

*MAJOR PROJECT ASSESSMENT:
Tallawarra Stage B
Gas Turbine Power Station*



Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

December 2010

© Crown copyright 2010
Published December 2010
NSW Department of Planning
www.planning.nsw.gov.au

Disclaimer:

While every reasonable effort has been made to ensure that this document is correct at the time of publication, the State of New South Wales, its agents and employees, disclaim any and all liability to any person in respect of anything or the consequences of anything done or omitted to be done in reliance upon the whole or any part of this document.

EXECUTIVE SUMMARY

TRUenergy Tallawarra Pty Ltd (the Proponent) proposes to construct and operate an open cycle gas turbine power station on the foreshores of Lake Illawarra, immediately adjacent to the recently commissioned Tallawarra Stage A power station.

The proposed power station, referred to as Tallawarra Stage B, includes the option of constructing either an open cycle or combined cycle gas turbine power station, pending the outcome of a detailed market analysis to determine the nature of the market need (i.e. base load electricity or peaking supply). Consequently, the project will comprise either:

- two or three open cycle gas turbine generators with a nominal capacity of 300-450 megawatts; or
- one combined cycle gas turbine generator with a nominal capacity of 400 megawatts.

Regardless of the option selected, associated infrastructure will include a high voltage switchyard, transmission line connection to the existing 132 kilovolt network, connecting gas pipelines, gas receiving and conditioning stations, potable/fire water tank and an emergency diesel generator. The project will utilise existing infrastructure associated with the Tallawarra Stage A power station including, but not limited to, the existing gas supply, control room, administration building, amenities, car park, water treatment plant, and water intake and outlet canal.

The project is subject to Part 3A of the *Environmental Planning and Assessment Act 1979* and requires the approval of the Minister for Planning.

The Environmental Assessment was placed on public exhibition from Wednesday 5 August 2009 until Thursday 3 September 2009. The Department received a total of ten submissions on the Project. All of these were from public authorities and included: the Commonwealth Department of Defence; AirServices Australia; the Civil Aviation Safety Authority (CASA); NSW Department of Environment, Climate Change and Water; NSW Office of Water; NSW Roads and Traffic Authority; Lake Illawarra Authority; Wollongong City Council; and Shoalhaven City Council (two submissions). Although none of the authorities objected to the Project, they did raise issues for the Department's consideration including noise, air quality impacts, potential impacts of the project on aircraft operations, and impacts on Lake Illawarra resulting from the discharge of cooling tower waters from a combined cycle gas turbine power station.

The Department has assessed the Proponent's Environmental Assessment, Response to Submissions and Statement of Commitments as well as the submissions received from agencies on the proposal and considers the key issues associated with the proposal are noise, air quality, water quality, aquatic ecosystem health, and aviation safety. The Department is satisfied that the Proponent has undertaken a robust and conservative assessment of the key issues associated with both open cycle and combined cycle gas turbine power stations. The Department is also satisfied that the Proponent's proposed management and mitigation measures will facilitate the achievement of acceptable environmental standards during both construction and operation. However, the Proponent's plume rise assessment has not demonstrated, to the satisfaction of the CASA, that the open cycle gas turbine can be operated safely in terms of potential aviation impacts. Accordingly, the Department recommends that construction and operation of the open cycle option not be permitted until it can be demonstrated to CASA's satisfaction that plume rise will not have an adverse impact on aviation.

To ensure that any impacts associated with the Project are minimised and appropriately managed, the Department has recommended conditions of approval to address the key environmental issues. These include performance standards that the project must meet, and management and assessment requirements that build on the assessment undertaken to date as a means of ensuring the impacts of the project are minimised.

On balance, the Department considers the proposal as a whole to be justified and in the public's interest as it will contribute to meeting the State's electricity demands and is also of the opinion that the project can be designed, constructed and operated to meet acceptable environmental and amenity limits subject to the implementation of recommended conditions of approval and the Proponent's Statement of Commitments. Consequently, the Department recommends that Tallawarra Stage B Gas Turbine Power Station be approved, subject to limitations on the operation of the open cycle option.

CONTENTS

1.	BACKGROUND.....	1
1.1	Location.....	1
1.2	Surrounding Land Use.....	1
2.	PROPOSED DEVELOPMENT	4
2.1	Project Description	4
2.2	Project Need.....	8
3.	STATUTORY CONTEXT	12
3.1	Major Development	12
3.2	Critical Infrastructure	12
3.3	Permissibility.....	12
3.4	Environmental Planning Instruments	12
3.5	Objects of the Act	12
3.6	Minister's Approval Power and Statement of Compliance	14
3.7	Commonwealth Legislation.....	14
4.	CONSULTATION AND ISSUES RAISED	15
4.1	Public Submissions	15
4.2	Submissions from Public Authorities	15
4.3	Submissions Report	17
5.	ASSESSMENT OF ENVIRONMENTAL IMPACTS.....	18
5.1	Noise	18
5.2	Air Quality.....	27
5.3	Greenhouse Gas Emissions.....	33
5.4	Aviation Safety.....	34
	Aeronautical Impact Assessments for both the open cycle and open cycle options were prepared by the Ambidji Group, on behalf of the Proponent, subsequent to the exhibition of the Environmental Assessment, and submitted to CASA. These documents are the main component of the part 2 Submissions Report.	35
5.5	Water Quality and Ecology of Lake Illawarra.....	36
5.6	Hazards and Risks	38
5.7	Other Issues	39
6.	CONCLUSIONS AND RECOMMENDATIONS	45
	APPENDIX A – ENVIRONMENTAL ASSESSMENT	46
	APPENDIX B – RECOMMENDED CONDITIONS OF APPROVAL	48
	APPENDIX C – RESPONSE TO SUBMISSIONS	50
	APPENDIX D – STATEMENT OF COMMITMENTS	52
	APPENDIX E – ADDITIONAL INFORMATION ON NOISE CRITERIA WITHIN THE TALLAWARRA LANDS AREA.....	58

1. BACKGROUND

1.1 Location

TRUenergy Tallawarra Pty Ltd (the Proponent) has sought Project Approval under Part 3A of the *Environmental Planning and Assessment Act 1979* for the construction and operation of gas a fired power station in Yallah, on the western foreshore of Lake Illawarra, New South Wales (refer Figure 1). The site is approximately 80 kilometres south of Sydney and 13 kilometres south-west of Wollongong. Access to the site will be from the Princes Highway via Yallah Bay Road, as is the case for the adjoining Tallawarra Stage A power station.

