequence the final proposal description could vary slightly from the description provided in this chapter.

As part of the proposal, Delta Electricity proposes to subdivide the land to be occupied by the gas turbine facility from the existing power station site to create a separate site boundary and facilitate the establishment of a separate Environment Protection Licence for the facility, as it would operate independently from existing operations. The proposed subdivision is illustrated in Appendix F.



Figure 4.1 Proposal Overview

- |                                  |                                 |                               |
|----------------------------------|---------------------------------|-------------------------------|
| Proposed pipeline route          | Land owned by Delta Electricity | Proposed delivery facility    |
| Sydney to Newcastle gas pipeline | Swamp                           | Proposed inlet facility       |
| Rail line                        | SEPP14 - Wetland Area           | Proposed gas turbine facility |





Figure 4.2 Proposed pipeline route ( western section)

- Proposed pipeline route
- Sydney to Newcastle gas pipeline
- + + + Rail line
- Proposed inlet facility
- Swamp





Figure 4.3 Proposed pipeline route ( central section)

- Proposed pipeline route
- Rail line
- Land owned by Delta Electricity
- Swamp



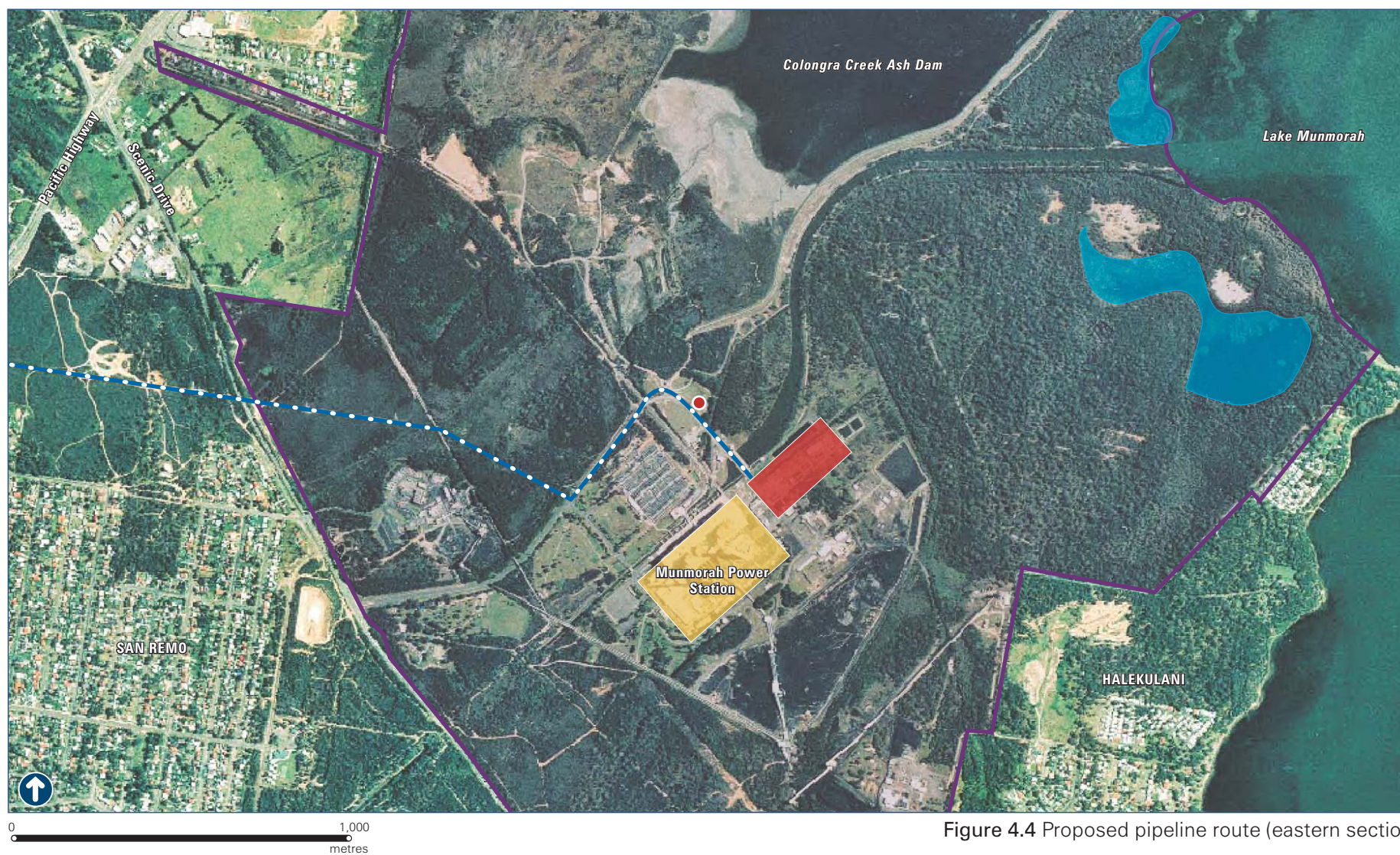


Figure 4.4 Proposed pipeline route (eastern section)

- Proposed pipeline route
- Land owned by Delta Electricity
- SEPP14 - Wetland Area
- Proposed delivery facility
- Gas turbine facility

## **4.2 Site context**

The proposal would be located at a site formerly used as a workers' compound during construction of the existing coal-fired power station (Units 3 and 4) within the Munmorah Power Station site. The Munmorah Power Station site comprises nearly 940 hectares, and is made up of a number of different land parcels. Much of the site is undeveloped and comprises 'buffer' lands separating the surrounding residential areas from the power station. TransGrid owns the existing electricity switchyard on the site under a separate land parcel.

The proposed underground pipeline would extend seven kilometres from the site across private properties, public roads and the Main Northern Railway line as far as the Sydney–Newcastle pipeline. The proposed pipeline route would follow an existing high-voltage electricity transmission easement currently managed by TransGrid. The proposed inlet facility would be located within private property, adjacent to the pipeline and at least 200 metres from the F3 Freeway.

## **4.3 Proposal description**

### **4.3.1 Natural gas pipeline**

The proposed gas supply concept comprises the installation of a large-diameter lateral pipeline connecting the Sydney–Newcastle pipeline to the proposed gas turbine facility. The lateral pipeline would also be equipped with a small compressor station near the off-take point to pack the pipeline with gas for use by the proposed gas turbine facility.

The proposed gas supply concept comprises the following key components:

- an underground pipeline connecting the Sydney–Newcastle pipeline to the proposed gas turbine facility
- an inlet facility near the off-take point to the Sydney–Newcastle pipeline, including a small compressor station, flow control, metering and safety systems
- a delivery facility within the Munmorah Power Station site, containing pressure regulation and safety systems to deliver natural gas to the proposed gas turbine facility.

A brief description of each of the above components is provided in the subsequent sections. Figures 4.2, 4.3 and 4.4 provide details of the key components of the proposed gas supply concept.

### **4.3.2 Pipeline design and installation details**

The pipeline would be designed to comply with requirements of Australian Standard *AS 2885 Pipelines: Gas and liquid petroleum and Dangerous Goods (General) Regulation 2005* and would be required to operate at a high pressure to meet the gas

supply requirements of the proposed gas turbine facility. A summary of the key design parameters of the proposed lateral pipeline is provided in Table 4.1. The proposed pipeline installation details are shown in Table 4.2.

**Table 4.1 Proposed pipeline design parameters**

Parameter	Value
Maximum operating pressure	12.0 megapascals
Minimum operating pressure	2.5 megapascals
Length	7,700 metres (nominal)
Outside diameter	1,066 millimetres
Wall thickness	19 millimetres
Coating	Either fusion-bonded epoxy or tri-laminate
Compressor size (inlet facility)	1–2 megawatts (to be confirmed during detailed design)
Compressor type and driver	Reciprocating with electric motor

**Table 4.2 Proposed pipeline installation details**

Parameter	Value
Burial depth to top of pipe	900 millimetres (minimum for land) 2,000 millimetres (minimum for railway and road crossings) 1,200 millimetres (power station site)
Corrosion protection	Impressed current, auto-potential controlled cathodic protection system
Induced AC control	Pipeline electrically isolated from upstream and downstream facilities; earthing systems installed to provide personnel protection in accordance with AS 4853 in locations where the pipeline is installed near high-voltage powerlines
Corrosion monitoring	Test points installed at nominal intervals of 2 kilometres
Marker signs	In accordance with AS 2885.1 and warning marker tape installed over pipeline

### 4.3.3 Specific pipeline design requirements

#### ***Railway crossing***

The proposed pipeline would cross the Main Northern Railway at one location, as shown in Figure 4.2. The railway crossing would be designed in accordance with Australian Standard *AS 2885.1 Pipelines: Gas and liquid petroleum* and *AS 4799 Installation of underground utility services and pipelines within railway boundaries* and the American Petroleum Institute's Standard *API RP 1102 Steel pipelines crossing railroads and highways*. The final crossing design would be developed in consultation with and approved by RailCorp.



### ***Pacific Highway crossing***

The proposed pipeline would cross the Old Pacific Highway on a long sweeping left-hand bend, as shown in Figure 4.3. The crossing would be designed in accordance with the requirements of Australian Standard *AS 2885.1 Pipelines: Gas and liquid petroleum* and the American Petroleum Institute's Standard *API RP 1102 Steel pipelines crossing railroads and highways*. The final crossing design would be developed in consultation with and approved by the NSW Roads and Traffic Authority.

### ***Mine subsidence considerations***

The proposed pipeline would pass over areas subject to potential mine subsidence. The proposed pipeline and ancillary infrastructure (such as the inlet facility) would be designed to meet the requirements of the NSW Mine Subsidence Board. The Mine Subsidence Board would only issue approval for the detailed design once it has determined that the pipeline and inlet facility would be capable of withstanding subsidence, strains and tilts associated with nearby planned, active and/or previous mining operations.

### ***Electricity transmission easement***

The proposed pipeline would be installed along the southern edge of the existing 330 kilovolt electricity transmission easement, which is currently under the control and supervision of TransGrid. The easement is 60 metres wide and centred on the centre phase conductor of the transmission line.

The electrical transmission infrastructure along the corridor has the potential to affect the pipeline's safe operation and maintenance, due to potential induction effects (steady state), and power line fault conditions. Hence, appropriate pipeline cathodic protection and alternate current mitigation measures would be provided to ensure the safety of the pipeline and maintenance staff. A detailed assessment would be conducted during the detailed design phase to ensure compliance with Australian Standard *AS 4853 Electrical hazards on metallic pipelines* and confirm whether the installation of discrete and/or continuous earthing points along the pipeline is necessary.

## **4.3.4 Pipeline Inlet facility**

The pipeline inlet facility would be designed for remote, unattended operation. It would be constructed near the Sydney–Newcastle pipeline on land that would either be purchased or leased for this purpose.

The inlet facility would contain the following equipment:

- a compressor station comprising a reciprocating gas compressor and associated electric motor drive inside a fully enclosed and ventilated building, equipped with noise suppression insulation to minimise noise emission levels
- gas filtration, custody transfer metering and flow control
- compressed-gas cooling
- process control and communications equipment.

### ***Gas compressor station***

The compression ratio required to deliver gas into the proposed lateral pipeline would vary throughout the daily operating cycle from zero to around four. At the commencement of a pressurisation cycle, gas pressure from the Sydney–Newcastle pipeline would be higher than that in the lateral pipeline. During this time, flow would be controlled by a flow control valve upstream of the compressor unit. In principle, flow would continue to be controlled by a combination of inlet flow control, compressor speed control and, possibly, recycle flow control. At the end of the pressurisation cycle, the compressor would stop, and the lateral pipeline would remain at the nominal maximum operating pressure until the proposed gas turbine facility commences operation.

The reciprocating compressor would be driven by an electric motor. An electric motor drive is preferred because of its relative simplicity, size and low noise emissions. The final location of the compressor would be finalised during detailed design and may be amended to accommodate possible pipeline upgrades or future land use constraints imposed by the current or future land owner.

### ***Gas cooling***

Gas compression, particularly at relatively high compression ratios, raises gas temperature. The gas must be cooled prior to delivery into the lateral pipeline. The proposal assumes that an air-cooled heat exchanger would be installed at the compressor discharge point. A design and efficiency refinement may be required to incorporate water cooling, possibly using stored rainwater from an on-site dam or tank to assist in the cooling cycle during the final compression stage, when the compression ratio and temperature rise would be at their highest. This option would be investigated during the detailed design phase.

### ***Facility layout***

The inlet facility would require a land area of approximately 50 metres by 50 metres. The facility would be security fenced to prevent unauthorised access. The compressor building would also be located at least 30 metres from the nearest transmission tower to satisfy TransGrid requirements.

The facility would comprise the compressor building, which would house the compressor station and other ancillary items. The building is likely to be 20 metres by 20 metres and eight metres tall. It would be constructed of precast concrete walls or blocks to provide sufficient mass to mitigate potential noise emissions from the compressor.

### ***Safety features***

The compressor building would be ventilated to control heat build-up. A number of critical safety devices would also be incorporated into the design of the building to ensure the facility's safe operation. The proposed safety devices include:

- building ventilation fans
- gas detectors installed at the ventilation outlet

- ultra-violet and infra-red detectors installed inside the building
- actuated isolation and vent valves installed outside the building
- a process control and monitoring system.

The building's ventilation fans would be started if gas is detected at 25 per cent of the lower explosion limit. The proposed gas turbine facility would be tripped (shutdown) and vented (gas released) if gas is detected at 50 per cent of the lower explosion limit. Any ultra-violet and infra-red signals would also trip the gas turbine and inlet facilities.

The compressor station would be monitored and controlled using computerised process control and monitoring equipment. The status of the inlet facility would be remotely monitored at control rooms located at the proposed gas turbine facility and Munmorah Power Station. Appropriate response actions would be taken by operating staff in the event that abnormal or unsafe conditions are detected by the control system.

The final design and operation of the inlet facility would be subjected to a rigorous hazard identification and prevention process to ensure the facility's operation meets all the relevant safety standards and regulations.

#### **4.3.5 Pipeline delivery facility**

The delivery facility would be located within the Munmorah Power Station and in close proximity to the proposed gas turbine facility. A minimum separation distance of 100 metres between the facility and the gas turbine facility would be required to maintain an appropriate level of system performance, but it may be necessary to vary this distance depending on specific design outcomes from the detailed design phase. The delivery facility would contain the following equipment:

- header pipeline connecting the facility to the gas turbine facility
- an actuated isolation valve installed at the inlet to the facility
- gas filtration, heating and pressure regulation equipment
- over-pressure protection and emergency venting systems
- process control and communications equipment.

##### ***Header pipeline***

The header pipeline would be constructed above-ground to connect the pressure regulation station to the inlet gas manifold at the proposed gas turbine facility. The pipeline would be designed to comply with requirements of Australian Standard *AS 4041 Pressure piping* and may be more than 100 metres long and about 450 millimetres in diameter. The actual length and diameter of the header pipe would be determined during the detailed design phase.

##### ***Pressure regulation station***

Pressure of the gas to be delivered to the proposed gas turbine facility would be regulated using two parallel control valve runs. Because the gas turbine facility would

comprise multiple gas turbine units, it would be necessary to provide adequate control during the plant start-up, normal operations and plant shutdown (or trip). In principle, one valve would be smaller than the other, with the smaller valve designed to open first, and the larger one opening when demand has sufficiently increased.

### ***Safety features***

Over-pressure protection would be provided at the facility by three methods:

- rapid control valve closure under process alarm conditions
- slam-shut isolation valve closure at the inlet to each control valve run
- pressure relief valve opening.

The pressure relief valve would protect the pipework from overpressure between the pressure regulation station and the proposed gas turbine facility as a result of a sudden reduction in gas demand following a plant trip. The detailed design phase would analyse the capacity of the control valves and slam-shut valves to close in response to a plant trip signal and determine whether the pressure relief valve can be eliminated from the design, minimising the potential for gas release.

The delivery facility would incorporate equipment to vent gas from the lateral pipeline if required during an emergency situation, or to permit pipeline maintenance. The length and location of the vent pipeline line required to provide the necessary safe release of gas would be determined during the detailed design phase.

### ***Facility layout***

The gas delivery facility would be located at least 100 metres away from the proposed gas turbine facility. It would require an area of approximately 50 square metres to accommodate the pipeline terminal, pressure regulation station and a small control hut.

## **4.3.6 Gas turbine facility**

The main components of the proposed gas turbine facility are:

- an open-cycle gas turbine peaking plant, comprising four gas turbines, four generators and four exhaust stacks
- ancillary equipment, including air-cooling equipment, power transformers, emergency generators, distillate fuel and demineralised water storages, and safety equipment
- process control and monitoring systems
- administration, amenities and control building.

Figures 4.5 and 4.6 provide an overview of the proposed gas turbine facility.



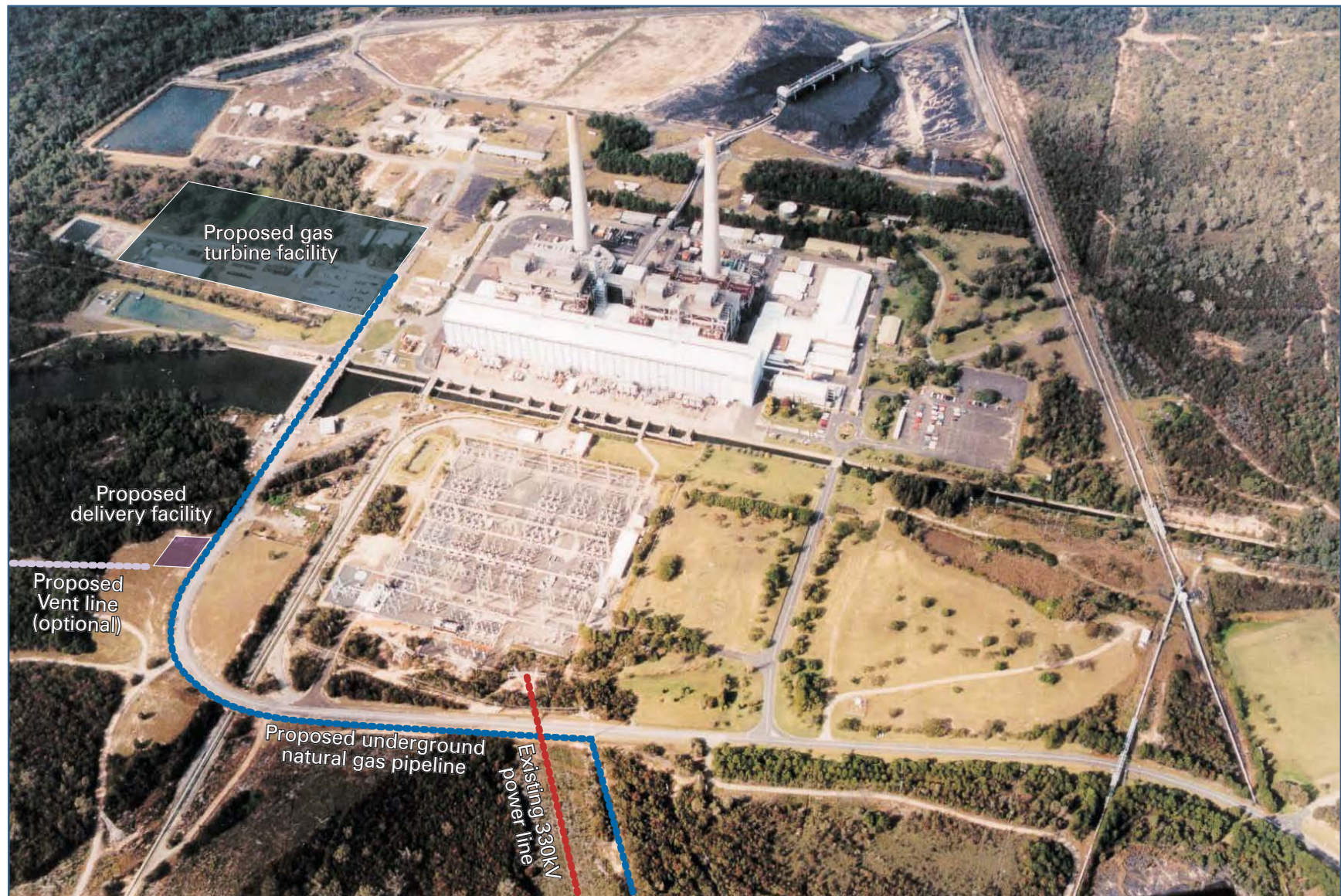


Figure 4.5 Proposed gas turbine facility overview

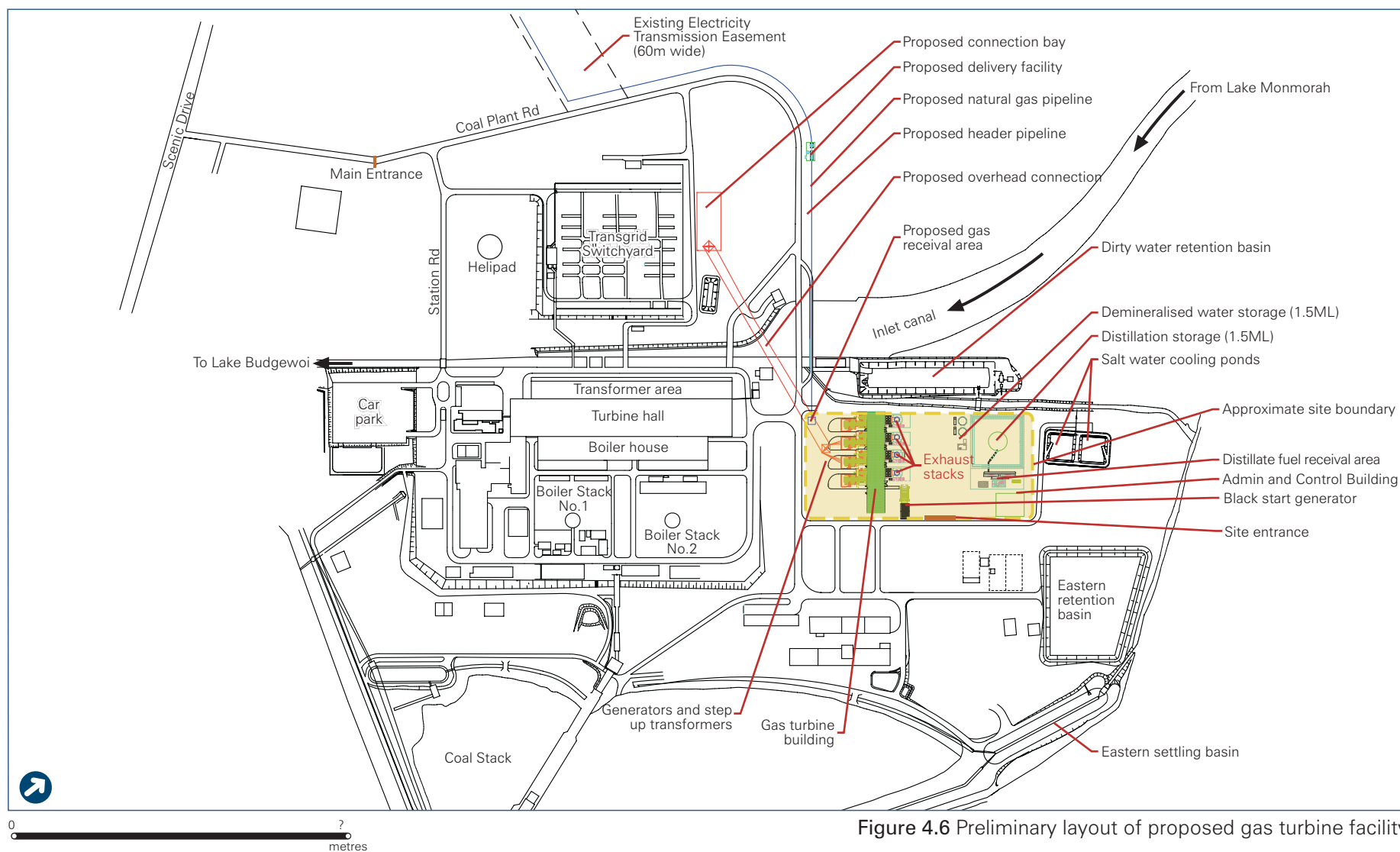


Figure 4.6 Preliminary layout of proposed gas turbine facility

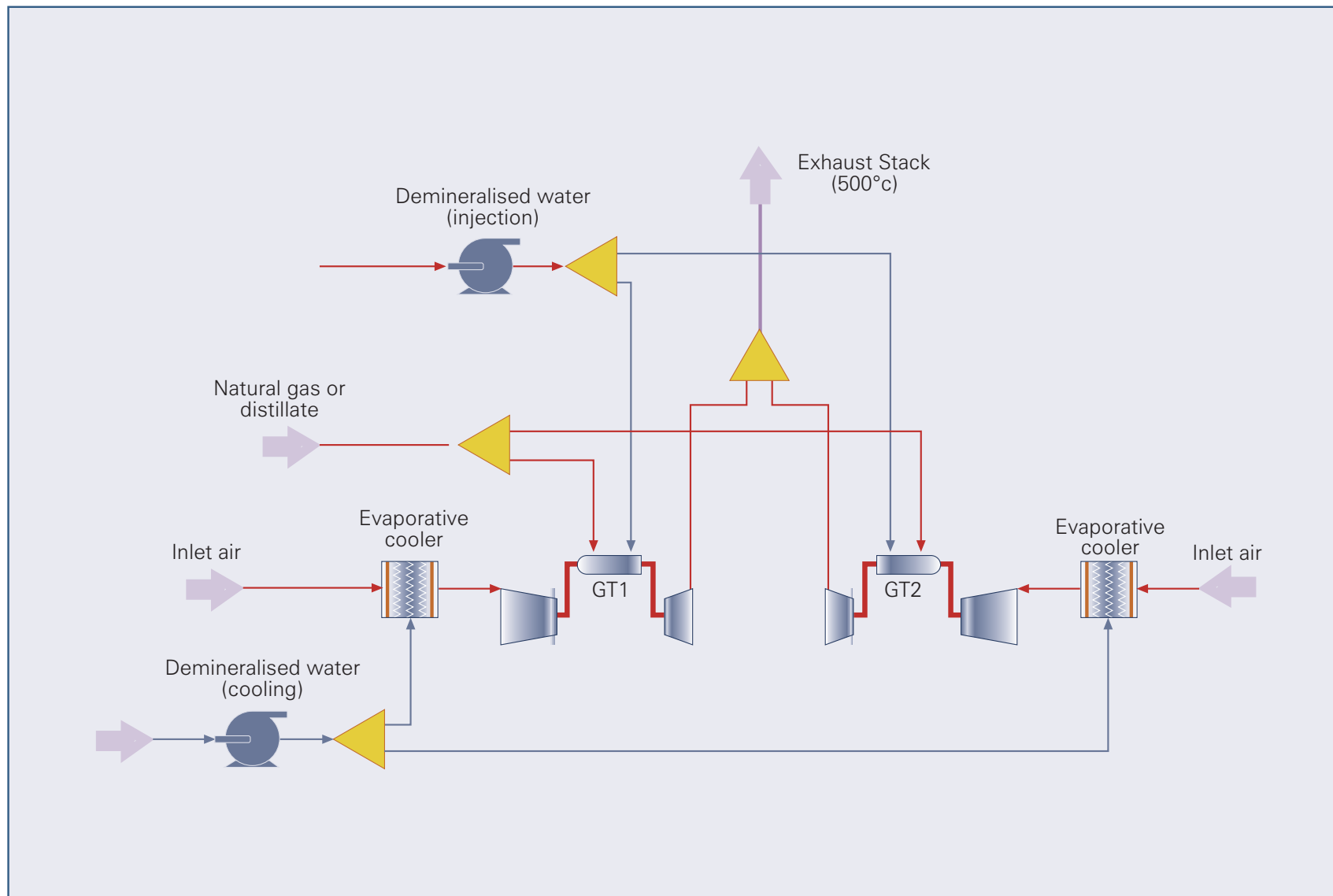


Figure 4.7 Process flow diagram for typical open cycle gas turbine with evaporative cooling



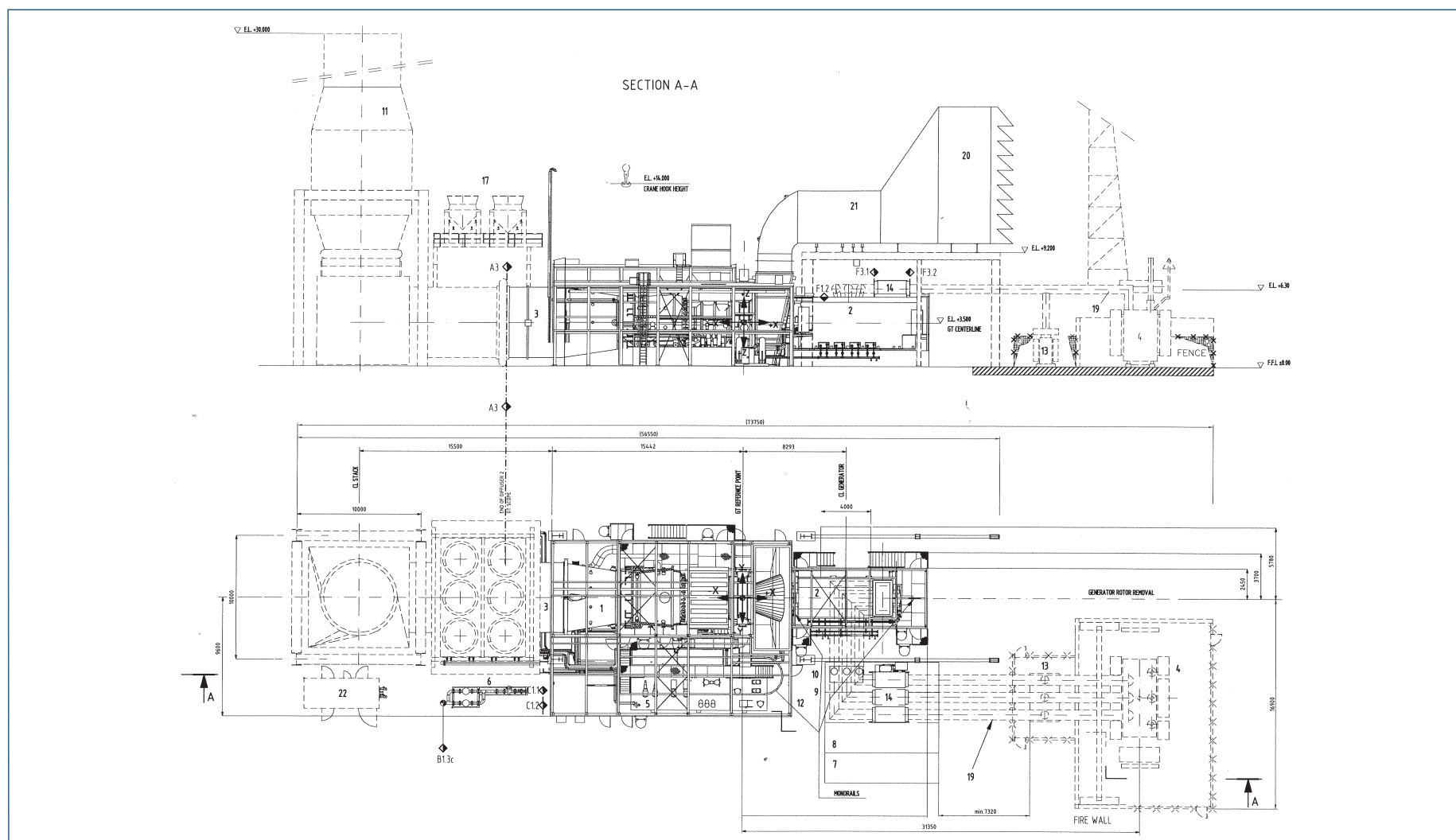


Figure 4.8 General arrangement for typical open cycle gas turbine

- |                            |                         |                               |  |
|----------------------------|-------------------------|-------------------------------|--|
| 1 Thermal block            | 7 SSD module            | 13 Unit auxiliary transformer | 19 Generator bus duct                            |
| 2 Generator                | 8 LV module CI          | 14 Generator breaker module   | 20 Air intake filter                             |
| 3 Exhaust diffuser         | 9 DC/UPS module BI      | 15 --                         | 21 Air intake duct                               |
| 4 GT - Step up transformer | 10 Excitation module EI | 16 --                         | 22 Combine fuel oil/No <sub>x</sub> water module |
| 5 Auxiliary block          | 11 Stack                | 17 Recoolers (option)         |  |
| 6 Fuel gas skid            | 12 Acoustic enclosure   | 18 --                         |  |



### **4.3.7 Open-cycle gas turbines**

The process used by an open-cycle gas turbine to generate electricity is relatively simple. The gas turbine draws cooled, filtered air through a compressor, where it is mixed with natural gas or distillate fuel and injected at high pressure into the combustion chamber of the gas turbine for combustion. The hot exhaust gases generated by the combustion process are used to drive an electrical generator to produce electricity. The hot exhaust gases are vented to the atmosphere at high velocity and temperature (about 40 metres per second and 500 degrees Celsius respectively) via a six metre diameter, 35 metre high exhaust stack fitted at the end of each gas turbine unit.

A simplified process flow diagram of the open-cycle gas turbine process is shown in Figure 4.7. A sketch of a typical open-cycle gas turbine is provided in Figure 4.8.

The proposal entails the installation of up to four gas turbines, with a total output capacity of about 600 megawatts. The gas turbines would be capable of running on natural gas and distillate fuel. Natural gas would be the primary fuel source, and distillate fuel would be used as a back-up should there be a major disruption to the natural gas supply. The switchover from natural-gas to distillate-fuel firing would generally occur automatically and triggered by a drop in natural gas pressure below a prescribed set point. Changeover from distillate-fuel to natural gas after resumption of the gas pressure would be manually initiated by the plant operator.

To improve the performance of the gas turbines, particularly during hot summer conditions, the inlet air stream to the gas turbine would be cooled via an evaporative cooling system using demineralised water to cool the air stream before it enters the combustion chamber of the gas turbine.

Options to utilise or re-use some of the waste heat that would be exhausted via the stack for other purposes, such as the generation of hot process water (co-generation) or the production of steam to be used by the coal-fired power station to generate electricity may be considered during the detailed design phase of the project.

### **4.3.8 Ancillary services and infrastructure**

#### ***Demineralised water storage***

Demineralised water would be supplied to the proposed gas turbine facility from the existing demineralisation plant currently used by Munmorah Power Station. This plant has ample capacity to meet the needs of both plants. The proposal includes installation of two demineralised water storage tanks with a total storage capacity of 1,500 kilolitres.

Demineralised water would be required for the following activities:

- gas turbine water injection during distillate-fuel firing
- compressor washing
- evaporative cooling for the gas turbine inlet air cooler.

As discussed in Section 3.6.2, water injection during distillate-fuel firing is the largest consumer of demineralised water. Based on a nominal operating profile of 500 hours per year, of which up to 75 hours could be operated using distillate fuel, the annual demineralised water consumption rate would be approximately 18.6 megalitres. It is expected, however, that the annual demineralised water consumption rate would generally be less than 6.6 megalitres per year, which corresponds to about 500 hours of operation using natural gas only.

When compared to the current consumption of demineralised water by Delta Electricity's Central Coast operations, which ranges between 800 to 1300 megalitres per year, the proposed demineralised water consumption rates are considered to be low. The rates are unlikely to have a significant impact on the local potable water supplies, particularly during current drought conditions. Nevertheless, Delta Electricity is in the process of investigating a range of water conservation measures at its Vales Point and Munmorah Power Stations to better manage water demand and reduce current potable water consumption rates (see Section 3.6).

### ***Distillate fuel storage***

The proposal includes installation of a new 1,500 kilolitre fuel tank adjacent to the proposed gas turbine facility. The tank would be approximately 20 metres in diameter and 5 metres tall. The tank and associated pipework would be designed and bunded to comply with requirements of Australian Standard *AS 1940 The storage and handling of flammable and combustible liquids*.

The fuel tank would contain enough distillate to supply the gas turbine facility with enough fuel to operate for about 7 consecutive hours, at full load, in the event of an interruption to the natural gas supply and there is a need to operate the gas turbine facility. Distillate would be transported to the site via road tankers on an as need basis.

### ***Chemical storage***

Due to the nature of the proposed gas turbine facility, only minor quantities of chemicals and/or dangerous goods would be stored at the facility. These substances would generally be associated with day-to-day maintenance and house keeping activities, and comprise small quantities of lubricant oils and cleaning chemicals. The storage of these substances would be within a designated bunded area of the administration building.

It is envisaged that any materials required during major maintenance activities would be brought onto the facility by the maintenance contractor and any excess materials would be taken off-site when the works are complete. There may also be an opportunity to share the existing drum storage facilities at Munmorah Power Station to temporarily store larger quantities of some of the day-to-day items, such as turbine lubricants, if required.

### ***Transmission connection***

Each of the four electric generators coupled to each of the four gas turbines would operate at a voltage of around 22 kilovolts. This would be stepped up to around 330 kilovolts using new step-up transformers. Connection to the existing switchyard would be via an above-ground connection from the step-up transformers to a new dedicated bay adjacent to the existing switchyard.

## **Liquid waste management**

Small quantities of wastewater (less than 12,000 litres per year) would be generated during the compressor washing cycle and other maintenance activities. This wastewater would be passed through an on-site oil/water separator prior to discharge to the existing wastewater treatment system at Munmorah Power Station. Other sources of potential wastewater, such as stormwater collected inside the distillate fuel bunds, would also be diverted to the same wastewater treatment system.

Small quantities of liquid waste would be generated during the day-to-day operation of the facility and generally include waste oils and solvents. All liquid wastes would be stored on-site inside dedicated 200 litre drums prior to collection and disposal by a licensed liquid waste contractor. There may be opportunities for these liquid waste streams to be recycled by the nominated contractor.

The entire facility would be bunded and isolated from the rest of the power station site via the installation of a stormwater isolation sluice valve. In the event of a major spill or fire at the facility, the sluice valve would be closed ensuring no contaminated water leaves the site.

Sewage from the amenities building would be connected to the existing Munmorah Power Station sewage transfer system, which comprises a series of sewage pumping stations that pump to Wyong Shire Council's sewerage network.

## **Solid waste management**

The normal day-to-day operation of the proposed gas turbine facility would not be expected to generate significant quantities of solid waste. Most of the solid waste would be classified as "inert waste" and would generally be generated during routine maintenance activities and comprise:

- spent filters – air, fuel and oil filters
- scrap metal – from packaging waste and plastic cabling
- general maintenance such as wood and cloth.

Solid waste would be segregated into recyclable and non-recyclable waste products where possible and disposed off-site by licensed waste contractors.

All waste would be classified and disposed of in accordance with the *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-Liquid Wastes (1999)* produced by the Department of Environment and Conservation.

## **Air pollution control**

The gas turbines would be specified with dry, low nitrogen oxide (NO<sub>x</sub>) combustors to produce NO<sub>x</sub> emissions of 25 parts per million or less at full load, when firing on natural gas. The use of selective catalytic reduction processes to further reduce NO<sub>x</sub> levels to about 10 parts per million was considered during the concept development phase, but was found to be unsuitable for the proposal, as the range of exhaust temperatures produced by the gas turbines (above 500 °C) would be too high to support this process.

When firing the proposed gas turbine facility on distillate fuel, injecting demineralised water into the combustion chamber of the gas turbine would lower the peak combustion temperature and reduce the generation of NO<sub>x</sub> emissions to less than 45 parts per million at full load.

The proposed 25 parts per million NO<sub>x</sub> emissions in natural-gas firing mode and 42 parts per million NO<sub>x</sub> emissions in distillate-fuel firing mode comply with the regulatory emission limits stipulated by the Protection of the Environment Operations (Clean Air) Regulation 2002. It is expected that actual NO<sub>x</sub> emissions would be much lower than those stated above.

A continuous emission monitoring system would be installed to monitor all stack emissions and ensure limits set by the Environment Protection Licence for the facility and other relevant regulations are complied with. Refer to Chapter 11 for a summary of the emission limits stipulated by the relevant regulations and a detailed assessment of the potential air quality impacts of the proposal.

### ***Emergency generators***

Emergency or back-up diesel generators would be installed to provide emergency power during a station trip or a complete system shutdown. The latter may occur where one or more of the base-load power stations trip and there is insufficient power in the grid to re-start these stations. The proposed gas turbine facility would be installed with black-start capability, which means that it would be able to start and re-energise or restore regional and possibly NSW power supplies in the event of an electrical system shutdown.

### ***Fire protection***

A comprehensive fire alarm and detection system would be installed at the gas turbine facility to monitor conditions at the facility. A gas leak detection system would also be installed at key areas of the facility to ensure the safe shutdown of the gas turbines in the event that a dangerous situation is detected by the system. Fire safety and hazard and operability (HAZOP) studies would be conducted during the detailed design phase to ensure any such hazards are managed and controlled in a safe effective manner, thus minimising risks to human life and the environment both within the facility and at the adjacent power station.

Fire training exercises and general staff education would be conducted on an annual basis to ensure the operational readiness of the staff and corresponding fire fighting equipment.

It is proposed that fire water would be supplied via a new pipeline connection to the existing fire water mains which currently surrounds the existing power station. The fire safety assessment mentioned above would assess whether or not additional firewater storage capacity would be required to meet the firewater supply requirements (in terms of pressure and flow) of both Munmorah Power Station and the proposed gas turbine facility.

### ***Emergency response***

It is proposed that the emergency response plan which is currently in place at Munmorah Power Station would be updated and amended prior to the commencement of construction and operational activities at the facility.

The amended plan would outline specific procedures to be followed by emergency response staff in the event of an emergency and would be approved by relevant agencies including NSW WorkCover and the NSW Fire Brigades.

A copy of the approved plan would be issued to the local State Emergency Services and the NSW Fire Brigade for their information. All emergency response procedures would be revised and adapted as new industry standards are established.

### ***Process control***

The proposed gas turbine facility would be controlled using local and remote screen-based monitors at both the gas turbine facility site and the existing Munmorah Power Station control room. A mimic panel may also be provided at the Vales Point Power Station to provide further operational flexibility.

The remote link would comprise some form of telemetry or radio link (no hardwire necessary) between the proposed gas turbine facility and the control room, with a local control panel for maintenance purposes or in case the link fails.

### ***Facility layout***

The footprint of the gas turbine facility would be in the order of 120 metres wide by 260 metres long. The facility would be security fenced to restrict unauthorised access. The preliminary site layout has been design to provide sufficient space for the possible future conversion of the facility to a combined-cycle gas turbine facility (see Figure 4.6).

### ***Sub-division of land***

The lot of land that would contain the proposed gas turbine facility would be subdivided from the rest of the power station site as part of the proposal. The excision of this land would create a separate site boundary and facilitate the creation of a separate Environment Protection Licence for the facility, as it would operate independently from existing coal-fired operations. The proposed subdivision is illustrated in Appendix F.

During detailed design, the current subdivision plans would be updated to reflect the final location of the gas turbine facility, ancillary items, access routes and services and would be submitted to Wyong Council for final approval and registration.

## **4.4 Construction of the proposal**

A detailed construction staging plan and method would be determined by the contractor prior to commencement. This plan would need to be in agreement with all applicable conditions of approval and other statutory requirements. Details of the actual

construction method and staging could vary due to detailed design changes and subsequent stakeholder consultations.

#### **4.4.1 Construction period**

The proposal — including design, construction, commissioning and operation — is estimated to take approximately two years to complete. Approximately 6 to 12 months would be needed to complete the detailed design, tender specifications/awards, and relevant fuel and power purchase agreements. Construction and commissioning is likely to last 12 to 18 months.

Construction hours would be limited to 7 am to 6 pm during week days and 7 am to 1 pm on Saturday mornings. If the proposal requires construction activities outside these hours, approval from the relevant regulatory authorities and affected landowners would be sought prior to undertaking these activities.

#### **4.4.2 Gas pipeline**

The proposed gas pipeline would be constructed using either trenching or directional drilling methods. The preferred pipeline construction method would depend on the physical circumstances along the pipeline route (including geotechnical conditions) and detailed design constraints.

In general, the pipeline would be installed using trenching construction methods due to the ease and speed of construction, and low cost. Directional drilling would be used where trenching is not possible due to the presence of surface obstacles such as roads, rail or sensitive vegetation. A brief description of the two methods is provided below.

##### ***Trenching***

The key steps involved in the trenching construction process would be:

- excavating a trench of approximately 2 metres wide and 2 metres deep using a back-hoe or excavator
- preparing of the pipeline bed, by placing, compacting and levelling a suitable grading of sand or soil
- laying and joining the pipe lengths
- backfilling and compacting the trench to appropriate standards
- restoring the surface cover with topsoil and native vegetation root stock to re-establish the vegetation disturbed during the construction period.

Typically, the construction footprint would include the length of the pipeline by the width of the construction zone. This would include a vehicle access track, the trench, spoil stockpile, and pipe-length stockpile. The width of the construction zone would generally vary between 10 and 15 metres in open space areas, and 4 to 5 metres in areas where there may be sensitive ecological communities or existing structures such as transmission towers.

### ***Directional drilling***

This construction technique would generally be used to cross roads, rail crossings and sensitive environmental areas and involves drilling of a hole along a pre-determined alignment to allow a product or liner pipe to be pushed and pulled into a borehole. Spoil is then removed to the surface. Drilling equipment would be guided by the drill head, which would steer the pilot hole in the desired direction. A tracking system could also be used to ensure the drill is on course.

Drilling and pipe installation activities would generally be carried out from launch and retrieval pits, located at either end of the directional drill. The launch pit would contain the drilling rig, power source for the drill rig, drill rods, pipeline lengths, and general site equipment.

Bentonite slurry would be used to lubricate the cutting head and drilling equipment, and to transport drill cuttings to the surface. Bentonite is a non-toxic, naturally occurring clay, and would be processed and re-used in the drilling process. The launch pit would also contain a drilling-mud processing plant, to remove drill cuttings from the drilling fluid.

The launch site would be approximately 20 metres by 20 metres, and the retrieval pit, approximately 10 metres by 10 metres. The launch and retrieval site layouts would be configured to avoid trees and other sensitive sites during the detailed design and installation phases of the proposal. Both the launch and retrieval sites would be fenced and made secure, with site access control implemented as appropriate. An area would also be required to lay out the pipe before it is installed into the borehole; however, this location would generally be manipulated to avoid sensitive areas.

TransGrid requirements stipulate that all excavation works are to take place more than 15 metres away from any transmission tower or other infrastructure within the electricity transmission easement. The pipeline would be laid inside the southern edge of the TransGrid easement, which is 60 metres wide. Excavation works associated with the pipeline trench would, therefore, be able to meet this requirement.

### ***Railway crossing***

The crossings would be constructed by under-boring the railway corridor, with a minimum depth of cover beneath the rail of at least two metres. The actual construction method and depth of cover would be determined for each crossing and after detailed consultation with and approval from RailCorp.

The bore would most likely be constructed using a directional drilling technique, with the bored hole lined with a concrete-casing pipe. Once constructed, the annulus between the casing and carrier pipe would be filled with cement grout to preserve the integrity of the cathodic protection system.

### ***Pacific Highway crossing***

The Pacific Highway crossing would be constructed using directional drilling methods. The minimum length of the directionally drilled pipe would be 200 metres. This would allow the pipe to be installed beneath the full width of the Pacific Highway at this location, and beneath an associated service road east of the Pacific Highway.

The pipeline would be installed at a depth of approximately five metres beneath the Highway, and a little less beneath the service road. The actual length constructed using directional drilling would be determined during detailed design, based on the profile of the crossing, the soil conditions, the flexibility of the pipe used in the crossing and other NSW Roads and Traffic Authority requirements.

### ***Construction safety provisions***

Undertaking construction activities near active high-voltage powerlines requires significant efforts to ensure the safety of construction workers. Consequently, these works would be carried out in accordance with the Electrical Supply Association of Australia's *National Guidelines for the Safe Approach Distances to Electrical Apparatus*. These guidelines recommend a minimum height of 4.3 metres above the ground as an adequate clearance for electricity transmission lines. This minimum clearance would apply to all plant and equipment at all times during the construction period. The pipeline construction contractor would be required to prepare work procedures and safe work method statements to ensure the works activities strictly comply with these guidelines.

### **4.4.3 Gas turbine facility**

#### ***Site preparation works***

Construction of the proposed gas turbine facility would involve earthworks and site preparation works, construction of concrete footings and pads and installation of associated pipework, controls, power and other ancillary services.

Excavation works associated with construction of the pad footings would extend into bedrock, due to the large loads imposed by the key components of the gas turbine facility. All excavated material found to be suitable would be re-used as backfill material on-site and at other construction sites associated with the proposal. Material unsuitable for this purpose would be retained on-site for landscaping purposes, where possible. Any spoil not suitable for on-site re-use would be transported to an appropriately licensed landfill for disposal.

The proposed site is mostly cleared of vegetation, but currently contains surplus materials, spare parts and demountable buildings that would require dismantling and/or relocation to other parts of the site, or disposal to an appropriate waste management facility. The construction contractor would be required to prepare a waste management plan prior to the commencement of works to ensure appropriate re-use and recycling measures are implemented, where possible or feasible, at all stages of the construction period.

Delta Electricity advised that there are no known site contamination issues, as the site was virgin land and was never used to store or dispose of hazardous materials such as asbestos or polychlorinated biphenyls.

Once the concrete structures are complete, the remainder of the works would entail the placement and installation of largely pre-fabricated plant equipment.



## ***Transport of plant equipment***

The gas turbine facility comprises a number of very large and heavy plant items. The transport of these items would require significant planning and coordination to ensure that the route used to transport the equipment is safe and able to withstand the loads and height clearances imposed by the type of equipment being transported.

The equipment would most likely arrive at the Port of Newcastle, where it would be loaded on to purpose-built trailers designed to carry large and heavy loads. From there it would be transported to the Munmorah Power Station site via an appropriate route. Once it arrives at the entrance to the Munmorah Power Station site, the equipment would be transported to the proposed site via the most appropriate access route.

A specialist heavy equipment transport contractor with specific experience in lifting and transporting these types of equipment would be engaged during the detailed design phase. The contractor would design and confirm the proposed route and obtain the necessary approvals from the relevant authorities to carry out the task. It is expected that this planning phase would take approximately 1 year to complete.

It is expected that once all relevant approvals are obtained and any route preparations are completed, the task of actually transporting the plant equipment to the site would take approximately one week. Refer to Chapter 14 for details.

## **4.5 Operation of the proposal**

### **4.5.1 Gas pipeline**

The establishment of a gas pipeline easement within the existing electricity transmission easement would provide Delta Electricity with access rights over the land that is affected by the proposed pipeline route. It would also limit the types of activities the land owner is permitted to conduct on the affected land, which would be no different to the current restrictions being imposed by TransGrid.

It is proposed, therefore, that a gas pipeline easement would be negotiated between Delta Electricity and the respective land owners directly affected by the proposed pipeline route. The width of the gas supply easement is expected to be 20 metres and would be located along the inside southern edge of the existing electricity transmission easement currently held by TransGrid.

As discussed in Section 4.3.4, the actual location of the inlet facility location would meet relevant TransGrid and AGL Gas networks requirements, and would be selected such that it does not adversely affect the future use of the surrounding land. The land required for the inlet facility (approximately 2,500 square metres) would either be purchased or leased from the corresponding land owner.

Weekly inspections would be conducted along the nominated gas pipeline easement by patrol officers. These officers would monitor the status of the inlet facility and underground pipeline to ensure no activities are taking place within the easement that

could jeopardise the safety of the pipeline. Vehicular access along the easement would generally be via cleared access tracks currently being used by TransGrid patrol officers to conduct inspections of existing electrical transmission infrastructure.

#### **4.5.2 Gas turbine facility**

Typically, the proposed gas turbine facility would operate mostly during summer, when there is likely to be a greater peak demand for electricity. The gas turbine facility would operate independently from existing operations at Munmorah Power Station and would only come on-line during critical peak demand periods or in response to system emergency or black out conditions.

Although the proposed gas turbine facility could operate for 24 hours per day and 365 days per year, the gas turbine facility is likely to operate for about 500 hours per year (5.7 % of the time). This nominal operating profile is based on an approximate estimate of the projected cumulative annual peak power demand period. The facility would also be required to respond to system emergency and security situations, which would be in addition to the nominal operating profile.

During normal operations, the facility would run on natural gas. Distillate fuel would only be used when there is an interruption to the natural gas supply, or when gas supply is drawn down to the point where there is insufficient gas to cover the peak demand period or system emergency situation. The nominal operating profile has assumed that up to 75 hours per year may be operated using distillate fuel depending on the availability of the natural gas supply.

Staffing of the facility may be provided either by existing Delta Electricity maintenance/operating staff or externally through the use of contractors. This would be determined during the subsequent stages of the project. Due to the automatic and infrequent nature of the facility, it would likely require between 2-5 staff to operate and maintain it.

As discussed in Section 4.3.8, Delta Electricity would be seeking to excise the lot of land assigned to the proposed gas turbine facility from the existing Munmorah Power Station site, thus creating a clearly defined and separate site boundary. Delta Electricity would be applying to the Department of Environment and Conservation for an Environment Protection Licence for the facility following the completion of commissioning activities and prior to the commencement of operations.

## LEGISLATIVE CONTEXT

5

## 5. Legislative context

### 5.1 Planning approval process

Planning approval is required for the gas turbine project under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). In accordance with s75B(1a) of the Act, the proposed development would be considered a 'Major Infrastructure Project'. The proposed development constitutes a 'Major Infrastructure Project' under *State Environmental Planning Policy (Major Projects) 2005*, constituting an electricity generating facility with a capital investment greater than \$30 million. Thus, the Minister for Planning would be the consent authority for this proposal.

The gas supply pipeline would meet the definition of a 'public utility undertaking' under the *EP&A Act Model Provisions 1980* (as adopted by the Wyong Shire Council Local Environment Plan), making the pipeline exempt from the need for development consent. However, the Department of Planning has advised that the pipeline is considered part of the 'Major Infrastructure Project' and should be assessed as one project.

Under Section 75R(1) of the Act, because the proposal is considered a project under Part 3A, provisions relating to other Parts of the Act, integrated development (Part 5A) and designated development (Part 4 77A) do not apply. Therefore, an environmental impact statement is not required. Instead, under 75F, 'environmental assessment requirements for approval' would be provided by the Director-General.

Clause 8J of this Regulation states that the Director-General may adopt (with or without modification), as environmental assessment requirements for a major project, requirements that were issued by the Director-General under Part 4 of the Act.

Under Part 3A (s75R(3)) of the Act, Local Environmental Plans, Regional Environmental Plans and Development Control Plans do not apply. These are nevertheless addressed briefly in the following sections. Clause 75J(3) of the EP&A Act does, however, require that the proposal should not be prohibited under an environmental planning instrument.

In accordance with Clause 8F(1) of the *Environment Planning and Assessment Regulations 2000* (EP&A Regulation), landowner consent is not required for an application for approval under Part 3A, as Delta Electricity is a public authority within the meaning of the EP&A Act. Delta Electricity, being a public authority, does not have the right to appeal the Minister's determination (s75K EP&A Act). However, third-party objector appeals are permitted.

Pursuant to clause 8F of the EP&A Regulation, the consent of the owner of land on which a project is to be carried out is not required for an application for approval under Part 3A where the application is made by a public authority.

However, in accordance with Clause 8F(3a) of the EP&A Regulation, public notice of the application is required through advertisement in a newspaper circulating in the area of the project before the start of the public consultation period for the project.

The planning approval process for the proposal is presented in Figure 1.2.

## **5.2 Environmental planning instruments**

### **5.2.1 Local planning**

#### ***Wyang Local Environmental Plan 1991***

The site of the proposed power station is zoned 5(a) Special Uses under the *Wyang Local Environmental Plan 1991* (Wyang LEP). Development for the purpose of a power station is permissible with development consent in this zone.

The entire power station site and part of the gas pipeline route are zoned 5(a) Special Uses under the Wyong LEP. Outside of Delta Electricity's landholdings, the pipeline route crosses the following zones: Special Uses 5(b) Railways, Special Uses 5(d) Arterial Road Reservation, Zone 4(e) Regional Industrial and Employment Development, Zone 7(g) Wetlands Management Zone and Zone 10(a) Investigation Precinct Zone.

Permissibility of the proposed turbine and pipeline within the affected zones is summarised in Table 5.1. For the Minister for Planning to approve the project, clause 75J(3) of the EP&A Act requires that the proposal is not prohibited under an environmental planning instrument. As shown in Table 5.1, the entire proposal is permissible with and without development consent (where relevant) across all land used.

The proposed subdivision (as described in Chapter 4) is permissible with development consent in zone 5(a) under the Wyong LEP.

The Wyong LEP adopts most clauses of the *EP&A Act Model Provisions 1980* (the Model Provisions). The application of the Model Provisions to the works is described separately below in regard to the pipeline, pressure regulating station and the gas turbine facility works.

**Table 5.1 Permissibility of proposal**

Zone	Permissibility	Zone objectives	Assessment of adherence with objectives
Special Uses 5(a)	Permissible with consent	<p>a) To cater for the provision of community and public facilities and services, and</p> <p>b) To provide for any other development of land within this zone, with the consent of Council, provided that:</p> <p>(i) The other development is ancillary to or related to the current or future use of the land for the purpose of a community or public facility or service, and</p> <p>(ii) The other development does not adversely affect the current or future usefulness of the land for the purpose of those facilities or services.</p> <p>NB: 'Community facilities' are defined in the LEP as '<i>a building or place owned or controlled by a public authority or a body of persons which may provide for the physical, social, cultural or intellectual development or welfare of the local community, but does not include a building or place elsewhere specifically defined in this clause</i>'.</p>	Generally consistent as the power station upgrade and gas pipeline would meet the definition of a community or public facility.
Special Uses 5(d) Arterial Road Reservation Zone	Permissible with consent	<p>a) To provide for the acquisition and development of land principally for arterial roads, and</p> <p>b) To provide for any other purpose with the consent of the Council, provided that the purpose does not affect the usefulness of the land for the purpose of arterial roads.</p>	Generally consistent as the pipeline would be buried and hence would not affect the usefulness of the land for purpose as an arterial road.
Special Uses 5(b) Railways Zone	Permissible with consent	To recognise existing railway land and to enable its future development for railway and associated purposes.	Generally consistent as the pipeline would be buried by directional drilling under the railway line and hence would not affect the future development for railway and associated purposes.

<b>Zone</b>	<b>Permissibility</b>	<b>Zone objectives</b>	<b>Assessment of adherence with objectives</b>
4(e) Regional Industrial and Employment Development Zone	Permissible with consent	<p>(a) To provide land to cater primarily for the special requirements of major industrial or employment-generating development which is within convenient distances to support population growth within the urban centres of the local government area of Wyong and has good road and rail access links, and</p> <p>(b) To facilitate major industrial and employment-generating activities by permitting development which:</p> <ul style="list-style-type: none"> <li>(i) generates significant new employment on-site, or</li> <li>(ii) requires a large site area but has a significant multiplier effect in the regional economy, and</li> </ul> <p>(c) To facilitate other industrial and employment-generating activities only where:</p> <ul style="list-style-type: none"> <li>(i) the development needs to be located with other major industry or activities within the zone, or</li> <li>(ii) the development requires a location with convenient access to the freeway or railway, and</li> </ul> <p>(d) To provide that new industrial development and other development does not present unacceptable risks by limiting development which:</p> <ul style="list-style-type: none"> <li>(i) exposes residences and the natural environment to unacceptable levels of pollution or hazard risk and does not incorporate adequate safeguards to mitigate any potential threats, or</li> <li>(ii) involves a process which generates toxic waste products the disposal of which cannot be properly managed either on site or otherwise, or</li> <li>(iii) limits the potential employment capacity of the zone by sterilising large areas of land through buffer or isolation requirements, and</li> </ul> <p>(e) To promote environmentally sustainable development by limiting development that:</p> <ul style="list-style-type: none"> <li>(i) contributes to the degradation of the Tuggerah Lakes or Lake Macquarie systems, and</li> <li>(ii) involves the transportation of hazardous or offensive materials through or in proximity to residential or environmentally sensitive areas, and</li> </ul> <p>(f) To provide for commercial and retail development:</p> <ul style="list-style-type: none"> <li>(i) that is ancillary to the main use of land within the zone, and</li> <li>(ii) that meets the day-to-day needs of occupants and employees of the buildings within the zone.</li> </ul>	<p>As part of a major industrial development, the gas pipeline would not be inconsistent with objectives (a) and (b).</p> <p>The works will only adhere with objectives (d) and (e), however, if the environmental effects (including hazard risks) of the pipeline can be managed to a level that is considered acceptable.</p>

Zone	Permissibility	Zone objectives	Assessment of adherence with objectives
7(g) Wetlands Management Zone	Permissible with consent unless otherwise provided in the LEP	<p>(a) To protect and conserve locally important wetland habitats, and</p> <p>(b) To lessen the development pressure on local wetlands by restricting the type and scale of development to which they are subjected, and</p> <p>(c) To ensure that ecological, scenic and other environmental attributes of local wetland areas are not altered, and</p> <p>(d) To limit development within the zone that is likely to have a detrimental effect on the ecological sustainability of wetland functions and values, in particular those functions relating to conservation and sediment and nutrient filtration.</p>	<p>If the pipeline is able to be directionally drilled underneath the wetland environments within this zone, then the works are likely to be considered as generally consistent with these objectives – assuming this is supported by a detailed flora and fauna assessment.</p> <p>If the works are not directionally drilled under the wetlands, then detailed management and mitigation measures would be required to avoid impacts on wetlands within this zone.</p>



<b>Zone</b>	<b>Permissibility</b>	<b>Zone objectives</b>	<b>Assessment of adherence with objectives</b>
10(a) Investigation Precinct Zone	Permissible with consent unless otherwise provided in the LEP	<p>(a) to protect native vegetation, maintain ecological processes and biological diversity within land that is under investigation for conservation purposes, and</p> <p>(b) to protect rural land that, after detailed environmental investigations, may be suitable for ecological conservation or future urban development, and</p> <p>(c) to prohibit development that it is likely:</p> <p>(i) to lead to the premature and sporadic subdivision of land, or</p> <p>(ii) to inhibit the potential for urban expansion in selected areas, particularly the urban fringe, or</p> <p>(iii) to prejudice the present environmental quality of the land, or</p> <p>(iv) to generate significant additional traffic or create or increase a condition of ribbon development on any road, relative to the capacity and safety of the road, and</p> <p>(d) to ensure that any interim development is carried out in a manner that minimises risks from natural hazards, minimises degradation of environmental values, functions efficiently, does not prejudice other economic development and does not detract from the scenic quality of rural areas, and</p> <p>(e) To allow mining to occur in an environmentally acceptable manner.</p>	<p>The gas pipeline works would only be consistent with the objectives of this zone if the ecological values of the zone can be protected. This cannot be confirmed without a detailed flora and fauna assessment.</p> <p>There is a risk that the consent authorities will determine that a gas pipeline also poses risks to future urban expansion in this zone, as per objective (c) (ii).</p>

### ***Permissibility of the gas supply pipeline***

Clause 35 of the Model Provisions provides that nothing in the Wyong LEP shall restrict or prohibit the carrying out of development described in Schedule 1. Clause 2(a) of Schedule 1 includes, amongst other activities, the carrying out of public utility gas undertakings at or below ground level. Therefore, since Delta Electricity is a public utility and the gas supply pipeline would be underground, the Model Provisions would apply, and development consent would not be required for the gas supply pipeline.

### ***Permissibility of the pressure regulating station***

The pressure regulating station would be a substantial above-ground structure. As the station would be above ground, the Model Provisions would not apply. Clause 10 of State Environmental Planning Policy No. 4 (SEPP 4) provides that certain ancillary development is permissible without consent. However, the pressure-regulating station does not meet any of the prescribed development types and therefore would be permissible only with development consent.

### ***Permissibility of the gas turbine facility***

The savings clauses under Clause 35 of the Model Provisions do not extend to the construction and operation of the gas turbine power generation plant. Similarly, the provisions of SEPP 4 do not extend to the construction and operation of this plant.

Therefore, the proposed plant would be permissible only with development consent. In accordance with s75J(3) of the EP&A Act, the Minister for Planning can approve the project as it is not prohibited under the Wyong LEP.

### ***Permissibility of the subdivision***

Although *Development Control Plan 66 – Subdivision* and the *Wyong Local Environmental Plan 1991* outline provisions relating to subdivision, they do not provide guidance with regard to the site in question. The proposed subdivision is the result of the functional requirement to obtain an Environment Protection Licence. The proposed subdivision is entirely for operational purposes and would not significantly alter the overall site. The proposed allotment will be approximately 3.1 hectares, representing the footprint of the proposed gas turbine power generation plant. The proposed subdivision should therefore be assessed against the merits relating to the operational need to obtain an Environmental Protection Licence for operational purposes.

### ***Other local plans***

Other specific issue management plans/policies that are relevant to the proposal include:

- Development Control Plan No. 13 – Interim Conservation Areas for Wyong Shire
- Development Control Plan No. 14 – Tree Management
- Development Control Plan No. 53 – Draft Ecological Survey and Assessment Requirements for Development

- Development Control Plan No. 66 - Subdivision
- Development Control Plan No. 69 – Controls for Site Waste Management
- Development Control Plan No. 75 – Industrial Development

While these are not required to be complied with pursuant to Clause 75R(3)) of the EP&A Act, these have been considered and will be complied with where practicable.

## **5.2.2 State environmental planning policies**

### ***SEPP No. 11 – Traffic Generating Developments***

SEPP 11 provides that applications for development listed in Schedules 1 and 2 of the policy shall be referred to the NSW Roads and Traffic Authority for review prior to determination. This SEPP does not apply to the proposal.

### ***SEPP 14 – Coastal Wetlands***

SEPP 14 requires that any proposal to clear, construct a levee, drain or fill land identified as a SEPP 14 wetland requires consent of the Council and the concurrence of the Director-General of the National Parks and Wildlife Service (now part of the Department of Environment and Conservation).

The power station is located adjacent to two SEPP 14 wetlands, as shown on Figure 4.1. However, the works would not require any clearance or disturbance within the boundary of these wetlands, and hence this SEPP does not apply.

### ***SEPP 33 – Hazardous and Offensive Development***

SEPP 33 applies to industry developments which are potentially hazardous and/or potentially offensive. The proposal would likely meet the definition of 'potentially hazardous' under this SEPP, and therefore the works would require preparation of a preliminary hazard analysis to demonstrate that the proposed risk management measures would be able to reduce off-site risk impacts to an acceptable level. The proposal would also be considered 'potentially offensive' under the SEPP, in recognition of the environment protection licence requirements (see below) for the works.

A preliminary hazard analysis has been undertaken in accordance with *Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis* to determine if the proposal meets the required land use safety criteria stipulated by the Department of Planning. The results of the analysis have been summarised in Chapter 16 of this document and conclude that with consideration to the proposed mitigation and safeguard measures, the proposal would not be considered potentially hazardous or offensive and would meet the requirements of SEPP 33 and relevant land use safety criteria.

### ***SEPP 34 – Major Employment Generating Development***

The works do not meet the definition of 'major employment generating development' in Schedule 1 to SEPP 34, and therefore this SEPP would not apply to the proposal.

### **SEPP No. 44 – Koala Habitat Protection**

SEPP 44 applies to land within local government areas listed under Schedule 1 to the SEPP, for which a development application is made, and which is over 1 hectare in area. Wyong Shire is listed under Schedule 1 and the proposal meets the other requirements listed above. The SEPP requires that if the land concerned is 'core koala habitat', a management plan must be prepared and considered before consent is granted. An existing flora and fauna assessment of the Munmorah site does not identify any areas of the site as core koala habitat.

A detailed flora and fauna assessment undertaken for the proposed pipeline route does not identify any areas as constituting 'core' or 'potential' koala habitat (see Chapter 9).

### **SEPP 71 – Coastal Protection**

The site is located within 1 kilometre of the coastline and is therefore classified as being within the 'coastal zone' subject to SEPP 71. The works meet the definition of 'significant coastal development' under Schedule 2 of this SEPP, comprising structures greater than 13 metres in height, making the Minister for Planning the consent authority for the works. However, the provisions of this SEPP do not yet apply to the Wyong LGA until mapping of the coastal zone has been signed by the Minister for Planning.

## **5.3 Licensing and approvals**

A number of other licences and approvals would be required for the proposal under other relevant environmental legislation. Under Part 3A 75U of the EP&A Act, the approval provisions of the following relevant Acts do not apply:

- *Heritage Act 1977* — approval under Part 4, excavation permit under section 139
- *National Parks and Wildlife Act 1974* — permit under section 87 or a consent under section 90
- *Native Vegetation Act 2003* — authorisation under section 12
- *Rivers and Foreshores Improvement Act 1948* — permit under Part 3A
- *Water Management Act 2000* — water use approval under section 89, 90 or 91.

Under Part 3A cl.75V of the EP&A Act, the following approvals cannot be refused if it is necessary for carrying out an approved project. These approvals are also required to be substantially consistent with the approval under this Part.

- *Mine Subsidence Compensation Act 1961* — approval under section 15
- *Protection of the Environmental Operations Act 1997* — environment protection licence
- *Roads Act 1993* — consent under section 138.

A summary of the potential licensing and approval requirements is provided in Table 5.2. The need for licensing and approval may change as a result of amendments to the proposal during the detailed design stage. The following assessment is, therefore, provided for consideration as part of the environmental assessment.

**Table 5.2 Summary of potential licensing and approval requirements**

<b>Legislation and responsible agency</b>	<b>Relevant provisions</b>	<b>Requirements to gain approval</b>
<i>Protection of the Environment Operations Act 1997</i>  Department of Environment and Conservation	The Act enforces licences and approvals formerly required under separate Acts relating to air, water and noise pollution and waste management with a single integrated licence.	As the proposal is a scheduled activity, being an 'electricity generating works' that supplies, or is able to supply, more than 30 megawatts of electrical power, a licence would be required covering both construction and operation.
<i>Threatened Species Conservation Act 1995 and Threatened Species Amendment Bill 2004</i>  Department of Environment and Conservation	The Act aims to protect threatened flora and fauna and their habitats.  Assessment of impact on threatened species, populations and communities is required in accordance with Section 94 of the Act.	If the '8-part test' determines a likely significant impact on threatened species or communities, a Species Impact Statement and Department of Environment Conservation approval may be required.  A flora and fauna assessment has been completed for the site (Technical Paper No 1) suggesting the project would not have a significant impact on threatened species, populations or communities pursuant to the <i>Threatened Species Conservation Act 1995</i> .
<i>Native Vegetation Conservation Act 1997 and Native Vegetation Act 2003</i>  Department of Natural Resources	The Act protects state-protected land and native vegetation that is identified by the Minister for Planning.	Pursuant to s75U(1) of the EP&A Act, proposals determined under Part 3A of the EP&A Act do not require separate approvals under s12 of this Act.
<i>Rivers and Foreshores Improvement Act 1948</i>  Department of Natural Resources	Under Part 3A of the <i>Rivers and Foreshores Improvement Act 1948</i> , approval is required for excavations within 40 metres of a waterway.	Pursuant to s75U(1) of the EP&A Act, proposals determined under Part 3A of the EP&A Act do not require separate approvals under Part 3A of this Act.
<i>Water Act 1912 and Water Management Act 2000</i>  Department of Natural Resources	Under the Act, a licence would be required if water was to be extracted from a creek or if any waterways were to be realigned during construction.	Pursuant to s75U(1) of the EP&A Act, proposals determined under Part 3A of the EP&A Act do not require separate approvals under s89, s90 or s91 of this Act.

<b>Legislation and responsible agency</b>	<b>Relevant provisions</b>	<b>Requirements to gain approval</b>
<i>National Parks and Wildlife Act 1974</i> Department of Environment and Conservation	The Act aims to prevent the unnecessary or unwarranted destruction of relics and the active protection and conservation of relics of high cultural significance. This Act covers relics of both 'Indigenous and non-European' habitation in NSW.	Pursuant to s75U(1) of the EP&A Act, proposals determined under Part 3A of the EP&A Act do not require separate approvals under s87 or s90 of this Act.
<i>Heritage Act 1977</i> Department of Environment and Conservation (NSW Heritage Office)	The Act protects heritage items, sites and relics in NSW older than 50 years regardless of cultural heritage significance.	Pursuant to s75U(1) of the EP&A Act, proposals determined under Part 3A of the EP&A Act do not require separate approvals under Part 4 or s139 of this Act.
<i>Dangerous Goods Act 1975</i> NSW WorkCover Authority	This Act regulates dangerous goods in NSW by requiring the various activities, such as the keeping, conveyance, use and manufacture of certain dangerous goods to be licensed by WorkCover.	A licence would be required for the storage of greater than 250 litres of a dangerous good (fuel or oil) and construction of a pipeline less than 10 km in length.
<i>Electricity Supply Act 1995</i> Department of Energy, Utilities and Sustainability	<p>This Act regulates network operations and electricity supply to establish a competitive retail market in electricity so as to promote efficient and environmentally responsible production.</p> <p>The Act confers powers to network operators to enable them to construct, operate, repair and maintain their electricity works.</p>	A licence to supply electricity is required.
<i>Roads Act 1993</i> NSW Roads and Traffic Authority	Consent is required from the Roads and Traffic Authority for work in, on, under or over a public road.	Closure of roads for transport of the gas turbines and other large plant items would require Roads and Traffic Authority consent under the Act.
<i>Crown Lands Act 1989</i> Department of Lands	The Act governs the use of Crown land.	The proposed development crosses two Crown roads and therefore may require approval from the Department of Lands for the ongoing operation of the pipeline.

<b>Legislation and responsible agency</b>	<b>Relevant provisions</b>	<b>Requirements to gain approval</b>
<p><i>Environment Protection and Biodiversity Conservation Act 1999</i></p> <p>Commonwealth Department of Environment and Heritage</p>	<p>Proposals which have the potential to significantly impact on matters of national environmental significance, or the environment of Commonwealth land, must be referred to the Commonwealth Minister for the Environment. Matters of national environmental significance include:</p> <ul style="list-style-type: none"> <li>• World Heritage properties</li> <li>• National Heritage places</li> <li>• Ramsar wetlands of international significance</li> <li>• listed threatened species and ecological communities</li> <li>• listed migratory species</li> <li>• Commonwealth marine areas</li> <li>• nuclear actions (including uranium mining).</li> </ul>	<p>The proposal would not impact on any nationally listed threatened or endangered species or communities or internationally listed migratory species.</p> <p>Referral to, or approval from, the Commonwealth Minister for the Environment is not required under the <i>Environment Protection and Biodiversity Conservation Act 1999</i>.</p>
<p><i>Coastal Protection Act 1997</i></p> <p>Coastal Council of NSW</p>	<p>Concurrence from the Minister for Planning is required for development by a public authority which in the opinion of the Minister may (under Section 38):</p> <ul style="list-style-type: none"> <li>▪ be inconsistent with the principles of ecologically sustainable development, or</li> <li>▪ adversely affect the behaviour or be adversely affected by the behaviour of the sea or an arm of the sea or any bay, inlet, lagoon, lake, body of water, river, stream or watercourse, or</li> <li>▪ adversely affect any beach or dune or the bed, bank, shoreline, foreshore, margin or flood plain of the sea or an arm of the sea or any bay, inlet, lagoon, lake, body of water, river, stream or watercourse, unless an order published in the Gazette states that this clause does not apply.</li> </ul>	<p>Under s75U(1) EP&amp;A Act, Part 3A projects are exempt from concurrence from that Minister under Part 3 of this Act.</p>

<b>Legislation and responsible agency</b>	<b>Relevant provisions</b>	<b>Requirements to gain approval</b>
<i>Civil Aviation Safety Regulation 1998</i> Civil Aviation Safety Authority	If a physical structure is greater than 110m or gaseous efflux greater than 4.3m/s at 110m above ground, the object will be considered an obstacle.	If considered an obstacle, CASA will regulate mitigation measures such as lighting, restricted air access, depiction on charts and notification etc.
<i>Mine Subsidence Compensation Act 1961</i> Mine Subsidence Board	An application for approval is required to alter or erect improvements within a mine subsidence district or to subdivide land.	An approval under Section 15 of this Act is required.

## 5.4 Summary of approval pathway

The following additional approvals and licenses are required for the proposal:

- *Protection of the Environment Operations Act 1997*
- *Dangerous Goods Act 1974*
- *Mine Subsidence Act 1961*
- *Threatened Species Conservation Act 1995*
- *Roads Act 1993*
- *Crown Lands Act 1989*
- *Civil Aviation Safety Regulation 1998*
- *Electricity Supply Act 1995.*

Various other agreements and approvals will also be required subsequent to development approval, as described in Section 6.3.



## COMMUNITY AND STAKEHOLDER CONSULTATION

6

## **6. Community and stakeholder consultation**

### **6.1 Overview**

Key stakeholders were consulted during the preparation of this environmental assessment to identify and address the key issues of concern. Community, environmental groups and government agencies were contacted following selection of the preferred technology and pipeline routes options, and at the commencement of the environmental assessment process. The approaches taken and responses received are described below.

### **6.2 Government consultation**

#### **6.2.1 Planning focus meeting**

A planning focus meeting with government agencies was held on 11 May 2005 at the Munmorah Power Station. A briefing paper outlining the proposal and the likely key issues was sent to invitees prior to the meeting.

Invitations were sent to all relevant government authorities as identified by the Department of Planning (formerly Department of Infrastructure Planning and Natural Resources). Representatives from the following authorities attended the meeting:

- Department of Infrastructure Planning and Natural Resources (now the Department of Planning and Department of Natural Resources)
- Wyong Shire Council
- Department of Energy and Utilities Sustainability
- Department of Environment and Conservation.

Written submissions stating the requirements of individual agencies were received by the Department of Planning following the completion of the planning focus meeting. The Director-General's requirements were issued by the Department in April 2005. These requirements were subsequently re-issued in September 2005 with minor modifications as required under Part 3A of the *Environmental Planning and Assessment Act 1979*.

A summary of the Director-General's requirements under Part 3A, including where these are addressed in this report, is provided in Table 6.1. A complete copy of the Director-General's requirements is provided in Appendix A.

**Table 6.1 Summary of Director-General's requirements under Part 3A**

<b>Director-General's requirements</b>	<b>Where addressed</b>
A strategic justification of the need, scale, scope and location for the development in relation to the strategic direction of the region and the State regarding electricity generation, likely electricity demand and any predicted electricity transmission constraints	<i>Chapter 2</i>
Strategic planning and analysis of the suitability of the proposed site regarding potential land use conflicts with existing and future surrounding land users	<i>Chapter 15</i>
Cumulative air quality assessment of the proposed development and the existing electricity generating station at the site at a local, regional and inter-regional level	<i>Chapter 11</i>
Assessment of contribution of the proposal to photochemical smog formation	
Assessment of greenhouse gas emissions (total emissions and emissions intensity) from the development, with consideration of government policies regarding greenhouse gases	
A description of the ownership, land use and zoning provisions for land along the pipeline route	<i>Chapter 15</i>
Identification of potentially impacted critical habitats; threatened species, populations or ecological communities, or their habitats along the proposed pipeline route, and application of the test of significance under Part 5A of the <i>Environmental Planning and Assessment Act 1979</i> in relation to any clearing	<i>Chapter 9</i>
An Aboriginal heritage impact assessment of land along the proposed pipeline route	<i>Chapter 13</i>
A screening of potential hazards on site (including the pipeline route) to determine the potential for off-site impacts and any requirements for a preliminary hazard analysis.	<i>Chapter 16</i>
Documentation of risk impacts associated with transport of dangerous goods and hazardous materials with reference to the Department's draft route selection guideline	<i>Chapter 14</i>
Assessment of the proposed source of water, and implementation of water saving measures (including use of treated effluent or rainwater)	<i>Chapter 3</i>
Identification of the quantity and quality of wastewater, how this wastewater would be disposed of, and how stormwater would be managed at the site	<i>Chapter 4</i>
Assessment of noise impacts	<i>Chapter 10</i>
Documentation of consultation with:	<i>Chapter 6</i>
<ul style="list-style-type: none"> <li>▪ Wyong Shire Council</li> <li>▪ Australian Rail Track Corporation</li> <li>▪ RailCorp</li> <li>▪ owners and users of land along the proposed pipeline route</li> <li>▪ relevant utility providers</li> <li>▪ community groups and potentially-affected residents.</li> </ul>	

### Director-General's requirements

### Where addressed

Consideration of applicable environmental planning instruments, *Chapter 5* including the:

- *Wyong Local Environmental Plan 1991*
- *State Environmental Planning Policy No. 33 – Hazardous and Offensive Industry*
- *State Environmental Planning Policy No. 44 – Koala Habitat Protection.*

The following government authorities were also contacted by letter, phone and/or email to seek comment on the proposal:

- RailCorp
- Civil Aviation Safety Authority
- Royal Australian Air Force
- Mine Subsidence Board
- TransGrid
- Darkinjung Local Aboriginal Land Council
- WorkCover NSW
- NSW Department of Lands.

A summary of the key issues raised by these stakeholders is provided in Table 6.2. A full copy of written correspondence received is provided in Appendix C.

**Table 6.2 Summary of agency issues raised**

Government authority	Issues raised	Where addressed
Wyong Council	Council approval required for works on Wyee Road.	<i>Chapter 5</i>
	Prepare flora and fauna assessment for the pipeline route. Identify and assess clearing along the pipeline.	<i>Chapter 9</i>
	Identify and assess current and future zoning and land use along the pipeline	<i>Chapter 5, 15</i>
	Clarify the need for owners consent for the pipeline and creation of easements.	<i>Chapter 5</i>
	Consider visual amenity impacts	<i>Chapter 12</i>
	Consider construction and operational impacts of noise and vibration.	<i>Chapter 10</i>
	Discuss options for water supply, including treated effluent and water re-use options.	<i>Chapter 3</i>
	Identify any impact on Council's water and sewer infrastructure.	<i>Chapters 3 and 4</i>

<b>Government authority</b>	<b>Issues raised</b>	<b>Where addressed</b>
	Consider and assess the impact of the pipeline route on the local road network.	<i>Chapter 4, 14</i>
	Detail likely timeframe for construction within road reserves.	<i>Chapter 4</i>
	Consult with the RTA.	<i>Chapter 6</i>
	Detail proposed consultation strategies.	<i>Chapter 6</i>
TransGrid	Access to and along the easement is not to be impeded in anyway by the proposal	<i>Chapter 4</i>
	All construction crew (including crane/excavator operators and spotters) should be appropriately certified/accredited, and be inducted by TransGrid before being permitted to enter/work within easement.	<i>Chapter 4</i>
	Operators of plant and equipment with the capacity to exceed 4.3m in height shall be certificated under ESAA NENS 04 – 200300 National Guidelines for Safe Approach Distances to Electrical Apparatus	<i>Chapter 4</i>
	The pipeline trench to be reinstated in accordance with AS1289.5.1.1 – 2003. Backfilled material is to be sown with a pasture of seed mix.	<i>Chapter 4</i>
	Risk assessment to be conducted in accordance with Australian Standard to determine the appropriate design/safety criteria.	<i>Chapters 4 and 16</i>
	Consider cathodic protection and AC mitigation in pipeline design.	<i>Chapter 4</i>
	No permanent building permitted to be erected within 30m of TransGrid structure.	<i>Chapter 4</i>
	No excavation works permitted within 15m of any TransGrid structure.	<i>Chapter 4</i>
NSW Roads and Traffic Authority	RTA and Council approval is required for works and structures in, on or over the Pacific Highway (SH10), Scenic Drive (MR336) and Motorway Link (MR675) under Section 138 of the Road Act.	<i>Chapter 5</i>
	Consider the impact on traffic during construction and operation.	<i>Chapter 14</i>
	Consider the relevance of SEPP 11 – Traffic Generating Development, Draft SEPP 66 – Integration of Land Use and Transport and DIPNR's EIS Guidelines – Energy (Transportation and Traffic).	<i>Chapter 5</i>
	Consider the impact on pedestrians and cyclist movements in the vicinity of Pacific Highway and Scenic Drive Doyalson.	<i>Chapter 14</i>
	Locate pipeline outside State road reserves in a separate easement to minimise impact on other existing and future infrastructure.	<i>Chapters 3 and 4</i>
	Pipeline crossings perpendicular to road reserve at a location that offers the shortest length. Location of the pipeline within the state road reserve shall be in accordance with RTA guidelines specifying location of utilities.	<i>Chapter 4</i>

<b>Government authority</b>	<b>Issues raised</b>	<b>Where addressed</b>
	Road crossing to be constructed to Australian Standards. Direction boring for crossing state roads is preferred. Minimum 1.5m cover be retained when crossing State roads.	<i>Chapter 4</i>
	No direct vehicle access will be permitted to / from the F3 Freeway.	<i>Chapter 14</i>
	A Works Authorisation Deed (WAD) with the RTA is required to enable works on the classified state road network.	<i>Chapter 5</i>
Department of Energy, Utilities and Sustainability	Environmental assessment to include details of greenhouse gas emissions from the plant.	<i>Chapter 11</i>
	Identify source of gas feed.	<i>Chapter 4</i>
	Address any potential for expansion/staging to combined cycle.	<i>Chapter 4</i>
	Outline water requirements and source.	<i>Chapters 3 and 4</i>
	Include full fuel cycle greenhouse emissions intensity of plant. i.e. all emissions associated with fuel including fugitive emissions from the gas production and transport to the power station (not life cycle analysis).	<i>Chapter 11</i>
AGL Gas networks	20m easement width required.	<i>Chapter 4</i>
	Portion of easement required to be maintained clear of vegetation. Generally 5-10m width.	<i>Chapter 4</i>
	Acceptance and approval by AGL required for connection to main gas pipeline.	<i>Chapter 5</i>
	AGL will consider factors relating to access arrangements, pipeline capacity requirements and risk assessment.	<i>Noted</i>
	Proposed pipeline off-take location avoids developed areas, to reduce the risk of interference.	<i>Chapter 4</i>
	The AGL gas pipeline is in a shared trench and easement with Caltex DN300 petroleum pipeline. Liaison with Caltex is required for detailed design and construction.	<i>Noted</i>
	Capacity in AGL Gas Network (AGLGN) should not be assumed without submitting a request and receiving (and maintaining) an offer for trunk transportation from AGLGN. Delta will need to contact a natural gas retailer to progress a formal request for a natural gas transportation service.	<i>Noted</i>
	Initial review considered the proposal to be technically satisfactory for planning purposes.	<i>Noted</i>
	Consider the impact of the high voltage power infrastructure and the subsequent cathodic protection issues.	<i>Chapter 4</i>
RailCorp	Approval from RailCorp is required for access to the rail corridor or work near the rail infrastructure as described in the Draft Guideline – Work in and around the Rail Corridor (January 2005).	<i>Chapters 4 and 5</i>

<b>Government authority</b>	<b>Issues raised</b>	<b>Where addressed</b>
	Rail Corridor Management Group (RCMG) is responsible for managing all third party rail access and would coordinate requirements from the relevant rail groups.	<i>Noted</i>
	RailCorp will require input into the detailed design to provide specifications for the protection and safety of rail infrastructure.	<i>Chapter 4, 5</i>
	Risk assessment to include risks to the rail network.	<i>Chapters 4 and 16</i>
	Estimated 4m below ground clearance required under the rail line. Access pits and valves etc should be located outside the rail corridor to reduce the requirement for compliance with the Rail Safety Act.	<i>Chapter 4</i>
	Consider electrolysis effects of the pipeline on the rail line in design.	<i>Chapter 4</i>
WorkCover	Approval under Dangerous Goods Act required.	<i>Chapter 5</i>
	Risk assessment required during detailed design phase.	<i>Chapter 16</i>
	Australian Standards for construction and testing required.	<i>Chapter 4</i>
Department of Environment and Conservation	Licence under the POEO Act required for air, water and noise impacts.	<i>Chapter 5</i>
	Consider site contamination issues such as asbestos and PCBS	<i>Chapter 4</i>
	Consider construction noise and erosion	<i>Chapters 7 and 10</i>
	Assess flora and fauna impacts in accordance with the TSC Act.	<i>Chapter 9</i>
	Comprehensive assessment of air emissions including the contributing emissions to photochemical smog formation.	<i>Chapter 11</i>
	Assessment of local, regional and interregional and cumulative air quality impacts from the plant in accordance with EPA criteria.	<i>Chapter 11</i>
	Assessment of water quality issues including alternate sources.	<i>Chapter 4</i>
	Consider and discuss re-use options for generated heat.	<i>Chapter 4</i>
	Noise impact assessment required (particularly in relation to plant, switch yard and electrical transmission equipment).	<i>Chapter 10</i>
	Prepare a waste management plan that identified and classifies waste generated on-site in accordance with EPA guidelines.	<i>Chapter 4</i>
	Flora and fauna impact assessment required.	<i>Chapter 9</i>
	Aboriginal cultural heritage impact assessment required.	<i>Chapter 13</i>
Mine Subsidence Board	The pipeline will need to be designed to cater for any potential residual movement as follows:  maximum vertical subsidence of 250mm maximum ground strain of +/- 2mm/m, maximum tilt of 3mm/m	<i>Chapters 4 and 7</i>  <i>Noted</i>

<b>Government authority</b>	<b>Issues raised</b>	<b>Where addressed</b>
	Consult with potentially affected landowner, for the siting and mine subsidence constraints for the pipeline.	<i>Chapter 6</i>
Civil Aviation Safety Authority	If the physical structure is greater than 110 metres above ground or gaseous efflux greater than 4.3m/s at 110 metres above ground, the object will be considered an obstacle under the Civil Aviation Safety Regulations 1998.  If considered an obstacle, CASA will regulate mitigation measures such as lighting, restricted air access, depiction on charts and notification etc.	<i>Chapters 5 and 16</i>
NSW Department of Lands	The proposed pipeline crosses two Crown roads (west of Lot 1 DP259306 and east of Lot 3 DP259306). Undertaking works, the placement of structures and activities of others in relation to Crown roads is regulated by the department under s138 of Roads Act 1993. Approval under the Crown Lands Act may also be required for the ongoing operation of the asset, particularly if it is to be privately owned.	<i>Chapter 5</i>

## 6.3 Community consultation

### 6.3.1 Methods

The consultation approach included targeted and broader community consultation. The following techniques were employed to engage community feedback on the proposal:

- letters to land owners affected by the proposed pipeline
- publication of a project newsletter
- publication of a media article
- a 1800 project information line
- a community advisory regional environmental (CARE) forum
- a project website
- letters to key community groups.

The scope and detail of each of the consultation components are described in detail below.

#### ***Letters to land owners affected by the pipeline***

Original contact was made with land owners affected by the proposed pipeline route via a letter requesting access for field surveys. This was subsequently followed by a phone call to identify and discuss any issues or concerns regarding the proposal.

An overview letter and a copy of Newsletter 1 (see below) were also sent to affected land owners in August 2005. Further contact was made in September 2005 for the second round of field surveys along the route. Discussions with affected land owners



also sought to identify future proposed land use plans, to ascertain any possible future land use conflicts.

### **Newsletter**

A project newsletter (Newsletter 1, June 2005) was produced, to overview the background to the proposal, the proposal description, environmental assessment process and consultation activities.

The newsletter was published in the following regional newspapers on 30 June 2005:

- *Central Coast Express Advocate*
- *Sun Weekly*.

A copy of Newsletter 1 is provided in Appendix C.

### **Media article**

A media article was published in the following local newspapers in August 2005:

- *Pelican Itch* (Northern and Budgewoi editions)
- *Windmill News*.

A copy of the article is provided in Appendix C.

### **1800 Line**

A free-call 1800 line was established for the project (1800 817 711). This was staffed by Delta's project manager, based at Munmorah Power Station. All inquiries were registered and actioned.

### **Community Access Regional Environmental forum**

The Community Access Regional Environmental (CARE) forum is an ongoing community liaison group comprising representatives from progress associations and the Central Coast Environment Council. This group meets quarterly to discuss the general activities and environmental monitoring results of Delta Electricity's Central Coast operations.

The proposal was discussed at CARE forums in December, February and August 2005. Issues raised at the forum were registered and discussed at subsequent project meetings and actioned accordingly.

### **Website**

Delta maintains a website of all its operations ([www.de.com.au](http://www.de.com.au)). An overview of the proposal, including a map of the proposed pipeline route and a link to the newsletter, was provided on the website during the environmental impact assessment phase.

## Letters to key community groups

Letters and newsletters were sent to key community groups in August 2005 with a copy of Newsletter 1 (the list of organisations contacted is provided in Appendix C). A presentation was made by Delta Electricity at a meeting of the Chain Valley Bay Progress Association in August 2005. This was undertaken in response to a request made by the Association.

### 6.3.2 Responses

The following community responses were received:

- six 1800 calls
- two emails

A summary of the issues raised is provided in Table 6.3.

**Table 6.3 Summary of community issues raised**

<b>Issues raised</b>	<b>Where addressed</b>
Impact on proposed future urban development	<i>Chapter 15</i>
Impact on future underground mining and possible surface infrastructure	<i>Chapter 15</i>
Visual amenity of additional stacks	<i>Chapter 12</i>
Gas-fired power considered a better environmental outcome than coal-fired	<i>Chapter 11</i>
Consider water supply from Newcastle via Vales Point Power Station	<i>Chapter 3</i>
Town water supply should not be used; alternatives should be investigated	<i>Chapter 3</i>
Cumulative air quality impacts from Vales Point need to be considered	<i>Chapter 11</i>
Employment generation	<i>Chapter 18</i>
Will the proposal provide natural gas connection for local residents?	<i>NA</i>
How are community surveys administered?	<i>NA</i>

Selected land owners responded with information regarding proposed land uses for their affected lands. This issue is discussed further in Chapter 15.

## 6.4 Ongoing consultation

The following agencies would be contacted to provide input into the detailed design phase and to obtain the necessary approvals, following determination of this application:

- Roads and Traffic Authority (regarding traffic)
- Wyong Shire Council (regarding traffic and water supply)
- RailCorp (regarding design criteria for the pipeline under the rail line)
- WorkCover (regarding a Dangerous Goods Licence for the pipeline)

- AGL Gas Networks (regarding access and a connection to the Sydney–Newcastle gas pipeline)
- TransGrid (regarding access, location and construction of the pipeline)
- Mine Subsidence Board (regarding design criteria for the pipeline and above-ground infrastructure)
- Civil Aviation Safety Authority (regarding potential aviation hazards due to stack emissions)
- Department of Environment and Conservation (regarding any threatened species permits)
- Caltex (regarding access to the Sydney–Newcastle pipeline easement)
- land owners affected by the proposed pipeline (regarding pipeline easements).

Further community input would also be sought through public exhibition of this environmental assessment. Community feedback (via written submissions) received during the exhibition phase would be considered and addressed in a Submissions Report to be prepared by Delta Electricity for the Department of Planning. The community would remain informed of the progress of the project through ongoing involvement in the CARE forum.

**SOILS AND GEOLOGY**

**7**

## **7. Soils and geology**

### **7.1 Existing environment**

#### **7.1.1 Topography**

The topography of the proposed gas turbine facility and gas pipeline route has been assessed with reference to the 1:25,000 Catherine Hill Bay and Dooralong topographic maps.

The proposed gas turbine facility would be located northeast of the existing power station site on low-lying, level land southeast of the Hammond Canal. The topographic maps indicate that the proposed pipeline route cuts through an area of gently undulating topography where slope gradients are generally less than 10 per cent. The topographic map shows that a section of the proposed route runs adjacent to an area of swampy ground that may be subject to inundation following significant rain events.

#### **7.1.2 Geology**

Reference to the 1:250,000 Sydney Geological Sheet S 156-5 indicates that the proposed gas turbine facility site is underlain by Quaternary sediments and rocks of the Gosford Formation belonging to the Narrabeen Group. This formation comprises sandstone claystone and shale.

Reference to the 1:100,000 Regional Coalfields Map SS 9231 indicates the proposed pipeline route is underlain by rocks belonging to the Narabeen Group. This group comprises sandstones, siltstone, conglomerate and claystone.

#### **7.1.3 Soils**

Soil profiles at the proposed gas turbine facility site and along the proposed gas pipeline route have been assessed by review of soil technical reports available from the Department of Natural Resources' databases and by reference to the 1:100,000 Gosford-Lake Macquarie Soils Landscape Map SS 9131-9231.

#### ***Gas turbine facility***

The Gosford-Lake Macquarie Soil Map indicates that the site is located within the Wyong Soil Landscape. These soils can be water logged and poorly drained. Wyong soils are described as being strongly acidic and may form acid sulfate soil conditions, foundation hazards and may be strongly saline.

A preliminary geotechnical investigation was carried out at the site by Parsons Brinckerhoff. The results of the investigation indicated that the site is underlain by alluvial loose to medium dense sand and firm to stiff clay soils. These soils are underlain by firm to very stiff residual clay soils and extremely weathered sandstone. Soil profiles across

the site were generally deep extending from 2.5 to 3.5 metre depths. Minor groundwater inflows were noted in one test location at 3.8 metres.

### ***Proposed pipeline route***

The Gosford-Lake Macquarie Soil Map indicates that the proposed pipeline route cuts through an area dominated by the Doyalson soil landscape. This soil landscape is characterised as forming moderately deep soil profiles ranging from 0.5 to 1.5 metre depths. The soil profile is described as being highly erosive, may undergo seasonal water logging, and may be strongly acidic and hard setting.

Short sections of the proposed route pass through low lying areas characterised by soils of the Tacoma Swamp and Wyong soil landscape. These soil landscapes are described as forming deep soil profiles greater than two metres. These areas may undergo flooding and soils may be water logged and poorly drained. Soils are described as being strongly acidic and may form potential acid sulfate soil conditions, foundation hazards and may be strongly saline.

The SPADE (2004) database provides information at two locations near the proposed route. The soil profiles consist of loamy sands underlain by clayey sands and residual sandy clays and medium clays. Depth to rock is between 0.7 and 1.0 metre, and soil pH varies from 4.5 to 5.5. Subsurface lithology is anticipated to be fine grained sandstone or siltstone. The Gosford-Lake Macquarie Soil Map reference manual describes the medium clays as having high plasticity and moderate to high shrink-swell characteristics. All of the soil types encountered are described as being potentially strongly acidic.

#### **7.1.4 Acid sulfate soils**

Acid sulfate soil conditions have been assessed with reference to the 1:25,000 Catherine Hill Bay Acid Sulfate Soils Risk Map and the 1:100,000 Gosford-Lake Macquarie Soils Landscape Map SS 9131-9231. The acid sulfate soil risk map indicates that the proposed gas turbine facility site is located on an area of disturbed ground. The filling of the site and/or reclamation of low lying terrain during development of the site could result in disturbance of these types of soils.

Preliminary geotechnical investigations carried out by Parsons Brinckerhoff indicate that potential acid sulfate soils were encountered generally at 2.5 metre depth across the site. Field screen testing indicated that potential acid sulfate soils may be present at shallower levels at some locations across the site.

The acid sulfate soil risk map indicates that the pipeline route runs through an area where acid sulfate soil conditions are not known to occur. However, the Gosford-Lake Macquarie Soil Map indicates that potential acid sulfate soils may occur in localised areas within the Doyalson, Wyong and Tacoma Swamp soil landscapes.

#### **7.1.5 Mine subsidence**

Reference to the 1:25,000 Catherine Hill Bay and Dooralong topographic maps indicates that the proposed gas pipeline route option and gas turbine facility are located

within the Swansea North Entrance Mine Subsidence District. The Mine Subsidence Board has advised that the pipeline route is partially underlain by old pillar extraction workings.

## **7.2 Potential impacts**

### **7.2.1 Construction**

The construction of the proposal may have the following impacts on the existing geological conditions.

- disturbance to soils during construction may expose potential acid sulfate soils, thereby creating actual sulfate soils. The types of soils may have an adverse impact on the durability of construction materials and possibly create acid surface water runoff without the use appropriate mitigation measures
- any construction in Tacoma Swamp area and Wyong formation soils may expose aggressive soil conditions that may lead to deterioration of buried concrete and steel foundation structures unless suitable corrosion protection methods are used
- the presence of mine subsidence may affect the long term stability and structural integrity of heavily loaded and/or buried structures
- potential for inundation of low-lying ground may lead to foundation hazards for the above ground facilities and pipeline
- excavation during earthworks may expose highly erosive soils which may lead to sediment runoff and siltation of nearby water bodies
- the possible shallow depth to rock at some locations along the pipeline route may create excavation difficulties in certain areas.

### **7.2.2 Operation**

The assessment did not find any significant potential impacts on the soil or geology of the areas affected by the proposal that would be associated with the operation of the proposal.

## **7.3 Mitigation**

### **7.3.1 Construction**

#### ***Acid sulfate soils***

A detailed acid sulfate soil investigation would be carried out across the areas of proposed soil disturbance (above ground structures and pipeline route) during the detailed design phase of the proposal to clearly ascertain the location and extent of these types of soils. Based on the results of this investigation, an acid sulfate soil management plan would be prepared by the construction contractor prior to the

commencement of construction activities. The management plan would document the occurrences of potential and actual acid sulfate soils across the development areas and provide information and recommendations for the appropriate treatment and disposal of these soils where/when encountered.

### ***Foundation hazards and aggressive soils***

A detailed geotechnical site investigation would be carried out at the proposed gas turbine facility site and along the pipeline route during the detailed design phase of the proposal. The investigation would provide a detailed assessment of the foundation conditions at each location and provide information on soil reactivity, aggressivity and bearing capacity of foundation soils and bedrock so that appropriate design considerations can be incorporated into all below ground structures to ensure their durability.

### ***Mine subsidence***

Approval from the Mine Subsidence Board would be obtained during the detailed design phase and prior to the commencement of construction activities. The facility and pipeline would be designed and constructed in strict accordance with the Board's specifications.

To ascertain potential future mine subsidence constraints, the Mine Subsidence Board has recommended ongoing discussions with the current mining leaseholders affected by the proposed pipeline route. It is noted that any future mining in this area would already be constrained by the need to manage potential impacts on the existing Sydney-Newcastle gas pipeline.

### ***Soil erosion***

An erosion and sediment control plan would be developed by the construction contractor to manage potential soil erosion during and for a period after construction has been completed. The management plan would be based on the following soil erosion and sedimentation control practices:

- soil and water management practices would be considered concurrently with engineering design and in advance of any earthworks
- the area and duration of soil exposure would be minimised
- stripped topsoil would be stockpiled for re-use and protected from erosion by using suitable erosion control measures
- stormwater runoff would be controlled by diverting stormwater from denuded areas, and minimising slope gradients, lengths and runoff velocities
- erosion and sediment controls measures such as silt traps, sediment basins, perimeter banks, silt fences and nutrient traps would be used as appropriate
- areas that have been denuded of surface vegetation areas would be re-vegetated with native vegetation as soon as practical after works are complete in that area.



The above practices would be incorporated in the construction environmental management plan that would be prepared for the works during the construction planning phase (see Section 8.3 for further details on erosion and sediment control measures).

## **7.4 Summary of impacts**

Potential impacts of the proposal on the local soils and geology are considered low for the following reasons:

- an acid sulfate soils management plan would be developed by the construction contractor prior to the commencement of construction activities which would effectively manage impacts associated with any areas that are to be disturbed by the proposal and which have been identified as containing potential or actual acid sulfate soils
- adherence to design specifications provided by the Mine Subsidence Board and the implementation of a regular inspection program, particularly along the proposed pipeline route, would ensure potential mine subsidence impacts are mitigated
- appropriate design considerations would be developed to effectively mitigate potential impacts of subsurface constraints including soil reactivity, aggressivity and bearing capacity of foundation soils and bedrock
- the erosion and sediment control plan would be developed and implemented to ensure effective management of soils affected by the proposal in order to prevent any erosion and sedimentation impacts that may arise during the construction.

It is concluded that by adopting these mitigation measures there would be no significant adverse impacts on the local geology and soils due to the construction of the proposal.

**SURFACE WATER**

8

## **8. Surface water**

### **8.1 Existing environment**

The dominant hydrological features of the area are Lake Munmorah and Budgewoi Lake, which are marine coastal (partly saline) lakes and form part of the Tuggerah Lakes system. These are important fish and prawn producing estuarine areas. Water quality is currently affected by the surrounding urban catchment of Wyong Shire, as well as industrial uses and poor tidal interchange (Pacific Power International and Delta Electricity, 2002).

The Colongra wetland and Colongra Creek are wetland environments within the Munmorah Power Station's buffer lands. Wallarah and Spring Creek drain into Budgewoi Lake, and various tributaries of Spring Creek lie in the path of the proposed gas pipeline route. The proposed pipeline route also passes through some swampy areas, namely Tacoma Swamp.

The inlet canal linking Lake Munmorah and Budgewoi Lake is artificially made. Lake Colongra (the ash dam) is also artificially made and was built to accommodate bottom ash generated by Munmorah Power Station.

The existing Munmorah Power Station draws cooling water from Lake Munmorah and discharges to Budgewoi Lake via a licensed discharge point. The existing Environment Protection Licence has set a temperature limit on this discharge point to control and minimise the potential heat load impacts on the aquatic environment in the lake.

Stormwater from undisturbed areas of the power station site is currently discharged directly to the inlet canal. Water from the developed sections of the power station site is collected, treated and discharged to the ash dam via the on-site drainage system. Stormwater that may carry contaminants is collected and directed through a water treatment system for discharge to the ash dam. The ash dam water is then discharged to the inlet canal via a licensed discharge point.

### **8.2 Potential impacts**

#### **8.2.1 Construction**

The construction of the proposed gas turbine facility and pipeline has the potential to expose and mobilise sediment, fuels, chemicals and other materials to local drainage lines. This would result in potential impacts on the water quality in the local drainage systems. The following activities have the potential for sediment or contaminated run-off during and after periods of rain:

- erosion of disturbed soil surfaces

- accidental spills and leaks of fuels, chemicals or other pollutants
- vehicle movements and site disturbance
- building wastes and litter
- disturbance of acid sulfate soils.

The proposed gas turbine facility would be located in close proximity to a number of artificial drainage lines and storage ponds that are part of the existing stormwater management system which was established at Munmorah Power Station some time ago. Stormwater runoff during the early stages of the construction phase, where the majority of earthworks would occur, would likely be laden with silt and other potential contaminants that would be considered pollutants if discharged into a natural water body. The potential presence of potential acid sulfate soils in this area, as discussed in *Chapter 7*, would further increase the potential surface water impacts of any stormwater runoff, in the event that these soils are exposed and generate acidic runoff.

The proposed pipeline route crosses Spring Creek, a swamp area and a number of relatively minor drainage lines along the route. Excavation, earthworks and other construction activities that would be associated with the construction of a pipeline crossing within and/or beneath these drainage lines and tributaries have the potential to temporarily affect the water quality on these water bodies.

### **8.2.2 Operation**

The potential impacts associated with the operation of the proposed gas turbine facility are considered low, as the stormwater system would be fitted with a sluice valve which would effectively isolate the facility's stormwater system from the rest of the power station in the event of a significant distillate spill or fire at the facility which generates large volumes of potentially contaminated fire water.

The distillate storage tank and tanker unloading facilities would also be bunded to meet the requirements of Australian Standard AS1940 and isolated from the rest of the site. Any spills that may be caused during tanker unloading procedures or due to a failure in the fuel transfer system would be contained within the confines of the bunded area and collected at a later date for appropriate disposal

Potential surface water impacts generally associated with the handling and disposal of large quantities of contaminated wastewater are considered low due to the relatively small volumes (about 12,000 litres per year) of wastewater that would be generated during the operation of the facility. There would be no storage or handling activities conducted at the facility, as all wastewater would be passed through an on-site oil/water separator and transferred to the existing wastewater treatment plant at Munmorah Power Station for treatment and disposal to the ash dam. Small quantities of waste oils that may be generated during routine maintenance activities would be stored in drums and collected by a licensed liquid waste contractor for appropriate off-site disposal.

## 8.3 Mitigation

### 8.3.1 Construction

A surface water management plan which covers construction activities along the proposed pipeline route and gas turbine facility site would be prepared by the construction contractor as part of the construction environmental management plan for the project prior to the commencement of any construction activities.

It is envisaged that the plan would be developed in consultation with Department of Primary Industries (Fisheries) and the Department of Environment and Conservation to ensure the appropriate mitigating measures and safeguards are incorporated into the plan. Reference would be made to the erosion and sediment control plan that would be developed to mitigate soil erosion impacts (see *Section 7.3*).

An outline of the likely measures that would be included in the surface water management plan follows:

- planning to be developed in accordance with *Managing urban stormwater: soils and construction* (Department of Housing 1998, revised Landcom 2004)
- inspecting regularly the temporary and permanent erosion and sedimentation control devices. Suitably qualified personnel would ensure appropriate controls are implemented and maintained in an efficient condition
- retaining grassed drainage lines and minimising vegetation removal in drainage lines to reduce topsoil run-off
- retaining topsoil in areas not excavated, to prevent exposure of the subsoil during clearing operations
- developing and implementing an acid sulfate soil management plan (see *Section 7.3.1*)
- developing and implementing site drainage management practices such as:
  - diverting of clean run-off around construction works, installing catch drains as soon as practicable to ensure drainage is in place during the early stages of construction and lining of catch drains where necessary
  - using temporary and permanent diversion banks and drains to convey run-off to required areas and reduce run-off volume and velocity; and short- or long-term stabilisation of drains, as appropriate
  - monitoring the quality of water draining from the site and assessing the need for treatment prior to disposal
- developing and implementing site erosion and sediment control measures such as:

- implementing erosion and sedimentation controls such as sediment fences, silt traps, turf strips, straw bales, vegetation barriers, rock barriers and other containment devices
  - using existing cleared vegetation and mulch where possible to minimise erosion and capture sediment. This would include smaller drainage lines, across contours, close to waterways, in inlets of sediment basins, below cutting construction areas and below fill batters (vegetation and mulch would be spread over the adjacent area at the conclusion of construction works)
  - minimising site disturbance by containing machinery access to site areas required for approved construction works, access tracks or materials stockpiles
  - installing wheel cleaning systems at construction site exits to remove excess mud from truck tyres and underbodies
  - cleaning roadways to remove sediments deposited from truck tyres, preventing contamination of road run-off
  - diverting as much run-off as possible from disturbed areas to sediment basins for treatment prior to release to watercourses. Sediment basins would be installed during the early stages of construction and appropriate locations to treat run-off should be considered during construction and operation.
- developing and implementing appropriate measures when constructing waterway structures and associated works, including:
    - preparing a site specific methods statement for waterway works
    - installing scour protection in creek/river bank areas at risk of erosion
    - minimising the extent of vegetation clearing and soil disturbance in waterways
    - using a temporary flow diversion structure to divert stream flows (if any) around or over disturbed areas. This structure may be a temporary coffer dam upstream and downstream of the excavation, and a pipeline to allow stream flows across the excavation
    - minimising the duration of construction works at creek crossings
    - undertaking water quality monitoring upstream and downstream of affected area, if required
    - restoring disturbed areas of channels and banks to their former condition as soon as possible following the completion of earthworks. This would involve either the use of turf and/or advanced plantings of locally indigenous species of plants

- o consulting prior to and during construction activities with relevant authorities, such as the Department of Primary Industries, as required.