The proposed site is located within Lot 109 DP 1050302, Wollongong City Council, Parish of Calderwood, County of Camden. The site, and surrounding Tallawarra Lands (a total area of 565 hectares), is owned by TRUenergy. The proposed power station will be located immediately adjacent to the Tallawarra Stage A power station.

The Proponent has chosen the site on the basis of its closeness to the high voltage transmission network and to the Eastern Gas Pipeline, which already connects to the site to provide fuel to operate the Tallawarra Stage A power station. The site is also easily accessible by road and co-location next to Tallawarra Stage A means that various facilities and infrastructure can be shared, reducing the total footprint of the development on the environment.

1.2 Surrounding Land Use

The proposed site is within the Tallawarra Lands, an area that generally is highly disturbed having been previously used for a coal-fired power station which was decommissioned in 1989. As a result of its previous use, the majority of the Tallawarra Lands site is vacant and has been cleared of vegetation.

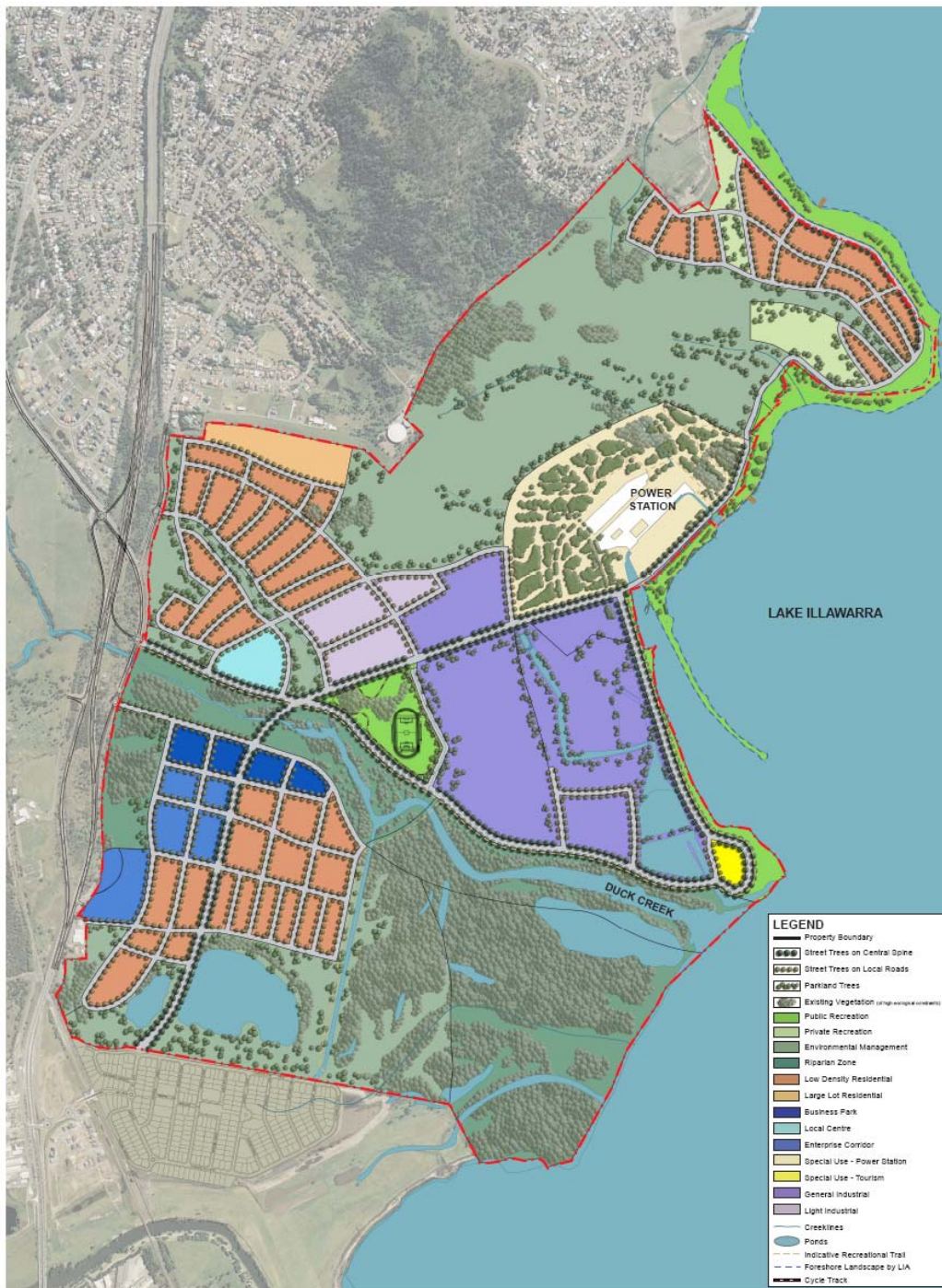
Three ash settling ponds, used by the former coal-fired power station, are located in the south of the site. Currently, cattle grazing and other rural activities constitute the primary land use, occupying nearly half of the Tallawarra Lands. In addition, the Tallawarra Lands site is used by a local bird watching group.

TRUenergy previously applied for rezoning of the Tallawarra Lands to enable surplus land (approximately 550 hectares) to be redeveloped to provide a mix of industrial, commercial, residential and community/conservation uses as illustrated in Figure 2.