### **8.3.2 Operation**

All wastewater discharges would be treated on-site to remove oil and grease and discharged to the wastewater treatment system at Munmorah Power Station for further treatment prior to discharge to the ash dam.

The distillate storage tank and entire facility would be bunded and contained to prevent potentially contaminated runoff from reaching the stormwater management system at the Munmorah Power Station and outlet canal.

## **8.4 Summary of impacts**

The likelihood of off-site water quality impacts from the erosion of disturbed areas is considered to be low for the following reasons:

- the majority of major excavation works are to occur within the grounds of Munmorah Power Station
- earthworks for the construction of the pipeline would predominantly be surrounded by vegetated terrain and away from watercourses or drainage lines, except where the particular pipeline needs to cross a creek or drainage line
- construction trucks leaving the site would pass through a wheel cleaning facility
- erosion and sediment transport from construction sites would be managed through the use of standard erosion and sediment controls
- an acid sulfate soils management plan would be developed by the construction contractor prior to commencement of works and once specific details of actual construction methods have been determined during the detailed design phase of the proposal
- spills and leaks would be controlled by routine inspections, storage and transport; and the storage and handling of these materials would be conducted in accordance with relevant standards and guidelines.

In recognition of the above, excavations and construction works in these areas are considered to create a low risk of water pollution.

The likelihood of surface water impacts associated with the operation of the proposed gas turbine facility are considered low as the entire facility and internal distillate storages within the facility would be bunded and self-contained.

FLORA AND FAUNA

9



## 9. Flora and fauna

### 9.1 Existing environment

Fauna and flora surveys were conducted by Parsons Brinckerhoff between 7 and 11 March 2005. During this time, the weather was warm and dry with maximum daily temperatures ranging between 26 and 32 degrees Celsius. Given the known occurrence nearby and possible presence of *Tetradlea juncea*, targeted surveys were undertaken between 30 and 31 August and 12 and 13 December to coincide with the flowering time of this species. The December survey period also coincided with the flowering period of *Cryptostylis hunteriana*.

A detailed description of the survey methodology and findings is provided in *Technical Paper 1 - Flora and Fauna Assessment of Munmorah Gas Turbine Facility*. This chapter summarises the key findings of that assessment.

#### 9.1.1 Flora

The proposed pipeline route would be located along an existing electricity transmission easement, which is currently maintained by TransGrid through the periodic slashing and selective clearing of canopy species. Due to the ongoing maintenance activities, vegetation within the easement lacks a canopy and contains only shrub and ground layers. Although the canopy species are generally absent and the easement is maintained as a grassland, sedgeland or heathland, the general species composition is consistent with the adjacent, relatively undisturbed, vegetation. Five vegetation communities occur within the assessment area:

- Coastal Plains Smooth-barked Apple Woodland
- Coastal Plains Scribbly Gum Woodland
- Wyong Paperbark Swamp Forest
- Swamp Mahogany-Paperbark Forest
- Riparian Melaleuca Swamp Forest.

Coastal Plains Smooth-barked Apple Woodland covers most of the proposed pipeline route, as well as the potential inlet facility site. Within the route, this vegetation generally has a high diversity of native species and weed invasion is restricted largely to areas immediately adjacent to roads and the Great Northern Rail Line corridor. The community is generally in good condition.

Coastal Plains Scribbly Gum Woodland occurs at two patches in the vicinity of the Great Northern Rail Line. This community intergrades with and is similar to the Coastal Plains Smooth-barked Apple Woodland described above. This community contains potential

habitat for *Tetratheca juncea*, *Cryptostylis hunteriana*, *Acacia bynoeana* and *Angophora inopina* (NSW National Parks and Wildlife Service, 2000).

Swamp Mahogany-Paperbark Forest occurs as a small patch in the eastern section of the proposed pipeline route near Munmorah Power Station. This community is a sub-unit of Swamp Sclerophyll Forest on Coastal Floodplain which is listed as an endangered ecological community under the *Threatened Species Conservation Act 1995* (NSW Scientific Committee, 2004). This community also provides potential habitat for threatened flora including *Tetratheca juncea* (NSW National Parks and Wildlife Service, 2000). This community has a moderate level of weed invasion and is in moderate condition.

Riparian Melaleuca Swamp Woodland, which is a sub-unit of Swamp Sclerophyll Forest on Coastal Floodplain and is listed as an endangered ecological community under the *Threatened Species Conservation Act 1995* (NSW Scientific Committee, 2004), also occurs in the eastern section of the proposed pipeline route. This community also provides potential habitat for threatened flora including *Angophora inopina* (NSW National Parks and Wildlife Service, 2000). This vegetation community generally has a low level of weed invasion and is in good condition. Refer to Figure 9.1 for details.

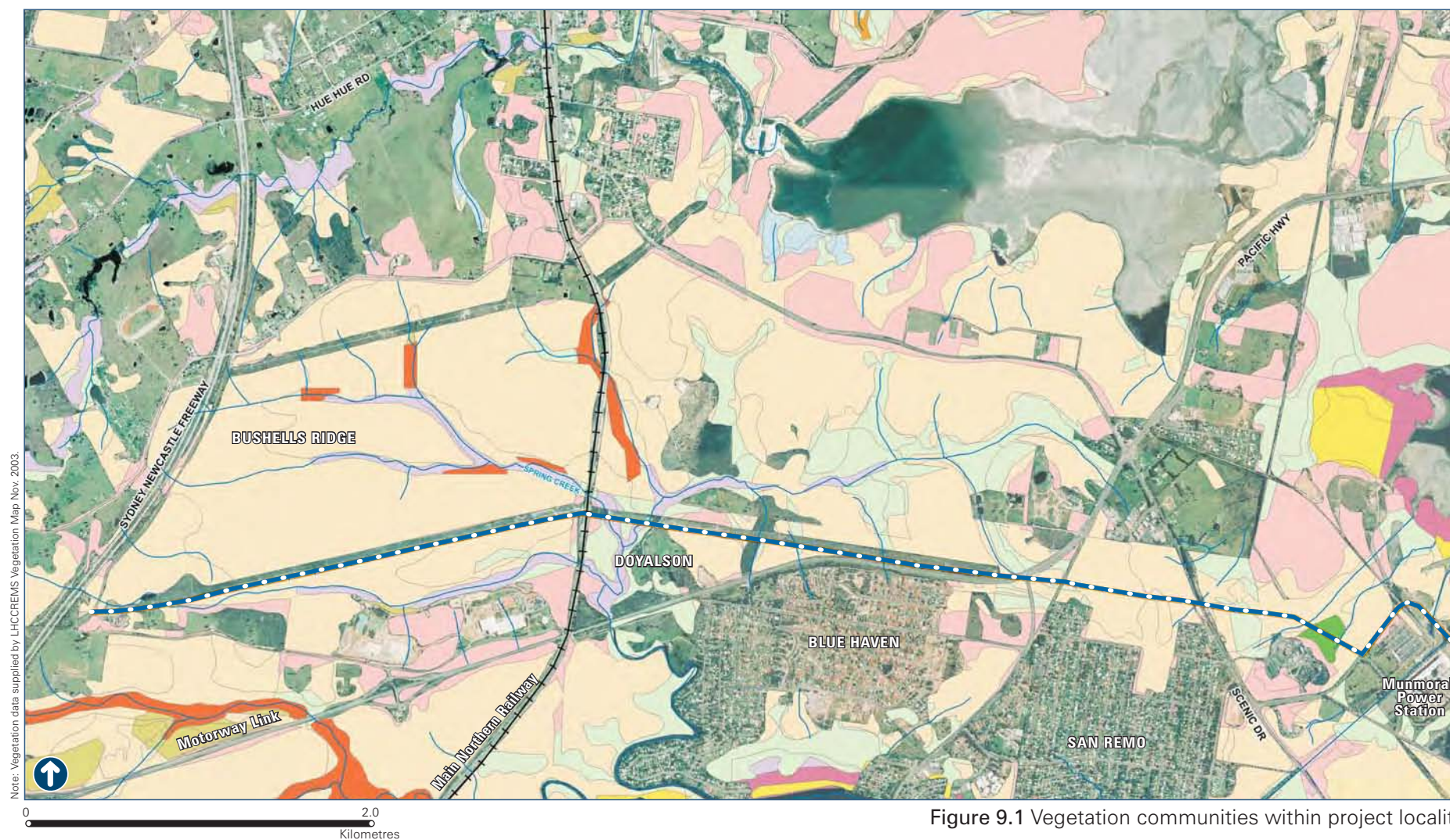
A total of 147 species of plant were recorded in the assessment area. Most of species (85 %) are native. No noxious weeds were recorded on the assessment area.

A total of 13 species of threatened flora listed under the *Threatened Species Conservation Act 1995* (Figure 9.2) and/or the *Environment Protection and Biodiversity Conservation Act 1999* are known to occur in the local area and are considered in this assessment (refer to Technical Paper No. 1).

*Angophora inopina*, listed as vulnerable under both the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*, was recorded within the easement near Charmhaven and also in the western section of the site. Only immature individuals were recorded (less than two meters tall).

Based on habitat assessment and the known distribution of threatened species in the Sydney Basin Bioregion, a further four species were assessed as having potential habitat within the site (refer to Technical Paper No. 1): *Acacia bynoeana*, *Cryptostylis hunteriana*, *Grevillea parviflora* spp. *parviflora* and *Tetratheca juncea*. However, *Tetratheca juncea* was not recorded within the site despite two targeted surveys (undertaken in August and December 2005) during its flowering period. Targeted surveys undertaken in December to coincide with the flowering period for *Cryptostylis hunteriana* failed to detect this species within the site.

Impact assessments as required under the *Threatened Species Conservation Act 1995* and/or the *Environment Protection and Biodiversity Conservation Act 1999* have been completed for the threatened species recorded or with potential habitat within the site (refer to Technical Paper No. 1).



- |                           |   |                                   |                                   |
|---------------------------|---|-----------------------------------|-----------------------------------|
| — Proposed pipeline route | Alluvial Tall Moist Forest                      | Freshwater Wetland Complex        | Swamp Mahogany - Paperbark Forest |
| + Rail line               | Coastal Foothills Spotted Gum - Ironbark Forest | Melaleuca Scrub                   | Swamp Oak Rushland Forest         |
| — Main roads              | Coastal Plains Scribbly Gum Woodland            | Redgum Rough Barked Apple Forest  | Wyong Paperbark Swamp Forest      |
| — Drainage                | Coastal Plains Smooth-barked Apple Woodland     | Riparian Melaleuca Swamp Woodland |                                   |



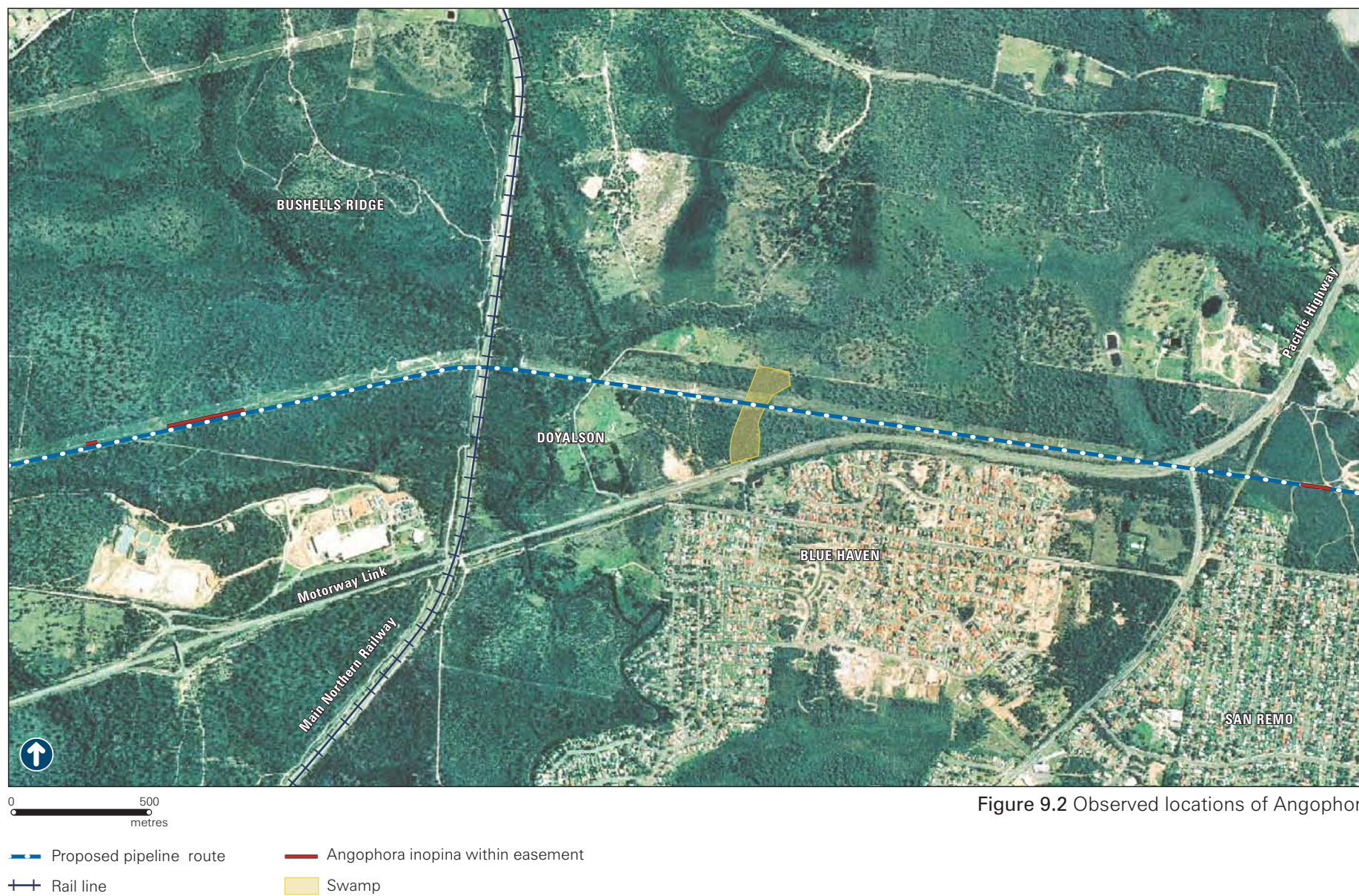


Figure 9.2 Observed locations of Angophora

### 9.1.2 Fauna

The fauna habitats for the Coastal Plains Scribbly Gum Woodland and the Coastal Plains Smooth-barked Apple Woodland have been collectively described as the two communities that share similar fauna habitat features and intergrade with each other. The fauna habitats of the heathland occur in an undisturbed state and as a regenerating shrub layer within some of the non-maintained areas of the electricity transmission easement.

#### ***Electricity transmission easement***

There are limited habitat features associated with the cleared grassland within the existing electricity easements due to ongoing maintenance activities. However, there are areas of regrowth vegetation including young tree saplings, *Acacia* shrubs and grasses that have not been maintained and are in the early stages of heathland formation.

Grasslands contained within the easement provide a marginal foraging area for macropods including the Eastern Grey Kangaroo and Swamp Wallaby. Insectivorous microchiropteran bats use the ecotone between the easements and adjacent to the woodland and heathland for foraging. The various stages of the regenerating shrub layer provides habitat for small ground-dwelling mammals including the Bush Rat and the Brown Antechinus.

The suitability of water holding sedgeland and drainage lines for amphibian diversity is likely to depend on the season or be ephemeral in nature, and the species recorded at Spring Creek include Leseur's frog and Striped Marsh frog.

Fauna habitats found along the electricity transmission easements are generally disturbed and in poor condition.

#### ***Coastal Plains Open Woodland***

The Coastal Plains Scribbly Gum Woodland and the Coastal Plains Smooth-barked Apple Woodland vegetation communities are the most abundant throughout the assessment area and form part of a wider area of bushland.

Understorey species include winter-flowering species such as *Banksia spinulosa* and *Acacia* sp. In association with summer flowering eucalypts, these species in the over storey provide important food resources for a variety of birds and arboreal marsupials throughout the year. There are a moderate number of trees that have developed medium to large sized tree hollows, mostly within the core of the woodland area. There is a moderate amount of leaf litter and fallen dead timber throughout most of the open woodland that provides refuge, shelter and foraging resources for a variety of native fauna.

The groundcover vegetation, including *Lomandra* grasses, and fallen dead timber and logs provide habitat for small ground-dwelling mammals including the Bush Rat and the Brown Antechinus as well as small reptiles including *Lampropholis* spp. The Eastern Grey Kangaroo and Swamp Wallaby forage throughout the woodland and in adjacent cleared areas of the easement. Native species of birds including fairy wrens and scrub wrens forage amongst the shrub layer, while honeyeaters and coastal woodland birds forage amongst the canopies of taller *Angophora* and eucalypt trees. Trees in varying stages of hollow formation are used by microchiropteran species of bat for roosting and

by arboreal marsupials. Some areas of the open woodland contain a disturbed understorey from grazing by goats and access tracks throughout the assessment area, although some of the tracks are likely to be used by microchiropteran bats as flight pathways for foraging.

The Threatened Squirrel Glider is also likely to use the foraging and breeding habitats available in the denser areas of woodland within the central and eastern areas of the assessment area.

Fauna habitats in the Open Woodlands are generally in moderate to good condition.

### ***Corridors and connectivity***

Wildlife corridors can be defined as “retained and/or restored systems of (linear) habitat which, at a minimum enhances connectivity of wildlife populations and may help them overcome the main consequences of habitat fragmentation” (Wilson and Lindenmayer 1995). Corridors can provide ecological functions at a variety of spatial and temporal scales from daily foraging movements of individuals, to broad-scale genetic gradients across biogeographical regions.

The assessment area is connected with broader areas of open sclerophyll woodland extending from the assessment area. The importance of the bushland in the areas adjacent to the existing electricity transmission easement is increased due to the overall disturbance to bush land areas in the coastal areas of the project locality. The proposed development would take place within the existing electricity transmission easement or cleared areas and does not require the removal of significant amounts of vegetation. The nature of the proposed clearing would not fragment populations and communities or their habitats.

### ***SEPP 44 – Koala habitat***

The site is located in the Wyong Shire Council which is listed under Schedule 1 of State Environmental Planning Policy - 44 Koala Habitat Protection (SEPP 44). The assessment area contains two preferred Koala feed tree species listed in Schedule 2 of the policy; Swamp Mahogany and Broad-leaved Scribbly Gum. The density of feed trees in these areas does not meet the SEPP 44 definition of ‘potential Koala habitat’.

A colony of Koala was once known from the Wyong local government area (Payne, 2002), however records are scattered and the nearest record of a Koala is two kilometres to the south of the site (Department of Environment and Conservation, 2005).

### ***Species of animal***

A total of 52 vertebrate species of animal was recorded on site, comprising four species of amphibian, five species of reptile, 32 species of bird, seven species of native mammals and four introduced species. No threatened species of animal was recorded.

A total of 58 threatened species of vertebrate fauna has been recorded or has the potential to occur within the project locality, including five species of amphibian, 37 species of birds (most being marine nomadic species), 16 species of mammal and one species of reptile. All species are listed under the *Threatened Species Conservation Act 1995* and twelve are listed under the *Environment Protection Biodiversity Conservation Act 1999*.



It is, however, highly unlikely that all these species occur at or near the proposed development site on a regular basis, and even fewer species would be affected by the proposal. Despite the occurrence of local records or predicted habitat, 48 threatened species are unlikely to be significantly affected by the proposal for one or more of the following reasons:

- core habitats were not recorded in the assessment area
- the species has a large home-range, significantly larger than the area of proposed development and as such are unlikely to be dependent on resources within the development areas
- the area is outside the normal range of the species and records are likely to be of vagrants
- the species is considered locally extinct.

Full details of species requirements are shown in *Technical Paper 1*. Impact assessments as required under the Threatened Species Conservation Act and/or the Environment Protection and Biodiversity Conservation Act have been completed for the remaining species (see *Technical Paper 1*).

A total of 25 migratory species has been predicted to occur within 10 kilometres of the assessment area based on the Department of the Environment and Heritage Protected Matters Search Tool. A majority of migratory species are coastal marine birds and no migratory species listed were recorded in the assessment area. While terrestrial migratory species of bird may potentially use the assessment area, the area is not classed as an 'important habitat' as defined under the administrative significance guidelines of the Environment Protection and Biodiversity Conservation Act, in that the assessment area does not contain:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species
- habitat utilised by a migratory species which is at the limit of the species range
- habitat within an area where the species is declining.

As such there is unlikely to be an impact on migratory species and this group is not considered further.

### **Conservation significance**

Although modified, the site is generally in good condition and has high species diversity. *Angophora inopina*, listed as vulnerable under both the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*, was recorded during the field survey along the proposed pipeline route. As such, the site is of national conservation significance.

## **9.2 Potential impacts**

### **9.2.1 Vegetation clearing**

The primary impact of the proposal is the removal of vegetation within the existing electricity transmission easement. It involves a maximum removal of 15 metre wide strip along the seven kilometre easement length (approximately 10.5 hectares).

The proposed inlet facility would require an area of approximately 0.3 hectares to accommodate plant equipment. It would be located within mostly cleared land adjacent to the electricity transmission easement but is likely to also require some additional clearing.

The proposed gas turbine facility and delivery facility are to be located within mostly cleared areas of the power station site. Some minor clearing is expected at the eastern section of the proposed gas turbine facility site.

Vegetation clearing also has the potential for seed dispersal of weed species; however, few weeds were recorded in the site.

An insignificant number of tree hollows were recorded, and the amount of vegetation to be removed would not significantly affect the habitats of threatened animals that are likely to occur in the adjacent bushland. Although removal of vegetation has a negative impact in terms of habitat values, mulching and reapplication the material may have some positive impacts in terms of nutrient cycling.

### **9.2.2 Fragmentation and edge effects**

The major impact of habitat fragmentation is the reduction of population sizes and the dispersal and the quality of remaining habitats. Edge effects may occur when a new boundary is established within an existing habitat producing a change in the remaining habitat (Goldingay and Whelan, 1997), and may also increase the invasion of noxious weeds and the vulnerability of native animals to predation by feral cats, dogs and the European Red Fox.

The proposed pipeline is within an existing electricity easement. Existing access, maintenance and motorcycle tracks traverse the easement and surrounding bushland. Clearing for the proposed pipeline and access tracks would be linear and restricted to already cleared or disturbed areas. The proposed inlet facility would be located within partially cleared areas adjacent to the electricity transmission easement. As such, there is unlikely to be an increase in the extent of fragmentation and associated edge effects.

### **9.2.3 Erosion**

Trenching for the pipelines and construction of the inlet facility would produce exposed soils that have the potential to enter surrounding areas of vegetation and Spring Creek (near the railway crossing) if not properly managed.



#### 9.2.4 Noise

During construction of the pipeline and other facilities there will be increased noise in the local area for a short period of time. This may cause disturbance for fauna in the area, although given the proximity of the pipeline to existing roads and infrastructure, it is expected that the impact of this would be minor. Access for maintenance vehicles may cause intermittent disturbance, however, the impacts are likely to be minor.

#### 9.2.5 Flora

*Angophora inopina*, listed as vulnerable under both the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*, was recorded in two areas along the proposed gas pipeline. The vegetation within the easement is regularly maintained through slashing and selective removal of tall vegetation. Only immature individuals were recorded (less than two metres tall) and the site is unlikely to contain a significant seed bank, as seeds are short-lived and seed dispersal is limited (Tierney 2004). Only individuals greater than two metres have been observed to set seed and it has been estimated that a minimum of 15 years is required for reproductive maturity (Tierney 2004). Due to regular maintenance, the easement is unlikely to contain a viable population of this species. Impact assessments concluded that the proposal is unlikely to have a significant impact on this species (refer to Technical Paper No. 1).

Although not recorded, the site provides potential habitat for a further four species of threatened plant: *Acacia bynoeana*, *Cryptostylis hunteriana*, *Grevillea parviflora* spp. *parviflora* and *Tetratheca juncea*.

Two of these species, *Cryptostylis hunteriana* and *Tetratheca juncea*, are highly cryptic and difficult to detect when not flowering. Targeted surveys were undertaken on 30 and 31 August 2005 to coincide with the beginning of the flowering season of *Tetratheca juncea* with a second targeted survey undertaken on 12 and 13 December to coincide with the flowering period of both *Tetratheca juncea* and *Cryptostylis hunteriana*. These species have not been recorded due to ongoing maintenance activities and other disturbances, and are considered unlikely to occur within the site.

Impact assessments were conducted for these species and concluded that the proposal is unlikely to have a significant impact (refer to Technical Paper No. 1).

#### 9.2.6 Fauna

No threatened species of animal was recorded on site during targeted surveys. A field assessment of fauna habitats and the NSW Department of Environment and Conservation Atlas of Wildlife database searches determined that the Squirrel Glider and Wallum Froglet may use habitats in the Coastal Plains Scribbly Gum Woodland located in the central area of pipeline route. It is likely that eight species of microchiropteran bat (East Coast Freetail Bat, Common Bent-wing Bat, Little Bent-wing Bat, Greater Broad-nosed Bat, Yellow-bellied Sheath-tail Bat, Eastern False Pipistrelle, Large-footed Myotis and the Large-eared Pied Bat) and two species of nocturnal bird (Masked Owl and Powerful Owl), use the site as a marginal foraging area.

Impact assessments for the threatened species under the significance assessment guidelines concluded that the proposal would not have a significant impact on threatened animal species (refer to Technical Paper No. 1).

## 9.3 Mitigation

Impacts on local flora and fauna would be minimised by utilising already disturbed areas including a maintained electricity easement and existing access tracks. However, some native woodland vegetation may be cleared for the inlet facility. In order to further minimise and mitigate impacts on ecological values of the site, the following would be undertaken:

- access for workers, their equipment and vehicles would be restricted to the electricity transmission easement and designated access tracks. No access would be allowed within bushland surrounding the electricity transmission easement
- clearing and soil disturbance would be minimised, particularly in the vicinity of threatened species *Angophora inopina* (see Figure 9.2)
- except for trenching, vegetation clearing would generally only involve the removal of above ground plant parts, with root systems and soil profile left undisturbed
- colour tape or 'parawebbing' would be used to delineate the maximum work area permitted. This would be implemented prior to any work commencing on site. If any tape is disturbed, it would be immediately replaced along the appropriate alignment
- soil disturbance limited and sediment control devices would be installed prior to clearing vegetation to ensure no impacts on surrounding vegetation or creeks
- topsoil that had been removed during trenching would be stockpiled within the electricity transmission easement and replaced once the pipe has been laid. Care should be taken not to transfer top soil between areas
- vegetative material removed along the easements would be retained in the area it is removed from to maintain the nutrient balance. The material would be chipped and spread around the towers to assist in the prevention of regrowth unless otherwise requested or agreed by the Department of Environment and Conservation. Weeds would not be mulched, but rather bagged and removed from the site
- vehicles and other equipment (including boots) would be thoroughly cleaned of soil, seeds and plant material before entering or leaving a site. This would help to prevent the further spread of weed species within the site or into the surrounding bushland
- a clearing management plan would be prepared and implemented for areas containing native woodlands including the inlet facility. The management plan would include tree clearing protocols such as:
  - ▶ shaking the tree using a bulldozer
  - ▶ slowly pushing the tree to the ground so that it largely remains intact

- ▶ leaving the tree in place once felled for at least one day/night before removing to allow animals to relocate to nearby vegetation
  - ▶ ensuring all contractors have the contact numbers of wildlife rescue groups should animals be injured during clearing
  - ▶ where possible, undertaking vegetation clearing during September/October or in March/May to avoid summer breeding seasons and the winter hibernation for hollow dependent species.
- trenches would be covered when work is finished for the day to prevent animals being accidentally trapped
  - any dead logs within the development footprint would be moved to an adjacent area which is outside the footprint thus minimizing the loss of habitat
  - parking of vehicles or stockpiling/storing of construction equipment and materials would generally not be permitted under trees. This will avoid compaction within the root zone.

## 9.4 Summary of impacts

The proposed gas turbine facility and delivery facility would generally be located in existing cleared or disturbed areas within the power station site and would have negligible impacts.

The proposed pipeline is within an existing electricity easement which is maintained through periodic slashing and selective clearing of canopy species. Due to this ongoing maintenance, vegetation within the easement lacks a canopy and contains only shrub and ground layers. Although the canopy species are generally absent and the easement is maintained as a grassland, sedgeland or heathland, the species composition is consistent with the adjacent vegetation. This vegetation generally has a high diversity of native species, low weed invasion and is in moderate to good condition. Vegetation communities recorded in the assessment area (i.e. pipeline and adjoining lands) include:

- Coastal Plains Smooth-barked Apple Woodland
- Coastal Plains Scribbly Gum Woodland
- Wyong Paperbark Swamp Forest
- Swamp Mahogany- Paperbark Forest
- Riparian Melaleuca Swamp Forest

The associated fauna habitats were in moderate to good condition within the Coastal Plains Woodland vegetation communities, and no significant fauna habitats were recorded within the electricity transmission easement.

The primary impact of the proposed gas pipeline and associated facilities is the removal of approximately 10.5 hectares of vegetation. Most of this vegetation would be within an existing electricity transmission easement which is highly modified. Its removal would not significantly affect the habitats of threatened flora and fauna that are likely to occur in the adjacent bushland.

One threatened species of plant (*Angophora inopina*) was recorded within the existing electricity easement. Impact assessments were completed for this species and concluded that due to ongoing disturbance to this species and its habitat through easement maintenance, the easement is unlikely to support a viable population and as such the proposal was unlikely to significantly impact this species.

Although not recorded during site inspections, the proposal area provides potential habitat for a further four threatened species (*Acacia bynoeana*, *Cryptostylis hunteriana*, *Grevillea parviflora* ssp. *parviflora* and *Tetradlea juncea*). Impact assessments were completed for these species and concluded that the proposal would not have a significant impact on their recovery due to the proposal being located almost entirely within already cleared areas or maintained easement.

No significant fauna habitats were recorded within the existing electricity transmission easements and impact assessments conducted for threatened animals that are likely to occur in the assessment area concluded that the proposal would not have a significant impact on threatened species or populations.

It is concluded that by adopting the proposed mitigation measures there would be no significant environmental impact from the proposed works and therefore, no further assessment would be required.

**NOISE**

**10**

# 10. Noise

## 10.1 Existing environment

Ambient and background noise levels were measured at four residential receivers representative of the various noise catchment areas from 19 to 29 August 2005. In addition, attended noise measurements during both the daytime and night time were conducted.

A detailed description of the survey methodology and findings is provided in *Technical Paper 3 – Munmorah Gas Turbine Facility Noise Assessment*. This chapter summarises the key findings of that assessment.

As there is some noise associated with the existing industrial operations, the noise loggers were located at residential receivers which were not directly exposed to the existing site in order to obtain the background noise level typical of the residential area rather than including any existing industrial noise. The attended measurements supplemented this information by confirming whether existing site noise was audible at the unattended logger locations.

For the purposes of this assessment, the surrounding residential receivers have been split into six catchment and sub-catchment areas (see Figure 10.1). A brief description of each catchment area follows:

- **Noise Catchment A:** Residential area to the northeast with residences located along Kamilaroo Avenue, Lake Munmorah, overlooking the lake and also at the Lakeside Leisure Village. Approximately 2.25 kilometres from the proposed gas turbine facility.
- **Noise Catchment B:** Residential area to the east with residences along Macleay Avenue, Halekulani, and including the Sunnyside Caravan Park. Approximately 910 metres from the proposed gas turbine facility.
- **Noise Catchment C:** The residential area to the southeast and south of Halekulani and Budgewoi, in particular, residences located along Woolana Avenue, Kalele Avenue and Ulana Avenue. Approximately 1.2 kilometres from the proposed gas turbine facility.
- **Noise Catchment D:** The residential area to the southwest in Buff Point with the nearest residences located in Barega Close. Some of these residences would be shielded by the existing power station buildings. Approximately 1.65 kilometres from the proposed gas turbine facility.
- **Noise Catchment E:** The residential area to the west in San Remo with the closest residences along Barker Avenue. Approximately 1.45 kilometres from the proposed gas turbine facility.

- **Noise Catchment F:** The residential area to the northwest in Colongra with residences located along Wentworth Avenue, Denman Street and Barton Road. Approximately 1.65 kilometres from the proposed gas turbine facility.
- **Noise Catchment G:** The residential area of Blue Haven, with residences located approximately 100 metres south of the proposed pipeline route and the Link Road and more than 2 kilometres west of the proposed gas turbine facility.
- **Noise Catchment H:** There are a small number of residences located at Bushells Ridge, approximately 100 metres south of the proposed pipeline route and inlet facility and east of the F3 Freeway.

### 10.1.1 Unattended noise measurements

The unattended noise monitoring locations are summarised as follows:

- Location 1 – 14 Kamilaroo Avenue, Lake Munmorah (Noise Catchment A). The logger was placed in the front yard of the dwelling facing the street.
- Location 2 – 127 Woolana Road, Budgewoi (Noise Catchment C). The logger was placed in the front yard of the residence on the eastern side of Woolana Road.
- Location 3 – 32 Barega Close, Buff Point (Noise Catchment D). The logger was located in the front yard of the residence.
- Location 4 – 83 Perouse Avenue, San Remo (Noise Catchment E). This residence is on the western side of Perouse Avenue and the logger was placed in the front yard.

The noise monitoring equipment used for these measurements consisted of environmental noise loggers set to A-weighted, fast response, continuously monitoring over 15-minute sampling periods. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

The logger determines  $L_{A1}$ ,  $L_{A10}$ ,  $L_{A90}$  and  $L_{Aeq}$  levels of the ambient noise.  $L_{A1}$ ,  $L_{A10}$  and  $L_{A90}$  are the levels exceeded for 1%, 10% and 90% of the sample time respectively. The  $L_{A1}$  is indicative of maximum noise levels due to individual noise events such as the occasional pass-by of a heavy vehicle. This is used for the assessment of sleep disturbance. The  $L_{A90}$  level is normally taken as the rating background level during the relevant period. The unattended noise monitoring results are detailed in Technical Paper 3 and are summarised in Table 10.1.

**Table 10.1 Unattended noise monitoring results**

Noise catchment area	Noise monitoring location	Rating background noise level (dBA)			Lowest background noise level at night (dBA)
		Day	Evening	Night	
A	14 Kamilaroo Avenue	38	38	37	35
C	127 Woolana Road	36	33	34	32
D	32 Barega Close	37	40	36	33
E	83 Perouse Avenue	39	38	34	33





Figure 10.1 Noise catchment areas

- |                                  |                                 |                               |
|----------------------------------|---------------------------------|-------------------------------|
| Proposed pipeline route          | Land owned by Delta Electricity | Proposed delivery facility    |
| Sydney to Newcastle gas pipeline | Swamp                           | Proposed inlet facility       |
| Rail line                        | SEPP14 - Wetland Area           | Proposed gas turbine facility |

Noise catchment areas



### 10.1.2 Attended noise measurements

Daytime noise measurements were carried out using a Rion NA27 precision sound level meter. For the night time measurements, a Bruel & Kjaer Type 2250 sound level meter was used. Both units were calibrated before and after the survey and no significant drift occurred. The attended noise monitoring results are detailed in Technical Paper 3 and are summarised in Table 10.2.

**Table 10.2 Attended noise monitoring results**

Noise catchment area	Noise monitoring location	Time of monitoring	Measured noise level (dBA)	
			L <sub>Aeq</sub>	L <sub>A90</sub>
A	14 Kamilaroo Avenue	14.30-14.45	52	41
		21.30-22.00	37	34
C	127 Woolana Road	12.45-13.00	46	37
		23.30-24.00	30	29
D	32 Barega Close	13.25-13.40	47	42
		22.55-23.20	46	44
E	83 Perouse Avenue	14.05-12.20	47.5	40
		22.20-22.40	38	36

L<sub>Aeq</sub> = Equivalent noise level (average)

L<sub>A90</sub> = Noise level 90% of time (background)

### 10.1.3 Construction noise level criteria

Guidelines for assessment of construction noise are specified in the Environmental Noise Control Manual, Chapter 171 (NSW Environment Protection Authority, 1994) and are as follows:

- for periods of four weeks or less, the L<sub>A10</sub> level should not exceed the background (L<sub>A90</sub>) level by more than 20 dBA.
- for periods greater than 4 weeks and less than 26 weeks, the L<sub>A10</sub> level should not exceed the background (L<sub>A90</sub>) level by more than 10 dBA.

Although not clearly stated by the Department of Environment and Conservation, it is considered that for construction periods longer than 26 weeks, the L<sub>A10</sub> noise level should not exceed the L<sub>A90</sub> level by more than 5 dBA. It is accepted that for determining noise criteria, the L<sub>A90</sub> background noise level should be quantified by the Rating Background Level value.

In addition, the Department of Environment and Conservation specifies the following time restrictions for construction activities where the noise is audible at residential premises:

- Monday to Friday (7.00am to 6.00pm)
- Saturday (8.00am to 1.00pm)
- No construction work is to take place on Sundays or Public Holidays

The Department of Environment and Conservation’s noise criteria are objectives to try and achieve. Where they can not be met, the Department of Environment and Conservation recommends that a “best practice” approach be used to ensure that all possible steps are taken to reduce noise levels of construction site equipment so as to minimise the impact of construction noise.

The duration of construction of the proposed gas turbine facility and pipeline project would exceed 26 weeks. Therefore, the construction noise objective would be that the  $L_{A10}$  noise level should not exceed the rating background level (RBL) by more than 5 dBA. Table 10.3 summarises the relevant construction noise criteria for those residential receiver locations potentially affected by construction noise from the proposal.

**Table 10.3 Construction noise criteria**

Noise catchment area	Receiver location	Daytime Rating Background Level (dBA)	Adopted criterion $L_{A10}$ (dBA)
A	Kamilaroo Avenue	38 <sup>(1)</sup>	43
C	Woolana Road	36 <sup>(1)</sup>	41
D	Barega Close	37 <sup>(1)</sup>	42
E	Perouse Avenue	39 <sup>(1)</sup>	44
F	Colongra	40 to 45 <sup>(2)</sup>	65 to 70
G	Blue Haven	40 to 45 <sup>(2)</sup>	65 to 70
H	Bushells Ridge	40 to 45 <sup>(2)</sup>	65 to 70

Notes: 1 Values obtained from Table 10.1

2 Values estimated based on typical noise levels at receivers affected by traffic noise

$L_{A10}$  = Noise level 10% of time

Since pipeline construction activities are likely to occur for less than 4 weeks at anyone location in close proximity to receivers located along noise catchment areas F, G and H, a criterion of RBL + 20dBA would be appropriate. Background noise levels have not been measured at these areas, however, during the day these receivers are likely to be affected by traffic noise from either the Pacific Highway or the F3 Freeway. Daytime background noise levels of 45 to 50 dBA would be expected, therefore, a criterion of 65 to 70 dBA is considered appropriate for these locations during the short-term construction period.

#### 10.1.4 Operational noise level criteria

Noise level criteria to assess the potential noise impacts of the proposal on the nearest sensitive receivers have been established in general accordance with the requirements of the Industrial Noise Policy (Department of Environment and Conservation 1998) and have considered both intrusiveness and amenity. Given that the existing power station and associated operations do generate some noise in the surrounding residential areas, the criteria have been established considering the existing contribution whilst allowing for future changes.

### **10.1.5 Industrial noise policy**

The Industrial Noise Policy recommends two criteria, “Intrusiveness” and “Amenity”, both of which are relevant for the assessment of noise. In most situations, one of these is more stringent than the other and dominates the noise assessment.

#### ***Intrusiveness criterion***

An intrusiveness criterion applies for residential receivers only. The intrusiveness criterion requires that the  $L_{Aeq}$  noise level from the source being assessed, when measured over 15 minutes, should not exceed the Rating Background Noise Level (RBL) by more than 5 dBA. The RBL represents the “background” noise in the area, and is determined from measurement of  $L_{A90}$  noise levels, in the absence of noise from the source.

Where the noise level from the source varies over time, due to changes in operating conditions, meteorological conditions or other factors, the upper 10<sup>th</sup> percentile of 15-minute  $L_{Aeq}$  noise levels can be used for comparison with the criterion.

#### ***Amenity criterion***

The amenity criterion sets a limit on the total noise level from all industrial noise sources affecting a receiver. Different criteria apply for different types of receiver (e.g. residence, school classroom); different areas (e.g. rural, suburban); and different time periods, namely daytime (7.00am–6.00pm), evening (6.00pm–10.00pm) and night time (10.00pm–7.00am).

The noise level to be compared with this criterion is the  $L_{Aeq}$  noise level, measured over the time period in question, due to all industrial noise sources, but excluding non-industrial sources such as transportation.

Where a new noise source is proposed in an area with negligible existing industrial noise, the amenity criterion for that source may be taken as being equal to the overall amenity criterion. However, if there is significant existing industrial noise, the criterion for any new source must be set at a lower value. If existing industrial noise already exceeds the relevant amenity criterion, noise from any new source must be set well below the overall criterion to ensure that any increase in noise levels is negligible. Methods for determining a source-specific amenity criterion where there is existing industrial noise are set out in the Industrial Noise Policy.

### **10.1.6 Project-specific criteria**

The unattended and attended noise monitoring results indicated existing industrial noise was either inaudible or only barely audible during the night at all respective measurement locations. The approach that was used to establishing noise level criteria is discussed below.

Although the proposed gas turbine facility is unlikely to operate during the night, it is nevertheless possible and therefore the night time period has been assessed as the most stringent. In addition, it is possible that at some residential locations, the rating background levels which were obtained using unattended monitoring techniques (Table

10.1) may be partially affected by existing industrial noise. Consequently, the lowest attended background noise levels measured during the night (Table 10.2) were considered to be representative of true background noise levels at each residential receivers and were used in the development of the project specific criteria.

Since the proposed gas turbine facility would generally operate in an intermittent manner, it is also considered that intrusiveness rather than amenity is the most relevant criterion.

On this basis, the project criteria have been set at 5 dBA above the lowest attended background noise level measured at each monitoring site. For those noise catchment areas where measurements were not undertaken, the noise level at the nearest catchment area was adopted. Table 10.4 summarises the proposed operational noise criteria.

**Table 10.4 Operational noise criteria**

Noise catchment area	Receiver location	Adopted criterion $L_{Aeq,15\text{ min}}$ (dBA)
A	Lakeside Village	40
	Kamilaroo Drive	40
B	Sunnyslake Caravan Park	37
	Macleay Street	37
C	Woolana Road	37
	Ulana Road	37
D	Barega Close	38
E	Baker Street (south)	38
	Baker Street (north)	38
F	Denman Street	38
G	south of Link Road (Blue Haven)	40
H	along Tooheys Road and east of F3 Freeway (Bushells Ridge)	40

$L_{Aeq, 15\text{ min}}$  = Equivalent noise level (15-minute average)

The Industrial Noise Policy recommends a night time amenity criterion  $L_{Aeq,15\text{ min}}$  for a suburban/rural setting an “acceptable” level of 40 dBA and a “recommended maximum” level of 45 dBA. Adopting the criteria of 37 dBA and 38 dBA for the contribution of noise from the proposed gas turbine facility alone is considered sufficiently below the amenity criterion recommended by the Industrial Noise Policy that negligible impacts would likely occur.

At the furthest receivers in Noise Catchment Area A, although a criterion of 40 dBA has been adopted, it is likely that any noise controls required to meet the proposed noise criteria of 37 to 38 dBA at the closer noise catchment areas would result in noise levels much lower than the criterion prescribed at these residences. At this area, noise from existing industry was inaudible both during the day and at night and was dominated by traffic noise along the Pacific Highway and the natural environment. For this reason, allowing a noise contribution of 40 dBA from the proposed gas turbine facility is considered appropriate. Even allowing for other industrial noise, this criterion would likely result in the total industrial noise falling between the “acceptable” amenity level and the “recommended maximum” level.

Background noise levels have not been measured at noise catchment areas G and H. The nearest residence to the inlet facility (Noise Catchment H), however, is likely to be affected by traffic noise from the F3 Freeway. It is therefore considered the amenity criterion of 40 dBA should apply for this area. The same criterion would apply to the residences at the Blue Haven area (Noise Catchment G), as they would also be affected by traffic noise from the Link Road and Pacific Highway.

## **10.2 Potential impacts**

### **10.2.1 Construction**

The potential impacts from construction noise have been assessed in accordance with the requirements of Chapter 174 of the Environmental Noise Control Manual (Department of Environment and Conservation 1992).

#### ***Gas turbine facility***

On site activities associated with the construction of the gas turbine facility, such as site clearing, earthworks and construction of the foundations associated with the proposed gas turbine facility are expected to take approximately eight to nine months with the installation and commissioning of equipment to follow over two to three months.

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

As discussed in Chapter 4, the proposed pipeline route would follow the existing electricity transmission easement. This would require excavation of a trench, installation of pipe sections, welding and then backfilling. The total duration of these works is expected to be approximately nine months and would generally occur concurrently with the construction of the proposed gas turbine facility, but at different locations. Noise would only occur in the vicinity of each receiver location for a few weeks. Directional drilling techniques would be used at all major crossings, such as the Pacific Highway and Northern Railway, which are expected to be much quieter than the more conventional open-trench techniques.

#### ***Inlet facility***

The construction and installation process is similar to the on site activities, although on a much smaller scale and is expected to last two to three months and would generally occur concurrently with the pipeline construction activities.

#### ***Construction noise sources***

The construction plant items and associated maximum sound power levels that were used in the assessment of potential construction noise impacts are summarised as follows:

- Front-end Loader: 110 dBA
- Dozer: 113 dBA

- Excavator: 107 dBA
- Grader: 107 dBA
- Concrete/Tip Truck: 109 dBA
- Concrete Vibrator: 103 dBA
- Mobile Crane: 110 dBA
- Hand Tools: up to 113 dBA
- Air Compressor: 100 dBA

Based on a typical worse-case operating scenario involving use of the dozer, excavator and truck, the maximum combined sound power levels that would be generated by each type of construction activity were estimated to be as follows:

- Earthworks and foundations: 115 dBA
- Plant installation: 113 dBA
- Pipeline trench construction: 112 dBA

### ***Predicted construction noise levels***

Taking into account attenuation due to distance and intervening topography, the following range of  $L_{A10}$  noise levels were predicted at the nearest residences during the construction phase. These are shown in Table 10.5 for on-site construction activities and Table 10.6 for pipeline and inlet facility construction activities.

Due to the distances to the receivers, the predicted construction noise levels at all receiver locations are at or below the adopted construction noise level criteria. Note that exceedances of the prescribed criteria are likely if construction activities were to occur closer than 100 to 150 metres from residences or other noise sensitive receptors.

**Table 10.5 Construction noise levels at receivers from on-site activities**

Noise catchment area	Receiver location	Predicted noise level $L_{A10, 15min}$ (dBA)		Adopted criterion (dBA)
		Earthworks	Installation	
A	Kamilaroo Avenue	21	19	43
	Lakeside Village	18	16	43
B	Sunnylake Caravan Park	27	25	41
	Macleay Street	37	35	41
C	Woolana Road	34	32	41
	Ulana Road	16	14	41
D	Barega Close	14	12	42
E	Barker Street (South)	11	9	44
	Barker Street (North)	28	26	44
F	Denman Street	23	21	44

$L_{Aeq, 15 min}$  = Equivalent noise level (15-minute average)

**Table 10.6 Construction noise levels at receivers from the construction of gas pipeline and inlet facility**

Noise catchment area	Receiver location	Predicted noise level $L_{A10, 15min}$ (dBA)		Adopted criterion (dBA)
		Pipeline	Inlet facility	
E	San Remo	64	-	65-70
F	Colongra	41	-	65-70
G	Blue Haven	71	-	65-70
H	Bushells Ridge (adjacent to F3 Freeway)	70	64	65-70

$L_{Aeq, 15 min}$  = Equivalent noise level (15-minute average)

### 10.2.2 Operation

The major noise generating activities associated with the operation of the proposal are the gas turbine facility and the inlet facility.

Noise impacts have been assessed through computer-based noise modelling to predict noise levels at the nearest sensitive receptors due to noise emissions from the proposal. Details of the modelling studies are included in Technical Paper 3 and the results of the modelling investigations are summarised in subsequent sections.

#### **Predicted operational noise levels**

Noise levels were predicted using the software Environmental Noise Model. This model takes into account geometric spreading, ground effects and shielding provided by topography. It is also capable of predicting noise under differing meteorological conditions.

There are three main noise sources associated with gas turbines:

- air intake
- turbine/generator noise radiated from the enclosure
- duct noise from the exhaust stack.

The following noise source data obtained for a generic gas turbine plant of similar rating to that proposed has been used to predict potential noise levels at the nearest noise sensitive receptors:

- air intake fans sound power level: 103 dBA (assumed source height 15 m)
- turbine / enclosure: 85 dBA at 1metre (assumed source height 4 m)
- exhaust stack sound power level: 98 dBA (assumed source height 30 m).

Noise from the air intake is likely to be reasonably directional and the turbines have been oriented such that the air intake faces the existing power station where the main power station buildings are likely to provide some shielding to residences at San Remo and Buff Point. The potential shielding effects of these building have been included in the noise model predictions.

The noise emanating from the discharge stack would also be directional in relation to surrounding residences typically at 90° to the discharge direction. For this reason, a correction was subtracted from the sound power level provided above in order to model noise from a source at this height propagating to the surrounding residences.

Since the four turbines are located adjacent to each other, it has been estimated based on the surface area of the enclosure that the 85 dBA at one metre specification is equivalent to a sound power level of 111 dBA for the two outer turbines and a reduced sound power level of 101 dBA for the two inner turbines. These sound power levels have been used in the noise model predictions.

Table 10.7 summarises the predicted noise levels under neutral and typical adverse (temperature inversion of 3 degrees per 100 metres) meteorological conditions. Noise level contours showing the  $L_{Aeq,15min}$  level are shown in Figures 10.2 (Neutral) and Figure 10.3 (Adverse).

**Table 10.7 Predicted operational noise levels**

Noise catchment Area	Receiver location	Adopted night-time criterion $L_{Aeq,15min}$ (dBA)	Predicted noise levels $L_{Aeq,15min}$ (dBA)	
			neutral conditions	adverse conditions
A	Lakeside Village	40	21	23
	Kamilaroo Drive	40	19	22
B	Sunnylake Caravan Park	37	27	29
	Macleay Street	37	35	<b>38</b>
C	Woolana Road	37	34	37
	Ulana Road	37	32	35
D	Barega Close	38	28	31
E	Baker Street (south)	38	18	21
	Baker Street (north)	38	30	32
F	Denman Street	38	24	29

$L_{Aeq, 15 min}$  = Equivalent noise level (15-minute average)

It can be seen from Table 10.7 that under neutral conditions noise levels are generally well below the criterion although at the closest residences to the east and southeast in Noise Catchment Areas B and C the criteria are only just met.

Under typical adverse meteorological conditions, noise levels typically increase by 2-3 dBA but still achieve the criteria at all noise catchment areas with the exception of the closest residences in Noise Catchment Area B located on Macleay Street. Given that the exceedance is only marginal (1 dBA) and the facility would rarely operate in the middle of the night, it is considered that noise levels would exceed the criterion less than ten per cent of the time in any one season and overall impacts would therefore be considered negligible. In addition, even under adverse meteorological conditions, the predicted noise level would still comply with the amenity criterion of 40 dBA.





Figure 10.2 Predicted noise level contours -  
Neutral meteorological conditions

- Existing Munmorah Power Station
- Proposed gas turbine facility
- LAeq 40dBA
- LAeq 35dBA
- LAeq 30dBA





Figure 10.3 Predicted noise level contours -  
Adverse meteorological conditions

- Existing Munmorah Power Station
- Proposed gas turbine facility
- LAeq 40dBA
- LAeq 35dBA
- LAeq 30dBA

### **Statistical analysis of potential noise impacts due to meteorological effects**

More detailed analysis of the worse-case adverse meteorological conditions indicate with temperature inversions of 5° per 100 metres and a wind speed from source to receiver of 3 metres per second, noise levels of 2-3 dBA higher than shown in Table 10.7 are possible, although infrequent.

Noise levels under worse-case adverse meteorological conditions are predicted to exceed the night time intrusiveness criteria at three of the residences to the east and southeast in noise catchment areas B and C. It is, therefore, important to quantify the proportion of time that this may occur to better understand the potential noise impacts.

Generally, the likelihood of concurrent wind speed and wind direction leading to noise levels significantly above the criteria is low. However, this higher degree of affectation can result if prevalent wind conditions dominate in certain directions.

Records of wind speed and direction were obtained for the meteorological station located at Munmorah Power Station from June 2002 to May 2005 inclusive. The data was processed to determine the likelihood of either wind or temperature inversions affecting the propagation of noise. Taking into account prevalent wind conditions or temperature inversions, statistical modelling was undertaken to determine the proportion of time that exceedances of the relevant criteria could occur in any one season.

A total of 110 separate meteorological condition combinations were considered – wind speeds of 1-3 metres per second in each of eight directions, and zero wind speed (representing both zero wind and wind speeds above 3 metres per second) with associated temperature inversions. Noise levels were calculated under each of these conditions, and the probability of occurrence of each wind condition was taken into account to determine the per cent of time that noise levels could exceed the relevant criterion.

The results are separated into seasons and tabulated in Table 10.8. Results are provided in percentile bands and show the proportions of time that meteorological conditions are predicted to give rise to noise levels in excess of the adopted night-time criteria.

**Table 10.8 Proportion of operating hours resulting in noise level exceedance**

Receiver location	Adopted night time criterion (L <sub>Aeq,15min</sub> dBA)	Proportion of time if continuous operation (%)			
		Summer	Autumn	Winter	Spring
B (Macleay Street)	37	6	11	23	15
C (Woolana Road)	37	5	8	15	10
C (Ulana Road)	37	3	6	5	4

L<sub>Aeq, 15 min</sub> = Equivalent noise level (15-minute average)

It is important to note that the above predictions assume that the proposed gas turbine facility would be operating continuously. However, as discussed in Chapter 4, the gas

turbine facility is likely to operate about 500 hours per year or 5.7 per cent of the time, with most of the operation likely to occur during hot summer days. The proportion of time should therefore be reduced by a factor of approximately 10, when considering the potential use at night time during the winter season and much higher factors for the other months.

On this basis, the percentage of time an exceedance above the adopted night-time criterion may occur is estimated to be less than one per cent and at worse-case less than two per cent in winter, which is considered reasonable and within generally accepted limits.

### ***Inlet Facility***

The operation of the compressor station associated with the inlet facility has the potential to impact the nearby residences. As described in Chapter 4, the compressor would be located within a dedicated building, which would be built of solid construction to significantly reduce the noise emissions from the compressor whilst in operation. The operation of this facility is likely to meet the adopted night-time noise criteria proposed in Table 10.4.

The acoustic properties of the compressor building necessary to achieve the night-time noise criterion would be determined during the detailed design phase, when the rating and noise emission characteristics of the compressor and ultimate location of the facility would be known. Given the distance between the inlet facility and the nearest residence would be greater than 100 metres, conventional acoustic control measures and building construction methods would likely be sufficient to ensure compliance with the adopted criterion.