Figure 1 - Site Location (SKM/TRUenergy, 2009)



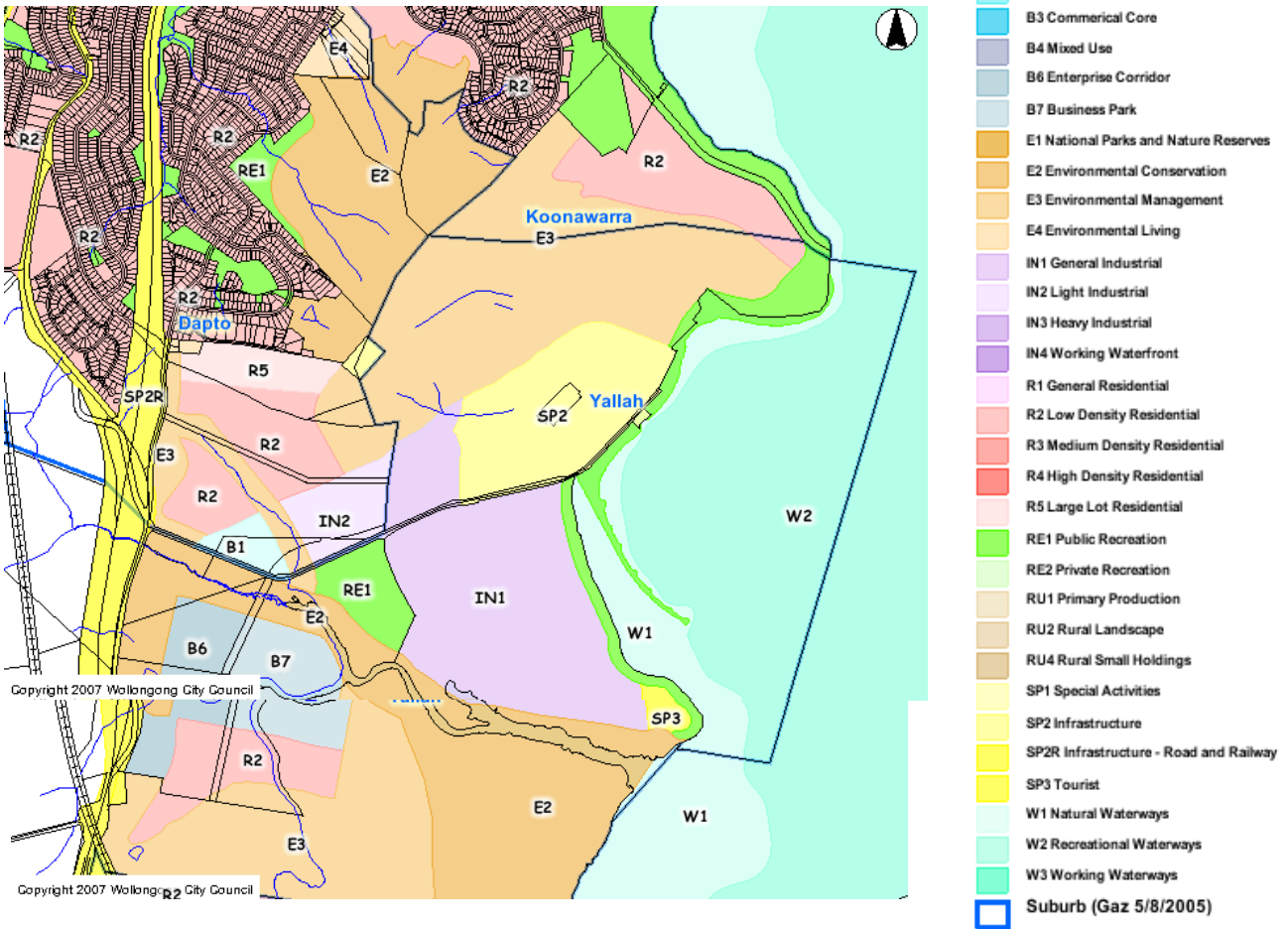
Figure 2 - Proposed Development for Tallawarra Lands (Don Fox Planning, 2009)



Note: This drawing is for indicative purposes only and is subject to change

The *Wollongong Local Environmental Plan 2009* was approved by the Minister for Planning in February 2010. The Plan adopted most of the rezoning proposal with amendments (decreases) to the size of the proposed residential areas in the north and south of the Tallawarra Lands. As can be seen from Figure 3, the rezoning includes the establishment of a buffer zone between the proposed power station and surrounding land uses in order to minimise potential land use conflicts. The buffer zone allows for distances of approximately 145 metres and 185 metres to the proposed residential zonings to the west and north, respectively.

Figure 3 - Zoning of Tallawarra Lands (Wollongong Local Environmental Plan 2009)



Predominant land uses in the wider area include residential, industrial, commercial, rural and open space. The closest existing residential areas are Koonawarra and Dapto which border the north and north-west of the Tallawarra Lands site (refer Figure 1) and Haywards Bay to the south. The nearest residences in the Koonawarra and Dapto precincts are approximately one kilometre from the proposed power station site, while those at Haywards Bay are about four kilometres away.

The proposed West Dapto Release Area is located approximately one kilometre from the western boundary of the Tallawarra Lands site (and three kilometres from the location of the Tallawarra Stage B power station).

The nearest industrial development is located at Yallah with the closest commercial centre being located at Dapto.

In terms of recreational use, the Mount Brown Reserve and a number of other smaller public reserves are located to the north and north-west of the Tallawarra Lands. In addition, the foreshore area adjacent to the proposed power station site and extending to the northern Tallawarra Lands boundary has been dedicated to the Lake Illawarra Authority and is accessible by the general public, providing residents with direct access to Lake Illawarra.

The Southern Freeway and Princes Highway form a major transport corridor along the western boundary of the Tallawarra Lands site. In addition, high voltage transmission lines traverse the Tallawarra Lands extending north and west from the proposed project site. Other major infrastructure includes the Wollongong Airport which is located approximately five kilometres to the south-west of the site.

The Tallawarra Lands site is intersected by three watercourses: Yallah Creek immediately to the north of the proposed site of the power station; Duck Creek some 1.5 kilometres south of the site; and Wollingurry Creek which flows north into Duck Creek. Both Yallah and Duck Creeks discharge into Lake Illawarra.