## **10.3 Mitigation**

### **10.3.1 Construction**

The construction contractor would be responsible for ensuring the proposed mitigation measures are implemented, and every reasonable effort is made to achieve the noise design goals prescribed by this environmental assessment. Measures proposed include:

- undertaking noise compliance monitoring during the initial stages of the construction phase to verify the assumptions and impact predictions made in this assessment, and to allow an opportunity for liaison with the local community;
- scheduling construction activities between Monday to Friday, 7.00 am to 6.00 pm, and Saturdays, 8.00 am to 1.00 pm. No works would be undertaken on Sundays or Public holidays;
- making every effort to minimise noise resulting from daytime construction of the gas pipeline within 100 metres of a receiver. Consideration of impacts from the proposed works and adoption of suitable ameliorative measures would be made on an 'as-needs' basis;

- providing information to potentially affected local residents prior to the commencement of noisy activities. Construction methods, duration and timing of events would be outlined;
- providing a contact number to the public so that information can be received or complaints made in relation to noise. A log of complaints would be maintained and the contractor would take action. A complaint handling procedure would be formulated and adhered to;
- using residential class mufflers and, where applicable, engine shrouds (acoustic lining). Noise emissions would be an important consideration when selecting equipment for the site. All equipment would be maintained in good order including mufflers, enclosures and bearings to ensure unnecessary noise emissions are eliminated.
- using plant and equipment appropriately. This includes reasonable work practices with no extended periods of 'revving', idling or 'warming up' within the proximity of existing residential receivers. Any excessively loud activities would be scheduled during periods of the day when higher ambient noise levels are apparent.
- undertaking construction activities in accordance with Australian Standard AS 2436-1981 *Guide to Noise Control on Construction, Maintenance and Demolition Sites*. All equipment used on-site would need to demonstrate compliance with the noise levels recommended within AS 2436-1981.

All of the above measures would be included in the noise management plan that would be developed as part of the construction environmental management plan to be prepared by the construction contractor prior to the commencement of construction activities. The noise management plan would identify and address noise impacts for all potentially affected receivers, and provide procedures, noise mitigation measures and noise management practices proposed throughout the duration of the works.

### **10.3.2 Operation**

The modelling results have indicated that noise emissions from the proposed gas turbine facility would comply with the noise criteria described in this environmental assessment under neutral and adverse meteorological conditions, with potential minor (1-4 dBA) and infrequent exceedances under worse-case meteorological conditions.

The model predictions have been derived based on noise source information from a typical gas turbine of similar characteristics. To confirm that the proposed gas turbine facility meets the noise criteria for the site, a review of the noise emission data and noise predictions would be undertaken during the detailed design phase; where actual plant specifications and characteristics are known.

Post commissioning noise source emissions and ambient noise monitoring levels would then be measured on a periodic basis to confirm the noise levels received at the nearest residential locations are consistent with the noise predictions stipulated by this environmental assessment.

It is proposed that a noise management plan would be prepared as part of the operational environmental management plan to be developed for the proposed gas

turbine facility, which would clearly outline the procedures necessary to manage noise emissions and potential adverse impacts from the facility, if required.

## **10.4 Summary of impacts**

The potential operational and construction noise impacts associated with the proposed gas turbine facility, gas pipeline and inlet facility have been assessed in accordance with the Department of Environment and Conservation's Industrial Noise Policy (1998) and Environmental Noise Control Manual (1992).

### **10.4.1 Construction**

Construction noise associated with the proposed gas turbine facility is predicted to meet the criteria at all residences. However during construction of the pipeline some exceedances may occur when activities are within 100-150 metres from any residence. The severity of this noise is expected to be relatively minor and any short-term impacts should be adequately mitigated by the implementation of the proposed mitigation measures.

### **10.4.2 Operation**

The gas turbine facility and inlet facility would be designed and operated to meet the noise criteria specified in Section 10.1.3.

Although the gas turbine facility would generally operate intermittently, particularly during hot summer days, it is possible that the facility would be required to operate during the night. Under neutral weather conditions the predicted noise levels would meet the criteria at all residences. Under typical adverse conditions, however, a marginal exceedance of 1 dBA was predicted at one residential area to the east of the gas turbine facility.

A detailed assessment of extreme adverse (worse-case) meteorological conditions indicates exceedances of up to 4 dBA are possible at a number of residential areas, located to the east and south east from the proposed gas turbine facility. Although the concurrence of night time operation and adverse weather is likely to be rare, historical meteorological data was used to assess the proportion of time the criteria may be exceeded. When allowing for only occasional use of the facility, the exceedance would occur less than two per cent of the time. On this basis, negligible impacts would be expected.

Based on the results of the noise impact assessment, and with consideration of the proposed mitigation measures to be implemented during the construction and operation of the proposal, it is concluded that the proposal is unlikely to result in adverse noise impacts on the nearest sensitive receptors.

**AIR QUALITY**

**11**

# 11. Air quality

## 11.1 Existing environment

This section provides a summary of the dispersion meteorology, general climate and existing air quality of the assessment area. An overview of the prevailing wind patterns, historical data on temperature, humidity and rainfall is also presented to give a more complete picture of the local climate.

Refer to *Technical Paper 4 – Air Quality Impact Assessment: Proposed Open Cycle Gas Turbine Plant at Munmorah Power Station* for a more detailed discussion on the existing ambient environment of the assessment area.

### 11.1.1 Dispersion meteorology

The meteorology in the assessment area is influenced by several factors including local terrain and land use. On a relatively small scale, winds are largely affected by the local topography. At larger scales, winds are affected by synoptic scale winds, which are modified by sea breezes near the coast in the daytime in summer (also to a certain extent in winter) and by a complex pattern of regional drainage flows that develop overnight.

Given the relatively diverse terrain and land use in the assessment area, differences in wind patterns at different locations in the assessment area would be expected. These varying wind patterns would arise as a result of the interaction of the air flow with the surrounding topography and the differential heating of the land and water.

### 11.1.2 Local climatic conditions

The Bureau of Meteorology collects climatic information from Norah Head Lighthouse, in the southeast of the assessment area. A summary of the climatic conditions recorded by this weather station is provided below.

The annual average maximum and minimum temperatures experienced at Norah Head are 21.7 and 14.6 degrees Celsius respectively. On average, February is the hottest month with an average maximum temperature of 25.2 degrees Celsius. July is the coldest month, with an average minimum temperature of 9.3 degrees Celsius.

The annual average humidity reading collected at 9 am from the Norah Head site is 77 per cent, and at 3 pm the annual average is 71 per cent. The month with the highest average humidity is February with a 9 am average of 83 per cent, and the lowest is August with a 3 pm average of 63 per cent.

Rainfall data collected at Norah Head shows that February is the wettest month, with an average rainfall of 142 millimetres over 11.9 days. The average annual rainfall is 1,227 millimetres over an average of 136 rain days.



### 11.1.3 Ambient air quality

At any given location within the airshed, the ambient concentration of a pollutant is affected by the contributions from all sources that have at some stage or another been upwind of the source. In the case of fine particulate matter that are less than 10 micrometres in diameter (PM<sub>10</sub>), the ambient concentration may contain emissions from the combustion of wood from domestic heating, from bushfires, from industry, roads, wind blown dust from nearby and remote areas, fragments of pollens, moulds, sea-salts and so on.

In general, the further away a particular source is from the area of interest, the smaller will be its contribution to air pollution at the area of interest. However the larger the area considered, the greater would be the number of sources contributing to the ambient concentration.

Ambient air quality is monitored at two sites in the assessment area, referred to as the Lake Munmorah and Wyee ambient monitoring sites. The location of these sites is shown in Figure 11.1. Data available for the June 2002 to December 2004 period included hourly records of sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and nitrogen dioxides (NO<sub>2</sub>) at both sites. There was no known long-term monitoring data available for carbon monoxide (CO) for the assessment area. A summary of the ambient air quality monitoring data is provided in Table 11.1

**Table 11.1 Summary of ambient air quality monitoring data (June 2002 to December 2004)**




Pollutant	Lake Munmorah (µg/m <sup>3</sup> )			Wyee (µg/m <sup>3</sup> )			Relevant air quality goal
	2002	2003	2004	2002	2003	2004	
NO <sub>x</sub> (maximum 1-hour average)	381	383	457	694	619	562	-
NO <sub>x</sub> (annual average)	17	17	20	67	57	55	-
NO <sub>2</sub> (maximum 1-hour average)	85	103	90	94	78	197	246
NO <sub>2</sub> (annual average)	13	10	15	14	15	15	62
SO <sub>2</sub> (10-minute maximum)	194	263	378	400	297	375	712
SO <sub>2</sub> (maximum 1-hour average)	163	140	189	212	177	226	570
SO <sub>2</sub> (maximum 24-hour average)	49	22	43	46	32	29	228
SO <sub>2</sub> (annual average)	6	3	6	6	3	3	60
PM <sub>10</sub> (maximum 24-hour average)	-	-	-	<b>133</b>	-	-	50
PM <sub>10</sub> (annual average)	-	-	-	25	-	-	30

Note 1 Refer to Table 11.2 for a description of the relevant air quality goals  
µg/m<sup>3</sup> = micrograms per cubic metre



Figure 11.1 Location of main emission sources and air quality monitoring sites in study area

0 10  
Kilometres

-  Meteorological monitoring site
-  Ambient air quality monitoring site
-  Existing Power Station site

Measurements of PM<sub>10</sub> by tapered element oscillating microbalance (TEOM) were made at Wyee from December 2001 to December 2002. For this period, there was over twenty days when the measured PM<sub>10</sub> concentration was above the goal of 50 micrograms per cubic metre. The majority of exceedances were measured in the summer months when bushfires are common, however, there was one occasion when the PM<sub>10</sub> concentration was above 50 micrograms per cubic metre in the cooler months (22-Jul-2002).

The measured highest 24-hour average PM<sub>10</sub> concentration was 133 micrograms per cubic metre and the annual average was 25 micrograms per cubic metre. The annual average PM<sub>10</sub> concentration is below the goal of 30 micrograms per cubic metre.

The data from Table 11.1 shows that ambient NO<sub>x</sub>, NO<sub>2</sub> and SO<sub>2</sub> levels at both ambient monitoring sites are well below the ambient air quality goals prescribed by the Department of Environment and Conservation (Table 11.2). The ambient monitoring data listed in Table 11.1 has been used to assess potential air quality impacts of the proposal (see Section 11.2.2 for further details).

## **11.2 Potential impacts**

### **11.2.1 Construction**

Construction of the proposal would generate fugitive emissions in the form of:

- dust from exposed excavations including the gas pipeline trench and the site excavations for the gas turbine facility.
- emissions generated by combustion of fuel from construction plant including small volumes of particulates, carbon monoxide, carbon dioxide, hydrocarbons and nitrogen oxides.

Generation of dust during construction can be effectively controlled through environmental management measures. The volumes and types of emissions that are likely to be generated from the construction activities associated with the proposal are considered to be relatively minor and would have a negligible impact on the local air quality.

Measures to manage dust generation and construction plant emissions would be clearly defined in the construction environmental management plan for the project. Specific mitigation measures are listed in Section 11.3.1.

### **11.2.2 Operation**

Operation of the proposed gas turbine facility would generate emissions from the combustion of natural gas or distillate fuel sources. Both of these fuel sources generate the following emissions:

- carbon monoxide (CO)
- carbon dioxide (CO<sub>2</sub>)

- nitrogen oxides (NO<sub>x</sub>)
- sulfur oxides (SO<sub>x</sub>)
- suspended particulate matter (such as PM<sub>10</sub> and PM<sub>2.5</sub>)
- unburnt hydrocarbons and other volatile organic compounds (VOCs).

Table 11.2 lists the ambient air quality goals for key air pollutants noted by the Department of Environment and Conservation and the relevant National Environment Protection Measures (NEPM) that are applicable to this assessment.

It is important to note that the primary air quality objective for these types of power generation projects is to ensure that the air quality goals listed in Table 11.2 are not exceeded at any location where there is a possibility of human exposure.

**Table 11.2 Ambient air quality goals referred to by the Department of Environment and Conservation**

Air pollutant	Ambient air quality goal	Averaging period	Source of goal
Carbon monoxide (CO)	25 ppm or 30 µg/m <sup>3</sup>	1-hour maximum	NSW DEC
	9 ppm or 10 mg/m <sup>3</sup>	8-hour maximum	NSW DEC
Nitrogen dioxide (NO <sub>2</sub> )	0.12 ppm or 246 µg/m <sup>3</sup>	1-hour maximum <sup>1</sup>	NSW DEC, NEPM
	0.03 ppm or 62 µg/m <sup>3</sup>	Annual mean	NSW DEC, NEPM
Particulate matter less than 10 micrometres in diameter (PM <sub>10</sub> )	50 µg/m <sup>3</sup>	24-hour maximum	NSW DEC, NEPM <sup>2</sup>
	30 µg/m <sup>3</sup>	Annual mean	NSW DEC long term reporting goal
Sulfur dioxide (SO <sub>2</sub> )	0.25 ppm or 712 µg/m <sup>3</sup>	10-minute maximum	NSW DEC
	0.20 ppm or 570 µg/m <sup>3</sup>	1-hour maximum	NSW DEC, NEPM <sup>1</sup>
	0.08 ppm or 228 µg/m <sup>3</sup>	24-hour maximum	NSW DEC, NEPM <sup>1</sup>
	0.02 ppm or 60 µg/m <sup>3</sup>	Annual average	NSW DEC, NEPM
Benzene	0.009 ppm or 0.029 mg/m <sup>3</sup>	1-hour maximum	NSW DEC
Formaldehyde	0.018 ppm or 0.02 mg/m <sup>3</sup>	1-hour maximum	NSW DEC
Toluene	0.09 ppm or 0.36 mg/m <sup>3</sup>	1-hour maximum	NSW DEC
Xylene	0.04 ppm or 0.19 mg/m <sup>3</sup>	1-hour maximum	NSW DEC
PAH (as benzo(a)pyrene)	0.0004 mg/m <sup>3</sup>	1-hour maximum	NSW DEC

Notes 1 One day per year maximum allowable exceedances

2 Five days per year maximum allowable exceedances

µg/m<sup>3</sup> = micrograms per cubic metre

ppm = part per million or milligrams per cubic metre

mg/m<sup>3</sup> = milligrams per cubic metre

NSW DEC - NSW Department of Environment and Conservation

NEPM – National Environment Protection Measure

Table 11.3 provides the ambient air quality National Environment Protection Measures developed by National Environment Protection Council (2004). At this stage, values for PM<sub>2.5</sub> and air toxics are termed “investigation levels” rather than goals which are applied on a project basis.

**Table 11.3 Air quality National Environment Protection Measures for PM<sub>2.5</sub> and relevant air toxics**

Air pollutant	Ambient air quality goal	Averaging Period	Source
Particulate matter less than 2.5 micrometres in diameter (PM <sub>2.5</sub> ) <sup>1</sup>	25 µg/m <sup>3</sup>	24-hour maximum	NEPM
	8 µg/m <sup>3</sup>	Annual average	NEPM
Benzene	0.003 ppm	Annual average	NEPM (Air Toxics)
Formaldehyde	0.04 ppm	24-hour maximum	NEPM (Air Toxics)
Toluene	1 ppm	24-hour maximum	NEPM (Air Toxics)
	0.1 ppm	Annual average	NEPM (Air Toxics)
Xylene	0.25 ppm	24-hour maximum	NEPM (Air Toxics)
	0.2 ppm	Annual average	NEPM (Air Toxics)
PAH	0.3 ng/m <sup>3</sup>	Annual average	NEPM (Air Toxics)

Notes <sup>1</sup> The goals for PM<sub>2.5</sub>, referred to as Advisory Reporting Standards, have been set for the purposes of gathering data to facilitate a review of these standards as part of the development of the PM<sub>2.5</sub> NEPM

µg/m<sup>3</sup> = micrograms per cubic metre

ppm = part per million

ng/m<sup>3</sup> = nanograms per cubic metre

NEPM – National Environment Protection Measure

Source National Environment Protection Council 2004

### **Local airshed modelling**

Local air quality impacts have been assessed through computer-based air dispersion modelling to predict potential ground-level pollutant concentrations due to emissions from the proposed gas turbine facility operating continuously under a number of different operating scenarios.

Refer to Chapters 5, 6 and 7 of Technical Paper 4 for a detailed description of the methodology that was used to assess the potential air quality impacts of the proposed gas turbine facility. The results of the modelling investigations are summarised in subsequent sections.

### **CALPUFF model**

In the last decade there has been a significant improvement in the capability of dispersion models to handle dispersion in areas where complex wind flows occur. The CALPUFF dispersion model has the capability to handle these complex wind flows and has been used extensively in this environmental assessment.

The CALPUFF model makes use of wind fields generated by the CALMET model. CALMET generates a three-dimensional wind field on an hourly basis by taking observations of winds at selected locations and interpolating these to produce information on wind speed and direction at a grid of regularly spaced points covering the area of interest. Modifications that are imposed on this interpolated wind field (by

topography and differential heating and surface roughness) are then applied to the winds at each grid point to develop a final wind field. The final wind field reflects the effects of local topography and different temperatures experienced by water bodies and land surfaces as well as different surface roughness that arise because of changes in vegetation or other variations in land use, such as the presence of residential developments.

Meteorological data collected from Dora Creek, Marks Point and Munmorah was used by the model and included hourly records of wind speed, wind direction and sigma-theta (a measure of horizontal wind fluctuations). Refer to Figure 11.1 for the location of the meteorological monitoring sites.

The data set available for the purposes of this assessment covered the period of June 2002 to May 2005 inclusive. Meteorological data obtained for the year 2003 was used by CALMET to develop the wind field file, as this year had the most complete data recovery for all three monitoring sites.

The same data set was used by the air pollution model TAPM to generate information on higher altitude winds and temperature profiles required by the CALMET model. A summary of the meteorological data that was used by the TAPM and CALMET models is provided in Table 11.4.

**Table 11.4 Summary of meteorological parameters used for this assessment**

<b>TAPM</b>	
Number of grids (spacing)	4 (30 kilometres, 10 kilometres, 3 kilometres, 1 kilometres)
Number of grids point	25 x 25 x 25
Year of analysis	Jan 2003 to Dec 2003
Centre of analysis	33°9 S, 151°34.5 E
Data assimilation	3 sites: Dora Creek, Marks Point and Munmorah
<b>CALMET</b>	
Meteorological grid domain	25 kilometres x 25 kilometres
Meteorological grid resolution	1.0 kilometre
Number of grid cells	40 x 40 x 10
Surface meteorological station	3 sites: Dora Creek, Marks Point and Munmorah for wind velocity. Cloud cover from Sydney Airport (Bureau of Meteorology). Ceiling height, pressure, temperature and relative humidity provided by TAPM for each site
Upper air meteorological station	Data extracted from TAPM simulation for Munmorah Power Station site
Simulation length	8760 hours (Jan 2003 to Dec 2003)
Mode	Diagnostic wind module

Source Table 4 of Technical Paper 4

## Air emission estimates

The CALPUFF dispersion model requires information on the source location, height, internal tip diameter, temperature, exit velocity and mass emission rate of the pollutants to be assessed. Temperature, exit velocity and mass emissions rates were assumed to be constant for an entire year (constant emission source). Four modelling scenarios were developed to assess the potential air quality impacts of the proposal under a range of conditions. The four scenarios that were modelled for the purpose of this assessment are described as follows:

- open-cycle gas turbine using natural gas under normal operation
- open-cycle gas turbine using natural gas under start-up condition
- open-cycle gas turbine using distillate fuel under normal operation
- open-cycle gas turbine using distillate fuel under start-up condition.

Table 11.5 provides the constant emission source information that was used by the CALPUFF dispersion model to predict potential ground level concentrations under the four modelling scenarios described above.

**Table 11.5 Emission characteristics of proposed gas turbine facility used by dispersion model**

Parameter	Natural gas fired		Distillate fired	
	Normal	Start-up	Normal	Start-up
Stack easting (metres) <sup>1</sup>	364129	364129	364129	364129
Stack northing (metres) <sup>1</sup>	6324355	6324355	6324355	6324355
Stack base elevation (metres)	15	15	15	15
Stack height (metres)	35	35	35	35
Stack tip diameter (metres)	6	6	6	6
Stack temperature (degrees Celsius)	524	398	518	401
Velocity (metres per second)	43	27	44	27
<b>Emissions (grams per second)</b>				
CO	4.4	895.6	35.6	1711.1
NO <sub>x</sub> (as NO <sub>2</sub> )	81.1	117.8	112.2	162.2
SO <sub>2</sub>	4.9	2.2	6.1	13.1
PM <sub>10</sub>	4.4	4.4	9.4	9.4

Notes <sup>1</sup> The four emission stacks have been modelled as a single point source  
Source Table 9 of Technical Paper 4

Table 11.6 provides information on the stack pollutant concentrations that have been estimated for the proposed gas turbine facility under normal operating conditions. The concentrations have been compared with the stack emission limits set by the *Protection of the Environment Operations (Clean Air) Regulation 2002*. Note that the limits set by the *Protection of the Environment Operations (Clean Air) Regulation 2002* do not apply to start-up conditions, due to the relatively short start-up period associated with the proposed gas turbine facility (i.e. less than 30 minutes).

**Table 11.6 Estimated stack pollutant concentrations from proposed gas turbine facility (normal operation)**

Air pollutant	Natural gas fired mg/Nm <sup>3</sup>	Distillate fired mg/Nm <sup>3</sup>	Concentration limits <sup>1</sup> (mg/Nm <sup>3</sup> )	
			Gas	Other
Carbon monoxide	3	21	-	-
Nitrogen oxides (as NO <sub>2</sub> )	49	65	70	90
Sulfur dioxide	3	4	-	-
Particulate matter less than 10 micrometres in diameter	3	5	50	50

Notes: <sup>1</sup> Schedule 3 of the Protection of the Environment Operations (Clean Air) Regulation 2002.

mg/Nm<sup>3</sup> = milligrams per cubic metre under normal atmospheric conditions

Source Table 10 of Technical Paper 4

## Modelling approach

The model used was the most recent version of the CALPUFF modelling system (Version 5.7) using the meteorological information described in Section 11.1.1. The modelling took account of stack dimensions, characteristics and emissions to predict potential ground-level concentrations of pollutants emitted from the stacks. The local terrain and land uses in the assessment area and building wake effects were also included in the model.

Dispersion modelling was undertaken for a 40 kilometres by 40 kilometres grid domain within the assessment area, as shown in Figure 11.1. Predictions were made at a set of grid receptors with one kilometre spacing. A finer spaced (200 metre spacing) set of receptors was included to assess an area of two kilometres radius from the proposed gas turbine facility. Discrete receptors were also placed at the location of each air quality monitoring station.

A conservative approach has been adopted for the purposes of this assessment. The existing or background ambient air quality environment has been conservatively quantified by selecting the 1-hour maximum background pollutant levels measured in the study area between June 2002 and December 2004, as listed in Table 11.1.

Dispersion modelling has been used to predict emissions from the proposed gas turbine facility contributing to the existing background air quality based on the predicted emissions provided in Table 11.5. The modelling assumed that the gas turbine facility would be operating continuously over the modelled year, which for the purpose of this assessment was selected to be 2003. The measured maximum 1-hour background ambient ground level concentrations were then added to the modelled maximum 1-hour ground level concentrations to determine the potential cumulative effect of the proposal on the air quality in the assessment area.

The cumulative concentrations were compared with the relevant ambient air quality criteria prescribed in Tables 11.2 and 11.3. The addition of maximum measured ground level concentrations to maximum predicted ground level concentrations provides a conservative worse-case prediction of potential impact. Where exceedances to the prescribed criteria were noted, the OLM was used to fine tune the assessment and provide a more realistic estimate of the potential cumulative ground level concentration.



The modelling approach that was used in this assessment complies with the *Approved Methods for Modelling and Assessment of Air Pollutants in NSW* (NSW EPA 2001). The methodology was also submitted to the Department of Environment and Conservation and was endorsed as suitable.

As dispersion models usually only predict on time scales of 1-hour or more, the predicted maximum 10-minute SO<sub>2</sub> concentrations were determined from the 1-hour predictions using an empirical relationship. The empirical relationship that was used in this assessment has the following form:

**Equation 1 (from Victorian EPA, 1986):**

$$C_t = C_{60} \left[ \frac{60}{t} \right]^{0.2}$$

Where:

$C_t$  = Concentration for time,  $t$

$C_{60}$  = Concentration for averaging time, 60 mins

$t$  = time (mins)

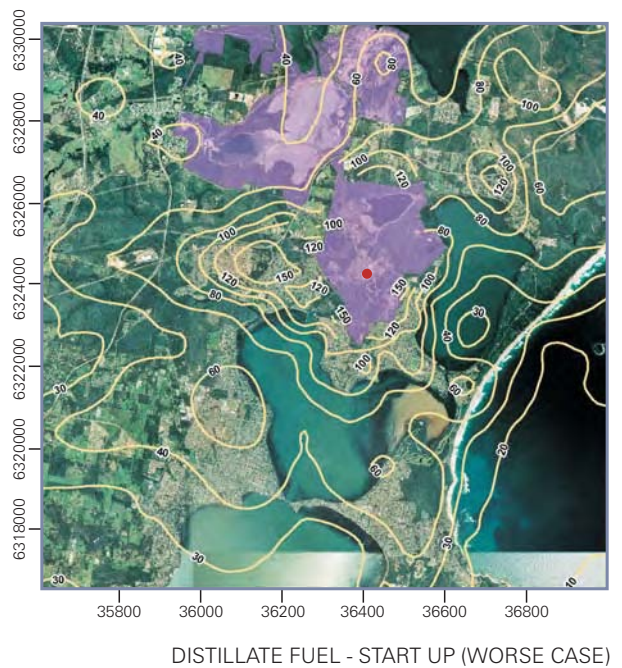
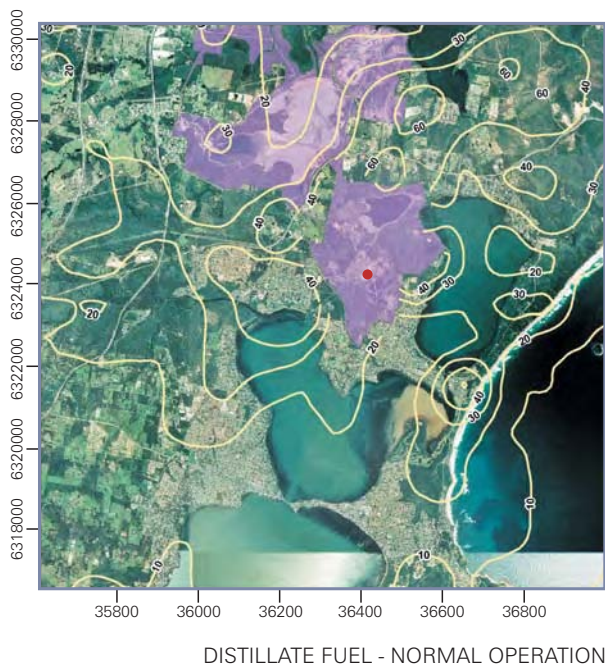
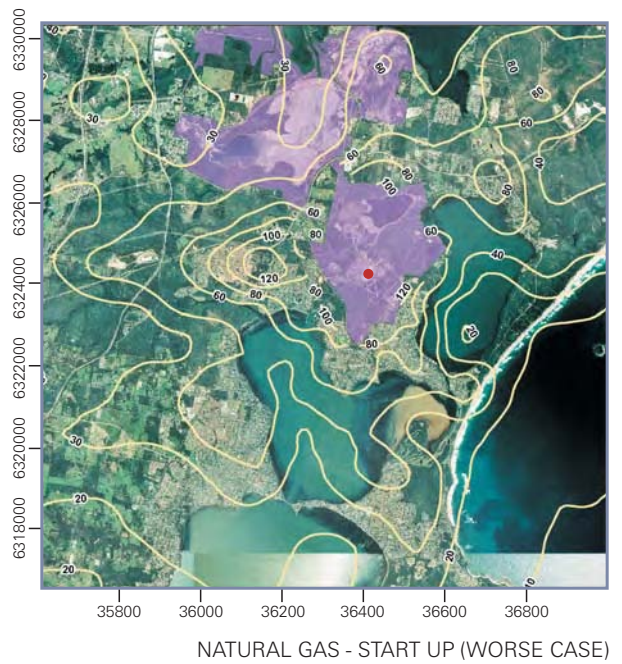
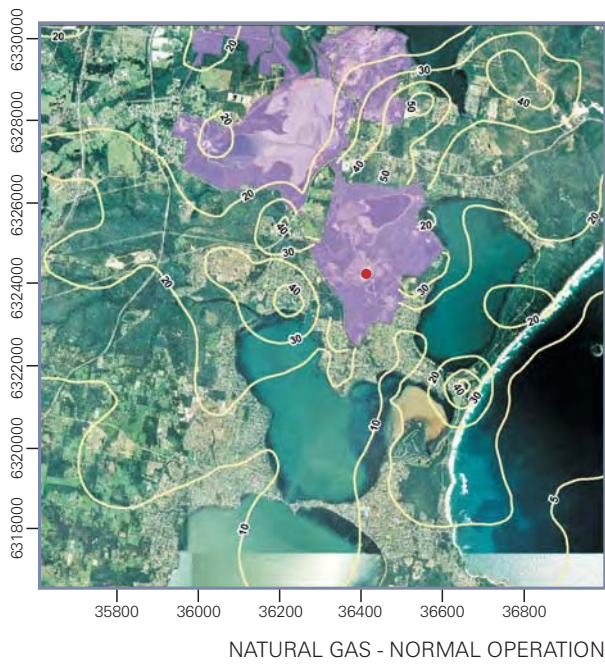
## **Assessment of impacts**

### **Dispersion model results**

Table 11.7 shows the dispersion model results for the gas turbine facility under the various operating scenarios. Predictions which exceed the relevant air quality goals are shown in bold font.

Contour plots for maximum 1-hour ground level concentrations of NO<sub>2</sub> and SO<sub>2</sub> are presented in Figures 11.2 and 11.3 respectively and show the pattern of dispersion due to emissions from the gas turbine facility only. It is important to note that plots showing maximum 1-hour ground-level concentrations do not present the pattern of pollutant concentrations at any one time, but show the maximum concentrations that could be reached at each location under the modelled conditions. The figures are helpful in determining where the maximum modelled concentrations shown in Table 11.7 are predicted to occur.

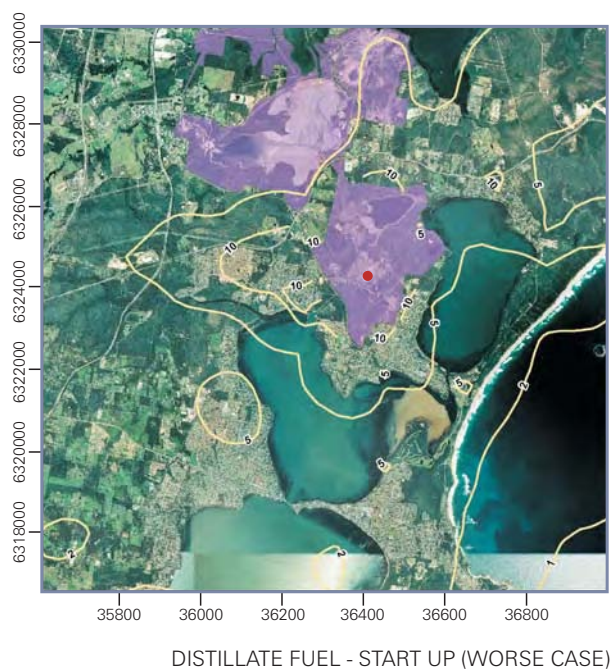
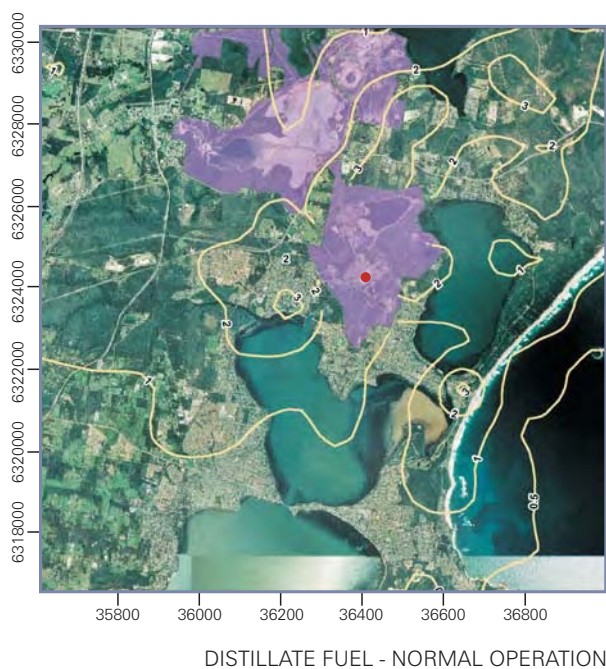
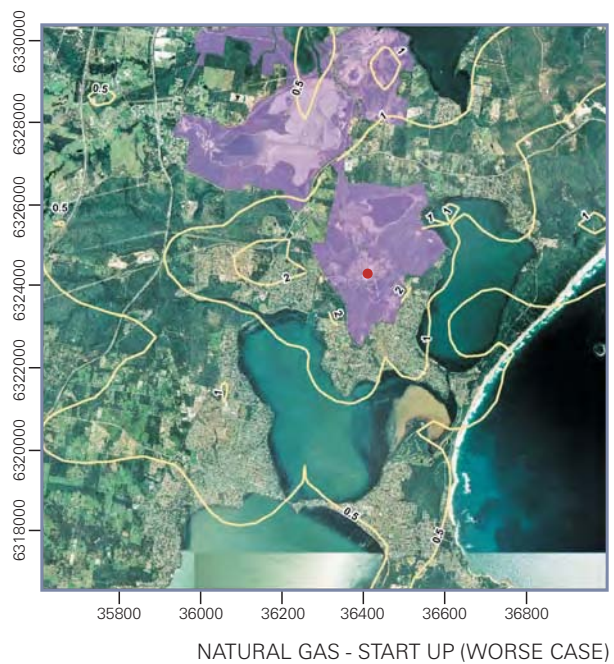
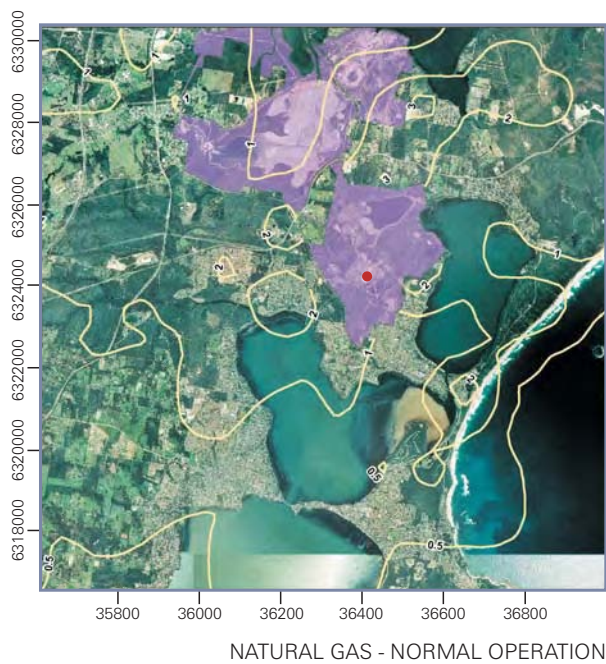
For the purposes of this assessment, the maximum 1-hour average NO<sub>2</sub> predictions assume that 20 per cent of the NO<sub>x</sub> is NO<sub>2</sub> by the time the plume has reached the point where the maximum ground-level concentrations are predicted. During start-up conditions, however, the model has assumed that 100 per cent of the NO<sub>x</sub> will be NO<sub>2</sub>.



- Land owned by Delta Electricity
- Contour ( $\mu\text{g}/\text{m}^3$ )
- Proposed gas turbine facility

**Figure 11.2** Predicted Maximum 1-hour Average NO<sub>x</sub> Concentrations at Ground Level





- Land owned by Delta Electricity
- Contour ( $\mu\text{g}/\text{m}^3$ )
- Proposed gas turbine facility

**Figure 11.3** Predicted Maximum 1-hour Average  $\text{SO}_2$  Concentrations at Ground Level

**Table 11.7 Summary of dispersion modelling results**

<b>Pollutant</b>	<b>Averaging period</b>	<b>Predicted maximum concentration<sup>1</sup> (µg/m<sup>3</sup>)</b>	<b>Measured maximum concentration (µg/m<sup>3</sup>)</b>	<b>Cumulative impact (Predicted + measured (µg/m<sup>3</sup>))</b>	<b>Relevant air quality goal<sup>2</sup> (µg/m<sup>3</sup>)</b>
<b>Natural gas fired – Normal operation</b>					
CO	1-hour maximum	3	-	3	30,000
	8-hour maximum	0.6	-	0.6	10,000
NO <sub>x</sub> (as NO <sub>2</sub> )	1-hour maximum	51	197	<b>248</b>	246
	Annual average	0.2	15	15	62
SO <sub>2</sub>	10-minute maximum	5	400	405	712
	1-hour maximum	3	226	229	570
	24-hour maximum	0.2	49	49	228
	Annual average	0.01	6	6	60
PM <sub>10</sub>	24-hour maximum	0.2	133	<b>133</b>	50
	Annual average	0.01	25	25	30
<b>Natural gas fired – Start-up operation</b>					
CO	1-hour maximum	1063	-	1063	30,000
	8-hour maximum	237	-	237	10,000
NO <sub>x</sub> (as NO <sub>2</sub> )	1-hour maximum	140	197	<b>337</b>	246
	Annual average	0.4	15	15	62
SO <sub>2</sub>	10-minute maximum	4	400	404	712
	1-hour maximum	3	226	229	570
	24-hour maximum	0.2	49	49	228
	Annual average	0.01	6	6	60
PM <sub>10</sub>	24-hour maximum	0.4	133	<b>133</b>	50
	Annual average	0.02	25	25	30
<b>Distillate fired – Normal operation</b>					
CO	1-hour maximum	22	-	22	30,000
	8-hour maximum	5	-	5	10,000
NO <sub>x</sub> (as NO <sub>2</sub> )	1-hour maximum	70	197	<b>267</b>	246
	Annual average	0.3	15	15	62
SO <sub>2</sub>	10-minute maximum	6	400	406	712
	1-hour maximum	4	226	230	570
	24-hour maximum	0.3	49	49	228
	Annual average	0.01	6	6	60
PM <sub>10</sub>	24-hour maximum	0.5	133	<b>134</b>	50
	Annual average	0.02	25	25	30
<b>Distillate fired – Start-up operation</b>					
CO	1-hour maximum	2027	-	2027	30,000
	8-hour maximum	453	-	453	10,000
NO <sub>x</sub> (as NO <sub>2</sub> )	1-hour maximum	192	197	<b>389</b>	246
	Annual average	0.6	15	16	62
SO <sub>2</sub>	10-minute maximum	22	400	422	712
	1-hour maximum	16	226	242	570
	24-hour maximum	1	49	50	228
	Annual average	0.05	6	6	60
PM <sub>10</sub>	24-hour maximum	0.9	133	<b>134</b>	50
	Annual average	0.03	25	25	30

Notes 1 Refer to Table 11.1 for details

2 Refer to Table 11.2 for details. Air quality goals are applicable to normal operation only

The results provided in Table 11.7 show that maximum air quality impacts would be observed when the gas turbine facility is using distillate fuel during start-up conditions, which although possible, is considered an unlikely event as natural gas would normally be used during all start-up sequences. It is important to note that the start-up sequence would generally take less than 30 minutes, after which the gas turbines would be operating at full load under normal conditions. The model predictions are based on one hour averages which would therefore lead to the overestimation of the start-up results presented in Table 11.7.

The predicted maximum 1-hour average ground-level CO concentration due to the proposal is two milligrams per cubic metre which is well below the goal of 30 milligrams per cubic metre. Compliance with the 1-hour CO goal would therefore be predicted. The predicted maximum concentration for 8-hour averages is 0.4 milligrams per cubic metre which is well below the goal of 10 milligrams per cubic metre.

The maximum predicted NO<sub>x</sub> concentration was 192 micrograms per cubic metre during start-up condition and using distillate fuel. Assuming that 100 per cent of the NO<sub>x</sub> is NO<sub>2</sub> and adding this to a maximum measured NO<sub>2</sub> concentration of 197 micrograms per cubic metre results in a total cumulative impact of 389 micrograms per cubic metre, which is above the goal of 246 micrograms per cubic metre (noting that the plant will only take approximately 30-minutes to reach normal operating conditions). A more refined assessment of potential NO<sub>2</sub> impacts has therefore been conducted using the Ozone Limitation Method (OLM) to provide a more realistic estimate of potential maximum ground level concentrations for NO<sub>2</sub>.

For all operating scenarios, predictions of annual average NO<sub>x</sub> concentrations due to the proposal are very low and the total cumulative impacts are below the goal of 62 micrograms per cubic metre even on the assumption that 100 per cent of the NO<sub>x</sub> is NO<sub>2</sub>.

The predicted highest 10-minute, 1-hour, 24-hour and annual average ground level SO<sub>2</sub> concentrations due to the proposal are below their air quality goals. The 10-minute average SO<sub>2</sub> concentrations were derived from the 1-hour average predictions. The exponent in the empirical relationship between 1-hour averages and shorter time averages may have some variation. The model predictions, however, are sufficiently low to allow some variation to the exponent in the equation without causing predictions to be above the goal of 712 micrograms per cubic metre. Even if the ratio of the 10-minute peak to 60-minute average were the maximum theoretically possible value of six, the predicted concentrations would be below the goal.

As expected, predicted maximum 24-hour average ground-level PM<sub>10</sub> concentrations due to emissions from the proposed gas turbine facility alone are low. The highest prediction is 0.9 micrograms per cubic metre and corresponds to a distillate-fired facility during start-up operations. This is well below the goal of 50 micrograms per cubic metre. The maximum measured 24-hour average PM<sub>10</sub> concentration is 133 micrograms per cubic metre, which is above the goal of 50 micrograms per cubic metre. However it is unlikely that the emissions from the proposed gas turbine facility would cause any additional exceedances of the PM<sub>10</sub> goal. Compliance with the NEPM PM<sub>2.5</sub> investigation level (25 µg/m<sup>3</sup>) would also be anticipated even if it is assumed that all of the PM<sub>10</sub> concentration comprises PM<sub>2.5</sub> particles.

## Estimate of NO<sub>2</sub> ground level concentrations using the Ozone Limiting Method

There are various methods for estimating NO<sub>2</sub> concentrations from model predictions of NO<sub>x</sub>. Air quality monitoring data can be used to assess the fraction of NO<sub>2</sub> in the NO<sub>x</sub> when the NO<sub>x</sub> concentration is high and since dispersion models are generally configured to predict maximum NO<sub>x</sub> concentrations the fraction of NO<sub>2</sub> in the NO<sub>x</sub> for high NO<sub>x</sub> concentrations may provide a reasonable estimate of the NO<sub>2</sub> concentration.

Alternatively, the oxidation of NO to NO<sub>2</sub> can be estimated using the OLM. This method uses the predicted NO<sub>x</sub> concentration with background ozone (O<sub>3</sub>) and NO<sub>2</sub> data to estimate the NO<sub>2</sub> concentration. The OLM has the form of the equation show below.

### Equation 2 (from DEC 2005)

$$[NO_2]_{total} = \{0.1 \times [NO_x]_{pred}\} + MIN \left\{ (0.9) \times [NO_x]_{pred} \text{ or } \left( \frac{46}{48} \right) \times [O_3]_{bkgd} \right\} + [NO_2]_{bkgd}$$

The Department of Environment and Conservation provides two levels of assessment using the OLM. A Level 1 assessment is based on the use of maximum predicted and maximum background concentrations. A Level 2 assessment requires contemporaneous hourly NO<sub>2</sub> and O<sub>3</sub> data for the area of interest. The Department of Environment and Conservation collects NO<sub>2</sub> and O<sub>3</sub> data at various locations in Sydney and the Lower Hunter, however, there are no monitoring sites in the assessment area. Therefore, a level 1 OLM assessment was considered feasible.

CSIRO have carried out a photochemical pollution assessment as part of this assessment (see Technical Paper 5). This report highlighted large spatial variations of both NO<sub>2</sub> and O<sub>3</sub> from Sydney to Newcastle and the Central Coast. Hourly NO<sub>x</sub> and O<sub>3</sub> data for Lindfield and three lower Hunter sites was attained from the Department of Environment and Conservation for the year 2003 to correspond with the set of ambient air quality data that was used in the modelling or potential air quality impacts. A combination of this data, the CSIRO assessment report and monitoring data for Wyee and Lake Munmorah (as presented in Table 11.1) has been used to determine the following NO<sub>2</sub> and O<sub>3</sub> concentrations:

- maximum measured 1-hour average ground level NO<sub>2</sub> concentration of 103 micrograms per cubic metre for the year 2003 (see Table 11.1)
- maximum measured 1-hour ground level O<sub>3</sub> concentration of 8.1 parts per hundred million or 173 micrograms per cubic metre for the year 2003 (from data provided by the Department of Environment and Conservation).

The above maximum ground level concentrations have been used to estimate the maximum cumulative ground level NO<sub>2</sub> concentration associated with the gas turbine facility firing on distillate fuel and operating under normal conditions using the OLM (Equation 2).

Normal operations using distillate have been assessed by the OLM as this represents the worse-case. Under start-up conditions, it has been assumed that all the emitted NO<sub>x</sub> is NO<sub>2</sub> and the OLM method provides no further information. Although the predicted

concentrations are higher for start-up conditions, the conditions persist for only 30-minutes or so. The predictions are, therefore, an overestimate of a 1-hour average by a factor of two. The maximum predicted 1-hour NO<sub>2</sub> concentration would therefore be 96 micrograms per cubic metre which with a background of 103 micrograms per cubic metre makes a total of 199 micrograms per cubic metre which is below the DEC goal of 246 micrograms per cubic metre.

The results of the assessment are summarised in Table 11.8.

**Table 11.8 Prediction of maximum ground level NO<sub>2</sub> concentrations using the Ozone Limiting Method**

<b>Scenario</b>	<b>Gas turbine facility using distillate during normal operation (µg/m<sup>3</sup>)</b>
Maximum predicted 1-hour average NO <sub>x</sub> (modelled for 2003 conditions)	70
Maximum measured 1-hour average NO <sub>2</sub> (during 2003)	103
Maximum measured 1-hour average O <sub>3</sub> (during 2003)	173
Maximum estimated 1-hour average NO <sub>2</sub> from proposal plus background using OLM	173

Note µg/m<sup>3</sup> = micrograms per cubic metre  
Source Table 12 of Technical Paper 4

The estimated maximum 1-hour average ground level NO<sub>2</sub> concentration of 173 micrograms per cubic metre due to emissions from the proposed gas turbine facility plus background using the OLM is well below the Department of Environment and Conservation's goal of 246 micrograms per cubic metre.

## **Air toxics assessment**

In general, emissions of air toxics are relatively low for gas turbines compared to other forms of combustion, due to the relatively high temperatures reached during normal operations. Information on air toxic emission has been drawn from the United States Environment Protection Agency (1995) AP-42 publication which provides emission rates for criteria pollutants and air toxics for turbines fuelled with natural gas and diesel distillate. Both controlled and uncontrolled emission rates are provided for NO<sub>x</sub> and CO.

The approach adopted in this assessment has been to normalise the air toxics emission rate to the NO<sub>x</sub> emission rate for controlled natural gas-fired gas turbines. AP-42 reports a NO<sub>x</sub> emission rate of 0.13 pounds per million British Thermal Units of fuel input. This is equivalent to 0.056 kilograms per gigajoule which is similar to the NO<sub>x</sub> emission rate of 0.039 kilograms per gigajoule estimated under normal operating conditions for the proposed turbines fuelled with natural gas. Table 11.9 provides emission estimates of selected air toxics from the proposed gas turbines.

**Table 11.9 Emission estimates and model predictions for selected air toxics**

<b>Fuel used under normal operation</b>	<b>Natural gas</b>	<b>Distillate</b>
<b>Emissions (kilograms per hour)</b>		
NO <sub>x</sub>	292	404
Benzene	0.027	0.124
Formaldehyde	1.59	0.629
Toluene	0.292	n/a
Xylene	0.144	n/a
Polycyclic Aromatic Hydrocarbons	0.002	0.0112
<b>Predicted maximum 1-hour average ground-level concentrations by pro-rata of NO<sub>x</sub> emissions and results (milligrams per cubic metre)</b>		
Benzene (Goal = 0.029 milligrams per cubic metre)	4.73 x 10 <sup>-6</sup>	2.16 x 10 <sup>-5</sup>
Formaldehyde (Goal = 0.36 milligrams per cubic metre)	2.80 x 10 <sup>-4</sup>	1.10 x 10 <sup>-4</sup>
Toluene (Goal = 0.02 milligrams per cubic metre)	5.13 x 10 <sup>-5</sup>	-
Xylene (Goal = 0.19 milligrams per cubic metre)	2.52 x 10 <sup>-5</sup>	-
Polycyclic Aromatic Hydrocarbons (Goal = 0.0004 milligrams per cubic metre)	3.55 x 10 <sup>-7</sup>	1.95 x 10 <sup>-6</sup>

Source Table 13 of Technical Paper 4

The model predictions provided in Table 11.9 can be seen to be well below the air quality goals set by the Department of Environment and Conservation for each of the selected air toxics.

### **Regional airshed modelling**

This section provides a summary of the regional airshed modelling that was conducted by CSIRO to assess the potential air quality impacts of the proposal on a regional context. Refer to Technical Paper 5 – *Photochemical Pollution Assessment of a Proposal Gas-fired Power Station at Munmorah* for a more detailed discussion on the modelling methodology and results of the assessment.

### **Background**

In a regional sense, the main air quality issue relates to the potential for generation of photochemical smog. The term photochemical smog refers to a family of secondary gaseous and aerosol species which are generated through the process of photolysis and oxidation of photochemical smog precursors. The precursors to photochemical smog are oxides of nitrogen (NO<sub>x</sub>), volatile organic compounds (VOCs) and carbon monoxide (CO). In NSW the principle component of photochemical smog is ozone (O<sub>3</sub>). Other components of interest include nitrogen dioxide (NO<sub>2</sub>), hydrogen peroxide, peroxyacetylnitrate, formaldehyde and aerosol nitrates.

Although the smog itself contributes to visual pollution due to the characteristic brown haze created, the main issues in terms of potential impact on human health are the associated concentrations of ozone and nitrogen oxides.



Ozone is of particular concern in NSW because the Department of Environment and Conservation has observed breaches of the 1-hour and 4-hour National Environment Protection Measure (NEPM) standards of 100 parts per billion and 80 parts per billion for many years. Breaches of the 4-hour NEPM (80 parts per billion) in particular show little downward trend over recent years (NSW EPA, 2003). The 1-hour NEPM standard for nitrogen dioxide is 120 parts per billion. Exceedances of this standard are rare, however, with maximum values usually no greater than 80 parts per billion.

The potential impact of the proposed gas turbine facility on photochemical smog levels in the Sydney basin and surrounding areas has been investigated by CSIRO Marine and Atmospheric Research using a prognostic meteorological and chemical transport model TAPM-CTM. Four case-assessment days of moderate-high ozone levels were selected for modelling. These days had previously been identified as days on which emissions from existing coal-fired power stations located north of Sydney were transported to the Sydney basin. A summary of the results of the modelling studies is provided below.

### **Modelling methodology**

A three dimensional modelling system (TAPM-CTM) has been used to assess the impact of NO<sub>x</sub> emissions from the proposed gas turbine facility on photochemical smog production in the Metropolitan Air Quality Assessment Region (MAQSR). The system has three major components.

- A numerical weather prediction system, TAPM Version 3.0, which has been used for the prediction of meteorological fields including wind velocity, temperature, mixing ratio, radiation and turbulence.
- CSIRO's Chemical Transport Model CTM (Cope et al. 2004) for modelling photochemical transformation.
- The Metropolitan Air Quality Assessment (MAQS) emissions inventory (Carnovale et al. 1996) with 2002 updates for the motor vehicle inventory (Charles Xu; NSW-EPA) and for the biogenic emissions methodology (CSIRO 2002).
- Industrial emissions inventory.

The air quality impact has been assessed by comparing modelled ozone and nitrogen dioxide concentrations from a base-case emissions scenario (all existing sources plus a proposed gas-fired power station at Tomago NSW) to those from a test-case scenario (all base-case sources plus the proposed gas turbine facility at Munmorah Power Station). This assessment has been undertaken for four 3-day photochemical smog episodes which have been observed in the MAQS region over recent years.

The proposed gas turbine facility was assumed to be firing continuously using distillate fuel to assess potential impacts, as it is considered to provide a worse-case emissions scenario when compared to firing using natural gas.

TAPM-CTM was run in nested mode, using two 75 by 75 grid point modelling domains with grid spacings of 4 kilometres and 2 kilometres respectively for both meteorology and air quality. The inner grid is centred on the Central Coast region covering an area of 150 kilometres by 150 kilometres and centred on Munmorah. The outer grid extends to Sydney in the south, Port Stephens in the north and the Blue Mountains in the west, and

covers an area of 300 kilometres by 300 kilometres. Local wind observations from the MAQS surface monitoring network were assimilated into TAPM-CTM for each modelled event.

The airshed modelling was conducted for four specific event periods which correspond to periods of high ozone levels in the Sydney basin. The dates for these periods were:

- 6–8 February 1997
- 11–13 March 1998
- 20–22 January 1997
- 25–27 October 1997

The base case modelling runs were compared to the Department of Environment and Conservation's air quality monitoring records to confirm the accuracy of the model results.

### **Assessment of impacts**

Table 11.10 shows the maximum concentration across the region for each event for the base-case (existing emissions plus the proposed gas-fired power station at Tomago NSW) and test-case (base-case emissions plus emissions from the proposed gas turbine facility at Munmorah when firing using distillate fuel) simulations. Results are shown for both modelling domains and, apart from NO<sub>2</sub> for the 20–22 January event, confirm that the largest NO<sub>2</sub> concentrations are found on the inner (small) domain and that those for O<sub>3</sub> occur on the outer (large) domain. The modelling results for the four events show that the maximum impact of emissions from the proposed gas turbine facility at Munmorah would be:

- an increase in the regional maximum 1-hour average NO<sub>2</sub> concentration of 0.2 parts per billion
- a decrease in the regional maximum 1-hour average O<sub>3</sub> concentration of 1.5 parts per billion
- a decrease in the regional maximum 4-hour average O<sub>3</sub> concentration of 0.9 parts per billion.

While the impact on the Sydney basin is estimated to be negligible, local NO<sub>2</sub> increases of between 1.5 parts per billion and 5.5 parts per billion were predicted. However, these were in sparsely-populated areas and occurred at base-case concentrations of less than 10 parts per billion.

Local increases in hourly-averaged O<sub>3</sub> ranged from 0.5 parts per billion to 5.4 parts per billion and these too were in areas of little or no population, such as the mountains to the northwest and south west of Munmorah. Base-case O<sub>3</sub> concentrations in these areas at these times ranged between 50 parts per billion and 60 parts per billion. This is consistent with the finding of Nelson et al. (2002) that biogenic emissions in rural areas are available to generate moderate concentrations of photochemical smog, but are limited by the availability of NO<sub>x</sub>.