2. PROPOSED DEVELOPMENT

2.1 Project Description

The project involves the construction and operation of either an open cycle gas turbine power station (open cycle plant) with a nominal capacity of 300-450 megawatts or a combined cycle gas turbine power station (combined cycle plant) with a nominal capacity of 400 megawatts. The decision as to which type of turbine facility would be constructed would be determined by the Proponent following completion of a detailed market analysis of NSW electricity demand projections. However, as a consequence of the Civil Aviation Safety Authority's (CASA) review of plume rise issues in relation to the open cycle option, the Proponent acknowledged in its Submissions Report further discussion is required with CASA before this option could proceed.

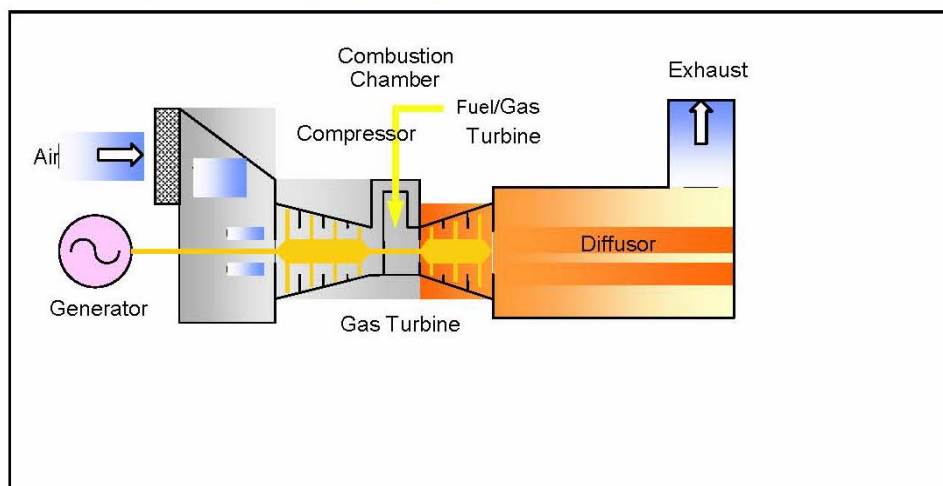
The main project components and ancillary infrastructure associated with either an open cycle plant or a combined cycle plant are described in the following subsections.

Open Cycle Gas Turbine Power Station

An open cycle plant would operate as a peaking facility to supply electricity at short notice during periods of peak demand or system emergency situations. This means that the power station would only operate for up to 10 percent of any year (emergencies excluded), typically on very hot summer days and cold winter nights. The power station would comprise two or three open cycle gas turbine generators with a nominal generating power capacity of 300-450 megawatts, an evaporative cooling system (using potable water), and a high voltage transformer.

The open cycle plant would operate by drawing in cool air through a compressor, where the air would be mixed with natural gas and injected at high pressure into a combustion chamber. When necessary, the air stream would be cooled with an evaporative cooling system using potable water. The combustion reaction produces hot exhaust gases which would be used to drive a turbine which in turn drives an electrical generator to produce electricity. The hot gases would then pass through a silencer unit before being vented to the atmosphere through exhaust stacks fitted at the end of each turbine unit (refer Figure 4). The exhaust stacks would be approximately 40 metres above existing ground level, with the plant building being some 25 metres above existing ground level.

Figure 4 - Generation Process for an Open Cycle Gas Turbine (SKM/TRUenergy, 2009)



The gas turbine units would feature low-nitrogen combustors and would run on natural gas as the primary fuel, with diesel fuel as a backup for use during a major interruption to, or periods of limited, natural gas supply. Natural gas would be supplied from a connection to the existing Tallawarra Stage A power station lateral which connects the Tallawarra site with the Eastern Gas Pipeline. A new gas metering and conditioning plant would be constructed adjacent to the Tallawarra Stage A gas receiving station (refer Figure 5 for location). Diesel fuel would be transported to the site by a tanker on an "as needed" basis and stored in tanks adjacent to the power station. Figure 6 shows the location of the tanks and general site layout. A continuous emission monitoring system would be installed to monitor stack emissions.

Figure 5 – Tallawarra Stage A Power Station Site Layout (SKM/TRUenergy, 2009)



Figure 6 – Tallawarra Stage B General Site Layout, Open Cycle Gas Turbine Power Station (SKM/TRUenergy, 2009)



The power station would generate electricity at a voltage in the range of 11,000-22,000 volts with the voltage being increased to 132 kilovolts by a transformer prior to being fed via a switchyard to 132 kilovolt transmission lines crossing the site.

The total operational potable water requirement (including potable use, general power station use, evaporative cooling, the control of oxides of nitrogen, fogging and compressor washing) would vary depending on the type of turbine unit selected. The annual potable water demand is estimated to be 175 megalitres under the worst-case scenario and would be sourced through the existing Sydney Water main connection for the Tallawarra Stage A power station. Water to be used for the control of nitrogen oxides and fogging is required to be of high purity to avoid damage through corrosion and/or deposition of salts. Consequently, the Tallawarra Stage A reverse osmosis water treatment plant would be expanded with the addition of a 200 kilolitre/day demineralised water train. In addition, a 200 kilolitre demineralised water tank would be constructed. Potable water would be piped direct to the water treatment plant.

The power station is estimated to cost in the order of \$200 million and would generate approximately 200-250 jobs during construction and once operational would require one to three personnel in addition to those employed by the Tallawarra Stage A operations. The project is anticipated to be constructed over a period of 24 months. Hours of operation would be dependent on production needs and usage demands.

Combined Cycle Gas Turbine Power Station

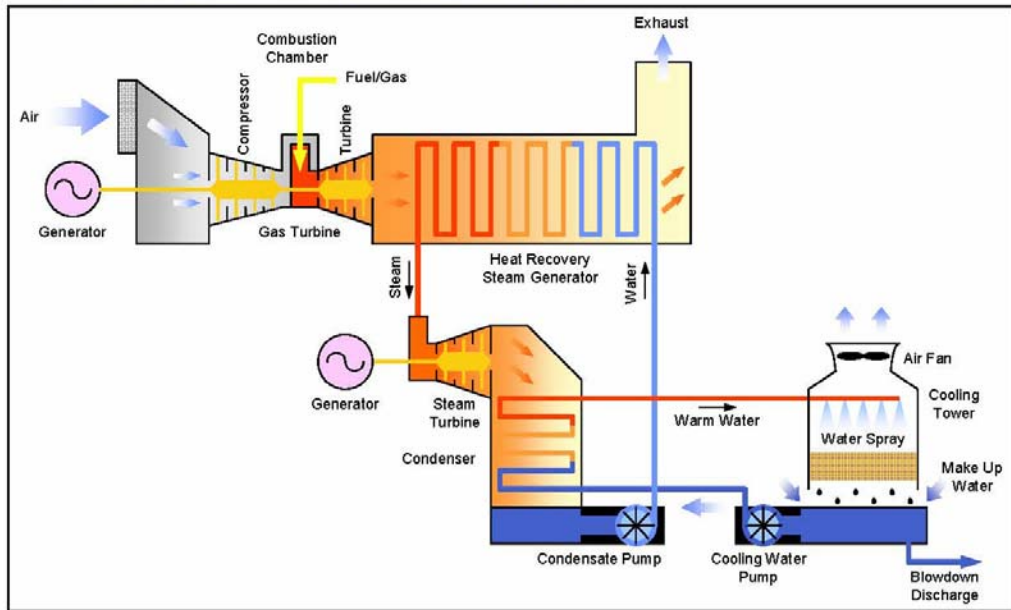
A combined cycle plant would operate as an intermediate to base load electricity generation facility, which would operate continuously for up to 90 percent of any year depending on demand. The power station would comprise a single combined cycle gas turbine generator with a nominal capacity of 400 megawatts, heat recovery steam generator, steam turbine, wet mechanical draft cooling tower, and a high voltage transformer. Figure 7 illustrates the general site layout.

Figure 7 – Tallawarra Stage B General Site Layout, Combined Cycle Gas Turbine Power Station (SKM/TRUenergy, 2009)



The combined cycle configuration would utilise a gas turbine and a steam turbine to drive a generator to produce electricity. The combined cycle plant would operate by drawing in cool air through a compressor, where the air would be mixed with natural gas and injected at high pressure into a combustion chamber. The combustion reaction would then produce hot exhaust gases which would drive a turbine (which in turn drives an electrical generator to produce electricity). The hot exhaust gases generated from the gas turbine would feed into a heat recovery system which produces steam to power a steam turbine which provides approximately one third of the power output (refer Figure 8). Excess hot gases would be vented to the atmosphere through an exhaust stack with a nominal height of 60 metres above existing ground level, with the plant itself being some 25 metres above existing ground level.

Figure 8 - Generation Process for a Combined Cycle Gas Turbine Plant (SKM/TRUenergy, 2009)



The power station would require the installation of a wet mechanical draft cooling tower for the steam cycle. In this system, a flow of cooling water is circulated through the condenser where the heat from the condensation process is transferred to it. The warm cooling water is then sent to a wet mechanical draft cooling tower and is cooled by falling through a current of air. The cooling water would be sourced from Lake Illawarra via the existing Tallawarra Stage A cooling water intake with blowdown water discharged via the Tallawarra Stage A mixing chamber into the existing cooling water outlet which flows to Lake Illawarra (see Figure 5). The typical design water demand for this system is estimated to be 304 litres/second.

The gas turbine unit will feature a low-nitrogen combustor and will run on natural gas which will be supplied from a connection to the existing Tallawarra Stage A power station lateral which connects the Tallawarra site with the Eastern Gas Pipeline. A new gas metering and conditioning plant will be constructed adjacent to the Tallawarra Stage A gas receiving station (refer Figure 5). A continuous emission monitoring system would be installed to monitor stack emissions.

As is the case for an open cycle plant, the combined cycle plant would generate electricity at a voltage in the range of 11,000-22,000 volts with the voltage being increased to 132 kilovolts by a transformer prior to being fed via a switchyard to 132 kilovolt transmission lines crossing the site.

The total operational potable water requirement is estimated to be 90-100 megalitres per annum with the plant operating at 95 percent. As water to be used for the control of nitrogen oxides and fogging is required to be of high purity to avoid damage through corrosion and/or deposition of salts, the Tallawarra Stage A reverse osmosis water treatment plant would be expanded with the addition of a 200 kilolitre/day demineralised water train. In addition, a 200 kilolitre demineralised water tank would be constructed. The Proponent estimates that the total lake water requirements for cooling purposes would be in the order of 379 litres/second under the worst case scenario (i.e. a hot day).

The power station is estimated to cost in the order of \$330 million and would generate approximately 600 jobs during construction and once operational would require 15-20 personnel in addition to those employed by the Tallawarra Stage A operations. The project is anticipated to be constructed over a period of 30 months. Hours of operation would be dependent on production needs and usage demands. However, the power station may operate 24 hours a day for extended periods to meet intermediate and base load demands.

Ancillary Infrastructure

Additional infrastructure required for either an open cycle plant or a combined cycle plant, irrespective of which type of plant is constructed includes:

- step-up transformers to increase the voltage from the electric generators to 132 kilovolts;
- dedicated high voltage switchyard bay, including an above ground connection from the transformers;
- two new 132 kilovolt transmission lines to provide connection from the switchyard to two existing feeder lines located approximately 550 metres north-east of the switchyard; and
- emergency diesel generator to provide emergency power.

The project will utilise existing infrastructure associated with the Tallawarra Stage A power station including:

- existing gas supply lateral;
- water intake canal from Lake Illawarra and outlet canal into the lake (should a combined cycle plant be constructed);
- control room;
- administration building, amenities and workshop;
- internal roads and car parking facilities;
- water treatment plant; and
- domestic wastewater treatment and disposal system.

2.2 Project Need

On 26 February 2008, the then Minister for Planning declared development for the purpose of energy generating facilities with the capacity to generate in excess of 250 megawatts to be critical infrastructure projects. In making this declaration, the Minister recognised that additional energy generating development of this scale was necessary to the State for economic and social reasons. The Minister based this decision on the outcomes of the Owen Inquiry into Electricity Supply in New South Wales (September, 2007) and the 2007 Annual Statement of Opportunities published by the former National Electricity Market Management Company (now the Australian Energy Market Operator). The Australian Energy Market Operator manages the supply of electricity in Australia and each year releases a Statement of Opportunities which provides an analysis of the supply and demand scenario for each region of the National Electricity Market.