**Table 11.10 Regional maximum glc for NO<sub>2</sub> and O<sub>3</sub> for the base-case and the test-case simulations**

<b>Averaging period</b>		NO <sub>2</sub> 1-hour		O <sub>3</sub> 1-hour		O <sub>3</sub> 4-hour	
<b>Air quality standard</b>		120 parts per billion		100 parts per billion		80 parts per billion	
<b>Selected event</b>	<b>Modelling domain</b>	<b>Base case</b>	<b>Test case</b>	<b>Base case</b>	<b>Test case</b>	<b>Base case</b>	<b>Test case</b>
6-8 February 1997	Small	54.5	54.5	95.9	95.9	<b>81.3</b>	<b>81.3</b>
	Large	56.9	56.8	<b>129.3</b>	<b>129.3</b>	<b>103.2</b>	<b>103.2</b>
11-13 March 1998	Small	77.8	77.8	85.2	85.2	78.0	78.0
	Large	77.0	77.0	<b>108.6</b>	<b>108.6</b>	<b>87.0</b>	<b>87.0</b>
20-22 January 1997	Small	39.3	39.3	95.9	95.9	<b>85.0</b>	<b>85.0</b>
	Large	63.9	63.8	<b>117.7</b>	<b>117.7</b>	<b>85.5</b>	<b>85.5</b>
25-27 October 1997	Small	76.3	76.5	74.3	74.5	66.4	66.4
	Large	75.4	75.5	84.8	83.3	76.6	75.7

It can be seen from Table 11.10 that emissions from the proposed gas turbine facility are predicted to have no adverse effect on concentrations of nitrogen dioxide and ozone in the Sydney basin region, under worse-case emissions associated with distillate firing.

### **Other operations**

Air emissions from the proposed black start generator, which may consist of one or two 4-5 kilowatt diesel engines coupled to the gas turbines, would be required to comply with the minimum emission standards set by the *Protection of the Environment Operations (Clean Air) Regulation 2002*, as part of the performance schedule that would be developed during the detailed design/tender specification phase of the project.

It is important to note that these relatively large diesel engines would only be used for a relatively short-period of time during system emergency or black-out conditions or during maintenance activities where the engine may be run for up to 1 hour per year to ensure they are in good working order. Emissions from these units are considered negligible when compared to the more frequent operation of the gas turbine facility and were therefore not included as pollutant point sources in the modelling of potential air quality impacts conducted as part of this assessment.

### **11.2.3 Greenhouse gas emissions**

This section provides an estimate of the greenhouse gas emissions associated with the operation of the proposed gas turbine facility. It excludes the greenhouse gas emissions that would be emitted during the construction phase of the proposal, which would mainly be associated with the use of diesel and other transport-related fuels, as the total greenhouse gas emissions from these sources were considered to be relatively minor when compared to the long-term operation of the gas turbine facility.

The assessment focuses on emissions of CO<sub>2</sub>, as total CO<sub>2</sub> emissions are by far the largest of all the greenhouse gases being emitted by the proposal.

### Estimated greenhouse gas emissions

Table 11.11 provides an estimate of the average greenhouse gas emissions that would be emitted by the proposed gas turbine facility in terms of total tonnes of carbon dioxide equivalent ( $\text{tCO}_{2-e}$ ) over one year of operation.

**Table 11.11 Estimated greenhouse gas emissions of proposal (annual average)**

Parameter	Units	Natural gas firing
Net power output	MW	600
Estimated fuel consumption rate	GJ/h	6,815
Operating hours per year (nominal)	hours	500
Capacity factor	%	5.7
Energy generated per year	MWh/year	300,000
Energy used per year	TJ/year	3,408
Efficiency	%	32.56
Greenhouse gas emission factor (natural gas)	$\text{tCO}_{2-e}/\text{TJ}$	51 <sup>(1)</sup>
Total greenhouse gas emissions	$\text{tCO}_{2-e}/\text{year}$	173,783
Greenhouse intensity factor	$\text{tCO}_{2-e}/\text{MWh}$	0.58

Notes: 1: Australian Greenhouse Gas Office 2005

### NSW pool coefficient

The NSW pool coefficient is an indicator of the average greenhouse gas emission intensity of electricity sourced from the pool of power stations supplying the NSW electricity grid. This is measured in terms of carbon dioxide equivalents per megawatt hour ( $\text{CO}_{2-e}/\text{MWh}$ ) of electricity supplied from the power stations, the majority of which are coal-fired.

The NSW pool coefficient is calculated by the NSW Independent Pricing and Regulatory Tribunal using data provided by operators of Category B Generators (of which Delta Electricity is a part of) and the National Electricity Market Management Company (NEMMCO). The NSW pool coefficient was used to compare and assess the performance of the proposed gas turbine facility to the State average.

### Assessment of results

The results in Table 11.11 show that the proposed gas turbine facility would emit greenhouse gases at an average rate of  $0.58 \text{ tCO}_{2-e}/\text{MWh}$ . This rate is significantly lower than the NSW pool coefficient set for 2005 ( $0.913 \text{ tCO}_{2-e}/\text{MWh}$ ) and for 2006 ( $0.928 \text{ tCO}_{2-e}/\text{MWh}$ ), and the greenhouse intensity factor for the National Electricity Market, which averages just above  $1 \text{ tCO}_{2-e}/\text{MWh}$  (NEMMCO 2005). In the event of the proposed gas turbine facility is converted to a combined-cycle gas turbine facility in the future, the respective greenhouse intensity factor would be reduced to about  $0.36 \text{ tCO}_{2-e}/\text{MWh}$ .

Greenhouse intensity factors reported in 2003 for existing coal-fired power stations operated by Delta Electricity ranged from  $0.892$  to  $0.902 \text{ tCO}_{2-e}/\text{MWh}$ , which are about 40 per cent higher than the proposed gas turbine facility. The proposal would, therefore,

help Delta Electricity reduce the average greenhouse intensity factor and attributable emissions of its current operations, whilst increasing generation capacity to meet expected future peak demands, and compliance with the generator greenhouse gas benchmarks set by the NSW Greenhouse Gas Benchmarks Scheme.

Delta Electricity would also be eligible under the NSW Greenhouse Abatement Scheme for the generation of NSW Greenhouse Abatement Certificates (NGACs) for trade, as a Category D generator. The generation of lower greenhouse gas intensity electricity and NGACs is of particular importance to electricity retailers, as it helps them maintain the greenhouse gas intensity of the purchased electricity below the benchmark set by the NSW Greenhouse Gas Benchmarks Scheme, particularly as annual electricity demand is expected to grow and greenhouse benchmark levels are projected to decrease.

The proposed gas turbine facility has a relatively high generation capacity of about 600 megawatts and has the potential to have a positive impact, although limited due to low capacity factor, on the NSW pool coefficient. This is considered to have important State-wide significance, as it would help to reduce greenhouse gas emissions per unit of output in NSW and achieve the ultimate goal of 7.27 tCO<sub>2-e</sub> per capita by the year 2012 set by the NSW Greenhouse Gas Benchmarks Scheme.

## **11.3 Mitigation**

### **11.3.1 Construction**

Dust and vehicle emissions have the greatest potential for air quality impacts during the construction works. Dust suppression measures are proposed during all construction works to minimise impacts throughout the local air shed.

The following mitigation measures are proposed for the construction phase of the project:

- water application to aggregate storage piles, internal unsealed access roadways and work areas. Application rates would be specific to atmospheric conditions and the intensity of construction operations
- where applicable, sealed roads would be swept to remove deposited material that could generate dust
- revegetation activities would proceed as soon as work activities are completed within a disturbed area
- dust generating activities (particularly clearing and excavating) would be avoided or minimised during dry and windy conditions
- site speed limits would be imposed on all construction vehicles
- vehicle and machinery movements during the construction works would be restricted to designated areas
- rumble grids and wheel wash facilities would be used at each construction site exit to remove mud and dust from vehicles

- vehicles transporting material to and from a construction site would be covered immediately after loading to prevent wind blown dust emissions and spillages
- tailgates of road transport trucks would be securely fixed prior to loading and immediately after unloading
- construction plant and equipment would be well maintained and regularly serviced so that vehicular emissions remain within relevant air quality guidelines and standards.

A dust management plan would be developed by the nominated construction contractor and included with the construction environmental management plan for the project.

### 11.3.2 Operation

Air quality modelling conducted as part of this assessment has indicated that emissions from the proposed gas turbine facility would comply with the air quality goals described in Table 11.2 under all operating scenarios.

The model predictions have been derived based on preliminary information obtained for a typical gas turbine facility of similar characteristics to the one proposed. To confirm that the proposed gas turbine facility complies with the relevant air quality criteria, a review of the stack emission data and modelled predictions would be undertaken during the detailed design phase, where actual plant specifications and characteristics are known.

During commissioning, stack monitoring would be conducted to verify the stack parameter and emission estimates that were used to produce the modelled predictions and assessment of potential impacts. The following stack parameters would be monitored during the commissioning phase during start-up/normal operation under natural gas/distillate firing modes:

- **Stack parameters:** stack height (as built), stack velocity (at tip), volumetric flowrate and exit temperature
- **Stack emissions:** Concentrations and mass emission rates for NO<sub>x</sub> (including NO, NO<sub>2</sub>), volatile organic compounds, SO<sub>x</sub>, and particulate matter (including PM<sub>10</sub>)

It is proposed that each of the four exhaust stacks would be fitted with in-stack monitoring equipment linked to the continuous emissions monitoring system that would form part of the automated process control system for the gas turbine facility. The monitoring system would be designed to meet the regulatory requirements stipulated in the Environment Protection Licence that would be issued by the Department of Environment and Conservation to regulate the operation of the gas turbine facility, once in full operation.

It is also proposed that the ambient air quality data currently being used by Delta Electricity to monitor ground level concentrations at the sensitive receptors nearest to the coal-fired power stations would be used to set baseline ambient air levels for NO<sub>x</sub>, SO<sub>x</sub> and PM<sub>10</sub>. The ambient air monitoring program at the two existing monitoring sites, namely Lake Munmorah and Wyee, would be used to monitor and detect potential

increases above established baseline levels at these locations that may be attributed to the operation of the gas turbine facility.

Based on the modelled predictions and the results of the impact assessment, the inclusion of additional ambient monitoring sites is not considered necessary. However, if adverse monitoring trends are noted during the operation of the gas turbine facility, Delta Electricity would consider adding ambient monitoring sites to determine and monitor the cause of the adverse trend so that appropriate mitigation measure can be developed and implemented.

The procedures that would be used to monitor and maintain the performance of the gas turbine facility to ensure it performs in accordance with the emission limits prescribed by the Environment Protection Licence for the facility would be incorporated into the operational environment management plan for the gas turbine facility.

## **11.4 Summary of Impacts**

### **11.4.1 Construction**

Potential impacts during construction relate to generation of dust from excavation works and emissions from construction plant. These impacts are minor and of short duration, and would be addressed through mitigation measures listed in Section 11.3.1 and implemented through the construction environmental management plan.

### **11.4.2 Operation**

#### ***Local airshed***

An assessment of the potential air quality impacts of the proposed gas turbine facility on the local airshed was undertaken using the CALPUFF computer-based dispersion model under a range of operating scenarios and meteorological conditions. The modelled results indicate that the proposed gas turbine facility would have a minor effect on the existing ambient air quality levels and would readily comply with the relevant air quality goals set by the Department of Environment and Conservation. A range of mitigation measures have been proposed in Section 11.3.2 to ensure the modelled predictions and conclusions of this assessment remain valid during the commissioning and operational phases of the project.

#### ***Regional airshed***

The impact of the proposed gas turbine facility on photochemical smog levels in the Sydney basin and surrounding areas has been investigated using the prognostic meteorological and chemical transport model TAPM-CTM. Four case-assessment days of moderate-high ozone levels were selected for modelling. These days had previously been identified as days on which emissions from power stations to the north of Sydney were transported to the Sydney basin.

The assessment concluded that emissions from the proposed gas turbine facility would result in no exceedances of air quality goals and standards for NO<sub>2</sub> and O<sub>3</sub> and no

adverse effects on concentrations of nitrogen dioxide and ozone in the Sydney basin region.

### ***Greenhouse gas emissions***

Although the proposal would be a net generator of greenhouse gas emissions, the proposed gas turbine facility would emit greenhouse gases at an average rate of 0.58 tCO<sub>2-e</sub> per megawatt hour, which is significantly lower than the NSW pool coefficient set for 2005 (0.913 tCO<sub>2-e</sub> per megawatt hour) and 2006 (0.928 tCO<sub>2-e</sub> per megawatt hour), and the greenhouse intensity factor for the National Electricity Market, which averages just above 1 tCO<sub>2-e</sub> per megawatt hour (NEMMCO 2005).

The proposal has the potential to have a positive impact, although limited due to low capacity factor, on the NSW pool coefficient. This is considered to have important State-wide significance, as it would help to reduce greenhouse gas emissions per unit of output in NSW and achieve the ultimate goal of 7.27 tCO<sub>2-e</sub> per capita by the year 2012 set by the NSW Greenhouse Gas Benchmarks Scheme.



LANDSCAPE AND VISUAL

12

## **12. Landscape and visual**

### **12.1 Existing environment**

Munmorah Power Station is a dominant element in the surrounding visual environment. It can be seen from most locations around Lake Munmorah (Budgewoi, Toukley, Lake Munmorah), the Pacific Highway (near Doyalson) to the east. The two existing 150-metre boiler stacks are visible from as far away as Belmont to the north, The Entrance to the south and the Watagans to the west.

Munmorah Power Station is located within the generally flat coastal plain that extends from the western side of Lake Munmorah, on which it sits, east towards the Pacific Ocean. West of Lake Munmorah, the topography rises slightly until reaching the foothills of the Watagans.

The area surrounding Munmorah Power Station is characterised by large areas of bushland and wetlands interspersed with small lakeside settlements and edged by the lakeside fringe. Lake Munmorah is the most dominant natural feature of the area which is recognised as a tourist destination owing to its natural beauty, coastal location and recreational opportunities that the lake offers. The general area surrounding Munmorah Power Station could be described as having a moderate scenic quality.

Munmorah Power Station consists of a number of large boiler buildings centrally located within the property (up to 60 metres high) and two stacks approximately 150 metres high protruding above. Surrounding this central area is an electricity switchyard, a number of car parks, water treatment and/or storage ponds, coal stock pile and a mixture of smaller buildings and supporting infrastructure.

There are two collieries on the site: the Munmorah Colliery close to the west of the power station (currently being decommissioned) and Endeavour Colliery to the south-east (decommissioned). There are several above ground pipelines that traverse the site and a number of electricity transmission lines with large transmission towers leading from the power station. There are substantial cleared, grassed areas immediately around the main power station, with limited vegetation close to the main power station buildings.

The power station and collieries are set within a substantial bushland buffer that physically separates the surrounding land uses (see Figure 4.1). Land uses outside this buffer include residential areas to the south-west and to the south-east (Charmhaven, Lakehaven, Budgewoi), Lake Munmorah to the east; and rural-residential and residential areas to the north. Delta Electricity also owns a large bushland site adjoining the ash dam across the Pacific Highway to the north-west.

### **12.2 Potential impacts**

The proposed gas turbine facility would be located within the grounds of Munmorah Power Station at a site formerly used for work sheds and currently used for equipment

storage. It would have a footprint of approximately 120 by 260 metres, and be approximately 20 metres high (excluding the 35 m exhaust stacks). Other components of the proposal include a seven kilometre underground gas pipeline extending from the gas turbine facility to the Sydney-Newcastle gas pipeline. The pipeline would be laid along the southern edge of an existing electricity transmission easement. The proposal also includes the construction of an inlet facility comprising a brick building of approximately 20 metres by 20 metres, within a perimeter fence containing a total area of approximately 50 metres by 50 metres, which would be located adjacent to the F3 Freeway at Bushells Ridge.

The two most important aspects to consider when assessing the visual impact of the proposal are:

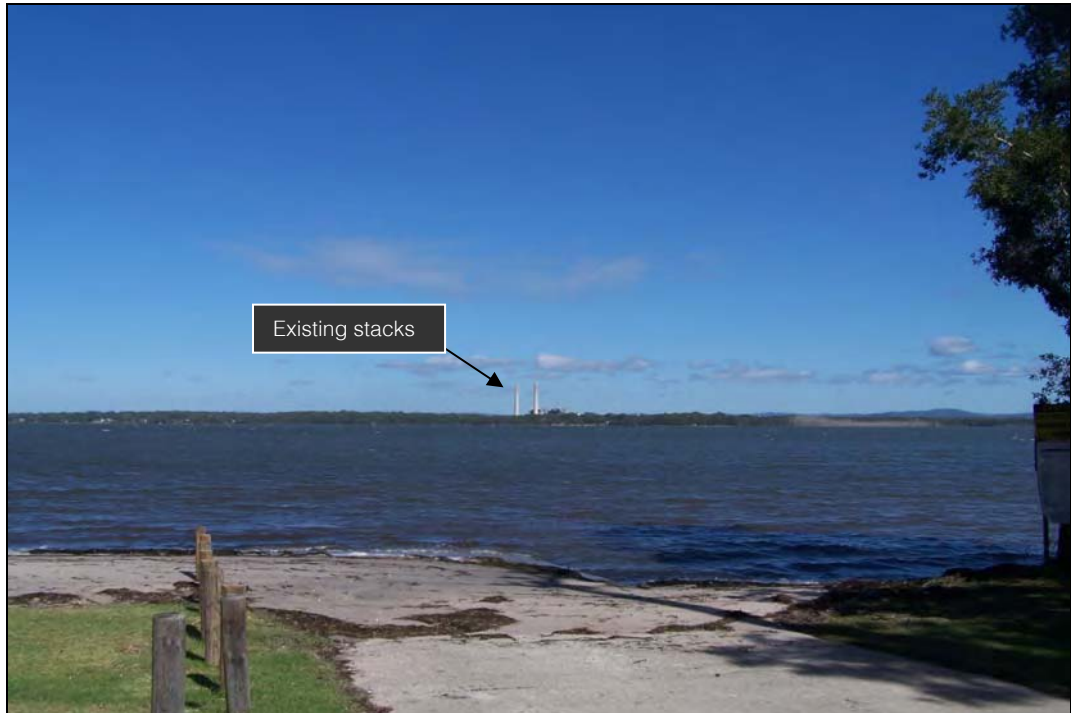
- how close and sensitive to change viewers are (particularly permanent viewers) to the proposal
- in what context the viewers are likely to view the proposal (considering impacts to scenic quality and landscape character).

Impacts in terms of viewer distance are normally divided into foreground views (less than 1 kilometre), mid-distance views (1-5 kilometres) and distance views (over 5 kilometres). Although foreground views are usually of most concern, there are no permanent foreground viewers within one kilometre of the proposed gas turbine facility.

There is a park within the existing power station site to the east of the entrance off Scenic Drive which is open to the public. The bushland surrounding this reserve means that it would be unlikely that users of this park would be able to see the 35 metre stacks from the gas turbine facility.

Views of the stacks about one kilometre away may be possible from a small number of residences at Doyalson. There may also be transient foreground views of the gas turbine facility approximately one kilometre away for travellers on the Pacific Highway near Doyalson and from Scenic Drive near the main entry to Munmorah Power Station. Views from the general area of Doyalson are likely to be intermittent due to intervening vegetation and buildings, and the comparatively lower elevation of the site. From these vantage points, some sections of the gas turbine facility may be seen behind or beside the existing power station buildings and stacks. However, for these viewers, the visual change and potential for impact would be low due to the limited opportunity for direct views and the large separation distance.

There are a large number of permanent residents within the mid-distance, 1-5 kilometres zone. These include parts of the residential areas of Lake Munmorah (2.5-3 kilometres), Budgewoi (three kilometres), Charmhaven/Lakehaven (3.5-4 kilometres) and Toukley (4.5-5 kilometres). It appears that the greatest visual change would be a number of permanent residents situated on elevated and/or waterfront land at Lake Munmorah to the north-east of the facility. Views would also be possible from several waterfront public reserves at this location. Refer to Photograph 12.1 for a typical view of Munmorah Power Station from the Lake Munmorah residential area.



**Photograph 12.1: View of existing stacks from Lake Munmorah residential area (approximately 3km away)**

As seen in Photograph 12.1, Munmorah Power Station currently dominates views of the western side of Lake Munmorah from this vantage point. The two boiler stacks and upper portions of the boiler building can be seen behind existing vegetation. The addition of an additional four 35 metre stacks associated with the proposed gas turbine facility is unlikely to increase the overall visual aspect of the power station from this view point, as these stacks would be difficult to distinguish above the existing vegetation from this vantage point.

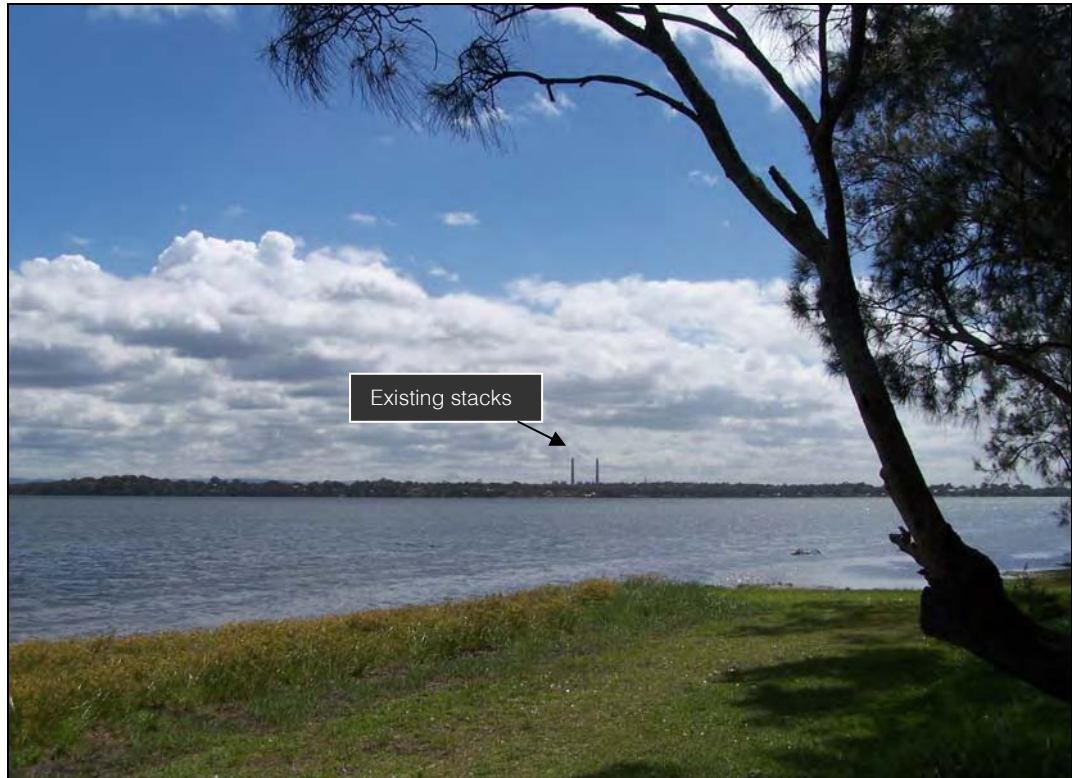
From all other viewpoints within the 1-5km range, Munmorah Power Station is currently seen against, and within, other urban development (see Photographs 12.2 and 12.3). This semi-urban context means that the addition of four exhaust stacks to these views would not be considered a significant visual change when compared to existing conditions.

Waterway users on Lake Munmorah would not be able to view the proposed exhaust stacks from any closer than 2 kilometres. The transient nature of these viewers, and the extensive nature of the lake system available for waterway users means that the potential visual impact of the proposal to lake users would be low.

Distance views of the existing boiler stacks are currently possible from a distance of 20 kilometres. The existing boiler stacks can be seen from Belmont in the north to The Entrance in the south. They can also be seen from the surrounding Watagan ranges in the west and possibly beyond. However, the impact of any changes to views beyond 5 kilometres would be considered insignificant due to the extent of view separation and the relatively low height of the proposed exhaust stacks.



**Photograph 12.2: Typical view from eastern side of Budgewoi (approximately 3 km away)**



**Photograph 12.3: Typical view from eastern side of Toukley (approximately 5 km away)**

The proposed gas pipeline would be buried underground and located within an existing electricity transmission easement requiring minimal vegetation disturbance. It is therefore assumed that the gas pipeline would cause negligible visual impact on the nearest sensitive receptors.

The proposed inlet facility would be located near the F3 Freeway at Bushells Ridge. There may be some vegetation clearance required, however, this would be minimised as far as possible through the site selection and design process. The final location would be determined in consultation with the landowner and may potentially be visible from the F3 Freeway and a small number of nearby residences. The scale and nature of the proposed building structure is unlikely to impose a significant visual impact on the nearest sensitive receptors.

### **12.3 Mitigation**

The assessment of potential visual impacts described in the previous section concluded that the proposal is unlikely to have an adverse effect on the amenity or quality of the current visual environment. Hence, no specific mitigation measures have been proposed for this proposal, as the management measures currently being implemented by Delta Electricity to maintain the vegetated buffer zone surrounding the main power station infrastructure would ensure the proposed gas turbine facility is visually shielded from most visual receptors.

### **12.4 Summary of impacts**

The proposed 35 meter height of the exhaust stacks associated with the gas turbine facility would be significantly less than the existing boiler building (60 metres) and boiler stacks (150 metres). The addition of these stacks is unlikely to increase the overall visual aspect of the power station from all view points, as these stacks would be difficult to distinguish above the existing vegetation. While the proposed gas turbine facility and associated exhaust stacks may be intermittently visible at distances greater than 20 kilometres, the proposal is unlikely to have a significant impact on the visual landscape of the area.

HERITAGE

13

# 13. Heritage

## 13.1 Existing environment

This section describes the Aboriginal archaeological context of the assessment area as well as information obtained from a recent field survey undertaken within the assessment area that was used to assess the potential impacts associated with the construction and operation of the proposal.

The information contained in this section has been summarised from *Technical Paper 2 – Aboriginal Archaeological Assessment and Statement of Heritage Impact: Proposed Gas Turbine Facility at Munmorah Power Station*.

### 13.1.1 Aboriginal archaeological context

Although there is quite a long history of archaeological investigations in the Central Coast region, much of this research has been somewhat limited, with areas selected on the basis of development and/or site-specific requirements.

Past studies have generally been based on coastal areas, with little work carried out to the west of the Tuggerah lakes system. As a result, there is not enough information available to develop a regional model of Aboriginal adaptation and population movements. However, results of previous work indicate that all of the available environments (rocky shore, estuarine, beach and swamp) were exploited by Aboriginal populations. Known sites in the assessment area include open camp sites, axe grinding grooves, middens, scarred/modified trees, shelters with art deposits, burials and quarries.

A search of the Aboriginal Heritage Information Management System (AHIMS) database identified ten reports associated with the assessment area, only five of which were available for review from the Department of Environment and Conservation. A further four reports were deemed closely related to the wider district surrounding the assessment area. To obtain an overview of the archaeological resource in Wyong Shire and surrounds the following reports were reviewed as part of the assessment:

- *An Aboriginal Devil Rock* (Walton 1932)
- *Predilection and Prediction: a assessment of Aboriginal sites in the Gosford – Wyong region* (Vinnicombe 1980)
- *Aboriginal Fishing Stations on the Newcastle Coastline, New South Wales* (Dyall 1980)
- *Revised Report on Aboriginal Relics at Proposed site for power station at Chittaway Point, NSW* (Dyall 1980)



- *A Preliminary Assessment of Aboriginal Relics on Power Station Site at Olney* (Dyall 1981)
- *Archaeological Survey along Hue Hue Road, Wyong, NSW* (Dallas 1986)
- *Analysis of an Australian Aboriginal Skeleton from Wamberal Beach, Central Coast of NSW* (Donlon 1990)
- *Holocene Shell Middens of the Central Coast of New South Wales, An investigation of the management problems concerning coastal shell middens* (Bonhomme 1994)
- *Test Excavations at The Hole, Mannering Bay, Lake Macquarie, NSW* (Officer, Navin & Saunders 1996).

Refer to Chapter 4 of Technical Paper 2 for a concise summary on the content of each of the above reports and how they relate to the assessment area.

### **13.1.2 Aboriginal sites recorded in the Wyong area**

A search of the Department of the Environment and Conservation's AHIMS database indicated that within a 29 kilometre by 15 kilometre radius of the assessment area, 72 Aboriginal sites had been identified and registered by September 2005 (see Table 4.1 of Technical Paper 2).

It should be noted that the absence or paucity of records on the AHIMS database does not necessarily mean that Aboriginal sites or site types are not present within a given area. The AHIMS database only contains formally recorded sites. Large areas of NSW have not been the subject of systematic survey or recording of Aboriginal history. These areas may contain sites and places which are not currently listed on the AHIMS database.

### **13.1.3 Legislative framework**

Aboriginal and historic cultural heritage in Australia is protected and managed under a variety of legislation. The following section provides a brief summary of relevant Commonwealth and NSW Acts and an assessment of how these Acts apply to the assessment area. Refer to Chapter 2 of Technical Paper 2 for a detailed discussion on the application of these Acts on the assessment area.

#### ***Commonwealth legislation***

A summary of the relevant Commonwealth legislation and how it applies to the assessment area is provided in Table 13.1.

**Table 13.1 Summary of Commonwealth legislation applicable to proposal**

<b>Legislation and responsible authority</b>	<b>Application to assessment area</b>
<i>Environment Protection and Biodiversity Conservation Act 1999</i> Department of Environment and Heritage	No items within the assessment area are listed on the Register of the National Estate, the National Heritage List or the Commonwealth Heritage List.
<i>Environment and Heritage Legislation Amendment Act (No 1) 2003</i> Department of Environment and Heritage	As above
<i>Australian Heritage Council Act 2003</i> Department of Environment and Heritage	As above
<i>Australian Heritage Council (Consequential and Transitional Provisions) Act 2003</i> Department of Environment and Heritage	As above

### **NSW legislation**

A summary of the relevant NSW legislation and how it applies to the assessment area is provided in Table 13.2.

**Table 13.2 Summary of NSW legislation applicable to proposal**

<b>Legislation and responsible authority</b>	<b>Application to assessment area</b>
<i>National Parks and Wildlife Act 1974</i> Department of Environment and Conservation	There are 72 Aboriginal objects and places registered with the NSW Department of Environment and Conservation within a 29 kilometre by 15 kilometre radius of the assessment area.  Seven fall within the assessment area and five are in close proximity to the proposed pipeline route.
<i>NSW Heritage Act 1977 (amended 1999)</i> NSW Heritage Council	There are no heritage items within the assessment area that are listed in the NSW State Heritage Register
<i>Environmental Planning and Assessment Act 1979</i> Department of Planning Wyangong Council	There are no items within the assessment area that are listed on the Schedule of Heritage Items contained in the Wyong Local Environment Plan (1991)
<i>Sydney Regional Environmental Plan No. 8 – Central Coast Plateau Areas (SREP 8)</i> Department of Planning	SREP 9 does not identify any items of cultural heritage significance that are contained within the curtilage of the assessment area

#### **13.1.4 Aboriginal stakeholder consultation**

Aboriginal stakeholder consultation for the proposal was undertaken in accordance with Department of Environment and Conservation's *National Parks and Wildlife Act 1974: Part 6 Approvals Interim Community Consultation Requirements for Applicants* (DEC 2005).

The assessment area falls within the boundaries of the Darkinjung Local Aboriginal Land Council (DLALC).

A search lodged with the National Native Title Tribunal on the 5th August 2005 and conducted the same day indicated that there were no Native Title claims within Wyong Shire.

Advertisements seeking Aboriginal stakeholder participation in the project were placed in the following newspapers:

- Central Coast Express Advocate on Wednesday 17 August 2005
- Central Coast Sun Weekly on Thursday 18 August 2005

This advertisement is included in Appendix 2 of Technical Paper 2.

DLALC were the only respondents to the advertisement. No other Aboriginal stakeholders came forward in response to the advertisements. DLALC were provided with details of the project and participated in the field inspections of the assessment area. A copy of the draft report was forwarded to DLALC for review. All comments received by DLALC were considered and incorporated into the final report.

#### **13.1.5 Field inspections**

An archaeological site inspection of the proposed gas turbine facility site and pipeline route was conducted by representatives of Heritage Concepts and the DLALC on the 13 and 14 September 2005. For ease of reference and subsequent discussion, the survey area was divided into the following sections:

- Area A - Munmorah Power Station and delivery facility
- Area B - Munmorah Power Station to Scenic Drive (eastern section of pipeline route)
- Area C - Scenic Drive to the Link Road
- Area D - The Link Road to Thompson Vale Road
- Area E - Thompson Vale Road to the Main Northern Railway Line
- Area F - Main Northern Railway Line to Tooheys Road

All of the assessment area was surveyed except for two areas of swamp in Areas B and D, which were impenetrable both on foot and by vehicle and one area adjacent to the

swamp in Area D, which was not accessible at the time of the inspection. Refer to Figure 13.1 for details.

### 13.1.6 Artefacts catalogue

A list of the artefacts identified during the survey is provided in Table 13.3. In total, three isolated artefacts (one fragment and two flakes) and two artefact scatters were recorded.

**Table 13.3 Location of artefacts located during the survey**

Site	Artefact type	Raw material	Maximum dimension (millimetres)
IA1	Fragment	Silcrete	21.2
IA2	Flake	Mudstone	40.0
IA3	Flake	Porc	15.2
AS1	Proximal flake	All mudstone / tuff	27.4
	Fragment		27.7
	Flake		34.0
	Scraper (appears to be retouched on distal end, but obscured)		31.4
	Flake (snapped into two halves)		44.9
	Proximal flake		16.7
	Flake		33.1
	Proximal flake		11.3
	Split flake		15.2
AS2	Distal flake	All mudstone/tuff	11.9
	Split flake		9.0
	Fragment		11.4
	Fragment		25.1
	Proximal flake		13.1
	Flake		46.8
	Proximal flake		
	Flake		38.9
	Distal flake		9.9
	Proximal flake		18.0
	Fragment		14.7
	Proximal flake		20.0
	Split flake		41.5
	Fragment		15.1
	Fragment		10.3
	Flake		28.2

Refer to Section 5.3 of Technical Paper 2 for further details



Figure 13.1 Location of study area boundaries, previously recorded heritage sites and artefacts identified during field inspections

0 2,500  
metres

- Proposed pipeline route
- Sydney to Newcastle gas pipeline
- Rail line

- Land owned by Delta Electricity
- Swamp
- SEPP14 - Wetland Area

- Proposed delivery facility
- Proposed inlet facility
- Proposed gas turbine facility

- Study area boundary
- Previously recorded heritage sites
- Heritage sites recorded during field inspection



### 13.1.7 Assessment of the archaeological resource

#### ***Known archaeological sites and potential archaeological deposits***

Three isolated artefacts and two artefact scatters were found during field inspections. Both of the artefact scatters have previously been recorded by others. A list of the artefacts that were located during field inspections is provided in Table 13.4

**Table 13.4 Location of artefacts located during field inspections**

Site	Survey area	Site type	Location	AHIMS no.
IA1	Area C	Isolated find	362587 6324784 (GDA '94)	
IA2	Area F	Isolated find	359091 6325303 (GDA '94)	
IA3	Area F	Isolated find	357842 6325014 (GDA '94)	
AS1	Area E	Artefact Scatter	359520 6325244 to 359484 6325246 (GDA '94)	45-5-3187
AS2	Area E	Artefact Scatter	359294 6325268 to 359289 6325284 (GDA '94)	45-3-3180

Refer to Chapter 6 of Technical Paper 2 for further details

Owing to the generally poor ground surface visibility surrounding sites IA3, AS1 and AS2, it was not possible to determine whether artefacts associated with the findings exist in adjacent grassed or vegetated areas. As a precautionary management measure, Potential Archaeological Deposits (PADs) have therefore been identified for each of these areas.

#### ***Other areas of potential archaeological deposits identified during field inspections***

The environment within the proposed pipeline route has been modified and although not landscaped, it is unlikely that any of it is undisturbed. In certain locations, recreational use of the easement has caused considerable intrusion to the surface. In these areas, it is unlikely that surface Aboriginal archaeological deposits are intact. However, with the exception of the Munmorah Power Station site (Area A) and the locations of the transmission towers along the electricity transmission easement, there would appear to be little sub-surface impact to the assessment area. The sub-surface integrity of the assessment area is therefore likely to be good.

Wetlands and swamps and their marginal areas are generally considered to have high a potential to retain and preserve archaeological deposits. Traditionally, wetlands were important areas for hunting and gathering foodstuffs and were likely to be frequented by local groups and as such, it is possible that any occupational debris would be preserved within them. Although no archaeological deposits were identified in the swamp areas located in Area E during the field inspections, owing to poor ground surface visibility, it is probable that these areas may contain archaeological deposits based on the recorded scatters and confirmed findings observed in the vicinity of these

areas during the recent field inspections. These areas have therefore been identified as potential archaeological deposits.

### ***Summary of potential archaeological deposit sites in the assessment area***

A list of the areas where potential archaeological deposits have been identified in the assessment area is provided in Table 13.5. Refer to Figure 13.1 for details.

**Table 13.5 Areas of potential archaeological deposits in the assessment area**

<b>PAD site identification</b>	<b>Survey area</b>	<b>Reason</b>
IA1	Area C	Isolated find
IA2	Area F	Isolated find
IA3	Area F	Isolated find
AS1	Area E	Artefact Scatter
AS2	Area E	Artefact Scatter
Colongra Wetland	Area B	Wetland
Swamp	Area D	Wetland

Refer to Chapter 6 of Technical Paper 2 for further details

### ***Aboriginal archaeological potential and sensitivity of the assessment area***

The Aboriginal archaeological potential and sensitivity of the assessment area is outlined Table 13.6.

**Table 13.6 Archaeological potential and sensitivity of the assessment area**

<b>Survey area</b>	<b>Description</b>	<b>Archaeological potential and sensitivity</b>
Area A	Munmorah Power Station and delivery facility	Nil to low
Area B	Munmorah Power Station to Scenic Drive (eastern section of pipeline route)	Low to moderate
Area C	Scenic Drive to the Link Road	Low to moderate
Area D	The Link Road to Thompson Vale Road	Moderate to high
Area E	Thompson Vale Road to the Main Northern Railway Line	High
Area F	Main Northern Railway Line to Tooheys Road	Low to moderate

Refer to Chapter 6 of Technical Paper 2 for further details

### **13.1.8 Assessment of cultural significance of assessment area**

An assessment of significance seeks to understand and establish the importance or value that a place, site, or item may have to the community at large. The concept of

cultural significance is intrinsically connected to the physical fabric of the item or place, its location, setting and relationship with other items in its surrounds. The assessment of cultural significance is ideally a holistic approach that draws upon the response these factors evoke from the community.

### ***Assessment criteria***

The criteria of evaluating cultural heritage value are generally applied to sites, places or items that have tangible historic structures or relics visible at the site, or where there is general understanding of the extent of the historic resources.

The criteria that were used to assess the cultural significance of the findings identified within the assessment area are based on the Australia ICOMOS Charter for the conservation of places of cultural significance (the Burra Charter). These criteria have been adopted by the Department of Environment and Conservation to address Aboriginal archaeological and cultural heritage values. It is important to note, however, that the determination of Aboriginal cultural heritage values can not adequately be conducted without the input of the relevant Aboriginal community groups.

The criteria are based on assessing, in a qualitative manner, the following cultural elements:

- Social or Aboriginal value
- Historic value
- Scientific value
- Aesthetic value.

Refer to Chapter 7 of Technical Paper 2 for a detailed discussion on what each of the above elements refers to and how they were applied to this proposal.

### ***Cultural heritage values of the assessment area***

#### **Scientific values**

The identified Aboriginal cultural heritage items identified within the assessment area possess scientific value through their ability to provide information about lithic technologies and raw material sources. The location of the sites will also add to the growing knowledge of land use and occupation strategies in the Wyong area.

#### **Aboriginal/social/historic and aesthetic values**

It is not the place of the consultant to provide information regarding the social, historic or aesthetic value of the Aboriginal cultural objects and places within the assessment area. Such information can only be provided by the local Aboriginal community.

The following information has been provided by Darkinjung Local Aboriginal Land Council (DLALC) regarding the likely use and role of the area in the past:



*The assessment area was an area used by traditional Aboriginal people for living and hunting in. There have been some archaeological studies done in the area that support this fact. It is known among the present local Aboriginal community of sites that are situated around the area.*

*The area previous to white settlement would have been rich in food sources and equipment and tool making materials.*

Refer to Appendix A of Technical Paper 2 for full details on the comments received from the DLALC regarding this matter.

## **13.2 Potential impacts**

### **13.2.1 Construction**

As discussed in Section 13.1.7 and listed in Table 13.4, two previously identified cultural heritage places (AS1, AS2) and three isolated artefacts (IA1, IA2, IA3) were located within the assessment area during recent field investigations.

It is noted that the assessment area has been subjected to disturbance in the form of land clearing and the erection of transmission towers along the electricity transmission easement and the construction of the existing Munmorah Power Station.

The construction and subsequent modifications to the existing Munmorah Power Station are likely to have removed or destroyed any Aboriginal archaeological deposits that may have been located in this area. Therefore, it is unlikely that works associated with the construction of the proposed gas turbine facility and delivery facility would have an impact on Aboriginal archaeological deposits.

The erection of transmission towers may have disturbed and had some impact on Aboriginal archaeological deposits, but may not have removed or destroyed these deposits. The construction of the pipeline along the electricity transmission easement would involve both tunnelling and open excavation. The areas of open excavation are likely to have an extensive impact on both known and potential archaeological deposits, where they are located directly in line with the proposed gas pipeline easement.

Construction traffic may also impact on the integrity of surface scatters along the route of the proposed pipeline. Ground surface disturbance works in the swamps and swamp marginal areas have a high potential to uncover sub-surface Aboriginal archaeological deposits.

### **13.2.2 Operation**

Once constructed, the operation of the proposed gas turbine facility and pipeline is unlikely to affect any listed or undiscovered items of cultural heritage value.

## **13.3 Mitigation**

### **13.3.1 Construction**

The construction of the proposed pipeline along the existing electricity transmission easement has the potential to impact a number of known or recently identified archaeological deposits. Consequently, a number of mitigation measures have been proposed to avoid or minimise impacts on the potential Aboriginal and scientific values of these archaeological deposits. The mitigation measures are summarised in Table 13.6.

**Table 13.6 Summary of proposed mitigation measures**

<b>Survey area</b>	<b>Description</b>	<b>Archaeological potential and sensitivity</b>	<b>Proposed mitigation measures</b>
Area E	Thompson Vale Road to the Main Northern Railway Line	High	<ul style="list-style-type: none"> <li>▪ Site cards for sites IA1, IA2 and IA3 would be submitted to the Department of Environment and Conservation for registration under the Aboriginal Heritage Information Management System (AHIMS) database.</li> <li>▪ Potential impacts on the identified Aboriginal stone artefact scatter sites (AS1 and AS2) would be managed through a program of Aboriginal archaeological testing by a qualified archaeologist, in partnership with representatives from the Darkinjung Local Aboriginal Land Council. The preliminary archaeological test excavations testing would be undertaken in the locality of the scatters during the detailed design phase of the project.</li> <li>▪ The preliminary archaeological test excavations would be carried out under the provisions of a Preliminary Research Permit to be issued by the Department of Environment and Conservation in accordance with Section 87 of the National Parks and Wildlife Act 1974. No ground disturbance at sites AS1 and AS2 would occur until consent is granted from the Department of Environment and Conservation</li> <li>▪ The use of 'avoid by design' principles would be exercised during the detailed design phase of the project, where possible, to avoid or minimise impacts during the construction of the proposed pipeline.</li> <li>▪ Based on the results of the preliminary archaeological test excavation, a request for a Section 90 Consent permit would be lodged with the Department of Environment and Conservation. A Section 90 Consent permit is a multi-faceted permit which allows the applicant to seek approval to destroy / disturb a site. The level of disturbance and the type of Section 90 permit required would depend on the findings of the preliminary surveys and may include <ul style="list-style-type: none"> <li>○ Consent to destroy</li> <li>○ Consent to destroy with salvage</li> <li>○ Consent to destroy with surface collection</li> <li>○ Care and Control permit for any artefact remains collected as part of Section 87 activities</li> </ul> </li> </ul>

Survey area	Description	Archaeological potential and sensitivity	Proposed mitigation measures
Area D	The Link Road to Thompson Vale Road	Moderate to high	<ul style="list-style-type: none"> <li>a program of Aboriginal archaeological monitoring and testing by a qualified archaeologist, in partnership with representatives from the Darkinjung Local Aboriginal Land Council would be undertaken prior to the commencement of earthworks in this area</li> <li>the applied method of archaeological investigation would depend on the final construction methods (either boring or open trench excavation), and the level of disturbance (such as size and depth of pipeline installation required), which would be determined during the detailed design phase.</li> <li>during the archaeological program, the archaeologist on site would have the authority to halt works as required, in order to undertake further investigation or detailed recording of any Aboriginal archaeological remains exposed during the monitoring process.</li> <li>depending on the findings of the archaeological program, an application to the Department of Environment and Conservation for a Section 90 Consent permit may be required would be submitted and approved prior to the re-commencement of any works in the areas</li> </ul>
Area A	Munmorah Power Station and delivery facility	Nil to low	<ul style="list-style-type: none"> <li>Although these sections of the assessment area have been assessed to be of nil to moderate Aboriginal archaeological potential and sensitivity, this determination does not necessarily preclude the existence of unknown Aboriginal cultural heritage relics or deposits.</li> <li>As required by the National Parks and Wildlife Act 1974, in the event that Aboriginal cultural fabric or deposits are encountered, works in the immediate area would cease immediately to allow an archaeologist to make an assessment of the find. The archaeologist would need to consult with the Department of Environment and Conservation and the relevant Aboriginal stakeholder groups, including the Darkinjung Local Aboriginal Land Council regarding any Aboriginal cultural material identified.</li> </ul>
Area B	Munmorah Power Station to Scenic Drive (eastern section of pipeline route)	Low to moderate	
Area F	Main Northern Railway Line to Tooheys Road	Low to moderate	
Area C	Scenic Drive to the Link Road	Low to moderate	

### **13.3.2 Operation**

No specific mitigation measures have been proposed for the operation of the gas turbine facility and pipeline.

## **13.4 Summary of impacts**

A detailed heritage assessment of the proposal identified that the assessment area contains items of Aboriginal cultural heritage. The proposal involves numerous excavations and earthworks and has the potential to interact with both listed and previously undiscovered items of Aboriginal and non-Aboriginal heritage value. It is possible that a number of permits may be required prior to the commencement of these types of work.

It is concluded that the proposed implementation of a sub-surface testing/monitoring program for areas of suspected high Aboriginal archaeological potential and sensitivity, together with ongoing monitoring of all excavations, would prevent, avoid, and/or minimise the extent and severity of any potential impacts on the cultural heritage values of the Wyong area.

**TRAFFIC AND TRANSPORT**

**14**

## **14. Traffic and transport**

### **14.1 Existing environment**

#### **14.1.1 Site location and access**

The proposed gas turbine facility would be located within the grounds of the existing Munmorah Power Station, which is currently accessible from Scenic Drive, a designated road which links The Entrance with the Pacific Highway and the F3 Freeway via Mandalong Road at the Morisset Interchange (if southbound) or the Link Road (if northbound).

#### **14.1.2 Regional road network**

The turbine equipment associated with the proposed gas turbine facility would likely be transported from the Port of Newcastle to Munmorah Power Station by specially adapted vehicle using the regional road network. There are two possible routes that connect the Port of Newcastle to Munmorah Power Station: the F3 Sydney-Newcastle Freeway to the west; and the Pacific Highway to the east. Of the two routes, the Pacific Highway passes through a number of built up areas and is considered less favourable for the transport of this type of equipment.

The two routes are linked to the Port of Newcastle by designated roads. To the north the link is the New England Highway, while to the south the link is the Scenic Drive.

The NSW Roads and Traffic Authority have identified certain designated roads as high vehicle routes which can be used by over height vehicles (up to 4.6 metres from a normal maximum of 4.3 metres). The designated high vehicle routes are the New England Highway, F3 Freeway, Pacific Highway and the Link Road between the F3 Freeway and Scenic Drive. The Scenic Drive is not an identified high vehicle route.

#### **14.1.3 Existing traffic flows**

The F3 Freeway is heavily used by freight transport. Traffic volumes vary with time of day and week, and heavy vehicles form a significant proportion of the total traffic flow. Based on data provided by the NSW Roads and Traffic Authority, the Sydney-Newcastle Freeway carries about 33,000 vehicles per day on weekdays and 26,500 vehicles per day on weekends. Southbound traffic volumes averaged 16,600 vehicles per day on weekdays and 13,100 vehicles per day on weekends.

Weekday traffic volumes varied by hour of day with 91 per cent of traffic using the road between 6am and 10pm. Between midnight and 5am hourly traffic flows were always less than one per cent of the daily traffic flow.

The Pacific Highway at Swansea carried over 15,000 vehicles per day on weekdays in 2004 and a similar volume at weekends, with 93 per cent of the daily traffic observed between 6am and 10pm.

The New England Highway at Hexham carried about 25,500 vehicles per day with 27,000 vehicles per day recorded westbound. Hourly traffic flows were observed to fall below 1 per cent of daily flows between midnight and 5am.

Overall hourly traffic flows are only light (less than one per cent of daily flows) between midnight and 5am-6am. The movement of very large loads in this period is likely to have the least impact on other road users.

## 14.2 Potential impacts

### 14.2.1 Equipment transport

The major plant items that comprise the proposed gas turbine facility would need to be hauled to the proposed site using special haulage vehicles known as Class 1 Restricted Access Vehicles. These plant components would be larger than the normal maximum haulage size and/or mass allowed on NSW roads, and as such, would require special permits and escorts.

The main components of the gas turbine facility that are likely to require these types of vehicles are described in Table 14.1.

**Table 14.1 Gas turbine component specifications**

<b>Plant item</b>	<b>Number of items</b>	<b>Approximate weight (tonnes)</b>	<b>Maximum width (metres)</b>	<b>Maximum length (metres)</b>	<b>Maximum height (metres)</b>
Turbine	4	343	5.4	11.2	5.2
Generator	4	230	3.8	10.7	4.2
Transformer	4	127	3.4	7.7	4.2

As shown in Table 14.1, the largest of the plant items to be transported is the gas turbine, which would need to be transported using a trailer that is approximately 33 metres long with a 343 tonne payload spread over 18 axles. The other plant items would require slightly smaller trailer sizes.

In addition to the gas turbine components, a number of large cranes and earth moving equipment would be transported to the site during the construction phase.

When selecting and assessing the route that would be used to transport large plant items such as those described in Table 14.1 in particular, the following issues must be considered:

- minimum curve radii
- vertical and horizontal clearances



- changes in grade
- road alignment on approach to bridges and rail crossings
- roadside furniture, such as overhead cables, that may need to be removed temporarily
- temporary stopping locations if the component cannot be transported from port to site in one day.

Further assessment and planning is required to ensure that a safe and efficient haulage route is achievable. Consideration of timing to avoid peak traffic times as well as an awareness of safety issues is critical. Management by experienced transport contractors, liaison with the permit section of the NSW Roads and Traffic Authority, and close liaison with the NSW Police and local councils en route would ensure that the overall impact and disturbance to infrastructure and other road users is minimised.

Improvements and temporary upgrades of external road infrastructure are not likely to be required along the main transport route between the Port of Newcastle and the Munmorah Power Station site. The final determination and assessment of what transport planning activities are required would be undertaken during the detailed design phase, where final details of actual plant weight and dimensions, route constraints etc would be accurately known. The route selection process would be undertaken in direct consultation with and under the approval of the relevant responsible authorities, which include Newcastle City Council, Lake Macquarie Council, Wyong Council and the NSW Roads and Traffic Authority.

### 14.2.2 Construction traffic

During the construction phase, several activities would generate traffic, including:

- equipment delivery
- construction material delivery
- construction staff transport.

The total number of vehicle movements likely to be generated on local roads during the construction period is summarised in Table 14.2. It should be noted that vehicle movements assume all bulk components and plant equipment would come from the Port of Newcastle.

Daily construction traffic would peak in the early morning when construction workers travel to the site for the day and in the afternoon when leaving the site for the day. The construction of plant foundations and the delivery of the large plant equipment, which is likely to occur during the middle stages of the construction program, would likely generate the highest traffic levels.

Construction traffic associated with the pipeline construction would primarily be restricted to the electricity transmission easement and a number of key access points along the route stemming from the Link Road and Tooheys Road.

**Table 14.2 Preliminary estimate of construction traffic volumes**

<b>Activity</b>	<b>Months</b>	<b>Number of deliveries</b>	<b>Per month</b>	<b>Per week</b>	<b>Per day</b>
Site preparation	0 to 4	100	40	10	2
Earthworks	5 to 8	100	40	10	2
Foundations	9 to 11	1,500	500	125	25
Support plant and equipment	12 to 18	400	90	23	5

Construction traffic would access the proposed gas turbine facility site via an existing access point from Scenic Drive that is currently being used to access Munmorah Power Station. Accessing the proposed gas turbine facility site is unlikely to require any modification to existing conditions, such as widening the existing entrances or creating new entrances. It may however require the strengthening of crossings within the power station site itself, such as the canal crossing located on the north eastern corner of the site, particularly during the transport of heavy plant equipment to the site.

Construction traffic would temporarily disrupt and impact on normal traffic flow. Based on the construction traffic estimates provided in Table 14.2, potential impacts on the local traffic conditions are likely to be low.

The transport of large plant components has the potential to restrict traffic flow due to their size and slow speed. This may result in significant disruption to traffic when passing through metropolitan areas or lead to delays on single lane roads where there are no opportunities for other traffic to pass. However, the transportation of large components would happen rarely, and any disruption would last for a short time. The scheduling of these activities during the early periods of the day and the use of appropriate traffic management measures would ensure disruptions to the local road users are minimised.

### **14.2.3 Operational traffic**

Traffic associated with the operation of the gas turbine facility would be minimal. During the commissioning stage, teams of technicians (10 to 20 staff) would be travelling daily, to and from the site, in commercial vehicles such as four-wheel drives and vans. In the long term the facility would be staffed by 5 to 10 staff which may be sourced from existing Munmorah Power Station staff. Operational traffic levels would, therefore, be low and consist of personal vehicles and some light commercial vehicles.

The transport of large equipment may be required during major maintenance activities, such as the replacement of a major piece of equipment. Although the transport of large equipment to the facility would be necessary under these conditions, the potential implications of such an activity on the local traffic conditions would be assessed during the early planning stages of this activity.

Deliveries of distillate fuel by road tanker currently take place on a regular basis at Munmorah Power Station to top up fuel supplies to the coal-fired power station. The road tankers currently use established routes that are permitted to transport dangerous goods.

As discussed in Chapter 4, distillate fuel would only be used by the proposed gas turbine facility when the natural gas supply is unavailable. Under these circumstances, the inventory of distillate fuel stored at the facility would be utilised and would be occasionally topped-up on an as need basis by road tankers. It is expected that the use of distillate fuel by the facility would seldom occur, therefore, potential incremental traffic impacts associated with the transport of fuel to the facility are considered negligible.

## **14.3 Mitigation**

As identified above, the major impacts associated with traffic and transport would occur during the construction phase of the proposal. The following sections outline mitigation and management measures proposed to minimise these impacts.

### **14.3.1 Haulage to the site**

Under the direction of Delta Electricity, the selected haulage contractor(s) would develop specific management measures as part of the process of obtaining approvals from the NSW Roads and Traffic Authority and Newcastle, Lake Macquarie and Wyong Councils for the transport of the large plant equipment. The plant equipment would be transported by a licensed and experienced haulage contractor(s), who would have the required equipment; experience in the transport of over-weight and over-sized cargoes; and established knowledge and contacts with the relevant road authorities. The nominated transport contractor(s) would be responsible for:

- selecting the final route, and confirming the mode of operation; the proposing the haulage timetable; organising required modifications to infrastructure (including physical improvements to access roads, temporary removal of street furniture and temporary modifications to existing infrastructure such as roundabouts)
- obtaining all required permits for undertaking the haulage tasks
- ensuring compliance with the permits obtained, including measures such as pilot cars and police escorts, and staging of deliveries to meet restrictions on travel times on different routes
- phasing of delivery schedules to meet construction requirements and ensuring deliveries do not overwhelm transport infrastructure (based on the permits obtained from the authorities)
- ensuring that all access roads are suitable by conducting surveys and pavement and infrastructure inspections prior to the commencement of the transport tasks
- alerting other transport users of the transportation activities by installing suitable warning signs and signage at appropriate locations along the route,.

Mitigation and management measures during transportation of equipment would also include:

- developing a specific Transport Management Plan for the proposal to coordinate the haulage contractor programs, ensuring that equipment is delivered to the required turbine locations on the site, and minimising impact on traffic flows on local roads
- designing and constructing access points along the local roads to meet required council safety standards and to ensure adequate access and egress is provided for transportation vehicles
- designing and constructing a site track network to ensure that it is safe and suitable for transportation vehicles and is adequately maintained
- developing community information and awareness program, to ensure that residents along the preferred routes are fully aware of the proposed transportation plans, timings and activities.

### **14.3.2 Construction**

A specific construction traffic management plan would be developed for the proposal as part of the construction environmental management plan, and integrated with the equipment transportation approvals/plans (as detailed above). The plan would be developed in consultation with the NSW Roads and Traffic Authority and Wyong Council, to ensure that all issues are addressed and incorporated, safety standards are maintained and impacts on the road network are minimised.

The plan would include a dilapidation report to assess the current state of local roads used during construction. This would allow any excessive wear on the road to be identified early and repaired during and following construction.

The measures in the plan would include:

- a community consultation program for local residents to ensure that the community is aware of the activities and timings and has an opportunity to comment. This would include newsletters and letter-box drops with regular updates
- designated delivery periods, delivery routes and access points to the site for all materials and plant supplied for different locations around the site
- design and construction of egress/access points to and from local roads to meet NSW Roads and Traffic Authority and Council requirements for safe and efficient site egress and access
- designated speed and load limits for heavy vehicle routes
- design and construction of site tracks to ensure safe vehicle movements around the site, including implementation of appropriate erosion and sediment management controls to avoid erosion from site tracks and lay-down areas
- directional and warning signage on designated access routes to the site
- designated reserves on the site for parking, turning, loading and unloading

- appropriate traffic controls and on-site management measures to ensure that vehicles use constructed site tracks and do not travel 'cross-country'
- implementation of an inspection and maintenance program for access routes and site tracks to ensure they are kept in an adequate and safe condition.

### **14.3.3 Operation**

The assessment concluded that there were likely to minor traffic impacts associated with the normal operation of the proposal. There may be the occasional requirement for additional vehicles to access the site during maintenance activities. This aspect of the proposal would be managed via a specific traffic management plan to be developed for the maintenance activity.

## **14.4 Summary of impacts**

Construction traffic would temporarily disrupt and impact on normal traffic flow. Based on the construction traffic estimates provided in this Chapter, potential impacts on the local traffic conditions are likely to be low.

The transport of large plant components has the potential to restrict traffic flow due to their size and slow speed. This may result in significant disruption to traffic when passing through metropolitan areas or lead to delays on single lane roads where there are no opportunities for other traffic to pass. However, the transportation of large components would happen rarely, and any disruption would last for a short time. The scheduling of these activities during the early periods of the day and the use of appropriate traffic management measures would ensure disruptions to the local road users are minimised

Transport of the major plant components would require liaison and approval of the NSW Roads and Traffic Authority and Newcastle, Lake Macquarie and Wyong Councils. A detailed planning assessment would be conducted in association with the haulage contractor to determine the most appropriate route and mitigation measures.

Traffic generated by site staff during normal operations would be negligible in comparison with existing traffic flows. There may be the occasional requirement for additional vehicles to access the site during maintenance activities. This aspect of the proposal would be managed via a specific traffic management plan to be developed for the maintenance task.

## LAND USE AND PROPERTY IMPACTS

15

## **15. Land use and property impacts**

### **15.1 Existing environment**

#### **15.1.1 Regional context**

Munmorah Power Station is on the Central Coast of New South Wales, approximately 150 kilometres north of Sydney and 10 kilometres north-east of Wyong, in the Wyong Local Government Area. The assessment area consists of the site of the proposed gas turbine facility and a lateral gas pipeline which would connect the facility to the Sydney-Newcastle natural gas pipeline, which is located approximately seven kilometres west of the proposed gas turbine facility.

Munmorah Power Station site is surrounded by the suburbs of (clockwise from north) Lake Munmorah, Halekulani, Budgewoi, Buff Point, San Remo and Doyalson. The proposed pipeline would be surrounded by the following residential suburbs: Bushells Ridge and Doyalson to the north and Blue Haven and San Remo to the south.

#### **15.1.2 Munmorah Power Station site**

The proposed gas turbine facility would be located within the grounds of the existing Munmorah Power Station site. The power station site comprises approximately 940 hectares of vegetated buffer land. This buffer area includes two collieries, the Munmorah Colliery to the west of the power station (currently being decommissioned) and the Endeavour Colliery to the south-east (decommissioned). Lake Munmorah is approximately 1.5 kilometres east of the proposed gas turbine facility and is surrounded by the residential suburbs of Budgewoi, Halekulani, Lake Munmorah, Colongra and San Remo.

The proposed gas turbine facility would be located within the existing Delta Electricity owned land, zoned 5b-Special Uses under the Wyong Local Environment Plan (as amended). The proposed subdivision of the land allocated to the gas turbine facility would excise this portion of land from the remainder of the power station site providing a clearly delineated site boundary. Refer to Section 15.2.2 for further details.

#### **15.1.3 Proposed pipeline route**

The proposed gas pipeline which would connect the proposed gas turbine facility to the Sydney-Newcastle natural gas pipeline would be located along the southern edge of an existing electricity transmission easement for most of the route. Once it reaches Munmorah Power Station, it would then follow an existing internal roadway until it reaches the proposed gas turbine facility (see Figure 4.1). It is proposed that a separate pipeline easement would be negotiated and established with all relevant land owners during the detailed design phase of the project.

Beyond Delta Electricity owned land, the pipeline crosses land zoned 4(e)-Industrial uses, 7(g)-Wetland conservation and 10(a)-development/conservation investigation (see Table 5.1 in Chapter 5). The proposal entails the construction of the pipeline within the southern edge of existing 60-metre wide, partially cleared, electricity transmission easement that is currently managed by TransGrid. This easement contains steel towers for 330-kilovolt powerlines, extending from an existing switchyard at Munmorah Power Station to the F3 Freeway and beyond.

Based on current land title information, the proposed pipeline route would cross 15 lots affecting six landowners. Landowners include Delta Electricity, private companies, NSW Roads and Traffic Authority, Darkinjung Local Aboriginal Land Council (LALC) and mining interests. The majority of the lots affected by the proposed pipeline route are not in active use. Four of the affected lots have residential dwellings and sheds within cleared areas and south of the existing electricity transmission easement (see Figure 4.2).

#### **15.1.4 Landowner issues**

A landowner that owns a number of lots immediately east of the railway line has expressed an interest in developing its land and a number of adjacent lots to the north of the proposed pipeline route (currently owned by others) for a mixed industrial, commercial and residential estate covering approximately 115 hectares. The landowner noted that the development proposal would require the relocation of the existing electricity transmission easement for a significant portion of the route. TransGrid advised that there have been no discussions or progress on this issue since initial discussions were held between TransGrid and the landowner several years ago. Wyong Shire Council is also aware of this proposal, however, no formal development application has been made or submitted to Council for review and consideration at the time of writing this document.

The Darkinjung Local Aboriginal Land Council, which owns the lot of land immediately west of the railway line, has not expressed any plans for the future use of the land or concerns in relation to the proposal.

The owner of the four adjoining lots located on the western section of the proposed pipeline route and immediately east of the F3 Freeway is a resource company with a current mining lease over these lots. The resource company is currently investigating the viability of undertaking underground mining activities underneath these sites. The Mine Subsidence Board is aware of these investigations but has not been provided with details of the extent and/or scope of the proposed works at the time of writing this document. The company advised that the long-term plans for the site may include construction of a new rail loop.



## **15.2 Potential impacts**

### **15.2.1 Construction**

The potential land use impacts associated with the construction of the proposed gas turbine facility would be limited to the confines of Munmorah Power Station site and would be managed internally between Delta Electricity and the nominated construction contractor.

The key potential impacts on surrounding land uses associated with the construction of the proposed pipeline are noise amenity, air quality, and traffic. These are described in detail in Chapters 10, 11, and 14 and have been assessed as being relatively minor based on the proposed mitigation measures. These measures would be incorporated and implemented in the construction environmental management plan for the project.

The construction of the pipeline along the transmission corridor and across the Pacific Highway and Main Northern Railway Line would require close coordination between the nominated construction contractor and TransGrid, NSW Roads and Traffic Authority and Railcorp to ensure the appropriate controls and safeguard measures are implemented to minimise the risk of a significant disruption to these important infrastructure corridors. Refer to Chapter 16 for further details.

### **15.2.2 Operation**

The proposed operation of the gas turbine and delivery facilities would be contained within lands owned and managed by Delta Electricity and is considered consistent with the power generation activities that are currently undertaken at the site.

The proposed subdivision of the land designated to contain the proposed gas turbine facility would facilitate the delineation of a clear site boundary for the purposes of developing site-specific environmental management plans and the application for an Environment Protection Licence to the Department of Environment and Conservation. The provision of separate easements providing site access and services required to formalise and register the subdivision application with Wyong Shire Council would be confirmed and finalised during the detailed design phase.

The proposed inlet facility would be located more than 100 metres away from current residences along Tooheys Road (Bushells Ridge) on land that is being considered for potential underground mining activities by the current land owner. In the absence of any details on the extent, scope or layout of the proposed aboveground/underground activities on this land, it is not possible to determine whether the location of the proposed inlet facility and pipeline could have an adverse effect on the future land use potential of these lands.

Pipeline maintenance and operation activities would be consistent with activities currently being carried out by TransGrid along the existing electricity transmission easement and are unlikely to have an adverse impact on the operation of and access to transmission infrastructure along the easement. The development of specific maintenance and operation procedures for the pipeline and inlet facility would need to

take into consideration the requirements stipulated by TransGrid's for activities being undertaken within electricity transmission easements.

The presence of underground infrastructure generally restricts the types of activities and developments that can be undertaken above ground due to safety and access requirements. Restrictions may also be imposed on the construction of particular types of sensitive developments, such as residential premises, within a particular distance from the underground infrastructure to ensure the relevant land use safety planning criteria is complied with.

The proposed establishment of a 20 meter wide gas pipeline easement within the southern edge of the existing electricity transmission easement would prevent further severance of land which would generally be associated with the establishment of such an easement. Although restrictions on access and development within the pipeline easement would be applicable, these restrictions would generally be consistent with the restrictions that are currently imposed by TransGrid along the entire length of the electricity transmission easement.

Based on current land uses, the proposed pipeline route is unlikely to affect any residential premises located near the pipeline, including residencies at the Bushells Ridge area, east of the F3 Freeway.

The results of the preliminary hazard analysis (see Chapter 16) indicate that there may be a requirement to establish a 30 metre buffer from the pipeline centreline to restrict future sensitive land use developments along the entire length of the proposed pipeline route. This is not considered a major constraint to potential future developments adjacent to the electricity transmission easement, as this buffer area would readily be contained within the area covered by the existing electricity transmission easement to the north and along public road reserves to the south for most of its length.

It is important to note that less sensitive developments, such as commercial and industrial developments, would not be constrained by this separation distance and could theoretically be constructed at the edge of the proposed pipeline easement. In this case, potential development restrictions imposed by TransGrid would need to be considered.

## **15.3 Mitigation**

### **15.3.1 Construction**

Mitigation of land use impacts relating to noise, air quality, and transport are discussed in more detail in Chapters 10, 11, and 14. There are currently few permanent residents on the lands that would be directly affected by the proposal which would potentially be impacted by the temporary construction noise, and dust impacts. With the majority of residents separated from the construction activity by the Link Road and substantial bushland buffers, the impacts would be negligible.

The construction of key pipeline crossings, namely the pipeline sections that cross the Pacific Highway and the Main Northern Railway would be undertaken in consultation with and with the approval of the NSW Roads and Traffic Authority and Railcorp.

Implementation of the mitigation measures discussed in the previous sections would ensure noise and dust impacts on the small number of affected residents are not significant. Detailed control measures would be incorporated into the construction environmental management plan that would be developed for the project by the nominated construction contractor. Given the pipeline construction would be mostly contained within the existing electricity transmission easement, the likelihood and extent of disturbance to landowners along the pipeline during construction is low.

### **15.3.2 Operation**

The proposed pipeline and above ground structures would be designed to the requirements of the Mine Subsidence Board to ensure any future underground mining in the area is not unreasonably obstructed. Any future mining in the area would, however, need to consider and mitigate impacts on the proposed pipeline and ancillary aboveground infrastructure as well as the existing Sydney-Newcastle gas pipeline.

It is proposed that the final location of the inlet facility and pipeline design details would be determined during the detailed design phase in direct consultation with the corresponding land owners and Mine Subsidence Board to minimise potential land use conflicts and ensure the safe and reliable operation of both activities. It is envisaged that the lot of land required for the inlet facility would either be purchased or leased from the corresponding land owner by Delta Electricity or corresponding pipeline operator (if different) for the purposes of this proposal.

Discussions would be held with all affected landowners to establish an easement corridor for the proposed natural gas pipeline. These discussions would provide an opportunity for landowners to negotiate conditions and compensation to offset the potential land use restrictions that would be applied by the negotiated easement agreement.

Appropriate specifications and safety standards would be incorporated into the design of the pipeline to ensure the safe construction and operation of the pipeline. TransGrid has been consulted as part of the environmental assessment and has provided a list of requirements (Chapter 6) which have been incorporated into the project description (Chapter 4). TransGrid would also be consulted during the detailed design and construction phases of the project to ensure the appropriate safety measures are implemented at all stages of the project.

## **15.4 Summary of impacts**

### **15.4.1 Construction**

Minor disturbances to local amenity (i.e. noise, dust) may result during pipeline construction. This is likely to affect only a small number of properties along the pipeline route. The temporary and minor nature of the construction works is not significant.

Appropriate construction planning during the construction of major pipeline crossings would prevent any significant impact to road or rail operations.

#### **15.4.2 Operation**

The containment of the proposed gas turbine and delivery facilities within land that is owned and controlled by Delta Electricity would prevent potential future land use conflicts.

The proposed establishment of a 20 meter wide gas pipeline easement within the southern edge of the existing electricity transmission easement would prevent further severance of land and would not have an adverse effect on the development potential of adjoining lands. Although restrictions to access and development within the pipeline easement would be applicable, these would be consistent with the restrictions currently imposed by TransGrid along the entire length of the electricity transmission easement.

The potential requirement of a 30 metre buffer distance from the pipeline centreline toward the north and south of the pipeline route may apply to potential future sensitive land developments, in particular residential premises. This is not considered a major constraint to development, however, as this buffer area would be contained within the area covered by the existing electricity transmission easement to the north and along public road reserves to the south for most of its length.

The proposed pipeline and above ground structures would be designed to the requirements of the Mine Subsidence Board to ensure any future underground mining in the area is not unreasonably obstructed. Any future mining in the area would, however, need to consider and mitigate impacts on the proposed pipeline and ancillary aboveground infrastructure as well as the existing Sydney-Newcastle gas pipeline.

The ongoing operation and maintenance of the proposed pipeline would not impact upon the continued operation of TransGrid's electrical transmission infrastructure. Liaison with TransGrid would establish protocols and management strategies to prevent any land use conflicts.

## HAZARDS AND RISKS

# 16

## 16. Hazards and risks

### 16.1 Introduction

The proposal requires evaluation under *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development* (SEPP 33), as the nature of the activities associated with the proposed gas turbine facility and pipeline are generally considered to be 'potentially hazardous'. Consequently, a preliminary hazard analysis has been prepared for the proposal in accordance with the Department of Planning's *Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis* (HIPAP 6).

It is important to note that the quantities of dangerous goods that would be stored at the facility, primarily comprising up to 1.5 megalitres of distillate (diesel or similar) which although not classified as a dangerous good may be considered as one, would be well below the risk screening thresholds stipulated in Table 3 of *Applying SEPP 33* (DUAP 1995). The transport and handling of compressed natural gas using an underground pipeline does not constitute 'storage' under the provisions of SEPP 33.

The objectives of the preliminary hazard analysis were to:

- identify the hazardous incidents which relate to the use and storage of dangerous materials in the lateral pipeline, associated equipment and gas turbine facility
- assess the significance of each incident in terms of potential on-site and off-site impacts
- assess the risk to people, property and the environment either quantitatively (where possible) or qualitatively and assess these against the relevant land use safety criteria
- identify and evaluate safeguards to ensure that risks to people, property and the environment are minimised and that the development imposes no unacceptable levels of risk.

The preliminary hazard analysis focuses on assessing potential risks associated with the construction and operation of the natural gas pipeline and ancillary infrastructure, gas turbines and distillate storage. A detailed description of the methodology and findings of the preliminary hazard analysis is provided in *Technical Paper 6 – Proposed Gas Pipeline and Gas Turbines at Munmorah Power Station, Preliminary Hazard Analysis*. This chapter summarises the key findings of that assessment.

### 16.2 Methodology

The preliminary hazard analysis was conducted in accordance with HIPAP 6 and entailed using a classical risk assessment approach which systematically analysed a range of potentially hazardous events or scenarios, the likely risk probability and

consequences of these events and the effectiveness of the proposed mitigation or safeguard measures to reduce the risks from these events to within acceptable levels.

The risk analysis was undertaken using a combination of qualitative and quantitative assessments, depending on the level of design information available for a particular component of the proposal and/or the potential severity of off-site consequences of a particular event.

A brief outline of the type of assessments which were conducted for each component of the proposal is provided below:

- natural gas pipeline (quantitative)
- inlet facility (semi-quantitative)
- distillate (diesel) storage facility (semi-quantitative)
- gas receival station (qualitative)
- gas turbines (qualitative).

The hazard analysis methodology used for both qualitative and quantitative risk assessments generally involved the following steps:

- identifying the initiating events at the lateral pipeline or gas turbine facility which could lead to hazardous incidents and the potential consequences of these hazardous incidents
- evaluating the likely frequency of the initiating events
- evaluating the consequences of the hazardous incidents on people, property and the environment
- assessing the adequacy of the operational measures and safeguards to minimise the identified risks
- assessing risk and comparing against relevant risk criteria
- identifying mitigating measures and/or safeguards to further minimise the risks to people, property and the environment, where appropriate.

## **16.3 Risk criteria**

The risk criteria relevant to this proposal are provided by the Department of Planning in *Hazardous Industry Planning Advisory Paper No 4- Risk Criteria for Land Use Safety Planning* (HIPAP 4). HIPAP 4 requires an evaluation of potential risks in terms of the following risk categories:

- individual risk
- risk of property damage

- societal risk
- biophysical environmental risk.

Detailed descriptions on what each risk category entails are provided in HIPAP 4 and have been summarised in subsequent sections for ease of reference.

### **16.3.1 Individual risk**

Individual risk is the risk experienced by an individual in a given time period and reflects the severity of the hazards and the amount of time the individual is exposed to them. The number of people present does not significantly affect individual risk although there could be second-order effects – for example in case of fire, the number of people in the vicinity would affect how quickly they could be evacuated.

For the purposes of this assessment, individual fatality risk has been assessed according to the relevant land use zoning criteria and has been assessed in terms of potential heat radiation effects.

### **16.3.2 Risk of property damage**

When assessing potential risks, the assessment needs to consider the potential for an incident at the facility to cause damage to other buildings at the facility and spread to neighbouring installations causing a potential escalation or domino effect.

For the purposes of this assessment property damage has been considered with regard to the closest receptors to the pipeline, inlet facility and gas turbine facility.

### **16.3.3 Societal risk**

Societal risk is the risk experienced in a given time period by the whole group of people exposed. It reflects the severity of the hazard and the number of people exposed to it.

Societal risk combines the frequency and consequence assessments of specific events with population information. For the purposes of this assessment societal risk has been assessed qualitatively using the relevant land use criteria.

### **16.3.4 Biophysical environmental risk**

Biophysical environmental risk considers the risk to the environment from accidental releases. For the proposed pipeline and gas turbine facility, accidental releases relate to the hazards of fire and explosion and have been assessed in relation to the previous risk criteria. Potential risks or impacts to the biophysical environment have been assessed in Chapters 7 to 11 of this environmental assessment.

## **16.4 Hazard identification**

Potential hazards arising from the pipeline, inlet facility, gas delivery facility, gas turbines and distillate storage were identified through a hazard identification process. For each of the hazardous events identified, causes, consequences and the effectiveness of the



proposed safeguard measures were assessed. A detailed description of the hazard identification assessment is provided in Chapter 6 of Technical Paper 6. A summary of the finding from this assessment is provided below.

The inherent hazards of the pipeline arise from the flammability of the natural gas, and the high pressure at which it is transmitted. Fire, flash fire or gas cloud explosion may occur if there is a leak in the pipeline.

The inherent hazard of the distillate storage tank arises from the bulk storage of combustible liquid. If a leak occurred and an ignition source was present a pool fire could result and potentially lead to an escalation of the event.

The hazards associated with the compressor station associated with the inlet facility and the gas turbines arise from the flammability of the natural gas. The types of hazardous incidents which may occur would all require a gas leak and build up of flammable gas in a confined space with the potential to cause an explosion.

Potential aviation hazards were also identified during the consultation phase by the Civil Aviation Safety Authority. The thermal plumes that would be generated by the four gas turbines during operation may create an aviation hazard due to the excessive turbulence that may be generated by these plumes. It is important to note that the existing two stacks at Munmorah Power Station are already considered an aviation hazard, as they physically exceed the 110 metre height limit set by the Civil Aviation Safety Authority. It is expected that the aviation hazard zone that already exists at Munmorah Power Station would be extended by the Civil Aviation Safety Authority to include the proposed gas turbine facility.

## **16.5 Risk assessment results**

The assessment of potential risks associated with the construction and operation of the proposed gas turbine facility and pipeline was conducted using preliminary design information that was produced during the concept design phase. It is proposed that a refinement of the findings of this assessment would be conducted during the detailed design phase where more detailed design information would be available.

### **16.5.1 Construction**

General construction activities such as the operation of construction machinery can cause potential hazards and risks to the safety of construction workers, local residents and members of the public as well as to the environment. Temporary barriers would be installed at specific site construction areas to prevent members of the public from entering these areas.

Construction along the proposed pipeline route would sometimes involve work sites being situated on or adjacent to roadways. Traffic would continue to use the adjacent roads where practical, however, temporary road closures or half-road closures may be required, and alternative routes provided. Construction work on or near roads may cause hazards and risks due to the changes in road conditions, increased driver confusion and nearby construction equipment such as stockpiles of fill or rocks, and stockpiles of pipes and other materials.

The nominated construction contractor would implement procedures in Australian Standard *AS1742.3 – 1985 Traffic Control Devices for Works on Roads*, which specify traffic control devices for works on roads. The implementation of these standards would minimise the risk of accidents resulting from driver confusion or error. Potential traffic impacts have been considered further in Chapter 14.

Construction sites have the potential to cause air, noise and water pollution to the surrounding environment. Surrounding waterways may potentially be affected by construction site run off causing increased turbidity, siltation and aquatic life degradation. Mitigating measures to minimise and control these potential impacts are detailed in Chapters 7 to 13 of this environmental assessment.

There would be risks associated with the undertaking of construction activities near or close to live electrical equipment or working plant, such as pipeline construction along the electricity transmission corridor and the construction of the gas turbine facility within the grounds of the Munmorah Power Station site. Particular risk management procedures and measures would need to be developed and implemented by the nominated construction contractor to ensure the operation of existing infrastructure items are not affected during the construction phase of the project.

The construction of pipeline crossings along major intersections, such as the Pacific Highway and Main Northern Railway would also require careful planning and the development of risk management procedures that ensure these important infrastructure items are not adversely affected by the proposed construction activities.

### **16.5.2 Pipeline**

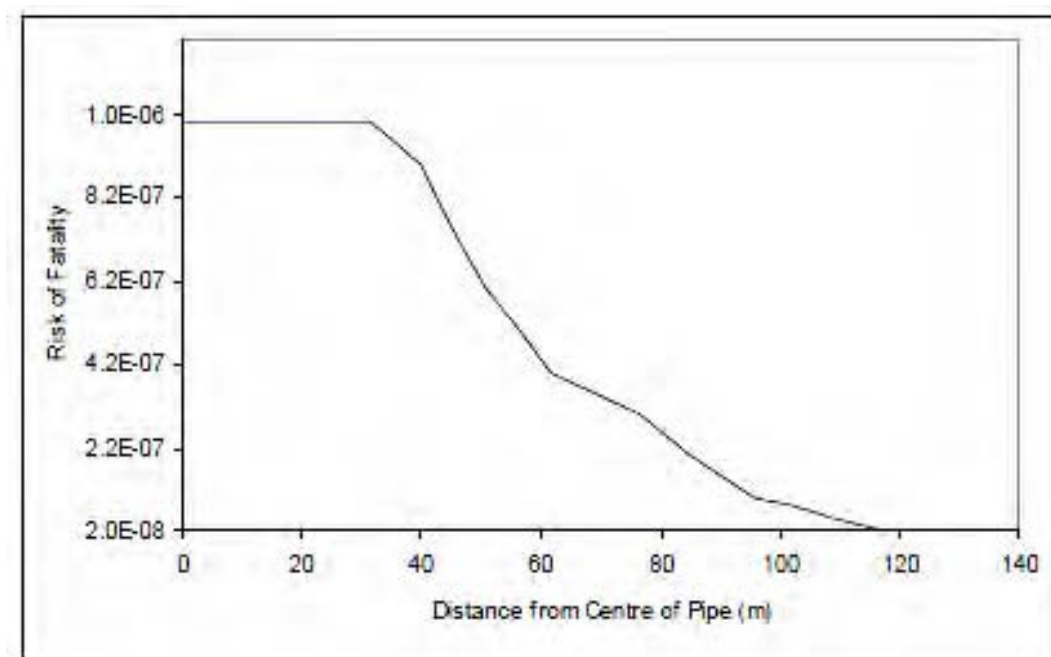
The hazard identification process showed that the main issue of concern was gas releases from the gas pipeline which may result in the generation of jet fires and heat radiation impacts. The potential causes of releases were identified to be as follows:

- scouring and erosion at creeks and drainage points
- high vehicle loads on road crossings
- third party interference with the pipeline.
- external corrosion.
- stress corrosion cracking
- weld/material defects
- ground movement and subsidence
- overpressure or high temperature.

The risk from a gas pipeline is a 'linear' risk, i.e. the risk follows the entire pipeline length, in contrast to a fixed hazardous facility, where the risk extends a limited distance from the facility. Thus the risk contours for a pipeline are represented as running parallel to

the pipeline. Risk levels for linear risks are often presented in the form of risk transects, showing the risk at a given distance from the pipeline centreline.

The consequence of all identified hazardous incidents from jet fires were combined with the estimated frequencies to assess the risks to surrounding land uses. The results of this assessment were plotted against the distance from the centreline of the pipeline to develop a set of risk transects. The risk transects were produced using the TNO Risk Curves software Program and apply to the entire pipeline length. The risk calculations also consider the proposed safeguards (underground construction, pipe wall thickness, depth of cover). The results are shown in Figure 16.1.



**Figure 16.1 Risk of fatality as a function of distance from pipeline centreline**

The assessed risk for gas release events along the pipeline length were assessed against the land use safety planning criteria defined by HIPAP No 4 as outlined in Table 16.1.

**Table 16.1 Pipeline risk evaluation**

Land use	Separation distance between pipeline and nearest land use (metres)	Individual fatality risk criteria (HIPAP 4, risk in a million per year)	Distance from pipeline where risk criteria is reached (metres)
Sensitive Land Use	900	$0.5 \times 10^{-6}$	57
Residential	60	$1 \times 10^{-6}$	32
Recreation	150	$10 \times 10^{-6}$	Not reached
Industrial	150	$50 \times 10^{-6}$	Not reached
Commercial	none identified	$5 \times 10^{-6}$	Not reached

Notes: Adapted from Table 9.1 of Technical Paper 6

The results in Table 16.1 indicate that the proposal complies with the land used safety criteria prescribed by HIPAP 4 for all relevant land uses near the proposed pipeline route. The results also suggest that there may be a requirement to establish a 30 metre buffer zone from the pipeline centreline to restrict future sensitive land use (residential) developments along the entire length of the proposed pipeline route. This buffer zone would, however, be contained within the area covered by the existing electricity transmission easement to the north and along public road reserves to the south for most of its length.

It is important to note that the proposed pipeline would primarily be constructed underground, located at a significant distance away from sensitive land uses and local population centres and would be located within an established electricity transmission easement, where above ground activities are closely monitored and controlled. Considering the above factors, the likelihood or probability of a hazardous event occurring (due to human error) and the potential consequences of this event causing serious harm to nearest sensitive receptors would be extremely low. These factors are reflected in the risk assessment results provided in Table 16.1.

### **16.5.3 Distillate storage**

The hazard identification showed that the main issue of concern was heat radiation resulting from tank roof fires and pool fires. These fires could be generated if a leak occurred into a bund or the tank roof and an ignition source that was of sufficient intensity to ignite the diesel was present.

Heat radiation effects were modelled for a tank roof fire and a pool fire resulting from the release of the entire contents of the tank into the surrounding bund. A semi-quantitative assessment of risk, which compared the heat radiation distances from the fire to potential receptors, confirmed that heat radiation from a distillate (diesel) fire would not extend beyond the gas turbine facility site boundary. Further, the potential for escalation of an incident outside the gas turbine facility site is low, as no equipment or building would be present within the 14 kilowatt per square metre heat radiation contour from the tank. Refer to Section 7.4 of Technical Paper 6 for further details.

The assessment identified that the likelihood of ignition of a spill is low, as the ignition temperature of diesel is extremely high and no ignition sources were identified in close proximity to the distillate storage area, with the exception of hot work which would be subject to a hot work permitting system.

### **16.5.4 Other components**

The hazard identification process showed that the main issue of concern was gas leaks resulting in a build up of flammable gas in a confined space with the potential to cause an explosion.

A semi-qualitative assessment of gas explosion risk in confined spaces was conducted to provide indicative estimates of the explosion frequency and explosion potential. The explosion risk for the gas compressor building at the inlet facility and gas turbine enclosure was assessed to be very low, due to the proposed safeguards to be provided within the design and the likely explosion frequency. Refer to Chapter 9 of Technical Paper 6 for further details.

## 16.6 Mitigation

### 16.6.1 Pre-construction activities

During the detailed design phase it is proposed to conduct a series of studies to ensure the construction, commissioning and operation phases of the proposal are implemented in a safe and effective manner without undue risks to the community and the environment. The following studies would be conducted:

- **Fire Safety Assessment:** The assessment would cover all aspects detailed in *Hazardous Industry Planning Advisory Paper No 2 – Fire Safety Assessment Guidelines* (HIPAP 2) and the *Best Practice Guidelines for Contaminated Water Retention and Treatment Systems*. The assessment would be submitted to NSW Fire Brigades for review and approval prior the commencement of construction activities
- **Hazard and Operability (HAZOP) Assessment:** The assessment would be conducted in accordance with *Hazardous Industry Planning Advisory Paper No 8 – HAZOP Guidelines* (HIPAP 8). A HAZOP assessment is used to critically analyse potential hazardous events during the construction and operation of the proposal and identifies appropriate design and operational measures which would ensure the identified risks are avoided or minimised. The assessment would be chaired by a suitably qualified independent person, to be appointed by the design contractor and approved by the Director-General.
- **Construction Safety Assessment:** The assessment would be developed in accordance with *Hazardous Industry Planning Advisory Paper No 7 – Construction Safety Assessment Guidelines* (HIPAP 7). The construction safety assessment process would critically review all of the risks associated with the construction and commissioning phases of the proposal to ensure risk levels to land uses that may be affected by the proposal remain within acceptable limits.
- **Aviation Safety Assessment:** An assessment of the potential vertical velocities and associated turbulence effects that may be caused by the proposed gas turbine exhaust stacks would be conducted during the detailed design phase to assess the potential air safety hazards of the proposal in relation to current Civil Aviation Safety Authority (CASA) requirements. The results of the assessment would be provided to CASA for consideration into their review of aviation restrictions currently in place at Munmorah Power Station.

Relevant outputs from the above studies would be incorporated into the construction environmental management plan which would be developed by the nominated construction contractor prior to the commencement of construction activities.

### 16.6.2 Risk reduction measures

A range of risk reduction measures have been identified as design safeguards and procedures to be incorporated into specific components of the proposal to avoid or reduce the identified hazards within acceptable levels.

The following sections provide a brief summary of the proposed measures. It is envisaged that these measures would be finalised during the detailed design phase when more precise design information would be available.

### **Gas pipeline**

Proposed risk mitigation measures for the gas pipeline are outlined below:

- provision of marker tape and marker signs or marker tape and stones along the whole length of the pipeline in trenched sections
- pipeline would be constructed with a minimum depth of cover of 1,000 millimetres to top of pipe within the 330 kilovolt electricity transmission corridor, with additional depth of cover (1,200 mm) and/or concrete slab protection where appropriate or necessary
- pipeline would have a minimum wall thickness of 19 millimetres and increased wall thickness where local conditions require, in accordance with Mine Subsidence Board specifications
- pipeline would undergo hydrostatic strength tests on all sections at 1.25 times maximum allowable operating pressure
- pipeline bore would be directionally drilled with a minimum of 2,000 millimetres depth of cover at all road, rail crossings in accordance with relevant authority requirements, including NSW Roads and Traffic Authority and RailCorp NSW
- provision of an external pipeline coating and undertake a 'holiday' detection of coating prior to burial
- provision of an impressed current, auto potential controlled cathodic protection system
- provision of electrical isolation from underground and aboveground sections with insulating flanges. Earthing systems would be installed to provide personnel protection in accordance with AS 4853 at locations where the pipeline is installed in proximity with high voltage power lines
- periodic pigging would be conducted for inspection and maintenance purposes
- regular inspections would be undertaken by vehicle patrols.

### **Inlet facility**

Proposed risk reduction measures for the inlet facility are outlined below:

- an actuated isolation valve would be installed at the pipeline off take point
- gas detectors would be installed at the ventilation exhaust of the compressor room. The detectors would alarm at 25 per cent of the lower explosion limit and shut down the compressor station at 50 per cent of the lower explosion limit.

- ultra-violet and infra-red detectors would be installed inside the compressor building
- the compressor building would be classified a 'hazardous area' in accordance with Australian Standard AS 2430.1 and all associated equipment inside this building would comply with this classification.
- actuated isolation and vent valves would be installed outside the compressor building
- vegetation would be cleared within the footprint of the inlet facility, if necessary
- the facility would be remotely monitored and controlled at the gas turbine facility's control room by an automatic process control system
- all pipework would be designed to comply with the requirements of Australian Standard AS4041
- any exposed pipes and equipment would be protected by impact barriers as appropriate
- all piping, fencing and equipment would be earthed to safely discharge fault or induced voltages in the event of lightning strike.
- the facility would undergo a regular inspection and maintenance program
- the facility would be security fenced to reduce the opportunity for unauthorised entry

### ***Gas receival facility***

Proposed risk reduction measures for the gas receival facility are outlined below:

- an actuated isolation valve would be installed at the inlet to the facility
- there would be a minimum separation distance of 100 metres between the receival facility and the gas turbine facility (to be confirmed at detailed design phase)
- anti-corrosion coating would be provided on all exposed fittings and pipework
- provision of emergency or maintenance venting and overpressure protection devices in case of turbine trip or process malfunction
- the facility would be remotely monitored and controlled at the gas turbine facility's control room by an automatic process control system

### ***Gas turbines***

Proposed risk reduction measures for the gas turbines are outlined below:

- gas and fire detectors would be provided inside each of the turbine enclosures and ventilation exhaust.
- double block and bleed valves would be provided at the gas inlet to each of the gas turbines

- programmable electronic protection systems which meet the necessary certification requirements would be provided
- all pipework would be painted with corrosion resistant paint

### ***Distillate storage***

Proposed risk reduction measures for the distillate storage tanks are outlined below:

- storage compound would be designed to comply with relevant sections of Australian Standard AS1940-2004 in relation to bunding, fire protection, pipework and minimum separation distances to on-site and off-site facilities
- storage tank would be designed to comply with API 650 - Welded Steel Tanks for Oil Storage
- all pipe work and the external surface of the tank would be painted with corrosion resistant paint
- the tank and distillate distribution system would be monitored and controlled at the gas turbine facility's control room by an automatic process control system

## **16.7 Conclusions**

Based on the results of the preliminary hazard assessment, the proposal meets the land use safety criteria defined by Department of Planning for all land uses on the basis that the proposed mitigation measures are implemented during the construction, commissioning and operation phases of the proposal.



## SOCIAL AND ECONOMIC IMPACTS

17

# 17. Social and economic impacts

## 17.1 Existing environment

The Central Coast of NSW is a growing urban area of approximately 300,000 people located between the major cities of Sydney and Newcastle. The Central Coast comprises the two local government areas of Gosford and Wyong, containing a mix of older residential and industrial land uses with newer urban growth and tourist development centres. The proposal is located within the Wyong local government area.

The F3 Freeway, Pacific Highway and Main Northern Railway provide good access to the Wyong region and this has facilitated the continued growth of this region. The region is surrounded by extensive bushland reserves, lakes and beaches, creating an attractive natural setting for tourist and urban development. Major industries include power generation, mining, large retail centres, food processing, manufacturing, construction, health and community services, tourism and information technology. The Australian Bureau of Statistics shows the Wyong region to be relatively more disadvantaged than the NSW and Australian average in terms of social indicators such as income, education, occupation, wealth, living conditions and expenditure (Wyong Shire Council 2004).

### 17.1.1 Population

The Central Coast is one of the fastest growing areas in Australia. From 1991 to 2001, population growth in the Central Coast has been much higher (23.5%) than in Sydney (13.1%) and NSW (12%). Wyong Shire Council suggests that the major catalyst for population growth on the Central Coast over the last thirty years has been the result of improvements in transport infrastructure, the electrification of the railway and construction of the F3 Freeway from Sydney, the affordability of land and housing, attraction of coastal lifestyle and increasing growth pressures in the Sydney Metropolitan Area (Wyong Shire Council 2004).

Further growth in Sydney and the ongoing attractiveness of the Central Coast lifestyle is expected to continue the rapid growth trend. Most of future growth on the Central Coast is expected to be accommodated within the Wyong Shire, due to the availability of land and the exhaustion of developable land in the Gosford local government area.

Wyong has a higher percentage of people aged 55 years and over (27.2%), than New South Wales (22.5%). This age group has increased in number across the Central Coast between 1991 and 2001 as people are attracted to the relaxed coastal atmosphere and scenic quality of the area for retirement (Wyong Shire Council 2004).

Young families are also relocating to the region for a more affordable lifestyle, and commuting to the cities for work. Table 17.1 below shows the high level of net migration influencing the growth of the Central Coast.

**Table 17.1 Components of Population Change 2001 to 2002**

<b>Area</b>	<b>Birth Number</b>	<b>Death Number</b>	<b>Natural Increase Number</b>	<b>Net Migration Number</b>	<b>Populations Change Number</b>
Gosford	1794	1386	408	1016	1424
Wyong	1619	1313	306	2411	2717

Source: ABS Regional Profile 2004 in Wyong Shire Council 2004.

At the 2001 census, most of the residents (49.2%) indicated they have not moved house in the past 5 years. 21.7 per cent had moved from elsewhere within Wyong Shire and 5.1 per cent had relocated from elsewhere in NSW. These statistics illustrate a high proportion of long-term residents, with a high rate of new residents to the area.

### **17.1.2 Employment**

A high percentage (43.7%) of the Wyong population is not in the labour force (ABS Census 2001), reflecting the high proportion of residents that are either retired, in full time education or caring full-time for children.

Most of Wyong Shire's labour force (43.5%) is employed as tradespersons, labourers and related workers, clerical and sales workers (ABS 2001). Historically the area has had a high proportion of the local population employed in 'blue collar' work, with many employed by the existing power stations. This employment context has established a level of acceptance of the industrial setting and a social connection to the existing power stations.

Since 1991, Wyong Shire has seen the greatest proportional increase of employment in intermediate and clerical (5.1%), associate professional (3.5%), professional (2.2%), and electricity industry (3%) fields. This shift toward tertiary employment is associated with the increasing proportion of commuters. This new 'white collar' community may have a reduced affinity with and hence lesser acceptance of the existing power stations in the local environment.

## **17.2 Potential impacts**

### **17.2.1 Construction**

The construction of the proposal has the potential to increase economic activity in the vicinity of Munmorah Power Station. Indicative average workforce numbers at any time during construction would be in the order of 50 employees for the construction of the proposed gas turbine facility and 40 to 50 employees for the construction of the gas pipelines and ancillary infrastructure.

Actual numbers would vary according to design specifications, and the construction staging and techniques utilised. In addition, indirect incomes would be generated from the purchase of materials, transportation of materials, petrol, diesel, fuel supplies, truck parts, tyres, office supplies, accommodation, and other requirements sourced from local suppliers.

Part of the wages of construction employees and contractor fees during the construction period would ultimately filter through the local economy by effects attributable to expenditure.

It is expected that economic benefits would flow throughout the local communities during the two year construction period. It is anticipated that a number of local businesses would also benefit from increased expenditure associated with construction activities. Therefore, it is anticipated that the overall economic effect of the construction phase would be beneficial to the local area.

The proposed gas turbine facility would be located within the grounds of Munmorah Power Station and as discussed in Chapter 12, would not have a significant impact on the visual amenity of the area, particularly to the east of the facility, where residential areas located along the fringes of Lake Munmorah are unlikely to notice the facility due to the relative low height of the four exhaust heights and vegetative cover surrounding this side of the power station. On this basis, the proposal is unlikely to have an adverse effect on the local tourism industry.

### **17.2.2 Operation**

The proposal is unlikely to significantly increase employment opportunities in the local area due to the nature of the facility (i.e. primarily operating during peak demand periods), although it would require the re-skilling of existing and/or future staff to operate and maintain the new facility.

A proportion of the operational expenditure that would be allocated to the gas turbine facility would likely be directed to local manufacturers and service providers. These benefits would be magnified during major maintenance activities, where the need for materials and services would increase significantly.

One of the key concerns raised during the stakeholder consultation phase of this environmental assessment has been related to water consumption. As discussed in Section 3.6, the potential environmental advantages of providing new infrastructure to provide an alternate water source that is not dependant on current potable water supplies would be outweighed by the adverse impacts, in terms of the resources/energy and costs that would need to be spent to provide this alternate source. Delta Electricity is currently developing water conservation and re-use strategies to minimise potable water consumption rates and it is proposed that these strategies would be extended to cover the proposed gas turbine facility, resulting in no net increase in water consumption by Delta Electricity due to this proposal.

The proposal would have the advantage of stabilising electricity pricing. In the absence of adequate peak supply, the costs of electricity are likely to rise during these peak periods in the not too distant future (see Chapter 2). The operation of the proposal during these peak demand periods would, therefore, facilitate state-wide economic growth through improved system reliability and overall reduced cost of supply.

The 'black start' capability of the plant would also provide security of supply for the NSW electricity network. In the event of a major network failure, the proposed gas turbine facility would be able to assist in the quick re-establishment of electricity supplies which would be of direct benefit to emergency and/or critical users such as hospitals and rail

operators and large industrial facilities located in the central and northern regions of NSW.

As discussed in Section 15.2.2, the operation of the proposal is unlikely to significantly restrict the development of lands that would be adjacent to the proposed pipeline route, as any restrictions would generally be contained within the footprint of the existing electricity transmission corridor. Consequently, it is considered that the potential adverse economic impacts associated with restrictions on the future development of lands in the area are low. The proposed establishment of a 20-metre wide pipeline easement within the existing electricity transmission corridor would provide an avenue to landowners to negotiate a compensatory package with Delta Electricity as a result of the land use restrictions that would be imposed by the pipeline easement (which would be on top of the current restrictions imposed by TransGrid) on the relevant portion of their land.

The risk assessment conducted as part of this environmental assessment (Chapter 16) concluded that the proposal, particularly along the pipeline route, would comply with relevant land use safety criteria based on current land uses. The assessment also indicated that there may be a requirement to establish a 30-metre buffer zone from the pipeline centreline to restrict future sensitive land use developments along the entire length of the proposed pipeline route. As discussed in Section 15.2.2, this is not considered a major constraint to potential future developments adjacent to the electricity transmission easement, as this buffer zone would readily be contained within the area covered by the existing electricity transmission easement to the north and along public road reserves to the south for most of its length.

The inlet facility would be located on land that is currently being considered for potential underground mining activities by the existing land owner. As discussed in Section 15.2.2, in the absence of any details on the extent, scope or layout of the proposed aboveground/underground activities on this land, it is not possible to determine whether the location of the proposed inlet facility and pipeline could have an adverse effect on the future land use potential of these lands. However, further discussions with the land owner would be conducted during the detailed design phase to determine a mutually acceptable location for this facility.

## **17.3 Mitigation**

### **17.3.1 Construction**

Although no specific mitigation measures have been proposed for the construction phase of the project, the use of local trades and services would be sourced, where possible, during the construction period to maximise the economic benefits to the local community.

### **17.3.2 Operation**

The proposed establishment of a dedicated pipeline easement within the existing electricity transmission easement, which would be negotiated with respective land

owners, would minimise potential economic impacts associated with restrictions on the future development of lands adjacent to the proposed pipeline route easement.

## **17.4 Conclusions**

It is expected that economic benefits would flow throughout the local communities during the two year construction period. It is anticipated that a number of local businesses would also benefit from increased expenditure associated with construction activities. It is, therefore, anticipated that the overall economic effect of the construction phase would be beneficial to the local area.

The proposal would provide the long-term benefit of stabilising electricity pricing during peak demand periods and facilitate state-wide economic growth through improved system reliability and overall reduced cost of supply. The 'black start' capability of the plant would also provide security of supply for the NSW electricity network which would be of direct benefit to emergency and/or critical users such as hospitals and rail operators and large industrial facilities located in the central and northern regions of NSW.

CUMULATIVE IMPACTS

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## **18. Cumulative impacts**

### **18.1 Introduction**

Cumulative impacts are those resulting from the interaction of the proposal with existing and future proposed land uses in the vicinity of the area affected by the proposal. The key potential cumulative impacts associated with the proposal relate to air and noise emissions from the facility owing to the presence of Vales Point and Munmorah Power Stations and other existing and/or proposed industrial facilities in the region.

A brief description of the potential cumulative impacts during the construction and operation phases of the proposal is provided in the following sections.

### **18.2 Construction**

Potential developments in the nearby area which may interact with the construction of the proposal include:

- urban redevelopment comprising industrial, commercial, retail and residential development covering approximately 115 hectares of land adjoining the northern side of the proposed pipeline route (at the time of writing no development application had been submitted for this development)
- other possible urban development of land adjoining the pipeline route, zoned for industrial, employment, special uses or investigation. Apart from the above mentioned proposal, Wyong Shire Council was not aware of any proposed development of these lands at the time of writing. Therefore these are not considered further.
- possible underground mining of the area affecting four lots located due east of the F3 Freeway. No plans of the proposal were available for review at the time of writing. The Mine Subsidence Board is also not aware of the proposed nature, extent and/or timing of the works.

Development of the surrounding land is constrained by protected wetlands and major infrastructure corridors (including road, rail and electricity transmission). As discussed in Chapter 15, the potential land use impacts of the proposal have been minimised by restricting the development of the pipeline route within an existing electricity transmission corridor which spans the length of the pipeline route. The assessment concluded that the proposed pipeline would not have an adverse impact on current and future land uses, such as those described above.

The impacts on noise and air during construction are described in detail in Chapters 10 and 11. It is not anticipated that any other construction works would be undertaken in the vicinity of the proposal at the same time. Therefore the cumulative impact would be negligible.



Local labour and materials would benefit from the facility construction. Local employment and expenditure would assist the cumulative economic growth of the local area through flow on benefits to retail, entertainment and services.

## **18.3 Operation**

The following existing and proposed facilities have the potential to interact in relation to air and noise emissions from operation of the proposed gas turbine:

### **Existing**

- Munmorah Power Station
- Vales Point Power Station
- Eraring Power Station.

These three power stations are all coal-fired.

### **Proposed**

- Gas turbine facility at Tomago NSW (Hunter Region), which received development approval in 2002.

In addition to these facilities, major transport infrastructure is present within the locality including the F3 Freeway, Link Road and the Main Northern Railway.

Potential cumulative impacts in relation to air quality have been assessed through local and regional airshed modelling. Results of the modelling are presented in Chapter 11 and Technical Papers 4 and 5. The modelling results indicate that emissions from the gas turbine facility would lead to minor increases in nitrogen dioxide levels within the local airshed and negligible change in ground level concentrations of ozone within the regional airshed. The air quality assessment concluded that the proposal does not pose an adverse cumulative impact on the current local and regional ambient air quality and would comply with the relevant ambient air quality goals set by the Department of Environment and Conservation and National Environment Protection Council.

Potential cumulative impacts in relation to noise have been assessed for nearby receptors as the noise assessment incorporates existing background noise levels determined by ambient monitoring. The noise assessment is presented in Chapter 10 and Technical Paper 3 and predicts a marginal exceedance of 1 dBA at one residential area to the east under typical conditions and up to 4 dBA at residential areas to the east and south east under extreme adverse meteorological conditions. A statistical analysis of these potential exceedances, however, demonstrated that the likely impacts associated with these exceedances were low and within acceptable limits. The assessment concluded that based on the assessment results, and with consideration of the proposed mitigation measures to be implemented during the construction and operation of the proposal, the proposal is unlikely to result in adverse noise impacts on the nearest sensitive receptors.

## **18.4 Mitigation**

Liaison with Wyong Shire Council would identify any projects with possible overlap of construction periods. Potential interactions would be addressed as needed through implementation of the construction environmental management plan for the project. The mitigation measures set out in Chapters 10 and 11 in relation to noise and air quality would mitigate potential cumulative impacts from the operation of the facility.

## **18.5 Conclusion**

The results of this assessment concluded that the proposal is unlikely to have an adverse cumulative impact on the surround land uses due to the location of the proposed pipeline route.

Potential cumulative impacts in relation to air quality have been assessed through local and regional airshed modelling. The air quality assessment concluded that the proposal does not pose an adverse cumulative impact on the current local and regional ambient air quality and would comply with the relevant ambient air quality goals set by the Department of Environment and Conservation and National Environment Protection Council.

Potential cumulative impacts in relation to noise have been assessed for nearby receptors. The assessment concluded that based on the assessment results, and with consideration of the proposed mitigation measures to be implemented during the construction and operation of the proposal, the proposal is unlikely to result in adverse noise impacts on the nearest sensitive receptors.

JUSTIFICATION

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## 19. Justification

The proposal has been developed to provide peak electricity supply to the NSW network with the least possible environmental and social impact. The principal findings of the environmental assessment are summarised below.

### 19.1 Biophysical considerations

The proposal described in Chapter 4 has been determined following extensive development and consideration of options as detailed in Chapter 3. Throughout this process, a principal objective has been to ensure that the proposal provides tangible environmental benefits as well as providing the necessary infrastructure to service future peak load energy demands.

The biophysical implications of the project are discussed in Chapters 7 to 18 of this environmental assessment. In summary, the key finding of the environmental assessment are that no significant adverse environmental impacts have been identified. A summary of the findings is provided below:

#### **Soils and geology**

The presence of mine subsidence requires consultation with a mining lease holder regarding future development plans to finalise design. Design would be undertaken in accordance with Mine Subsidence Board specifications. Possible acid sulfate, reactive and aggressive soils would be identified and managed during construction to prevent any adverse impacts.

#### **Surface water**

Preparation of a soil and water management plan would control the impacts associated with construction and operation of the facility. Site erosion and sediment control measures would be developed to prevent any sedimentation or contamination of water bodies located near the proposed works.

#### **Flora and fauna**

The proposal is unlikely to have a significant impact on any local or regionally significant plants or animals. Located within existing cleared areas and a partially cleared maintained electricity easement, the proposal would require minor vegetation clearing.

#### **Noise**

Construction noise associated with the proposed gas turbine facility is predicted to meet the criteria at all residences. Based on the results of the noise impact assessment, and with consideration of the proposed mitigation measures to be implemented during the construction and operation of the proposal, the assessment concluded that the proposal is unlikely to result in adverse noise impacts on the nearest sensitive receptors.

### **Air quality**

An assessment of the potential air quality impacts of the proposed gas turbine facility on the local and regional airsheds concluded that the proposal would have a minor effect on the existing ambient air quality levels and would readily comply with the relevant air quality goals set by the Department of Environment and Conservation.

The proposal has the potential to have a positive impact, although limited due to low capacity factor, on the NSW pool coefficient. This is considered to have important State-wide significance, as it would help to reduce greenhouse gas emissions per unit of output in NSW.

### **Visual and landscape**

The proposed stacks would not protrude above the existing buildings and not be as visually dominant as the two existing boiler stacks. While the stacks and buildings may be intermittently visible at greater distances, it is unlikely to have a significant impact on the local visual landscape.

### **Traffic and transport**

Additional traffic impact on the local road network would be negligible. A detailed transport assessment would be prepared to identify the most appropriate transport route for delivery of the oversize plant components. A traffic management plan would detail specific control measures to manage traffic disruptions. Transport of the major plant components would be undertaken in consultation with and with the approval of the NSW Roads and Traffic Authority, Newcastle, Lake Macquarie and Wyong Shire Councils

### **Land use and property impacts**

Containment of the facility within the existing Delta property with its extensive buffer lands would prevent potential land use conflicts and minimise potential noise and visual impacts. Land use impacts of the pipeline route are reduced by utilising the existing electricity transmission easement, which already imposes land use restrictions along the easement. The proposal would not impede or restrict future land use opportunities.

### **Hazards and risks**

Based on the preliminary hazard assessment, the proposal meets the land use safety criteria defined by Department of Planning for all land uses on the basis that the proposed mitigation measures are implemented during the construction, commissioning and operation phases of the proposal.

### **Social and economic impacts**

The construction would provide short-term economic benefits to the local community. Long-term economic benefits would be gained through out NSW due to the improved reliability of electricity supply during peak demand periods.

## 19.2 Cumulative effects

With consideration of the surrounding existing and proposed land uses, the mitigation measures proposed to manage noise, air, traffic, visual amenity and land use would ensure the construction and ongoing operation of the facility would not have an adverse cumulative impact on the existing or future proposed environment.

## 19.3 Proposal Objectives

The justification of the proposal in terms of the proposal objectives outlined in Section 1.1.5 of this environmental assessment is discussed below.

- **Provide electricity at relatively short notice during periods of peak demand:** The proposed gas turbine facility is based on open-cycle gas turbine technology, which can start-up and reach full load in less than 30 minutes.
- **Provide black start capability to improve system security, stabilisation and emergency response:** The proposed gas turbine facility would be provided with a black-start generator which would be able to start the gas turbines during a complete system shutdown or black out.
- **Provide electricity using best available technology and low greenhouse gas emissions:** Although there are a number of suitable technology options available, the open-cycle gas turbine technology described in this environmental assessment was selected as it currently represents the most commercially viable and proven technology suited for peaking plant operation. The greenhouse intensity factor of an open-cycle gas turbine facility is significantly lower than coal-fired power generation and would help to reduce the NSW pool coefficient.
- **Establish electricity supply that is market-competitive and consistent with current trends and future energy demands:** The proposal has been based on currently available market information relating to existing and projected peak energy demands, gas supply prices etc. The proposal has been designed with sufficient flexibility which would allow the conversion of the open-cycle gas turbine facility to a combined cycle gas turbine facility, should future market conditions and energy demand requirements become favourable for such a conversion.
- **Produce socially acceptable environmental outcomes:** The proposal has been designed to minimise environmental impacts by using 'avoid by design' principles. The assessments provided in Chapters 7 to 18 of this environmental assessment concluded that the proposal would not have an adverse effect on the biophysical environment.