The proposed project meets the definition of critical infrastructure under the Minister's declaration of 26 February 2008, as the power station would have the capacity to generate greater than 250 megawatts.

Both the Owen Inquiry and the then National Electricity Market Management Company's 2007 Statement of Opportunities recognised that there is a need to provide additional electricity generating capacity in New South Wales to service growing energy demands. At the time the Minister made the abovementioned critical infrastructure declaration, both the Owen Inquiry and the 2007 Statement of Opportunities predicted that additional generating capacity would be required by 2013/2014 to ensure ongoing energy supply within acceptable reliability standards. This is consistent with the NSW Government discussion paper titled *Energy Directions Green Paper* (2004) which identified that additional base load generation capacity may be needed by 2012/13.

Since the Owen Inquiry Report (based on a medium economic growth scenario in TransGrid's 2007 Annual Planning Report supporting a forecast 1,600 GWh per annum growth in energy demand), TransGrid's Annual Planning Reports have presented a decline in forecast energy demand growth. In 2008, this figure had fallen to approximately 1,400 GWh) and in 2009 to 1,200 GWh. The two key factors contributing to these reductions in forecast energy demand growth were a lower economic growth outlook and allowances made for residential

energy demand reduction measures, specifically, the phasing out of incandescent light bulbs, accelerated uptake of solar hot water systems and small-scale rooftop photovoltaics. TransGrid also highlighted a predicted reduction in forecast scheduled energy demand based on assumed 'much stronger energy contributions from non-scheduled generators, particularly wind farms'.

Nevertheless, the most recent TransGrid Annual Planning Report forecasts an increase in energy demand growth with energy projections being 3,034 GWh, or 3.8 per cent, on average (for the common forecast period 2010-11 to 2018-19) higher than 2009 projections. TransGrid has noted that these differences are due to changes in key assumptions used in previous projections; primarily, the higher than expected economic growth rates based on faster than expected recovery from the global financial crisis.

In each of the Annual Planning Reports from 2008 to 2010, TransGrid has also highlighted the uncertainty around the timing, scale and effect of the Commonwealth Government's Carbon Pollution Reduction Scheme (CPRS). The CPRS has the potential to affect electricity prices, demand for electricity and investment in renewable energy alternatives, but the extent to which this effect presents itself will depend on the timing of the CPRS and, more significantly, the net carbon reduction outcome targeted by the Scheme.

Based on forecast energy demand growth consistent with Transgrid's medium growth estimate among other contributing sources, the Australian Energy Market Operator (AEMO) has prepared and published the annual Statement of Opportunities for 2010. In that report, AEMO predicts that low reserve conditions (LRC) may occur in New South Wales during 2016/2017 (with a predicted shortfall of 27 megawatts) but more likely in 2017/18 (with a predicted shortfall of 416 megawatts). AEMO also predicts that this shortfall would increase to 1,335 MW by 2019/2020. The LRC point is the time at which the network reliability standard may not be met, and at which point loadshedding may be required and brown-outs may occur in some areas. Continued demand growth beyond the LRC without provision of additional generating capacity increases the need for loadshedding and exacerbates issues with the quality and reliability of supply (i.e. brown-out extent, severity and duration).

The predicted 2010 LRC point in 2016/2017 is a revision from the 2009 estimate of 2015/2016 and the 2008 estimate of 2014/2015, principally due to the commissioning of a number of gas-fired power stations in New South Wales (including Tallawarra, Colongra and Uranquinty), the expected completion of the upgrade to the Eraring Power Station and the expected upgrade of Tumut 3. The 2010 LRC is also a revision from the Owen Inquiry estimate of 2013/2014 and also the 2007 Statement of Opportunities LRC in 2013/2014. A key assumption applied in the 2010 Statement of Opportunities (as with previous Statements and in the case of the Owen Inquiry) is the decommissioning of the Munmorah Power Station around winter 2014, with a consequent reduction in New South Wales generating capacity of 600MW. It is noted, however, that a project application for rehabilitation of the Munmorah Power Station was approved in October, 2010.

It has only been three years since the publication of the Owen Inquiry Report, but during that time, the predicted timing of a generation capacity shortfall in New South Wales has similarly shifted by three to four years. This in itself is sufficient to suggest that a level of caution should be applied to predictions made about events five to ten years into the future, based on several assumptions which themselves carry levels of uncertainty. Further, the changing regulatory, policy and market setting for electricity generation in New South Wales and more broadly across the National Electricity Market is another significant factor that has the potential to substantially and rapidly affect future predictions.

The Department therefore considers that estimates of the New South Wales LRC point in 2016/2017 -2017/18 should be viewed with requisite caution and as a current 'best guess' estimate. On the one hand, this estimate may prove to be too early if significant progress is made with demand management, energy efficiency, new (and currently approved) additional renewable generation capacity, and if domestic and international economic activity remains depressed. However, the 2016/2017 -2017/18 date may prove to be too late if uptake of demand management and energy efficiency measures is less vigorous than expected and if there is a significant improvement in economic activity. On this latter point, the Department also highlights that demand growth predictions and estimates of the New South Wales LRC point have not accommodated any potential for sudden significant increases in demands, as may be expected with the establishment of major new energy-intensive developments or industrial complexes. As an example of this, the existing Tomago Aluminium smelter has a constant energy demand of 900MW – establishment of another (hypothetical) energy-intensive industry such as

the smelter has the potential to shift the LRC forward by several years. In short, it is prudent to bear in mind that energy supply-demand balances have been based on extrapolation of current and historical information (with some reasoned accommodation of variability and change over time), and that potentially different future conditions (relative to the assumptions underpinning the forecasts) may change the conclusions reached by Owen, TransGrid and AEMO.

Accordingly, the Department considers it prudent to take a broad, strategic approach to the issue of timing of additional generating capacity by accepting that such additional capacity *may be required* at any point in the period 2014-2020. That is, additional generating capacity should be available for implementation within that period, if required, rather than conclusively determining a date for implementation at this time. This approach is consistent with the Owen Inquiry recommendations, and Owen's own clear distinction between the need to be *prepared* and the act of *implementation*.