## **19.4 Ecologically sustainable development**

The broadest meaning of Ecologically Sustainable Development (ESD) is “*using, conserving and enhancing the community’s resources so that the ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased*” (Commonwealth of Australia, 1992). ESD suggests how far protection needs to extend and does this by measuring how a development influences the natural environment’s ability to maintain itself. The main thrust behind ESD is that current and future generations should leave a natural environment that functions as well or better than the one inherited.

### **19.4.1 Precautionary principle**

According to the *Protection of the Environment Administration Act 1991*, the precautionary principle means that ‘*if there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation*’.

This principle was developed in response to the great difficulty of interpreting scientific data. Scientific method produces results based on confidence limits that are controlled by the scope of data acquisition, interpretation methods and general understanding within a particular scientific discipline. On occasion they have been used to validate a lack of response to a potential threat of serious or irreversible environmental degradation. ESD requires that uncertainty and the associated level of risk be considered indecision making.

The environmental impacts associated with the proposal have been thoroughly assessed and are well understood. A variety of options have been considered in the design of the proposal, including the “do-nothing option”. The “do-nothing option” has been rejected, as it does not address the needs for the project.

The environmental assessment does not identify any threats of serious or irreversible environmental harm by proceeding with the proposal and the application of the identified mitigation measures. Many of the mitigation measures outlined in Chapters 7 to 18 are designed to ensure the environment would not be threatened by serious or irreversible damage as a result of the construction and operation of the proposal.

### **19.4.2 Social equity including intergenerational equity**

Social equity involves value concepts of justice and fairness so that the basic needs of all sectors of society are met and there is fair distribution of costs and benefits to improve the well-being and welfare of the community, population or society. Social equity also includes intergenerational equity which requires that the present generation ensure the health, diversity and productivity of the environment is maintained or enhanced for future generations (Department of Urban Affairs and Planning, 1995).

The proposal would provide social benefits for the local communities, as discussed in Chapter 17.

### **19.4.3 Conservation of biological diversity and maintenance of ecological integrity**

Biological diversity refers to the diversity of genes, species, populations, communities and ecosystems and the linkages between them. Biological resources provide food, many medicines, fibres and industrial products. They are also responsible for providing ecological services such as maintaining soil fertility and the supply of clean and freshwater (Harding et al 1994).

The proposal is consistent with the conservation of biological diversity and ecological integrity. A comprehensive examination of terrestrial ecology has been undertaken with specific focus on the threatened species potentially affected by the proposal. Significance assessments for a number of threatened flora species have been undertaken and have determined that the proposal would not have a significant or adverse impact on any of these species.

### **19.4.4 Improved valuation and pricing of environmental resources**

The principle establishes the need to determine economic values for services provided by the natural environment, such as the atmosphere's ability to receive gaseous emissions, cultural values and visual amenity. Applying standard methods for valuation and pricing to environmental resources is a difficult process. This is largely due to the intangible nature of much of the natural environment. The environment has conventionally been considered a free resource as environmental factors have been excluded for determining the real cost of an activity. The process of identifying impacts of a project on the environment and the services it provides (such as clean air or biological diversity) and formulating mitigation actions to ameliorate those impacts recognises the value of those resources. The indicative costs to the environment are shown by the cost of the mitigation measures and safeguards. The costs of those measures have, therefore, been included in the costs of the proposal.

The environmental assessment has examined the environmental consequences of the proposal and identified mitigation measures to address adverse impacts. These are summarised in Chapters 7 to 18. An indirect indication of the value of the environmental resources would be the cost of the proposed mitigation measures. The cost of these mitigation measures would be included in the proposal budget, demonstrating that the value of the environmental resources affected by the proposal would be maintained or enhanced. Therefore, the affected environmental resources would be acknowledged and provided for in the proposal. The mitigation measures proposed would preserve and improve environmental conditions and hence, the value of environmental resources.

## **19.5 Summary of justification**

The major benefits of the proposal relate to:

- the proposal will provide electricity at relatively short notice during periods of peak demand



- the proposal will improve electrical system security, stabilisation and emergency response by the inclusion of black start capability
- the proposal will generate electricity using best available technology and producing minimal greenhouse gas emissions
- the proposal will generate electricity that is market-competitive and consistent with current trends and future energy demands

Sections 19.1 and 19.2 demonstrate that the proposal is justified in terms of biophysical, social and economic considerations. Section 19.3 clearly demonstrates that the proposal satisfies the proposal objectives set by the community, and Section 19.4 demonstrates that the proposal is consistent with the principles of ESD.

The proposal is justified based on the above considerations, as it clearly represents the best solution in terms of environmental, social and economic outcomes and meets the requirements and expectations of Delta Electricity, the NSW government and community to deliver a reliable and effective electricity generation proposal which can adequately meet the peak energy demands that are expected to occur in NSW over the next three to five year period.

## GLOSSARY OF TERMS

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## 20. Glossary of terms

<b>Term</b>	<b>Definition</b>
ACF	Available Capacity Factor
ACW	Auxiliaries Cooling Water
AGO	Australian Greenhouse Office
BOP	Balance of Plant
CW	Cooling Water
ISO	International Standards Organisation
NEC	National Electricity Code
NEMMCO	National Electricity Market Management Company
NMI	National Metering Identifier
OCGT	Open Cycle Gas Turbine
CCGT	Combined Cycle Gas Turbine
OEM	Original Equipment Manufacturer

<b>Engineering Unit</b>	<b>Definition</b>
kL	Kilolitres
kLpa	Kilolitres per Annum
kW	Kilo Watt
MW	Mega Watt
kWh	Kilo Watt Hour
kg/h	Kilograms per Hour
kg/kWh	Kilograms per Kilo Watt Hour
μS/m	Microsimens per Metre
μS/cm	Microsimens per Centimetre
ppm	Parts per Million or Milligrams per Cubic Metre
ppb	Parts per Billion or Micrograms per Cubic Metre
LHV	Low Heating Value
HHV	High Heating Value
L/h	Litres per Hour
L/s	Litres per Second
kV	Kilo Volts
MVA	Mega Volt Amps
GJ/h	Giga Joules per Hour
scm	Standard Cubic Metres
OD	Outside Diameter
DN	Diameter Nominal
MPa	Mega Pascals

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# **ADOPTED DIRECTOR GENERAL'S REQUIREMENTS**

**APPENDIX**

**A**



NSW GOVERNMENT  
**Department of Planning**

20 OCT 2005

Contact: Scott Jeffries  
Phone: (02) 9228 6426  
Fax: (02) 9228 6466  
Email: scott.jeffries@dipnr.nsw.gov.au

Mr Carlos Olles  
Senior Environmental Engineer  
Parsons Brinckerhoff Australia Pty Limited  
PO Box 1162  
NEWCASTLE NSW 2300

Our ref: 9037381 - 905/3361  
Your ref:

Dear Mr Olles

**Proposed Gas-Fired Power Station, Existing Munmorah Power Station Site,  
Scenic Drive, Doyalson, Wyong Local Government Area**

I refer to your correspondence of 22 August 2005, with which you seek adoption of the Director-General's requirements for the preparation of an Environmental Impact Statement for the above proposal as Environmental Assessment requirements under Part 3A of the *Environmental Planning and Assessment Act 1979*.

Pursuant to clause 8J(1) of the *Environmental Planning and Assessment Regulation 2000*, the Director-General hereby adopts the requirements issued on 10 June 2005, as Environment Assessment Requirements under section 75F(3) of the Act. These requirements have been recast to include administrative matters under Part 3A of the Act, and are attached.

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.

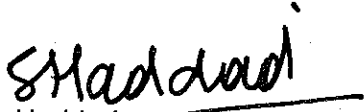
You should ensure that you consult with the Department prior to submission of a draft Environmental Assessment to determine:

- 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, Scott Jeffries ((02) 9228 6426, [scott.jeffries@dipnr.nsw.gov.au](mailto:scott.jeffries@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



Sam Haddad

**Deputy Director-General**

As delegate for the Director-General

27/9/2005.

# OPEN CYCLE GAS FIRED POWER STATION, MUNMORAH

## ENVIRONMENTAL ASSESSMENT REQUIREMENTS UNDER PART 3A OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

<b>Project</b>	The construction and operation of an open cycle gas-fired power station with output capacity up to 500 megawatts, and associated lateral gas supply infrastructure to connect the power station to the existing.
<b>Site</b>	Lot 61 DP 1065038, Scenic Drive, Doyalson, Wyong local government area (in relation to the power station component of the project). Land between the power station site and the Horsley Park to Hexham gas pipeline to the west (in relation to the gas supply infrastructure component of the project).
<b>Proponent</b>	Delta Electricity
<b>Date of Issue</b>	10 June 2005
<b>Date of Expiration</b>	10 June 2007
<b>General Requirements</b>	<p>The Environmental Assessment must be prepared to a high technical and scientific standard and must include:</p> <ul style="list-style-type: none"> <li>• an executive summary;</li> <li>• a description of the proposal, including construction, operation, and staging;</li> <li>• an assessment of the environmental impacts of the project, with particular focus on the key assessment requirements specified below;</li> <li>• justification for undertaking the project with consideration of the benefits and impacts of the proposal;</li> <li>• a draft Statement of Commitments detailing measures for environmental mitigation, management and monitoring for the project; and</li> <li>• certification by the author of the Environment Assessment that the information contained in the Assessment is neither false nor misleading.</li> </ul>
<b>Key Assessment Requirements</b>	<p>The Environmental Assessment must include assessment of the following key issues:</p> <ul style="list-style-type: none"> <li>• <b>Strategic Planning</b> – the Environmental Assessment must provide a strategic assessment of the proposal, including a strategic justification of the need, scale, scope and location for the project in relation to the strategic direction of the region and the State regarding electricity generation, likely electricity demand and any predicted transmission constraints; and strategic planning and analysis of the suitability of the proposed site regarding potential land use conflicts with existing and future surrounding land users.</li> <li>• <b>Air Quality Impacts</b> – the Environmental Assessment must include a comprehensive cumulative assessment of the emission of air pollutants in accordance with the <i>Approved Methods for Modelling and Assessment of Air Pollutants in NSW</i> (EPA, 2001). Particular reference must be made to: cumulative air emissions from the project and the existing electricity generating station at the site at a local, regional and interregional level; the air emissions that contribute to photochemical smog formation; and greenhouse gas emissions (total emissions and emissions intensity) from the project, with consideration of Government policies regarding greenhouse gases.</li> <li>• <b>Gas Pipeline Route</b> – the Environmental Assessment must identify the proposed route for the natural gas pipeline and clearly describe the ownership, land use and zoning provisions for the land along the route. Where relevant, the Environmental Assessment must, with respect to the pipeline route, clearly identify potentially impacted critical habitats; threatened species, populations or ecological communities, or their habitats along the proposed pipeline route, and apply the test of significance under Part 5A of the <i>Environmental Planning and Assessment Act 1979</i> in relation to any clearing; and include an Aboriginal heritage impact assessment of land along the proposed pipeline route.</li> <li>• <b>Hazards and Risk Impacts</b> – the Environmental Assessment must include a screening of potential hazards on site (including the pipeline route) to determine the potential for off site impacts and any requirement for a Preliminary Hazard Analysis (PHA), under the provisions of SEPP 33. The PHA, should one be required, must be prepared in accordance with the Department's <i>Hazardous Industry Planning Advisory Paper No. 3, Hazardous Industry Planning Advisory</i></li> </ul>

	<p><i>Paper No. 6 and Multi-level Risk Assessment.</i> Risk impacts associated with the transport of dangerous goods and hazardous materials must be documented with reference to the Department's draft <i>Route Selection</i> guideline.</p> <ul style="list-style-type: none"> <li>• <b>Water Quality and Management</b> – the Environmental Assessment must include an assessment of water management associated with the project, with particular reference to the water needs of the project, the proposed source of water, and the implementation of water saving measures (including use of treated effluent or rainwater). The Environmental Impact Statement must also identify the quantity and quality of wastewater, how this wastewater would be disposed of, and how stormwater would be managed at the site.</li> <li>• <b>Noise Impacts</b> – the Environmental Assessment must assess noise impacts from the project in accordance with the <i>Industrial Noise Policy</i> (EPA, 2000), with reference to cumulative noise impacts to nearby sensitive receivers.</li> <li>• <b>General Environmental Risk Analysis</b> – notwithstanding the above key assessment requirements, the Environmental Assessment must include an environmental risk analysis to identify potential environmental impacts associated with the project (construction and operation), 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 this additional key environmental impacts must be included in the Environmental Assessment.</li> </ul>
<b>Consultation Requirements</b>	<p>You must undertake an appropriate and justified level of consultation with the following parties during the preparation of the Environmental Assessment:</p> <ul style="list-style-type: none"> <li>• NSW Department of Environment and Conservation;</li> <li>• Wyong Shire Council;</li> <li>• Australian Rail Track Corporation, the Rail Infrastructure Corporation and the NSW Roads and Traffic Authority; and</li> <li>• the local community.</li> </ul> <p>The Environmental Assessment must clearly indicate issues raised by stakeholders during consultation, and how those matters have been addressed in the Environmental Assessment.</p>
<b>Deemed refusal period</b>	<p>Under clause 8E(2) of the <i>Environmental Planning and Assessment Regulation 2000</i>, the applicable deemed refusal period is 60 days from the end of the proponent's environmental assessment period for the project.</p>



# GOVERNMENT AUTHORITY CORRESPONDENCE

APPENDIX

B



Department of  
**Environment and Conservation (NSW)**

Received  
1 JUN 2005

Your reference : Attn Mr Tim Ward  
Our reference : 270754A6 NEF16880  
Contact : Trevor Henderson, 49 086 824

27 MAY 2005

**Department of Infrastructure  
Planning and Natural Resources  
GPO Box 39  
SYDNEY NSW 2001**

**North East Branch**

Dear Sir,

**PROPOSED OPEN CYCLE GAS TURBINE POWER PLANT AND NATURAL GAS SUPPLY  
PIPELINE – MUNMORAH POWER STATION**

I refer to your request for the Department of Environment and Conservation to provide requirements for an environmental impact statement (EIS) for the above development described in the briefing paper dated 5 April 2005 and discussed at the subsequent planning focus meeting on 11 May 2005.

The DEC assumes the Department of Infrastructure Planning and Natural Resources (DIPNR) will provide the applicant with details of the general requirements for the EIS.

The DEC has considered the details of the proposal as provided by DIPNR and Delta Electricity and has identified the information it requires, to determine if it can issue general terms of approval are set out in Attachment 1. In summary, the DEC's specific information requirements for the proposal are:

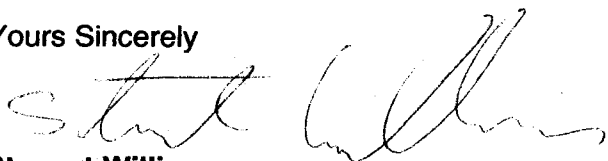
1. A comprehensive assessment of air emissions including the contribution of emissions to photochemical smog formation.
2. Details of all other emissions from the plant.
3. An assessment of local, regional, interregional and cumulative air quality impacts from the plant.
4. An assessment of water quality issues including water source and consideration of alternative water sources (aside from potable water), including the use of treated effluent.
5. Re-use options for the heat generated in the process should be investigated and discussed.

6. A noise impact assessment with particular attention to emissions from the operation of the plant, switch yard and transmission equipment on-site.
7. A waste management plan that identifies and classifies waste generated on-site in accordance with the EPA's waste guidelines.
8. Flora and fauna impact assessment.
9. Aboriginal cultural heritage impact assessment.

The DEC requests that the applicant provide four (4) copies of the DAVEIS when lodging its application with the DEC. These documents should be lodged at PO Box 488G NEWCASTLE WEST NSW 2302.

If you have any questions concerning the overall project or pollution control issues please contact Trevor Henderson on (02) 49086824. For any questions concerning flora and fauna contact Estelle Blair on 02 6659 8256 and for Aboriginal cultural heritage matters Liam Dagg on 02 6659 8282.

Yours Sincerely



**Stewart Williams**  
**Acting Head, Regional Operations Unit**  
**Environment Protection & Regulation Division**  
**Department of Environment & Conservation (NSW)**

## Attachment 1

### Specific Information required by the DEC

The EIS must provide sufficient information for the DEC to be able to fully assess the development in so far as the impacts related to the DEC's statutory responsibility under the provisions of the environmental legislation administered by the DEC. More specifically the requirements of Section 45 of the Protection of the Environment Operations Act 1997 must be addressed.

The EIS must include a comprehensive description of the production processes and a comprehensive description of any proposed control measures.

The DEC requires the EIS to address in detail the following issues.

#### 1. Air Pollution

The EIS must include a robust Air Quality Impact Assessment (AQIA) based on dispersion modelling in accordance with the publication "*Approved Methods and Guidance for Modelling and Assessment of Pollutants in NSW*". The EPA's requirements for the AQIA to be included in the EIS are specified in Attachment 2 of this document.

The EIS must describe in detail the measures proposed to mitigate the impacts and quantitatively the extent to which the mitigation measures are likely to be effective in achieving the relevant environmental outcomes. A Cost Benefit Analysis on different mitigation measures/ technologies that have been investigated should also be included. \*

#### 2. Water Issues

The DEC understands that there will be no discharge of process waters to Tuggerah Lakes and that the development would only generate 12 KI of wastewater per year associated with compressor washing activities.

The EIS should identify the sources of potable water required investigate other sources of water including treated wastewater from local sewage treatment plants. The potential for on-site re-use of wastewater and waste heat generated by the plant should be assessed.

The EIS must include a water management plan and site water balance incorporating the following principles:

- Maximum on-site reuse of wastewater together with the use of control and storage works to avoid to the maximum practical extent, any discharge of pollutants from the premises.
- Prevention of wet weather overflows of contaminated stormwater by collection and reuse or treatment of contaminated first flush stormwater.
- Segregation of contaminated water from non-contaminated water to minimise the volume of polluted water to be dealt with.
- Spillage controls and bunding for material used onsite, including any biocides that may be applied to the cooling water stream.
- Sealing and effectively bunding storage areas and active areas of the plant to prevent soil and groundwater contamination.
- Characterising the quality of stormwater or process water to be drained from the development site and propose measures to mitigate against the impacts on water quality in the Tuggerah

Lakes or ground waters. The DEC has adopted the Australian and New Zealand Environment conservation Council Water Quality Guidelines for Fresh and Marine Waters (ANZECC, 1992) as a guide for the assessment of environmental impacts on aquatic ecosystems.

If it is proposed to build an amenities block for site employees the EIS should describe the sewage treatment and effluent management system, estimate the quantity and quality of the effluent, and demonstrate by way of water balance and land capability assessment that the effluent management system is sustainable and will not result in pollution of the Tuggerah Lakes or groundwater.

The methodology, data and assumptions used to design pollution control works and assess the potential impact of the development on water quality in Tuggerah Lakes and groundwater must be fully documented and justified.

### **3. Noise Issues**

The EIS should identify all potential noise sources and describe the extent to which noise emissions are likely to impact on any residential receiver in the vicinity of the site – including but not necessarily limited to the residential areas of Budgewoi and San Remo. The publication, '*New South Wales Industrial Noise Policy*' (EPA 2000) provides the methodology and assessment criteria applied by the EPA to assess the impacts and to determine project-specific noise planning levels.

The evaluation should take into account the construction and operational phases (including noise from the transmission equipment onsite) of the development over the 'construction' and 'operating' hours proposed and take into account adverse weather conditions including temperature inversions.

Sound power levels measured or estimated for all plant and equipment should be clearly stated and justified.

The EIS should include an assessment of cumulative noise impacts, having regard to any other developments existing and/or approved for the Budgewoi and San Remo area in general. The EIS should clearly detail any noise impacts from the plant's operations, and if necessary provide details on proposed noise control measures.

#### **3.1 Road Traffic Noise**

Road transport to and from the premises has the potential to increase disturbance at residential properties along private or public haulage routes. To assess the extent of the impact the Noise Impact Assessment (NIA) should identify the transport route(s) to be used, the hours of operation and quantify the noise impacts. The publication '*Environmental Criteria for Road Traffic Noise*' (EPA, 1999) describes the methods generally applied by the EPA to determine noise planning levels for road traffic noise in locations of varying sensitivity.

The methodology, data and assumptions used to assess the impact of road haulage on residential properties must be fully documented and justified.

Where disturbance due to road transport is likely to exceed the recommended criteria, the EIS must describe the measures proposed to mitigate the impacts and the extent to which the measures are likely to be effective in achieving the relevant criteria.

#### **4. Waste Issues**

The proponent should have a waste management plan, which details its philosophy and proposals for minimising and disposing of all waste streams. The waste management plan should identify and classify any waste onsite in accordance with the EPA's '*Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes*'. The EIS should clearly identify methods of reducing waste volumes and recycling and reusing wherever possible.

The avenues for disposal of industrial/hazardous waste are limited within New South Wales at present and the proponent should detail the likelihood of generation of these wastes and anticipated storage/disposal methods.

The EIS must identify any fuel or chemical storage areas to be established on the site and describe the measures proposed to minimise the potential for leakage or migration of pollutants into the soil, groundwater or Tuggerah Lakes.

#### **5. Gas Feeder Pipeline**

The EIS should fully assess the impacts from the construction and operation of the gas pipeline leading to the plant. Careful site selection will be important to mitigate any impacts from these developments.

#### **6. Construction Phase**

Impacts of any specific activities involved in site preparation should be identified. Details of appropriate erosion and sedimentation, dust and noise controls should be included in the EIS.

All areas disturbed during construction, which are not included in the working area of the plant, must be revegetated to a high standard.

The likelihood of disturbing acid sulphate soils during the construction phase must be detailed in the EIS and contingency plans proposed for the management of acid sulphate material proposed.

#### **7. Monitoring Programs**

The EIS should specify and assess all monitoring programs for measuring noise, air quality and water quality monitoring during the construction phase and on-going operation of the facility. These monitoring programs should be capable of assessing whether or not the development achieves a satisfactory level of environmental performance. The evaluation should include a detailed description of the monitoring strategies, sample analysis methods and the level of reporting proposed.

#### **8. Community Consultation**

The proposal should demonstrate decision-making processes that are predictable and transparent and include:

- Making information available at an early stage so that major issues are addressed during the project planning stage;
- Adopting consultative mechanisms between the proponent and the community as a means of minimising disputation at the formal environmental assessment stage;
- Establishing appropriate conflict resolution mechanisms for use during the project assessment process;
- Discussion of Best Practice Management techniques including the potential use of environmental management plans and environmental audits;
- Ensuring that best practice monitoring and enforcement procedures are proposed;

- Identifying the responsibilities of the proponent and government agencies for environmental management and enforcement.

## 9. Flora And Fauna

The EIS must detail the existing environment including discussion on flora and fauna characteristics. The following requirements should be addressed at a level of investigation appropriate to the site's current condition.

Your attention is also drawn to the Commonwealth legislation, the *Environment Protection and Biodiversity Conservation Act 1999*. If any species requiring consideration under this legislation may be affected by the proposal, approval for the works may also be required from the Commonwealth Department of Environment.

### Flora

A comprehensive description of the vegetation of the subject site should be prepared. This will include an assessment of the condition of the plant communities present, including the designation of conservation significance at a local, regional and State level, and an assessment of the likely occurrence of any threatened species, populations and / or ecological communities listed under Schedules 1 or 2 of the *Threatened Species Conservation Act 1995* and any Rare or Threatened Australian Plant (ROTAP) species.

A plan showing the distribution of any threatened or ROTAP species and the vegetation communities on the subject site, and the extent of vegetation proposed to be cleared should be provided. This plan should be at the same scale as the plan of the area subject to development, and preferably showing the footprint of the proposed development superimposed on the vegetation, in order to assist in the assessment of impacts on existing vegetation.

Where the assessment concludes that threatened species, populations or their habitats, or endangered ecological communities exist on or are in close proximity to the subject site, the effect of the proposed development should be determined by an assessment pursuant to Section 5A of the *Environmental Planning and Assessment Act 1979*. An assessment of the impact of the development on the plant communities and / or ROTAP species should also be provided.

A description of the measures proposed to mitigate and / or ameliorate the impact of the development on the plant communities, threatened and ROTAP species.

### Fauna

A fauna survey to identify the distribution and abundance of fauna species known or likely to use the subject site should be undertaken. This should include a description of available fauna habitats and an assessment of the conservation status of each of the faunal components at a local, regional and State level.

A plan showing the results of the above survey should be provided. The plan should be at the same scale as (or as an overlay to) the plan of the development footprint and overall site, to assist in the assessment of potential impacts of the proposal on fauna.

An assessment of the potential impact of the development on fauna should be provided.

An assessment of the occurrence or likely occurrence of threatened species or populations, or their habitats, on the subject land should be provided. Where the assessment concludes that threatened species or populations, or their habitats, exist on or in close proximity to the subject site, the effect of the proposal should be determined in accordance with an assessment pursuant to Section 5A of the *Environmental Planning and Assessment Act 1979*.

A description of the measures proposed to mitigate and/or ameliorate the impact of the development on fauna should be provided.

### **Surveys and Assessments**

The DEC can provide records of flora and fauna held in the Wildlife Atlas and / or Rare or Threatened Australian Plants (ROTAP) databases. The Wildlife Atlas can be accessed at <http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>. It should be noted that these databases are not comprehensive, should only be used as a guide and do not negate the need for specific site investigations.

Suitably qualified persons should undertake fauna, flora, vegetation and cultural heritage surveys and the qualifications and experience of the persons undertaking the work should be provided. Surveys and assessments should not be confined to the immediate development footprint, but also include any areas where ancillary works may be undertaken, for example, any upgrade in site access roads or other supporting infrastructure.

Dates and times, site locations, survey design and methodology, analysis techniques and weather conditions at the time of the assessments and surveys must be provided. The limitations of surveys should be identified and the results interpreted accordingly.

Conclusions drawn in surveys and assessments should be substantiated by evidence resulting from those surveys and assessments. The document being supported by the surveys and assessments should reflect the conclusions and clearly state where recommendations of the survey and assessments have been incorporated in the proposal.

## **10. Aboriginal Cultural Heritage**

### **General Issues**

For the purpose of these guidelines Aboriginal heritage is considered to include "Aboriginal objects" and places of significance to Aboriginal communities.

Under the *National Parks and Wildlife Act 1974* (NP&W Act), an "Aboriginal object" is defined as any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of the area by persons of non-Aboriginal extraction, and includes Aboriginal remains. Aboriginal objects are confined to physical evidence. Aboriginal objects are sometimes referred to as Aboriginal sites.

An "Aboriginal place" is a place, which has been declared so by the Minister for the Environment because s/he believes that the place is or was of special significance to Aboriginal culture. It may or may not contain physical Aboriginal objects.

It should also be noted that there are places in the landscape, which have particular meaning for Aboriginal people, for example, spiritual areas or natural mythological areas. Although these



areas are not protected under the NP&W Act, unless they contain physical remains of Aboriginal occupation or have been declared an "Aboriginal place", it is recommended that the potential impact of proposals on such places also be considered in the assessment process.

Should any Aboriginal archaeological sites be present in the study area, the requirements of the NP&W Act with respect to Aboriginal objects should also be considered. Under s.90 of the NP&W Act, it is an offence to knowingly damage deface or destroy Aboriginal objects without prior permission of the Director-General of the DEC.

### Assessment requirements

It should be noted that Aboriginal cultural heritage is ubiquitous in the Lower Hunter/Central Coast area, even in areas, which have already been highly modified. If any topsoil disturbance or excavation is proposed then there may be potential to uncover Aboriginal objects.

The presence or absence of Aboriginal objects should be identified and the significance of the area to the local Aboriginal community must be determined. Accordingly a search of the Aboriginal Heritage Information Management System (AHIMS) should be conducted as a first step. Search results can be obtained upon written application to the Registrar, Cultural Heritage Division, on telephone (02) 9585 6471.

An assessment of the archaeological sensitivity of areas of the subject site and identification of significance of the site to the local Aboriginal community should be undertaken by an appropriately qualified person in consultation with the local Aboriginal community. This may require field survey.

Aboriginal objects and places of significance to the Aboriginal community should be detailed on a plan. This plan should be at the same scale as that of the subject site and development footprint, to assist in the assessment of the impact of the proposal on the identified cultural components.

A report discussing the results of survey and consultation, and including a description of measures proposed to mitigate impacts of the development on any identified Aboriginal objects and other recommendations, should be prepared in accordance with the *NPWS Aboriginal Cultural Heritage Standards and Guidelines Kit* and submitted with the EIS for review. Please note these guidelines are under review but should be used for reference purposes. A contingency plan that details the measures to be taken in the event that Aboriginal objects are discovered during the course of works on the subject site must be prepared.

Details of extensive consultation with the local Aboriginal community must be provided as per the DEC Interim Community Consultation Requirements for Applicants, which may be found on the DEC website at [www.nationalparks.nsw.gov.au/npws.nsf/Content/Publications](http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Publications). Please note these guidelines are interim, with a view to being finalised following consultation with external stakeholders in 2005.

### **11. Protection of the Environment Operations Act 1997 (POEO)**

The proponent should be aware that any commitments made in the EIS might be formalised into the EPA's general terms of approval for the proposal. These commitments may also be included as conditions of an Environment Protection Licence issued for the construction and operation of the proposed works under the POEO Act. Consequently, pollution control measures should not be proposed if they are impractical, unrealistic or beyond the financial viability of the development.

## **Attachment 2**

### **Air Emissions and Regulatory Controls for an Open Cycle Gas Turbine Plant**

#### **Air Quality Impact Assessment Requirements**

At a minimum, the EPA requires the following information to be included in the Air Quality Impact Assessment.

##### **1. Site plan**

A site plan should be provided which clearly details the following information:

- Layout of the site clearly showing all existing and proposed unit operations;
- All emissions sources clearly identified;
- Plant boundary;
- Sensitive receptors (eg. nearest residences); and
- Topography.

##### **2. Description of the Proposal**

A detailed description of both the existing process and the proposed process should be provided. This description should include a detailed discussion of all unit operations to be carried out at the site and a process flow diagram.

A detailed list of all raw materials used in the process should be provided.

Plans, process flow diagrams and descriptions should be provided which clearly identify and explain all proposed pollution control equipment and pollution control techniques for all processes on the premises. All aspects of the proposed air emission control system should be discussed and described, with particular regard to any fugitive emission capture (eg. hooding, ducting), treatment (eg. scrubbers, bag filters etc) and discharge systems (eg. stack).

A manufacturers performance guarantee or similar should be provided for all air emission control equipment. The guarantee should include items such as pollutant removal efficiency and pollutant emission rates for all relevant air pollutants (eg. Clean Air (Plant & Equipment) Regulation 1997 pollutants and other pollutants of concern).

Details should be provided on proposed measures to continuously monitor all relevant air pollution control equipment parameters (eg. for a bag filter, these may include an opacity and bag breakage monitor) to ensure efficient operation under all operating conditions.

All potential emission sources should be identified and discussed. Detail should be provided regarding the expected parameters of all potential emission sources i.e. location, release type (stack, volume or area) and release parameters (eg. stack height, stack diameter, exhaust velocity, temperature, emission rate).

##### **3. Local Meteorology**

A detailed discussion of the prevailing dispersion meteorology at the proposed site should be provided. The report should typically include wind rose diagrams and an analysis of wind speed, wind direction, stability class, ambient temperature and joint frequency distributions of the various meteorological parameters.

A description of the techniques used to prepare the meteorological data into a format for use in the dispersion modelling should be provided.

A QA/QC analysis of the meteorological data used in the dispersion modelling should be provided. Any relevant results of this analysis should be provided and discussed.

The meteorological data used in the dispersion modelling should be supplied in a suitable electronic format.

#### 4 Existing Ambient Air Quality

The existing ambient air quality in the vicinity of the proposal should be characterised and discussed. Ambient monitoring data from a number of locations in the Newcastle Region is published in the EPA's *Quarterly Air Monitoring Reports*, and may be of assistance in characterising the existing ambient air quality.

#### 5 Emission Inventory

The methodology used to calculate the expected pollutant emission rates for each source should be discussed in detail. All supporting source emission test reports and calculations relating to these emission rates should be provided.

The emission inventory should be supported with the following information:

- All supporting source emission test reports etc;
- Methodologies used to sample and analyse for each of the pollutants considered;
- Detailed pollutant emission rate calculations for each source; and
- A table showing all stack and fugitive source release parameters (eg. temperature, exit velocity, stack dimensions and emission rates).

#### 6 Regulatory Requirements

A detailed comparison of the expected emission concentrations for each pollutant from all proposed emission sources with the relevant standards of concentration prescribed by the Clean Air (Plant & Equipment) Regulation 1997 should be provided. Specific NO<sub>x</sub> and particulate limits for electricity generation plants are described in Table 1.

**Table 1**  
**Clean Air (Plant & Equipment) Regulation 1997 Emission Limits**

NO <sub>x</sub> (Gas Turbine, gas fuel) total electricity generating capacity <10MW >10MW	90 mg/Nm <sup>3</sup> (as NO <sub>2</sub> ) 70 mg/Nm <sup>3</sup> (as NO <sub>2</sub> )
Solid Particles	100 mg/Nm <sup>3</sup>

While the Clean Air (Plant and Equipment) Regulation 1997 specifies the maximum allowable emission levels, the NSW EPA may specify more stringent emission limits for

specific pollutants in the General Terms of Approval to ensure the necessary performance based environmental outcomes are achieved.

## 7 Air Quality Impact Assessment Criteria

The air quality impact assessment should use the following criteria (where relevant) to determine the potential air quality impact of the proposal at any location beyond the boundary of the premises.

**Table 2: National Environment Protection Measure for Ambient Air Quality (ANEPM)**

Pollutant	Exposure Period	Limit
SO <sub>2</sub>	1 hour	20 pphm
SO <sub>2</sub>	24 hour	8 pphm
SO <sub>2</sub>	Annual average	2 pphm
NO <sub>2</sub>	1 hour	12 pphm
NO <sub>2</sub>	Annual average	3 pphm
*PM <sub>10</sub>	24 hour	50 µg/m <sup>3</sup>
CO	8 hour	9 ppm
Lead	1 year	0.5 µg/m <sup>3</sup>

\*PM<sub>10</sub> is the suspended particulate matter, which has a diameter of less than 10 µm

## Dust Amenity Criteria

During the construction and operational phase of the project, impacts on amenity due to emissions of particulate matter will need to be effectively managed. The dust deposition and TSP criteria currently noted by the EPA are outlined in Table 4. Both criteria are annual averages for total solids and apply to sensitive receptors (eg at nearby residences or schools). The criteria do not generally apply within the boundaries of premises. These criteria should be used as a guide to determine whether amenity impacts are likely to occur but not as boundary limit conditions.

**Table 4**

Parameter	Measurement	Limit	Organisation
TSP	Annual average	90 µg/m <sup>3</sup>	NH&MRC**
Dust	Annual average of Monthly Depositions	4 g/m <sup>2</sup> /month	SPCC**

\*\*Ambient Air Quality Goals noted by NSW EPA

## 8 Dispersion Modelling

The cumulative impact of all proposed and existing sources at the premises should be determined by dispersion modelling. The existing ambient air quality in the vicinity of the proposal should be accounted for in the assessment of potential impacts.

A detailed discussion should be provided of air quality impacts for all relevant pollutants, based upon predicted ground level concentrations (glcs) at the plant boundary and beyond and at all sensitive receptors. The discussion should include all parameters used in the modelling and the manner in which topography, building wake effects and other site-specific peculiarities, which may effect plume dispersion, have been treated. The report should also include glc isopleths (contours) and tables summarising the predicted concentrations at sensitive receptors.

All input, output and meteorological files used in the dispersion modelling should be supplied in hard copy and suitable electronic format.



Received

31 MAY 2005

Mr Scott Jeffries  
A/Manager, Manufacturing and Rural Industries  
Major Development Assessment  
DIPNR  
GPO Box 39  
SYDNEY NSW 2001  
By Fax: 9228 6466

Dear Mr Jeffries

Thank you for the opportunity of providing comment on the requirements for the preparation of an Environmental Impact Statement (EIS) for the proposed Munmorah gas fired power station. DEUS will look forward to commenting on the EIS later in the year following the release of the *Energy Directions White Paper* and the findings of the NEMMCO 2005 *Statement of Opportunities*.

In addition to the specific requirements that DIPNR has already compiled for this proposal, DEUS would be interested for the EIS to include details of the greenhouse gas emissions for the proposed plant. The proponent should indicate the proposed source of the intended gas feed – would it for example be proposing to use a proportion of waste mine gas from local coal mining operations? Any future expansion/staging of the project to combined cycle operation should be also addressed.

DEUS would also request that the proponent details the full fuel cycle greenhouse emissions intensity of the proposed plant and outline in detail the assumptions pertaining to these intensities. The proponent should also outline the water requirements for the plant and how they would be sourced.

Should you wish to discuss these issues further please contact Kathy Staggs (8281 7443).

Yours sincerely

David Nemtsov  
Director-General

26/5/05



505.564;1  
05/1148  
James Li

Director, Major Development Assessment  
Department of Infrastructure, Planning and Natural Resources  
GPO Box 39  
SYDNEY NSW 2001

**Attention: Mr Tim Ward**

**PROPOSED GAS-FIRED POWER STATION, MUNMORAH – REQUIREMENTS FOR THE PREPARATION OF AN ENVIRONMENTAL IMPACT STATEMENT (EIS)**

Dear Mr Ward

I refer to your letter dated 18 May 2005 (Your ref: 9037381) regarding the subject proposal for a gas-fired power station and connecting gas pipeline. The RTA understands that the proposed development is listed in Schedule 1 under *State Environmental Planning Policy (State Significant Development) 2005* and the Minister is the consent authority for this proposal.

In accordance with the *Roads Act 1993*, the RTA has powers in relation to road works, traffic control facilities, connections to roads and other works on the classified road network. The Pacific Highway (SH 10), Scenic Drive (MR 336) and Motorway Link (MR 675) are classified state roads and Council is the roads authority for the above roads. The F3-Freeway is a classified road and the RTA is the roads authority for the freeway. RTA concurrence is required for works and structures in, on, under or over state roads with Council consent, under section 138 of the Act.

The RTA understands that there are two routes (one with 2 deviation options) being considered for the underground gas pipeline to connect the proposed gas-fired power station to the existing Horsley Park-Hexham gas pipeline located on the eastern side of the F3-Freeway. It is assumed from the plan provided (drawing no. 2116541B\_2000 dated 1 December 2004 by Parsons Brinckerhoff) that crossing of the F3 Freeway is not required.

The RTA has reviewed the information provided and has the following requirements for inclusion in the Director General's Requirements for the EIS:

Critical Requirements

- A traffic impact study shall be prepared in accordance with the RTA's *Guide to Traffic Generating Development*. The study should consider the impact from both construction and operational traffic generated from the proposed development. Detailed analysis of the road network including (but not limited) road capacity, key intersection performance and projected vehicle volumes are required. The study should also identify any road improvement works, intersection treatments and traffic management measures that may be required on the classified state roads.

Roads and Traffic Authority  
150 Darby Street  
Newcastle NSW 2300



150 Darby Street  
Newcastle NSW 2300

Locked Bag 30 Newcastle NSW 2300  
Fax: 02 49240342

02 49240342  
02 49240342

- The EIS would need to address DIPNR's EIS guidelines - *Energy* (Transportation and traffic issues) and accordingly all relevant State Environmental Planning Policies (SEPP) including *SEPP 11 - Traffic Generating Development* and *draft SEPP 66 - Integration of Land Use and Transport*.
- Detailed descriptions, plans and cross section drawings of the proposed pipeline located within and/or crossing through the road reserve of classified state roads should be included. This may also include details of construction works required within the road reserve.
- The impact on pedestrians and cyclists movements in the vicinity of Pacific Highway and Scenic Drive, Doyalson should be addressed.

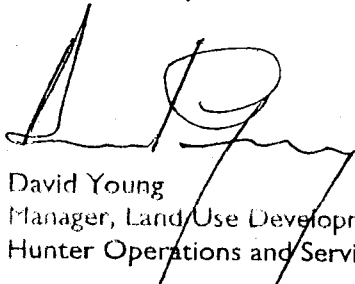
#### Other Issues for Consideration

- Wherever practical, the pipeline shall be located outside of State road reserves in a separate easement. This will minimise the impact on existing and possible future road infrastructure/assets.
- Pipeline crossings of State roads shall be perpendicular to the road reserve at a location that offers the shortest length possible. The location of the pipeline within the State road reserve shall be in accordance with RTA guidelines specifying allocation and the location of utilities.
- Road crossings are to be constructed to Australian Standards to ensure minimal disturbance to the road network in the future. Direction boring is the preferred method of construction when crossing under State roads. It is also suggested that a minimum of 1.5 metre cover be retained when crossing State roads.
- No direct vehicular access will be permitted to / from the F3-Freeway.
- The developer is advised that conditions of consent determined by the Minister do not guarantee the RTA's final consent under the *Roads Act 1993* to the specific roadwork, traffic control facilities and other structures works on the classified road network. In this regard, the developer would be required to enter into a Works Authorisation Deed (WAD) with the RTA to enable works on the classified State road network.

The RTA encourages the proponent to discuss the above issues early in the EIS process, with the RTA, Wyong Shire Council and other relevant authorities.

Following completion of the EIS, it is requested that a copy of the EIS be forwarded to the RTA for comment and requirements. Please contact me on (02) 4924 0688 if you have any queries.

Yours sincerely



David Young  
Manager, Land Use Development  
Hunter Operations and Services

9 June 2005



**Network/Property & Environment/Northern**

Telephone: (02) 4967 8681

Our Reference: 2002/ 1920 – 06 [P85661]

ABN 19 622 755 774

Northern Region • Newcastle Area  
Wirra Crescent (off University Drive)

PO Box 93 Waratah

New South Wales 2298 Australia

Facsimile (02) 4967 8783

Telephone (02) 4967 8678

Web <http://www.transgrid.com.au>

Carlos Olles  
PPK House, 9 Blaxland Road  
Locked Bag 248  
Rhodes  
NSW 2138

Dear Mr Olles,

**RE: Munmorah Gas Turbine Project – Transmission Line 21.**

In response to your enquiry of the 4<sup>th</sup> of July 2005, requesting initial comments for inclusion into the Munmorah Gas Turbine Project EIS, TransGrid offers the following comment:

- 1) Appropriate consideration should be given regarding Cathodic Protection and AC Mitigation of the pipeline during the design phase
- 2) TransGrid easement is 45m wide, centred on the centre phase conductor of the transmission line
- 3) No permanent building should be erected within 30m of any TransGrid structure
- 4) No excavation works are to take place within 15m on any TransGrid structure
- 5) The pipeline is to be installed at the edge of the easement
- 6) The pipeline trench is to be backfilled with select fill and compacted to a minimum of 98% of the maximum dry density by standard compaction. The filled disturbed surface of the trench and the compacted backfilled select material is to be sown down with a pasture seed mix of turfed
- 7) TransGrid holds the proponent responsible to make good/repair any slumping of subsidence of the pipeline trench within TransGrid easements, all associated costs are to be borne by the proponent

Further, in regard to the pipeline installation works, the ESAA National Guidelines for Safe Approach Distances to Electrical Apparatus, which Transgrid endorses, recommends a maximum height of 4.3 metres above the ground to allow adequate clearance to the transmission lines. The clearance applies at all times during construction. In particular be aware of plant and

equipment that exceed 4.3 metres in height, or are able to extend past 4.3 metres in height. If equipment exceeds 4.3 metres, operators are required to hold appropriate certification issued by the Electricity Supply Association of Australia. Any reductions in the safety clearance could result in dangerous induced voltages causing human injury or death.

Transgrid considers that an arc incident caused by equipment under the control of the proponent would jeopardise Transgrid's capacity to exercise its functions and discharge its responsibilities under the Energy Services Corporations Act.

**IMPORTANT:** Please note the following:

1. If mechanical equipment or any other thing (not specifically insulated and tested for application to high-voltage apparatus) or a person comes too close to a live power line, electrical current can "arc" – that is, it can jump the gap between the power line and the equipment, object or person, and then follow a path through the equipment, object or person to the earth.
2. Arc incidents always involve a large stream of ionised gas at extremely high temperatures, from the power line, through the equipment, thing or person, along the path to earth.
3. An arc incident can have any or all of the following consequences:
  - Death or horrific (usually to the head, face, upper body and internal organs) especially to the equipment operator or any other person in near or near the path to earth
  - Fires (especially bushfires), which can cause serious damage to, or destruction of, homes and other property, and forests
  - Damage to the mechanical equipment involved
  - Damage to Transgrid's equipment
  - The powerline itself going out of service [this can cause serious damage to the community, it can cause serious dangers to some electricity consumers, especially in hospitals, and it can have highly expensive consequences in some industries where operating plant can be damaged or destroyed if electricity supply is interrupted (especially in metal smelting plants).]
  - Serious damage to the revenue of electricity distributors
  - Serious damage to the revenue of electricity generators
  - Serious damage to Transgrid's revenue
  - Damage to TransGrid's reputation

The proponent must have in place processes and procedures to ensure that all its work activities within TransGrid's easements are in strict accordance and compliance with the ESAA Guidelines referred to above. Transgrid is

willing to provide assistance to the proponent in interpreting and understanding these guidelines.

If you have any further enquiries please do not hesitate to contact myself on (02) 4967 8758 or Robert Norton (02) 4967 8681.

Yours Sincerely

 25/8/05

Peter Minehan

Manager – Environment/ Northern Region



Our Ref: D05/036110  
Your Ref: 2116541A.LT\_0840

To: Carlos Olles 2005

From: Shay Gill

4<sup>th</sup> October 2005

Mr Shay Gill  
Parsons Brinckerhoff  
PO BOX 1162  
NEWCASTLE NSW 2300

**Re: Delta Munmorah Gas Turbine Proposal**

Dear Mr Gill,

We acknowledge the receipt of your letter dated 5<sup>th</sup> July 2005.

Please see attached a copy of the existing provisions that are currently in place and that have been carried forward from the Dangerous Goods (General) Regulation 1999 to the current Amendment (Dangerous Goods) Regulation 2005 for Gas Pipelines.

Should you require any further information or assistance please contact our information line on 131050.

Yours Sincerely

A handwritten signature in black ink, appearing to read 'D. Chamings'.

David Chamings  
Acting State Coordinator  
Substances

**WorkCover. Watching out for you.**

WorkCover NSW ABN 77 682 742 986  
WorkCover Assistance Service **13 10 50**  
Facsimile 02 4325 4145 DX731

92-100 Donnison Street Gosford NSW 2250  
Locked Bag 2906 Lisarow NSW 2252  
Website [www.workcover.nsw.gov.au](http://www.workcover.nsw.gov.au)

- (1) The WorkCover Authority must, in every licence for a transport container that is in or on, or forms part of, a vessel in or on which explosives are to be carried, insert a condition specifying the maximum quantity of explosives that may be carried in the container.
- (2) Explosives must not be carried in or on a vessel:
  - (a) unless they are stowed in such a manner and in such positions as will, so far as is practicable, prevent them from coming into contact with, or being endangered by, any other articles or substances carried in or on the vessel that are liable to cause fire or explosion, or
  - (b) by sea, unless they are stowed in such holds or places, or such receptacles, or both, as are approved, and in accordance with any conditions attached to the approval.

Contravention of this subclause is an offence and is punishable in accordance with clause 340.

- (3) The approval referred to in subclause (2) (b) is, if the quantity of explosives to be loaded or carried is:
  - (a) greater than 5 kilograms—an approval given in the particular case, or
  - (b) not greater than 5 kilograms—an approval given in the particular case or a general approval.

### Division 3 Conveyance of other dangerous goods

#### 192 Gas pipelines

- (1) In this clause:

**Gas Distribution Code** means the code issued by the Australian Gas Association and the Australian Liquefied Petroleum Gas Association under the title AG 603: Gas Distribution Code.

**pipeline** means a pipeline for the conveyance of dangerous goods of Class 2, being a pipeline that:

- (a) passes over, under or through a public place, or
- (b) passes from premises occupied by one person to premises occupied by another person.

**Note.**

Also see definition of **pipeline** in section 4 of the Act. Includes pipes or systems of pipes less than 10 kilometres in length (does not include pipelines constructed under the authority of another Act).

- (2) A person must not construct or use a pipeline unless:
  - (a) the pipeline is designed, constructed, tested and maintained in accordance with the requirements of AS 1697 (*SAA gas pipeline code*), AS 2885 (*Pipelines—Gas and liquid petroleum*), AS 4041 (*Pressure piping*) or the Gas Distribution Code that are appropriate to a pipeline of its type and intended use or in accordance with approved specifications, and

**1999 No 453**

Clause 192 Dangerous Goods (General) Regulation 1999

Part 6 Conveyance of dangerous goods

Division 3 Conveyance of other dangerous goods

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- (2) A person must not construct or use a pipeline unless:
- (a) the pipeline is designed, constructed, tested and maintained in accordance with the requirements of AS 1697 (SAA gas pipeline code), AS 2885 (Pipelines—Gas and liquid petroleum), AS 4041 (Pressure piping) or the Gas Distribution Code that are appropriate to a pipeline of its type and intended use or in accordance with approved specifications, and
  - (b) wherever it passes underground beneath a highway, road, street or thoroughfare, the pipeline is protected against damage from traffic:
    - (i) by being enclosed in a casing pipe having a diameter at least twice that of the pipeline at that place (with provision for access at both ends), or
    - (ii) by some equivalent means of protection.
- (3) In addition, a person must not construct a pipeline:
- (a) unless its construction has been approved, or
  - (b) otherwise than in accordance with any conditions attached to an approval for its construction.
- (4) An application for an approval must be accompanied by plans showing the route of the proposed pipeline, details of its proposed construction (including the position of valves) and, in the case of an underground or partly underground pipeline, full data in regard to the corrosive tendencies and other characteristics of the soil through which it is to be laid.
- (5) A person must not use a pipeline unless:
- (a) it has been tested by a competent person in the presence of an inspector, and
  - (b) if it is underground or partly underground:
    - (i) it has, within the previous 5 years, been examined for defects by a competent person at points not more than 150 metres apart along its length underground, or
    - (ii) it is equipped with a cathodic protection system in accordance with AS 2832 (Guide to the cathodic protection of metals), Part 2 (Compact Buried Structures), and that system has been monitored at intervals not exceeding 6 months by a person competent in corrosion protection, or

**1999 No 453**

Dangerous Goods (General) Regulation 1999

Clause 192

Conveyance of dangerous goods

Part 6

Conveyance of other dangerous goods

Division 3

- (iii) it is constructed of materials that resist the corrosive tendencies of the soils through which it passes, and
  - (c) it is protected on the outside in such manner as the WorkCover Authority may require, and
  - (d) wherever it crosses a river, railway or other place on a bridge or other support it is provided with an excess flow valve on the supply side of the crossing and a non-return valve on the other side.
- (6) Whenever a person tests or examines a pipeline in conformity with subclause (5) the owner must:
- (a) make and retain for at least 5 years a record of the fact and the results of the tests or examination, and
  - (b) whenever required by an inspector at a reasonable time, produce it for examination or copying by the inspector.

Contravention of this clause is an offence and is punishable in accordance with clause 340.

**193 Use of plastics or rubber piping or pipelines**

- (1) A person must not use wholly or partly within a building piping or a pipeline:
- (a) more than one metre in length, and
  - (b) made of plastics or rubber,
- for the conveyance of dangerous goods of Class 2 at a pressure of or greater than atmospheric pressure.
- (2) Subclause (1) does not apply to the use of plastics piping or a plastics pipeline for the conveyance of dangerous goods of Class 2.1 or 2.2 at a pressure of or greater than atmospheric pressure if:
- (a) the piping or pipeline and its fittings and jointing material are appropriate for the goods and their pressure, and
  - (b) the plastics has properties appropriate for the location of the piping or pipeline.

Contravention of this clause is an offence and is punishable in accordance with clause 340.

25 August 2005

Brett Corderoy  
Project Manager  
Delta Electricity  
Level 12 Darling Park  
201 Sussex Street  
Sydney, NSW 2000

cc. Carlos Olles, Parson Brinkerhoff Australia Pty Limited  
Shay Gill, Parson Brinkerhoff Australia Pty Limited

CONFIDENTIAL

Dear Brett,

Re: MUNMORAH GAS TURBINE PROJECT

We refer to the inquiry by Parsons Brinkerhoff on behalf of Delta Electricity on July 5<sup>th</sup> and the subsequent meeting with yourself and your letter of August 5<sup>th</sup>. Agility on behalf of AGL Gas Networks (AGLGN) have reviewed all the information that has been provided to date.

Agility are not in a position to consider building, owning and operating the proposed gas pipeline until a formal request for trunk transportation is received. When this occurs, a detailed engineering investigation will be required. The results of such an analysis will include capacity utilisation and may require that the concept design is changed to reflect capacity constraints at that time.

Please note that availability of capacity in AGLGN's Network should not be assumed without submitting a request and receiving (and maintaining) an offer for trunk transportation from AGLGN. Delta Electricity will need to contact a natural gas retailer to progress a formal request for a natural gas transportation service.

Agility's initial review considers the proposed design to be technically satisfactory for planning purposes only. One particular issue that requires careful analysis is the proximity to high voltage power infrastructure and the subsequent cathodic protection issues that may arise. Carlos Olles of Parsons Brinkerhoff indicated in a telephone call that contact had been made with Transgrid and further information was pending.

If Delta Electricity choose to build, own and operate the pipeline then Agility would charge for further engineering investigation on the basis that the work is for an Embedded Network Service. This service is described in AGLGN's Access Arrangement.

Please telephone me on 8977 6823 if you wish to discuss this letter.

Yours sincerely

Catherine Jones  
Contracts Manager  
For and on behalf of AGL Gas Networks Limited



## CONSULTATION MATERIALS

APPENDIX

C

# Delta

## GAS TURBINE FACILITY

NEWSLETTER NO. 1

JUNE 2005



DELTA ELECTRICITY PROPOSES TO ESTABLISH A GAS TURBINE FACILITY AT THE EXISTING MUNMORAH POWER STATION SITE TO SUPPLEMENT THE EXISTING POWER GENERATION ACTIVITIES AT THIS SITE.

### Background

Delta Electricity proposes to establish a gas turbine facility at the existing Munmorah Power Station site to supplement the existing power generation activities at this site.

Recently, the NSW Government released an Energy Directions Green Paper which demonstrated that peak demand in NSW is growing much faster than average demand. Peak demand occurs on hot summer days and cold winter days, when there is a high instantaneous demand for cooling or heating. The gas turbine facility being proposed would operate as a peaking plant to supply electricity at short notice during these times of high demand.

### Project Description

The proposed gas turbine facility will be located within the grounds of the existing Munmorah Power Station site and comprise four gas turbines and other ancillary plant items including four 35m stacks (the two existing power station stacks are 150m high). It is proposed that the existing staff would provide most of the operational and maintenance services necessary to support the new facility. Where appropriate, existing infrastructure and power lines on the power station site will also be utilised.

The natural gas will be supplied via a new underground pipeline connecting the facility to the existing Sydney-Newcastle gas pipeline located west of the facility and adjacent to the F3 Freeway.

Gas-fired power stations have the environmental advantage of producing significantly less greenhouse gas emissions than coal-fired power stations due to their increased efficiencies. Gas fired power stations can also be started and fully operational within half an hour compared to coal-fired power stations, which can require up to two days to be fully operational.