The Department considers that the consequences associated with reaching the LRC point in New South Wales, and the consequences of potentially going beyond that point, are fundamental to the justification for the project. As noted above, LRC represent the point at which the National Electricity Market Reliability Standard may not be met; that is, less than 99.998 per cent of consumer demand is met (or alternatively, that annual levels of unserved energy demand over the long-term exceed 0.002 per cent). It is at this point that network intervention may be required to loadshed.

Any loadshedding event will have negative economic and/ or social impacts, and in some circumstances may even have negative environmental impacts (including, for example, the impacts associated with alternative, temporary power supplies). Continued growth in demand beyond the LRC point will place greater pressure on the network and will ultimately lead to more significant impacts. While any loadshedding that may occur across the network under these circumstances will be managed and undertaken in a controlled manner, it is inevitable that without action to address generating capacity shortfalls that non-essential consumers (including, for example, energy-intensive manufacturing) will be called upon to shed some or all of their usual load. Shortly beyond the LRC point, the negative economic impacts of such actions may be limited, but if allowed to continue over the longer term, or to worsen in frequency, duration or extent then it is likely that cumulative economic impacts will become significant. Loadshedding may also affect the extremities of the network, generally rural and regional communities, with impacts ranging from initial inconvenience to more significant economic and social impacts in the longer term.

The adverse impacts of operating up to and beyond the LRC point are also an issue in terms of perception and in terms of future growth. Development is attracted to New South Wales based on a number of contributing factors, including the availability and security of essential services, such as electricity provision. Even if the LRC point is not reached, but simply approached, the perception that there isn't, or will not be, sufficient secure energy supplies to continue to support development and to accommodate future development could have a very significant negative effect on further investment in the State. This is particularly relevant in the case of larger-scale, more energy-intensive industrial and manufacturing developments (noting again that demand growth forecasting has not assumed any major new industrial load). This effect is likely to remain as a perception as the State approaches the LRC point, but would become a clear reality once the LRC point is reached: development and investment potential would be significantly impacted in those areas and those sectors that rely on a secure energy supply and for which such a supply has not been provided.

In this context, the Department considers it highly undesirable for the State to reach or move beyond the LRC point. Ideally, the State will have sufficient installed capacity at any one time to accommodate growth in demand for at least the lead time(s) necessary to implement further measures to keep pace with the growth in demand. The consequences of not doing so (and going beyond the LRC point) are considered so significant that all reasonable measures should be implemented to minimise the likelihood of those consequences becoming reality.

The Department is satisfied that the proposed project is justified as an important and necessary component of a suite of capacity generating measures to secure the State's energy supplies in the medium and longer term. This position is based on the need to address the potential demand-supply imbalances, and avoid the adverse consequences of not addressing the imbalance (e.g. load shedding). Gas-fired power generation, such as the development which is the subject of this assessment, is generally viewed to be a suitably efficient approach for

meeting electricity generation needs in the medium term. The *Energy Directions Green Paper* and Owen Inquiry Report identify that managing and meeting base load demand can occur through the construction of gas generation facilities. In addition, the *Energy Directions Green Paper* identifies gas-fired power stations to be a highly effective measure for meeting peak demand and highlights that a suitable site for the development of a gas-fired peaking plant would be at Tallawarra.

Gas-fired power generation is also seen as an important 'transition' fuel that would provide important greenhouse gas advantages when compared to coal-fired generation. Although the project would generate greenhouse gases, the greenhouse gas emission intensity when compared to coal-fired power stations is low. When operating as a combined cycle plant at 95 percent capacity, the emission intensity would be approximately 465 tonnes of carbon dioxide equivalents per gigawatt hour. The emission intensity for an open cycle plant operating at 35 percent capacity would be 750 tonnes of carbon dioxide equivalent per gigawatt hour. On a comparison basis, brown coal-fired power stations in Australia can produce up to 1,500 tonnes of carbon dioxide equivalent per gigawatt hour. Black coal-fired power stations in NSW have been shown to produce in the order of 1,000 tonnes of carbon dioxide equivalent per gigawatt hour. The relatively low emission intensity of the proposed project is compliant with the *The National Greenhouse Strategy* (1998) which aims to lower the emissions intensity associated with electricity production.

When considering the construction of new electricity generating facilities, it is not only important to consider their ability to contribute to electrical production but also their ability to provide supply to areas in need. The majority of electricity usage in NSW occurs between Wollongong and Newcastle, accounting for over 75 percent of the State's power demand and a third of the total load in the national electricity market. In its report, *New South Wales Annual Planning Report 2009*, TransGrid indicated that the load in the Newcastle-Sydney-Wollongong area is growing and that this load growth will be partially met by generation developments within the load area.

The limited capacity of the transmission network between Newcastle-Sydney- Wollongong constrains the location of future electricity generation facilities. The document *Development of Supply to the Newcastle-Sydney-Wollongong Area* (TransGrid, 2006) acknowledged that the existing 330 kilovolt network is reaching the upper limit of its capacity in supplying these areas during periods of high demand. The *New South Wales Annual Planning Report 2009* by TransGrid and the *Transgrid Strategic Network Development Plan 2008* indicate that the number of locations where new generation could be connected to the NSW transmission network without the need to augment the network is now limited. Connecting generators outside the Sydney-Newcastle-Wollongong load centre is constrained by limited transmission line capacity to those major load centres. Consequently, the construction of the Tallawarra Stage B power station provides the opportunity to utilise existing infrastructure without significant additional network augmentation and investment and more importantly will provide for electricity flows to the major load centres of Newcastle-Sydney-Wollongong. This means that electricity generated by the power station would be directed to the major centres which generate most of the demand in New South Wales.

Furthermore, the proposed location of the power station adjacent to the Tallawarra Stage A power station avoids the need to duplicate various infrastructure as well as the environmental impacts that could arise from such development.

In consideration of the above matters, the Department is satisfied that the Proponent has established a need for the project.