The proposed facility will use state of the art technology that maximizes energy efficiency. The current concept design of the peaking plant has been based on approximately 500 operating hours per year, of which up to 75 hours per year may be operated using distillate fuel. The peaking plant would also respond to electricity system security needs, as required.

The key potential issues relate to visual amenity and noise. The proposed facility, while located on the existing power station site which has a significant buffer zone with mature vegetation, may allow possible views of the stacks from some nearby locations.

The noise generated by the gas turbines will be considered during the design of the project and mitigated using control measures such as acoustic insulation and plant design. Noise levels at the boundary of the site will be well within environmental guidelines.

The estimated demineralised water consumption of the proposal is 24 megalitres per year (maximum), based on the estimated hours of operation per year of the proposal. The source of water supply has not yet been determined. A range of water supply options will be assessed and determined during the functional design and EIS development phases.

The proposed gas pipeline will be buried underground and will not impact on the use of adjoining land. A full hazard and risk assessment and pipeline route selection will be undertaken during the preparation of the Environmental Impact Statement (EIS) for this project. The pipeline route will be selected on the basis that cleared areas will be used where possible, with minimal impact on the conservation value of the area.

## The Process

Delta Electricity is in the process of refining the functional design of the proposed facility and pipeline route options. The preferred design and pipeline route will then be assessed with the EIS. During the preparation of the EIS, detailed studies will be undertaken to assess the social and environmental impacts of the project and develop appropriate mitigative measures.

During this process, there will be opportunities for community input via newsletters, letters, Delta's website and information line. Community feedback received during this period will be reported in the EIS document. The EIS will be displayed for public comment for a period of at least 30 days. The community will also have an opportunity to provide feedback and comments on the EIS during the public exhibition period.

The proposal is considered 'State Significant', due to the capital value of the project making the Minister for Infrastructure, Planning and Natural Resources the approval authority for the proposal.

## Keep informed

You are invited to find out more about the consultation process or provide your comments and ideas on the project by;

// Visiting the Delta Electricity website at **www.de.com.au**

// Calling the Information Hotline on 1800 817 711

The timeline for the project assessment phase is shown below.

## Timeline for Consultation Activities



## STATEMENT OF COMMITMENTS

APPENDIX

D

# Contents

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## Schedule 1: Description of the Activity

The Activity is the Munmorah Gas Turbine Facility as described in the:

- *Munmorah Gas Turbine Facility Environmental Assessment* prepared by Parsons Brinckerhoff for Delta Electricity dated November 2005
- *Munmorah Gas Turbine Facility Submissions Report* prepared by Parsons Brinckerhoff for Delta Electricity dated **[date to be inserted]**
- *Munmorah Gas Turbine Facility Preferred Project Report* (if required) prepared by Parsons Brinckerhoff for Delta Electricity dated **[date to be inserted].**

## Schedule 2: Statement of Commitments

### **Definitions**

<i>Acid sulfate soils</i>	naturally acid clays, mud and other sediments usually found in swamps and estuaries. These may become extremely acidic when drained and exposed to oxygen, and may produce acidic leachate and run-off which can pollute receiving waters and liberate toxins
<i>Activity</i>	the Activity is as described in Schedule 1
<i>Ancillary Facility</i>	temporary facility for Construction that does not form part of the Activity. Examples are an office and amenities compound, batch plant (concrete or bitumen), materials storage compound
<i>Construction</i>	includes all work in respect of the Activity other than survey, acquisitions, fencing, investigative drilling or excavation, building/road dilapidation surveys, minor clearing (except where threatened species, populations or ecological communities would be affected), establishing site compounds (in locations meeting the criteria of the Conditions), or other activities determined by the EMR to have minimal environmental impact (e.g. minor access roads, minor adjustments to services/utilities, etc.)
<i>Council</i>	Wyong Shire Council
<i>Department, the</i>	the NSW Department of Planning
<i>Director-General, the</i>	Director-General of the Department of Planning (or delegate)
<i>Director-General's Agreement</i>	a written advice from the Director-General (or delegate)

*Environmental Assessment*

means the environmental assessment for the Munmorah Gas Turbine Facility prepared by Parsons Brinckerhoff dated November 2005

*EMR*

an independent environmental auditor appointed with the approval of the Director-General to audit The Proponent's performance in implementation of the CEMP. Refer to Schedule 2, Clause 13.

*Minister, the*

NSW Minister for Planning

*Operation*

means the Operation of the Activity, but does not include commissioning trials of equipment or temporary use of parts of the Activity during Construction

*Proponent, the*

Delta Electricity

*Publicly Available*

available for inspection by a member of the general public (for example available on an internet site or at a display centre)

*Reasonable and Feasible*

consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and nature and extent of potential improvements

*Sensitive Receiver*

residence, education institution (eg school, TAFE college), health care facility (eg nursing home, hospital), religious facility (eg church), public theatre and public art gallery

*Site*

the land to which this Statement of Commitments applies



*Statement of Commitments*

refers to this document

*Submissions Report*

Munmorah Gas Turbine Submissions  
Report prepared by Parsons  
Brinckerhoff for Delta Electricity  
**[date to be inserted]**

### ***Abbreviations***

dBA	decibel, 'A' weighted scale
CEMP	construction environmental management plan
DEC	Department of Environment and Conservation. Also includes the Environment Protection Authority and the National Parks and Wildlife Service
EMP	environmental management plan
EMR	environmental management representative
L <sub>A90</sub>	the noise level exceeded for 90% of a monitoring period, also referred to as the background noise level
L <sub>A10</sub>	sound pressure level exceeded for 10% of a monitoring period
L <sub>A10, 15 min</sub>	sound pressure level exceeded for 10% of the time over a 15 minute period
OEMP	operation environmental management plan
RTA	NSW Roads and Traffic Authority

## **Administrative**

### ***The Activity***

1. The Proponent will carry out the Activity consistent with:
  - a) the procedures, identified plans, safeguards and mitigation measures identified in the Environmental Assessment prepared by Parsons Brinckerhoff and dated November 2005, as modified by the Submissions Report
  - b) this Statement of Commitments.

This Statement of Commitments prevail in the event of any inconsistency with the requirements for the Construction and Operation of the Activity arising out of the documents described in (a) above.

2. The Proponent acknowledges that this Statement of Commitments does not relieve it in any way from its obligations under any other Act.

### ***Statutory requirements***

3. The Proponent will ensure that all licences, permits and approvals are obtained and kept up-to-date as required throughout the Construction and Operation of the Activity. This Statement of Commitments does not remove any obligation of the Proponent to obtain, renew or comply with such licences, permits or approvals.

### ***Compliance***

#### *General*

4. The Proponent will ensure compliance with all of this Statement of Commitments and will implement any measures arising from this Statement of Commitments.
5. The Proponent will bring to the Director-General's attention any matter that may require further assessment by the Director-General.
6. The Proponent will comply with any requirements of the Director-General arising from the Director-General's assessment of:
  - a) any reports, plans or correspondence that are submitted to satisfy this Statement of Commitments
  - b) the implementation of any actions or measures contained in such reports, plans or correspondence.

#### *Pre-Construction Compliance Report*

7. The Proponent will prepare and submit a Pre-Construction Compliance Report to the Director-General at least four weeks before Construction commences (or within any other time agreed to by the Director-General).

The Pre-Construction Compliance Report will include:

- a) details of how the Statement of Commitments required to be addressed before Construction were complied with
- b) the time when each relevant Statement of Commitments was complied with, including dates of submission of any required reports and/or approval dates
- c) details of any approvals or licences required to be issued by government departments before Construction commences.

The Construction Compliance Reports will be made Publicly Available.

#### *Construction commencement*

- 8. The Proponent will notify the Director-General and all relevant authorities in writing at least four weeks prior to the commencement of Construction.

#### *Construction Compliance Reports*

- 9. The Proponent will provide the Director-General, Council and any other government department nominated by the Director-General with Construction Compliance Reports. The Environmental Management Representative will review the Construction Compliance Reports before they are submitted to the Director-General and bring to the Director-General's attention any shortcomings.

The first Construction Compliance Report will report on a time interval agreed to by the Director General. The second, and subsequent, Construction Compliance Reports will be submitted within agreed intervals from the date of submission of the first Construction Compliance Report for the duration of Construction and the final Construction Compliance Report will be submitted prior to demobilisation of the civil construction workforce.

The Construction Compliance Reports will include information on:

- a) compliance with the CEMP and this Statement of Commitments
- b) compliance with any approvals or licences issued by the RTA, the DEC or other government department for Construction
- c) the implementation and effectiveness of environmental controls. The assessment of effectiveness will be based on a comparison of actual impacts against performance criteria identified in the CEMP
- d) environmental monitoring results, presented as a results summary and analysis
- e) the number and details of any complaints, including a summary of main areas of complaint, action taken, response given and intended strategies to reduce recurring complaints
- f) details of any review and amendments to the CEMP resulting from Construction during the reporting period

- g) any other matter relating to compliance with the Statement of Commitments or as requested by the Director-General.

The Construction Compliance Reports will be made Publicly Available.

*Pre-Operation Compliance Report*

- 10. The Proponent will submit a Pre-Operation Compliance Report to the Director-General at least four weeks before Operation commences (or within any other time agreed to by the Director-General).

The Pre-Operation Compliance Report will include:

- a) details of how the Statement of Commitments required to be addressed before Operation were complied with
- b) the time when each of the relevant Statement of Commitments was complied with, including dates of submission of any required reports and/or approval dates
- c) details of any approvals or licences required to be issued by government departments before Operation commences.

The Pre-Operation Compliance Report will be made Publicly Available.

*Operation commencement*

- 11. The Proponent will notify the Director-General and all relevant authorities in writing at least four weeks prior to the commencement of Operation.

***Environmental impact audits***

*Environmental Impact Audit Report - Construction*

- 12. The Proponent will prepare an Environmental Impact Audit Report - Construction and submit it to the Director-General at a time interval agreed to by the Director-General. The Environmental Impact Audit Report – Construction will also be submitted to other government departments upon the request of the Director-General.

The Environmental Impact Audit Report – Construction will:

- a) identify the major environmental controls used during Construction and assess their effectiveness
- b) summarise the main environmental management plans and processes implemented during Construction and assess their effectiveness
- c) identify any innovations in Construction methodology used to improve environmental management
- d) discuss the lessons learnt during Construction, including recommendations for future Activities.

### **Construction Environmental Management Plan**

13. The Proponent will prepare and implement a CEMP in accordance with this Statement of Commitments and all relevant Acts and Regulations. The Proponent will obtain the Director-General's approval for the CEMP before Construction commences or within any other time agreed to by the Director-General. The CEMP will be reviewed by the EMR before the Proponent seeks the Director-General's approval for the Plan. The EMR will be required to bring to the Director-General's attention any shortcomings.

The Proponent will ensure that the mitigation measures identified in the Environmental Assessment, Submissions Report and in this Statement of Commitments are incorporated into the CEMP.

The CEMP will:

- a) state how the Construction related mitigation measures identified in Environmental Assessment will be implemented
- b) include a Construction program, identifying Construction activities and their location and timing
- c) cover any relevant environmental elements identified in any environmental due diligence investigations undertaken by, or on behalf of, the Proponent
- d) contain the following Sub-plans prepared in accordance with this Statement of Commitments:
  - i. a Flora and Fauna Sub-plan.
  - ii. an Indigenous Heritage Management Sub-plan.
  - iii. a Construction Noise Management Sub-plan.
  - iv. an Acid Sulfate Soil Management Sub-plan
  - v. an Erosion and Sediment Control Sub-plan
  - vi. a Surface Water Management Sub-plan
  - vii. a Dust Management Sub-plan
  - viii. a Traffic Management Sub-plan
  - ix. Waste Management and Re-use Sub-plan(s)
  - x. a Fire Safety Study for the Activity that addresses all aspects of the Department's publication *Hazardous Industry Planning Advisory Paper No. 2 – Fire Safety Guidelines* and the NSW Government's *Best practice Guidelines for Contaminated Water Retention and Treatment Systems*. The study will include a maintenance schedule for essential services and other safety measures. The Proponent will submit the study to the

Commissioner of the NSW Fire Brigades for approval prior to inclusion in the CEMP

- xi. a Hazard and Operability Study (HAZOP) for the Activity prepared by an independent, qualified person or team approved by the Director-General. The study will be carried out in accordance with the Department's publication *hazardous Industry Planning Advisory Paper No. 8 – HAZOP Guidelines*
  - xii. a Construction Safety Study for the Activity, prepared in accordance with the Department's *hazardous Industry Planning Advisory Paper No. 7 – Construction Safety Study Guidelines*.
- e) be Publicly Available
- f) include a community consultation and notification strategy (including local community and businesses and Council) that is prepared in accordance with this Statement of Commitments and which includes a Construction program that describes:
- i. details of any traffic disruptions and controls
  - ii. construction of temporary detours
  - iii. details of any passenger rail disruptions and alternative transport arrangements
  - iv. work approved to be undertaken outside standard Construction hours, in particular noisy works, before such works are undertaken
  - v. a complaints management system
- g) include environmental management details such as:
- i. identification of statutory obligations that the Proponent is required to fulfil during Construction, including all approvals and licences
  - ii. an environmental management structure indicating the responsibility, authority and accountability for personnel relevant to the CEMP
  - iii. the role of the EMR and identification of Construction activities requiring EMR attendance
  - iv. details of the Construction personnel induction and training program
  - v. emergency response procedures
- h) include implementation details such as:
- i. identification of relevant environmental elements
  - ii. measures to avoid and/or control environmental impacts

- iii. the tools to be used to implement the CEMP such as plans, schedules and work instructions
- i) include monitoring and review details such as:
  - i. performance criteria
  - ii. performance monitoring methods
  - iii. auditing and corrective actions procedures
  - iv. CEMP review procedures.

### **Operation Environment Management Plan**

14. The Proponent will manage Operation of the Activity in accordance with its own environmental management system, which is aligned with international standard ISO14001:2004, to the extent that it is applicable to the Activity. The Proponent will provide details of this system to the Director-General to demonstrate its applicability to the Activity.
15. Alternatively, should the Proponent decide not to operate the Activity in accordance with its own environmental management systems, it will prepare and implement an OEMP in accordance with this Statement of Commitments and all relevant Acts and Regulations. Any OEMP prepared would
  - a) identify the Operation activities
  - b) cover relevant environmental elements arising from any environmental due diligence investigations or as required to satisfy any licence or approval
  - c) be made Publicly Available
  - d) include environmental management details such as
    - i. identification of statutory obligations which the Proponent is required to fulfil during the Activity's Operation, including all approvals and licences
    - ii. an environmental management structure indicating the responsibility, authority and accountability for personnel relevant to the OEMP
    - iii. details of a personnel induction and training program
    - iv. emergency response procedures
  - e) include implementation details such as:
    - i. identification of relevant environmental elements
    - ii. measures to avoid and/or control environmental impacts
    - iii. the tools to be used to implement the OEMP such as plans, schedules and work instructions

- f) include monitoring and review details such as:
  - i. performance criteria
  - ii. performance monitoring methods
  - iii. auditing and corrective actions procedures
  - iv. OEMP review procedures.

### ***Environmental management system***

- 16. The Proponent will ensure that any appointed Construction and/or Operation head contractor(s) have an environmental management system that is aligned to the requirement of AS/NZS ISO 14000 series and/or have a proven environmental management performance record.

### ***Environmental Management Representative***

- 17. The Proponent will request the Director-General's approval for the appointment of an EMR at least four weeks before Construction commences (or within any other time agreed to by the Director-General). In its request, the Proponent will provide the:
  - a) qualifications and experience of the EMR including demonstration of general compliance with relevant Australian Standards for environmental auditors, including AS/NZS ISO 14012:1996 *Guidelines for Environmental Auditing: Qualification Criteria for Environmental Auditors*
  - b) role and responsibility of the EMR
  - c) authority and independence (from the Proponent or its contractors) of the EMR, including details of the Proponent's internal reporting structure
- 18. The EMR will be available:
  - a) for sufficient time to undertake the EMR role. This timing will be agreed between the Proponent and the EMR and advised to the Director-General in the request for approval
  - b) at any other time requested by the Director-General
  - c) during any Construction activities identified in the CEMP that require the EMR's attendance
  - d) for the duration of Construction.
- 19. The EMR will have responsibility for:
  - a) considering and advising the proponent on matters specified in this Statement of Commitments and compliance with such



- b) certifying all activities defined by the proponent as not constituting Construction as having minor environmental and/or community impacts
  - c) periodically monitoring the Proponent's environmental activities to evaluate the implementation, effectiveness and level of compliance of on-site Construction activities with the CEMP and associated plans and procedures, including carrying out site inspections at least fortnightly
  - d) recording and providing a written report to the proponent on non-conformances with the CEMP and requirements of the Proponent to undertake mitigation measures to avoid or minimise any adverse impacts on the environment including reporting required changes to the CEMP
  - e) directing the Proponent to stop work immediately where considered necessary, if in the view of the EMP an unacceptable impact on the environment is likely to occur, or require other reasonable steps to be taken to avoid or minimise any adverse impacts
  - f) reviewing corrective and preventative actions to ensure the implementation of recommendations made from the audits and site inspections
23. The Proponent understands that the Director-General may at any time immediately revoke the approval of an EMR appointment by providing written notice to the Proponent. Interim arrangements for EMR responsibility following the revocation will be agreed in writing between the Director-General and the Proponent.
24. The Proponent understands that the Director-General may at any time conduct an audit of any actions undertaken by the EMR. The Proponent will:
- a) facilitate and assist the Director-General in any such audit
  - b) include in the conditions of the EMR's appointment the need to facilitate and assist the Director-General in any such audit.
25. The Proponent will authorise the EMR to:
- a) consider and advise the Director-General and the Proponent on matters specified in the Statement of Commitments and compliance with such
  - b) determine whether work falls within the definition of Construction where clarification is requested by the Proponent
  - c) review the CEMP
  - d) periodically monitor the Proponent's activities to evaluate compliance with the CEMP. Periodic monitoring will involve site inspections of active work sites at least fortnightly
  - e) provide a written report to the Proponent of any non-compliance with the CEMP observed or identified by the EMR. Non compliance will be managed as identified in the CEMP.

- f) issue a recommendation to the Proponent to stop work immediately if in the view of the EMR an unacceptable impact on the environment is occurring or is likely to occur. The stop work recommendation may be limited to specific activities causing an impact if the EMR can easily identify those activities. The EMR may also recommend that the Proponent initiate reasonable actions to avoid or minimise adverse impacts
- g) review and monitor corrective and preventative actions arising from the implementation of recommendations made from Environmental Impact Audits or any other site inspections
- h) reviewing and approving minor revisions
- i) certify that minor revisions to the CEMP are consistent with the approved CEMP
- j) provide regular (as agreed with the Director-General) reports to the Director-General on matters relevant to carrying out the EMR role, including notifying the Director-General of any stop work recommendations.

The EMR will immediately advise the Proponent and the Director-General of any incidents relevant to this Statement of Commitments resulting from construction that is not dealt with expediently or adequately by the Proponent.

## **Communication and consultation**

### ***Contact telephone number***

26. Prior to the commencement of Construction, the Proponent will institute, publicise and list with a telephone company a 24 hour toll-free complaints contact telephone number, which would enable any member of the general public to reach a person who can arrange an appropriate response action to the complaint.

### ***Advertisement of activities***

27. Prior to the commencement of Construction, the proponent will undertake consultation with Council and the local community, including all affected landowners and occupiers along the route. As a minimum, the Proponent will, prior to the Commencement of Construction, and then at three-monthly intervals during Construction, advertise in relevant local newspapers the proposed works for the forthcoming three months, the areas in which these works are proposed to occur, the hours of construction and the 24 hour toll-free complaints contact telephone number. The Proponent will ensure that the local community is kept informed of the progress of the Activity, including but not limited to prior notice of:
- a) the nature of the works proposed for the following period
  - b) the 24 hour toll-free complaints contact telephone number
  - c) any traffic disruptions or controls or changes to property access

- d) any irregular work practices such as the use of helicopters
  - e) individual's rights under the Statement of Commitments
  - f) the Activity internet site.
28. The Proponent will establish an Activity internet site (that may be part of an existing the Proponent internet site) prior to the commencement of Construction and maintain the internet site until 12 months after commencement of Operation of the Activity. This internet site will contain:
- a) periodic updates of work progress, consultation activities and planned work schedules. The site will indicate the date of the last update and the frequency of the internet site updates
  - b) a description of relevant approval authorities and their areas of responsibility
  - c) a list of reports and plans that are Publicly Available under this Statement of Commitments and details of how these can be accessed
  - d) contact names and phone numbers of relevant communications staff
  - e) the 24 hour toll-free complaints contact telephone number.

The Proponent will provide updates of work progress, Construction activities and planned work schedules where significant changes in noise or traffic impacts are expected.

29. The Proponent will consult adjacent property owners about implementing mitigation measures that affect their property. Mitigation measures will be implemented according to a program derived from that consultation if consistent with this Statement of Commitments.

### ***Dispute resolution***

30. In the event that a dispute arises between the proponent and Council or the proponent and a public authority other than the Department in relation to a specification or requirement applicable under this Statement of Commitments, the proponent will refer the matter to the Director-General or, if not resolved, to the Minister. The Proponent will regard the determination of the dispute as final and binding.

### ***Construction Complaints Management System***

31. The Proponent will prepare and implement a Construction Complaints Management System before Construction commences and maintain the System for the duration of Construction. The Construction Complaints Management System will be consistent with AS 4269 *Complaints Handling* and include:
- a) a 24 hour, toll-free telephone number listed with a telephone company and advertised

- b) a system to receive, record, track and respond to complaints within a specified timeframe. When a complaint cannot be responded to immediately, a follow-up verbal response on what action is proposed will be provided to the complainant within two hours during night-time works and 24 hours at other times
- c) a process for the provision of a written response to the complainant within 10 days, if the complaint cannot be resolved by the initial or follow-up verbal response
- d) a mediation system for complaints unable to be resolved.

Information on all complaints received, including the means by which they were addressed and whether resolution was reached with or without mediation, will be included in a Construction Compliance Reports and will be made available to the Director-General on request.

## **Air quality**

### ***Dust Management Sub-plan***

- 32. The Proponent will prepare a Dust Management Sub-plan as part of the CEMP. This Sub-plan will include:
  - a) potential sources of dust
  - b) dust management objectives consistent with the DEC guidelines
  - c) mitigation measures to be implemented, including measures during weather conditions where high level dust episodes are probable (such as strong winds in dry weather)
  - d) a progressive rehabilitation strategy for exposed surfaces with the aim of minimising exposed surfaces.

### ***Construction***

- 33. The Proponent will maintain Construction vehicles using public roads to prevent any loss of load, whether dust, liquid or soils. Facilities will be provided at exit points of all Construction sites/compounds to minimise tracking mud, dirt or other material onto a public road or footpath. In the event of any spillage, the Proponent will remove the spilled material as soon as practicable within the working day of the spillage.
- 34. The Proponent will ensure that all plant and equipment used in Construction of the Activity is:
  - a) maintained in a proper and efficient condition
  - b) operated in a proper and efficient manner.

## Operations

### *Monitoring and discharge points*

35. For the purpose of this Statement of Commitments, air monitoring/air discharge points shall be identified as provided in *Table D.1*.

**Table D.1 Identification of air monitoring and discharge points**

<b>Monitoring/discharge point identified</b>	<b>Monitoring/discharge point description</b>
1	Gas turbine No. 1
2	Gas turbine No. 2
3	Gas turbine No. 3
4	Gas turbine No. 4
5	Black start generator

### *Odour*

36. The Proponent will design, construct, operate and maintain the Activity to prevent the emission of any offensive odour from the Site that is attributable to Construction and Operation of the Activity. For the purpose of this commitment, 'offensive odour' has the same meaning as defined under the NSW *Protection of the Environment Operations Act 1997*.

### *Dust emissions*

37. The Proponent will design, construct, operate and maintain the Activity in a manner that minimises dust emissions from the Site. The Proponent will prepare a Dust Management Sub-plan as part of the CEMP. The Sub-plan will be prepared in consultation with the DEC and Council and will include details of all procedures to be implemented during Construction to suppress dust generation.

### *Discharge limits*

38. The Proponent will design, construct, operate and maintain the Activity to ensure that at the monitoring/discharge points identified in Table D.1, the concentration of pollutants does not exceed the maximum allowable discharge concentration limit specified in any Environmental Protection Licence issued by the DEC for the Activity under the *Protection of the Environment Operations Act 1997*.

39. The Proponent will:

- a) undertake a review of stack emission data and modelled predictions of air emissions during detailed design of the Activity once actual plant specifications and characteristics are known to confirm compliance with the Activity's air quality goals
- b) undertake stack monitoring during commissioning of the Activity to verify the stack parameters and air emission estimates used in the Environmental Assessment

- c) fit each of the four exhaust stacks with in-stack monitoring equipment linked to the continuous emissions monitoring systems that will form part of the Activity's automated process control system
- d) use existing ambient air quality monitoring sites at Lake Munmorah and Wyee to set baseline ambient air levels for NO<sub>x</sub>, SO<sub>x</sub> and PM<sub>10</sub>. The Proponent may establish additional ambient air quality monitoring sites should adverse monitoring trends be observed during Operation of the Activity that require the collection of additional ambient air quality monitoring data to determine the cause of any such adverse monitoring trend
- e) design the air quality monitoring system to meet the requirements of any Environmental Protection Licence issued by the DEC to regulate the operation of the Activity.

## **Flora and fauna**

### **Construction**

- 40. The Proponent will prepare a Flora and Fauna Management Sub-plan as part of the CEMP. The Sub-plan will be prepared in consultation with the DEC and Council and will include:
  - a) plans showing terrestrial and aquatic vegetation communities; important flora and fauna habitat areas; locations where threatened species, populations or ecological communities were recorded (including *Angophora inopina*); and areas to be cleared. The plans will also identify vegetation adjoining the Activity where this contains important habitat areas and/or threatened species, populations or ecological communities
  - b) methods to manage impacts on flora and fauna species (terrestrial and aquatic) and their habitat which may be directly or indirectly affected by the Activity. These will include:
    - i. procedures for vegetation clearing, soil management and managing other habitat damage (terrestrial and aquatic) during Construction. Specific tree clearing protocols will be documented, including the following:
      - ▶ shaking the tree using a bulldozer
      - ▶ slowly pushing the tree to the ground so that it largely remains intact
      - ▶ leaving the tree in place once felled for at least one day/night before removing to allow animals to relocate to nearby vegetation
      - ▶ ensuring all contractors have the contact numbers of wildlife rescue groups should animals be injured during clearing
      - ▶ where possible, undertaking vegetation clearing during September/October or March/May to avoid summer breeding seasons and the winter hibernation for hollow dependent species.

- ii. methods to protect vegetation both retained within, and also adjoining, the Activity from damage during Construction
  - iii. a habitat tree management program including fauna recovery procedures and habitat maintenance (e.g. relocating hollows or installing nesting boxes)
  - iv. where possible, and where consistent with the DEC or NSW Fisheries requirements, strategies for re-using in rehabilitation works individuals of any threatened plant species that would be otherwise be destroyed by the Activity
  - v. performance criteria against which to measure the success of the methods
- c) rehabilitation details, including:
- i. identification of locally native species to be used in rehabilitation and landscaping works, including flora species suitable as a food resource for threatened fauna species
  - ii. where possible, seed of locally native species within the Activity will be collected before Construction commences to provide seed stock for revegetation and landscaping works
  - iii. methods to re-use topsoil (and where relevant subsoils) and cleared vegetation
  - iv. measures for the management and maintenance of all preserved, planted and rehabilitated vegetation (including aquatic vegetation)
- d) a Weed Management Strategy including:
- i. identification of weeds within the Activity and adjoining areas
  - ii. weed eradication methods and protocols for the use of herbicides
  - iii. methods to treat and re-use weed infested topsoil
  - iv. strategies to control the spread of weeds during Construction
- e) a program for reporting on the effectiveness of terrestrial and aquatic flora and fauna management measures against the identified performance criteria. Management methods will be reviewed where found to be ineffective.

## **Indigenous heritage**

41. Prior to the commencement of Construction, the Proponent will undertake the following:

- a) submit site cards for sites IA1, IA2 and IA3 in area E (Thompson Vale Road to the Main Northern Railway Line) to the DEC for registration under the Aboriginal Heritage Information Management System (AHIMS) database
  - b) arrange for the issue of a preliminary research permit by the DEC in accordance with Section 87 of the NSW *National Parks and Wildlife Act 1974* for preliminary archaeological test excavations in the vicinity of artefact scatter sites AS1 and AS2 and, following the issue of this permit, arrange for a suitably qualified archaeologist to undertake the excavations in partnership with representatives from the Darkinjung Local Aboriginal Land Council
  - c) following the preliminary archaeological test excavation and if destruction or disturbance of artefact scatter sites AS1 and AS2 is found to be unavoidable during the detail design of the Activity, lodge a request with the DEC for a Section 90 Consent permit.
42. The Proponent will invite the Darkinjung Local Aboriginal Land Council to have a representative present on the Site during those Construction activities in which the Darkinjung Local Aboriginal Land Council has previously expressed an interest.

### ***Indigenous heritage management***

43. The Proponent will prepare an Indigenous Heritage Management Sub-plan as part of the CEMP. This Sub-plan will be prepared in consultation with the DEC and will include:
- a) details of any archaeological investigations to be undertaken and any associated licences or approvals required
  - b) procedures to be implemented if previously unidentified Aboriginal objects are discovered during Construction. If such objects are discovered, the Proponent will cease all work in the vicinity of the discovered objects and will inform the DEC and the Darkinjung Local Aboriginal Land Council in accordance with the *National Parks and Wildlife Act 1974*
  - c) an awareness program for Construction personnel on their obligations for Aboriginal cultural materials, which will be incorporated into site induction training
  - d) specific procedures for the management of earthworks in area D (The Link Road to Thompson Vale Road) that include the following:
    - i. arranging for a suitably qualified archaeologist to undertake archaeological monitoring and testing in partnership with the Darkinjung Local Aboriginal Land Council prior to the commencement of earthworks and also during earthworks
    - ii. assigning the archaeologist with the authority to halt Construction works in this area in order to undertake further investigation or detailed recording of any Aboriginal archaeological remains exposed during the monitoring process



- iii. lodging a request with the DEC for a Section 90 Consent permit should disturbance of the Aboriginal archaeological remains be determined by the Proponent to be unavoidable, and only re-commencing Construction works following the issue of a permit.

## **Noise**

### ***Construction Noise Management***

44. The Proponent will prepare a Construction Noise Management Sub-plan as part of the CEMP. This Sub-plan will include:
  - a) an awareness program for construction personnel on noise minimisation, which will be incorporated into site induction training
  - b) identification of each Construction activity, including Ancillary Facilities, and their potential for generation of noise, including noise from Construction vehicles and any traffic diversions
  - c) identification of all potentially affected Sensitive Receivers
  - d) the Construction noise criteria specified in this Statement of Commitments
  - e) determination of appropriate noise criteria for each identified Sensitive Receiver
  - f) noise monitoring, reporting and response procedures
  - g) a description of management methods and procedures and specific noise mitigation treatments that will be implemented to control noise during Construction
  - h) justification for any activities outside the Construction hours specified in this Statement of Commitments. This includes identifying areas where Construction noise would be audible at any Sensitive Receiver
  - i) procedures for EMR approval of out of hours works
  - j) procedures for notifying residents of Construction activities that are likely to affect their noise amenity
  - k) contingency plans to be implemented in the event of non-compliances and/or noise complaints.

### ***Construction hours***

45. The proponent will restrict Construction to between the hours of 7:00 am to 6:00 pm (Monday to Friday), 8:00 am to 1:00 pm (Saturday) and at no time on Sundays and public holidays except:

- a) for the delivery of materials required outside these hours by the Police or other authorities for safety reasons
- b) where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm
- c) where works are required due to traffic management and safety reasons, subject to relevant traffic management approvals, as verified by the EMR

The Proponent will inform local residents and the Department of the method, timing and duration of Construction work approved under items (a) to (c) at least 48 hours before that work commences.

### **Construction noise criteria**

46. The Construction noise criteria for the Activity is to manage noise from Construction activities (as measured by an  $L_{A10}$  descriptor) so it does not exceed the background  $L_{A90}$  noise level by more than 5 dBA wherever possible.

The Construction noise criteria is shown in *Table D.2* or otherwise identified in the Submissions Report or Construction Noise Management Sub-plan.

**Table D.2 Construction noise criteria (dBA)**

Noise catchment area	Receiver location	Daytime Rating Background Level	Criteria
A	Kamilaroo Avenue	38	43
C	Woolana Road	36	41
D	Barega Close	37	42
E	Perouse Avenue	39	44
F	Colongra	40 to 45	65 to 70
G	Blue Haven	40 to 45	65 to 70
H	Bushells Ridge	40 to 45	65 to 70

Source: *Table 10.3 of Munmorah Gas Turbine Facility Environmental Assessment (Parsons Brinckerhoff 2005)*

The Proponent will identify and manage any activity that has the potential for noise emissions that exceed the criteria in accordance with the Construction Noise Management Sub-plan. The Proponent will implement all Reasonable and Feasible noise mitigation and management measures with the aim of achieving the Construction noise criteria.

If the noise from a Construction activity is substantially tonal or impulsive in nature (as described in Chapter 4 of the *NSW Industrial Noise Policy*), 5dBA will be added to the measured Construction noise level when comparing the measured noise with the Construction noise criteria.

### **Operation noise criteria**

47. The Proponent will design, construct, operate and maintain the Activity to ensure the noise emissions from the facility do not exceed the noise criteria specified in

any Environmental Protection Licence issued by the DEC for the Activity under the *Protection of the Environment Operations Act 1997*

The Proponent will identify and manage any activity that has the potential for noise emissions that exceed the Operation noise criteria in accordance with their own EMS or OEMP. The Proponent will implement all Reasonable and Feasible noise mitigation and management measures with the aim of achieving the Operation noise criteria.

## **Soils and geology**

### ***Acid sulfate soils management***

48. During the detailed design of the Activity, the Proponent will undertake a detailed acid sulfate soil investigation in areas where soils are proposed to be disturbed to ascertain the location and extent of any acid sulfate soils.
49. The Proponent will prepare an Acid Sulfate Soil Management Sub-plan as part of the CEMP. This Sub-plan will be prepared in consultation with the Department of Natural Resources and will:
  - a) be consistent with the *Acid Sulfate Soils Manual* (Acid Sulfate Soil Management Advisory Committee 1998) or update
  - b) include a contingency plan to deal with the unexpected discovery of actual or potential acid sulphate soils
  - c) include a water quality monitoring program.

### ***Foundation hazards and aggressive soils***

50. The Proponent will undertake a detailed geotechnical site investigation of the Site during the detailed design of the Activity to assess soil reactivity, aggressivity and bearing capacity of foundation soils and bedrock and will incorporate the findings of this assessment into the design of the Activity.

### ***Mine subsidence***

51. The Proponent will consult the Mine Subsidence Board during the detailed design and Construction of the Activity and design and construct the Activity in accordance with the Mine Subsidence Board's specifications.

### ***Erosion and sediment control***

52. The Proponent will prepare an Erosion and Sediment Control Sub-plan as part of the CEMP. This Sub-plan will be prepared in consultation with Council and will:
  - a) where relevant, be consistent with the Landcom guideline *Managing Urban Stormwater - Soils and Construction* (2004 or as updated), and the Road and

traffic Authority's *Guidelines for the Control of Erosion and Sedimentation in Roadworks*.

- b) identify the Construction activities that could cause soil erosion or discharge sediment or water pollutants from the site
  - c) describe management methods to minimise soil erosion or discharge of sediment or water pollutants from the site including a strategy to minimise the area of bare surfaces during Construction
  - d) describe the location and capacity of erosion and sediment control measures
  - e) identify the timing and conditions under which Construction controls will be decommissioned
  - f) include contingency plans to be implemented for events such as fuel spills
  - g) identify how the effectiveness of the sediment and erosion control system will be monitored, reviewed and updated.
  - a) include the locations of major (defined as a volume greater than 500 cubic metres) spoil stockpiles
  - b) include the source of imported fill material and where it will be stockpiled and used
  - c) include methods to re-use or dispose of excess or unsuitable spoil material including estimated volumes and disposal sites.
53. During Construction, the Proponent will consult an appropriately qualified soil scientist according to a schedule identified in the Erosion and Sediment Control Sub-plan to:
- a) undertake inspections of temporary and permanent erosion and sedimentation control devices
  - b) ensure that the most appropriate controls are being implemented
  - c) check that controls are being maintained in an efficient condition
  - d) check that controls meet the requirements of any relevant approval and/or licence condition.

The Proponent will report the results of these inspections and any follow-up actions in the Construction Compliance Reports.

54. The Proponent will re-use or recycle all material excavated from Construction unless otherwise approved in the Erosion and Sediment Control Sub-plan. The Proponent will ensure that the re-use of material generated from Construction is maximised in preference to importing fill.

## Surface water

### Surface water management

55. The Proponent will prepare a Surface Water Management Sub-plan in consultation with the Department of Primary Industries (Fisheries) and the DEC and will:
- a) be developed in accordance with *Managing Urban Stormwater: Soils and Construction* (Department of Housing 1998, revised by Landcom 2004)
  - b) be consistent with the Erosion and Sediment Control Sub-plan and Acid Sulfate Soil Management Sub-plan
  - c) include requirements for regular inspections of temporary and permanent erosion and sediment control devices by suitably qualified personnel
  - d) require the retention of grassed drainage lines and minimisation of vegetation removal in drainage lines
  - e) require the retention of topsoil in areas of the Site not excavated
  - f) include drainage management practices and procedures for their implementation

### Operation

56. The Proponent will treat on-Site all wastewater discharges to remove oil and grease prior to discharging the wastewater to the wastewater treatment system at Munmorah Power Station. The Proponent will bund and contain the distillate storage tank and entire facility to prevent contaminated run-off from reaching the stormwater management system at the Munmorah Power Station and outlet canal.

## Traffic

57. The Proponent will appoint haulage contractor(s) with the necessary over-weight and over-sized cargo haulage experience and equipment to transport the gas turbine facility infrastructure to the Site under licence. The Proponent will direct its haulage contractor(s) to undertake the following in consultation with Wyong Shire Council, Newcastle City Council, Lake Macquarie City Council and the RTA:
- a) select the haulage route, mode and timetable
  - b) organise and necessary or required modifications to infrastructure, including any improvements to roads, temporary removal of street furniture and temporary modifications to existing infrastructure (eg roundabouts)
  - c) obtain all necessary haulage permits

- d) comply with the haulage permits, including any requirements for pilot vehicles, police escorts and staging of delivery to satisfy travel time and route restrictions
  - e) phasing of delivery to satisfy Construction requirements and to ensure that transport infrastructure is not overwhelmed
  - f) alerting other transport users of the haulage activities by installing suitable warning signs and signage at appropriate locations along the route.
  - g) a community information and awareness program to ensure that residents along the haulage route for the gas turbine facility infrastructure are informed of the haulage prior to its commencement
58. The Proponent would prepare a Transport Management Plan in consultation with Wyong Shire Council, Newcastle City Council, Lake Macquarie City Council and the RTA specifically for the haulage of the gas turbine facility infrastructure that will include the following:
- a) the exact location for delivery of gas turbine facility infrastructure on arrival at the Site
  - b) design and construction requirements for Site entry and exit points for the vehicles transporting the gas turbine facility infrastructure
  - c) a Site track network that is safe and suitable for the transportation of the gas turbine facility infrastructure
  - d) a community information and awareness program to ensure that residents along the haulage route for the gas turbine facility infrastructure are informed of the haulage prior to its commencement
59. The Proponent will prepare a Traffic Management Sub-plan as part of the CEMP. The Sub-plan will be prepared in consultation with Council and the RTA and will meet all reasonable requirements of Council and the RTA. The Sub-plans will be prepared in accordance with the RTA's *Traffic Control at Work Sites* guidelines and Australian Standard 1742.3 *Manual of Uniform Traffic Control Devices, Part 3: Traffic Control Devices for Works on Roads* and will include:
- a) identification of all public roads to be used by Construction traffic, in particular roads proposed to transport large quantities of Construction materials (other than the gas turbine facility infrastructure referred to in clause 40). The expected timing and duration of road usage will be stated
  - b) management methods to ensure Construction traffic uses identified roads
  - c) identification of all public roads that may be partially or completely closed during Construction and the expected timing and duration of these closures. Consideration will be given to programming Construction works to minimise road closures during peak hours and/or holiday periods

- d) impacts on existing traffic (including pedestrians, vehicles, cyclists and disabled persons)
  - e) temporary traffic arrangements including property access
  - f) designating speed and load limits for heavy vehicle routes
  - g) identifying areas for Construction vehicle parking, turning, loading and unloading
  - h) access to Construction sites including entry and exit locations and measures to prevent Construction vehicles queuing on public roads and to satisfy Council safety standards
  - i) a response plan for any Construction traffic incident
  - j) controls and management measures to ensure farm stock (sheep and cattle) are unable to escape from the Site through Construction entry and exit points.
  - k) monitoring, review and amendment mechanisms.
60. The Proponent will prepare road dilapidation reports for all roads that are proposed to be used by Construction traffic, to the extent the Traffic Management Sub-plan indicates that Construction is likely to have a substantial impact on them. These reports will be prepared before Construction commences and after Construction is complete. Copies of the reports will be provided to the relevant roads authority. Any damage resulting from Construction, except that resulting from normal wear and tear, will either be repaired at the Proponent's cost or an alternative arrangement for road damage negotiated with the relevant roads authority.

## **Waste management**

61. The proponent will store and dispose all hazardous and industrial waste (as defined by *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes* (Environmental Protection Authority 1999)) that may be generated on the Site in a manner that minimises the impacts of the waste on the environment, including appropriate segregation for storage and separate disposal by a waste transporter licensed by the DEC.
62. The Proponent will prepare Waste Management and Re-use Sub-plan(s) as part of the CEMP. The Sub-plans will address the management of wastes during the Construction and Operation stages respectively in accordance with the NSW Government's Waste Reduction and Purchasing Policy. The Sub-plan(s) will identify requirements for:
- a) the application of the waste minimisation hierarchy principles of avoid/reduce/re-use/recycle/dispose
  - b) waste handling and storage

- c) disposal of wastes. Specific details will be provided for cleared vegetation, contaminated materials, glass, metals and plastics, hydrocarbons (lubricants and fuels) and sanitary wastes
- d) any waste material that is unable to be re-used, re-processed or recycled will be disposed at a facility approved to receive that type of waste.

## **Hazard and risk**

### ***Bunding and spill management***

63. The Proponent will store and handle all combustible liquids and dangerous goods (as defined by the Australian Dangerous Goods Code) in accordance with:

- a) all relevant Australian Standards
- b) a minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund
- c) the DEC's Environmental Protection Manual Technical Bulletin *Bunding and Spill Management*.

In the event of an inconsistency between the requirements listed from a) to c) above, the most stringent requirement will prevail to the extent of the inconsistency.

### ***Aviation hazards***

64. At least six months prior to the commencement of Operation, the Proponent will consult with the Civil Aviation Safety Authority to include an appropriate warning notice in pilot documents.

## **Land use and property**

- 65. Where the Proponent obtains an easement over land for the Activity, the Proponent will negotiate conditions and compensation with affected landowners to offset any land use impacts.
- 66. The Proponent will undertake Construction activities in the vicinity of railway lines and roads in consultation with RailCorp and the RTA respectively.



**DECLARATION**

**APPENDIX**

**E**

# Declaration

## Submission of Environmental Assessment

Prepared under Part 3A of the *Environmental Planning and Assessment Act 1979*, Section 112

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### EA Prepared By

Name	Carlos Olles
Qualifications	BE (Chem) GradDip(Env Studies)
Address	Parsons Brinckerhoff Australia Pty Ltd Level 27, Ernst & Young Centre 680 George Street Sydney NSW 2000
In respect of	Munmorah Gas Turbine Facility

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### Part 5 Activity

Proponent name	Delta Electricity
Proponent address	Level 12 Darling Park 201 Sussex Street Sydney NSW 2000
Address of the land on which the activity is to be carried out	All lands required for the construction and operation of the proposal, as shown in Figure 4.1 in Chapter 4 of Main Volume.
Proposed development	The key components of the proposal relate to the construction and operation of an open-cycle gas turbine facility and natural gas pipeline as described in Chapter 4 of Volume 1.
	Or
	<input checked="" type="checkbox"/> refer to maps included in Chapters 4 of Main Volume.

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### Environmental Assessment

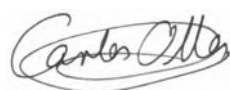
#### Certificate

☒ An environmental assessment (EA) is attached.

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

- has been prepared in accordance with clauses 230 and 231 of the Environmental Planning and Regulation 2000;
- the document contains all available information that is relevant to the environmental assessment of the activity to which the document relates; and
- the information contained in the document is neither false nor misleading.

Signature



Name

Carlos Olles  
(for Parsons Brinckerhoff Australia Pty Ltd)

Derek Low

Date

1 November 2005

## PROPOSED SUB-DIVISION PLANS

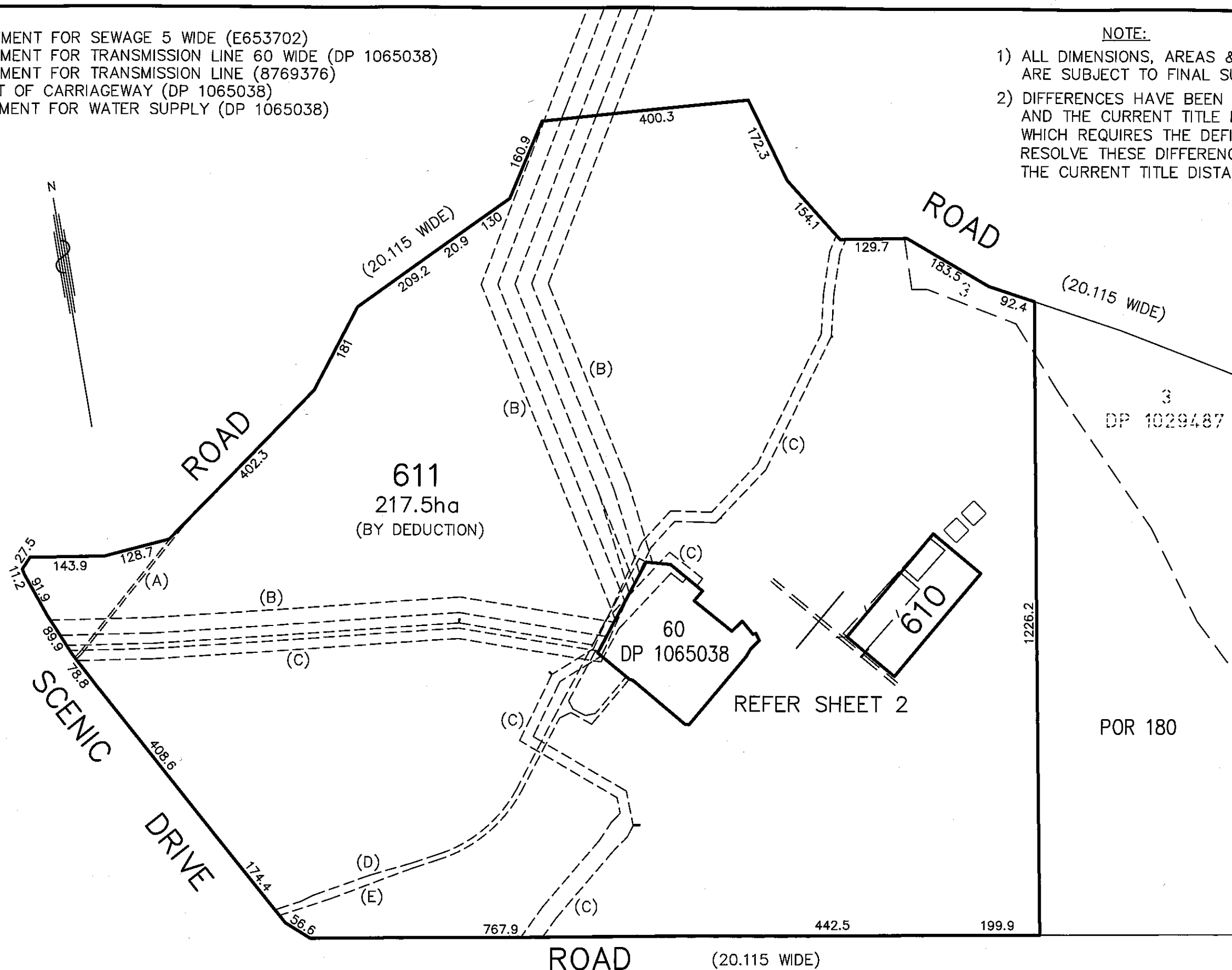
APPENDIX

F

- (A) - EASEMENT FOR SEWAGE 5 WIDE (E653702)
- (B) - EASEMENT FOR TRANSMISSION LINE 60 WIDE (DP 1065038)
- (C) - EASEMENT FOR TRANSMISSION LINE (8769376)
- (D) - RIGHT OF CARRIAGEWAY (DP 1065038)
- (E) - EASEMENT FOR WATER SUPPLY (DP 1065038)

**NOTE:**

- 1) ALL DIMENSIONS, AREAS & EASEMENTS ARE SUBJECT TO FINAL SURVEY.
- 2) DIFFERENCES HAVE BEEN NOTED BETWEEN RECENT SURVEYS AND THE CURRENT TITLE DIMENSIONS. ANY FUTURE SURVEY WHICH REQUIRES THE DEFINITION OF LOT 611 WILL NEED TO RESOLVE THESE DIFFERENCES. THE DIMENSION SHOWN ARE THE CURRENT TITLE DISTANCES.



DWG - 05167A

SHEET 1 OF 2

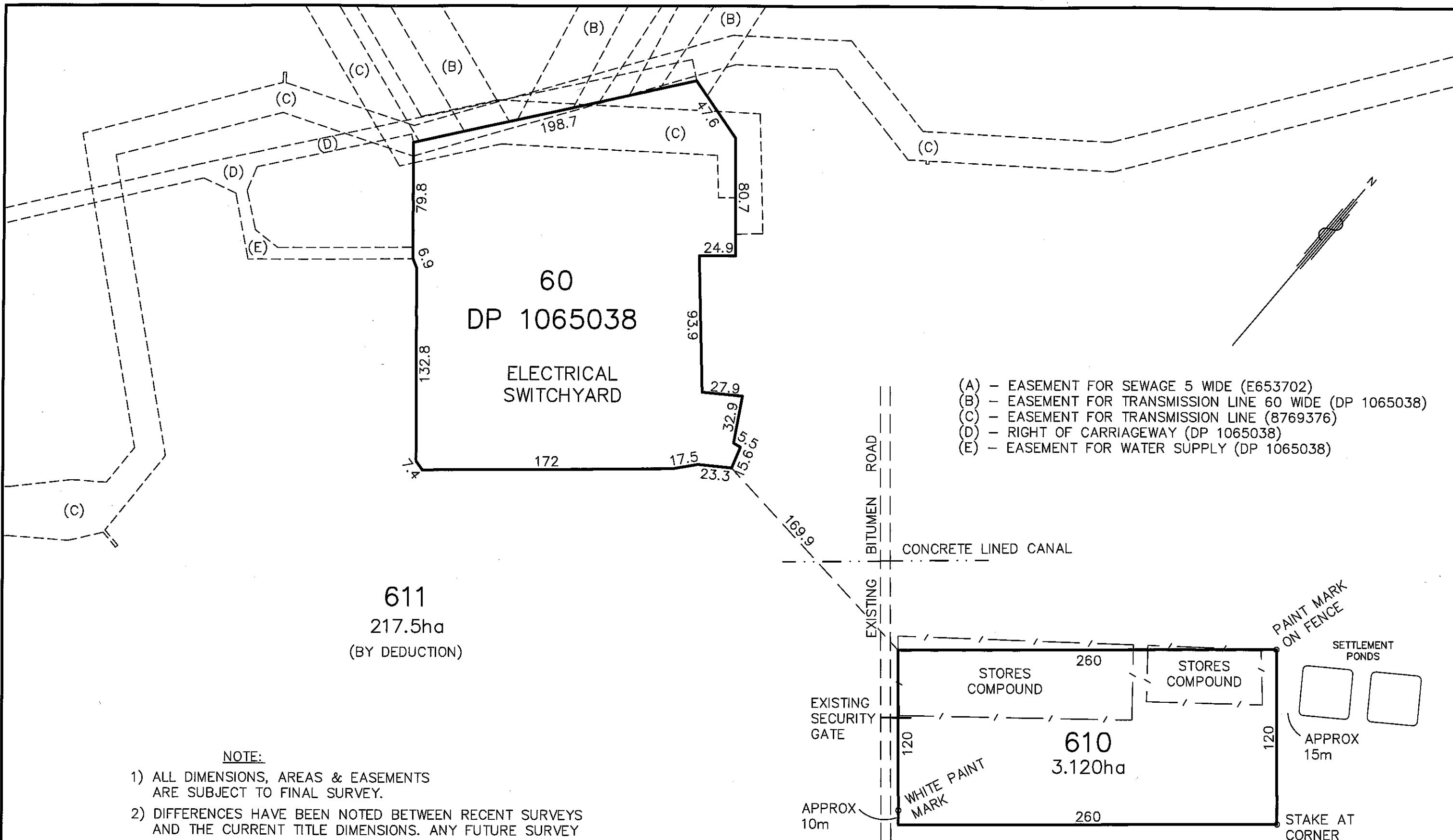
*[Signature]*  
REGISTERED SURVEYOR

CLIENT:	DELTA	
TITLE:	PROPOSED SUBDIVISION OF LOT 61 DP 1065038 AT MUNMORAH POWER STATION	
DATE: 30/09/05	R.R.(A3): 1:8000	REF.: 05/167



**MONTEATH & POWYS** PTY. LTD.

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PHONE (02) 49 261388 FAX (02) 49 293475



- (A) - EASEMENT FOR SEWAGE 5 WIDE (E653702)  
(B) - EASEMENT FOR TRANSMISSION LINE 60 WIDE (DP 1065038)  
(C) - EASEMENT FOR TRANSMISSION LINE (8769376)  
(D) - RIGHT OF CARRIAGEWAY (DP 1065038)  
(E) - EASEMENT FOR WATER SUPPLY (DP 1065038)

611  
217.5ha  
(BY DEDUCTION)

**NOTE:**

- 1) ALL DIMENSIONS, AREAS & EASEMENTS ARE SUBJECT TO FINAL SURVEY.
- 2) DIFFERENCES HAVE BEEN NOTED BETWEEN RECENT SURVEYS AND THE CURRENT TITLE DIMENSIONS. ANY FUTURE SURVEY WHICH REQUIRES THE DEFINITION OF LOT 611 WILL NEED TO RESOLVE THESE DIFFERENCES. THE DIMENSION SHOWN ARE THE CURRENT TITLE DISTANCES.

REGISTERED SURVEYOR

DWG - 05167A

SHEET 2 OF 2

CLIENT:	DELTA	 <b>MONTEATH &amp; POWYS</b> PTY. LTD. A.B.N. 94 000 861 110 CONSULTING SURVEYORS & PLANNERS TONELLA COMMERCIAL CENTRE 125 BULL ST, NEWCASTLE WEST Email: survey@monteathpowys.com.au P.O. BOX 726 NEWCASTLE 2300. PHONE (02) 49 261388 FAX (02) 49 293475
TITLE:	PROPOSED SUBDIVISION OF LOT 61 DP 1065038 AT MUNMORAH POWER STATION	
DATE: 30/09/05	R.R.(A3): 1:2500	
REF.: 05/167		

DATE OF LAST EDIT: 04/10/2005 - MAK