3. STATUTORY CONTEXT

3.1 Major Development

The project is declared to be a Major Project under *State Environmental Planning Policy (Major Development) 2005* because it is development for the purpose of an electricity generation facility for gas-fired generation that has a capital investment value of more than \$30 million (clause 24(a)). On 15 September 2007, the Director-General, under delegation from the Minister, formed the opinion that the project meets the requirements of the *State Environmental Planning Policy (Major Development) 2005* and declared the project to be a major project under Part 3A of the *Environmental Planning and Assessment Act 1979*. Therefore, the project will be assessed and determined by the Minister for Planning under Part 3A of the Act.

The Director-General's requirements for the preparation of an Environmental Assessment were issued on 31 October 2007. For the purpose of section 75H of the *Environmental Planning and Assessment Act 1979*, the Environmental Assessment complied with the Director-General's requirements, subject to a number of amendments being made, and the Proponent was notified of this compliance (with the need for amendments) on 22 June 2009.

3.2 Critical Infrastructure

On 26 February 2008, the Minister declared development for the purposes of a facility for the generation of electricity that has a capacity to generate at least 250 megawatts and is the subject of an application lodged pursuant to section 75E or 75M of the Act prior to 1 January 2013, to be critical infrastructure pursuant to section 75C of the *Environmental Planning and Assessment Act 1979*. The project relates to the construction of either an open cycle gas turbine power station with a nominal capacity of 300-450 megawatts or a combined cycle gas turbine power station with a nominal capacity of 400 megawatts and the subject application was received on 14 September 2007. It therefore meets the criteria to be considered a critical infrastructure project.

3.3 Permissibility

The Project falls within the boundary of the Wollongong Local Government Area. The proposed project site is currently zoned SP2 Infrastructure under the *Wollongong Local Environmental Plan 2009*. Pursuant to the *Wollongong Local Environmental Plan*, the project is permissible. Under Clause 34 of *State Environmental Planning Policy (Infrastructure) 2007*, "development for the purposes of electricity generation may be carried out by any person with consent on land in a prescribed zone" (or equivalent zoning). SP2 Infrastructure is a prescribed zone, and consequently, the project is permissible with consent on the subject land.

3.4 Environmental Planning Instruments

The environmental planning instruments that substantially govern the project are *State Environmental Planning Policy (Major Development) 2005* and *State Environmental Planning Policy (Infrastructure) 2007*. The relevance of these is outlined in Sections 3.1 and 3.3.

The relevant regional environmental planning instrument is the *Illawarra Regional Environmental Plan No.1*. The proposed development is consistent with the objectives of this instrument.

3.5 Objects of the Act

Decisions made under the Act must have regard to the objects of the Act, as set out in Section 5 of the Act. The relevant objects are:

- (a) *to encourage:*
 - (i) *the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,*
 - (ii) *the promotion and co-ordination of the orderly and economic use and development of land,*
 - (iii) *the protection, provision and co-ordination of communication and utility services,*

- (iv) *the provision of land for public purposes,*
- (v) *the provision and co-ordination of community services and facilities, and*
- (vi) *the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and*
- (vii) *ecologically sustainable development, and*
- (viii) *the provision and maintenance of affordable housing, and*
- (b) *to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and*
- (c) *to provide increased opportunity for public involvement and participation in environmental planning and assessment.*

Of particular relevance to the environmental impact assessment and eventual determination of the subject project application by the Minister, are those objects stipulated under section 5(a). Relevantly, the objects stipulated under (i), (ii), (iii), (vi) and (vii) are significant factors informing determination of the application (noting that the proposal does not raise significant issues relating to land for public purposes, community services and facilities or affordable housing). With respect to ecologically sustainable development, the Act adopts the definition in the *Protection of the Environment Administration Act 1991*, including the precautionary principle, the principle of inter-generational equity, the principle of conservation of biological diversity and ecological integrity, and the principle of improved valuation, pricing and incentive mechanisms. In applying the precautionary principle, public decisions should be guided by careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment and an assessment of the risk-weighted consequences of various options.

It is important to recognise, that while the Act requires that the principles of ecologically sustainable development be encouraged, it provides other objects that must be equally included in the decision-making process for the subject proposal. The Department's assessment has given due consideration to the objects of the Act in its assessment including:

- the need to encourage the principles of ecologically sustainable development:
 - the Department has taken a conservative approach to the assessment of risks and conditioning of the project, consistent with the precautionary principle;
 - the Department's assessment of greenhouse gas emissions (section 5.3) has considered the benefits of the project in helping to encourage the use of a less-greenhouse gas intensive fuel, and hence limit climate change, which is consistent with the principle of inter-generational equity;
 - the Department's assessment of the ecological impacts of the project (sections 5.5 and 5.7) is based on a conservative assessment of the likely extent of ecological impacts and of likely offset requirements to ensure that appropriate and adequate measures are put in place to prevent the threats of serious or irreversible environmental damage consistent with the precautionary principle and the principle of conservation of biological diversity and ecological integrity. It should be noted that, given the past uses of the site, the ecological values are generally low; and
 - the Department's assessment of key issues has considered the need to apply mitigation measures to minimise impacts such as air quality and apply appropriate offsets for residual biodiversity impacts, which is consistent with the principle for the appropriate valuing of natural resources. The Department notes that the power station will burn a natural resource (gas). However, the pricing of fuel is beyond the scope of a project specific assessment under the Act;
- the proper management, development and conservation of natural and artificial resources has been considered in section 5 (in relation to landuse, water and biodiversity impacts);
- the orderly development of land, which has been considered in sections 5.1 - 5.2 and 5.6, in particular, of the Department's assessment in relation to the potential amenity impacts of the project (noise, air quality and risks) on surrounding receptors, and sections 2.2 and 5.3 in relation to project need and its benefits in promoting the social and economic welfare of the community and a better environment by helping to ensure a reliable electricity supply, with reduced greenhouse gas emissions;
- provision of utility services will be achieved by the establishment of a new power station; and
- the protection of the environment including threatened species, which has been considered in sections 5.5 and 5.7 of the Department's assessment.

In addition to the above, the agency and community consultation undertaken as part of the assessment process (see Sections 3 and 4 of this report), address objects 5(b) and (c) of the Act.

3.6 Minister's Approval Power and Statement of Compliance

On 31 October 2007, the Director-General issued Environmental Assessment Requirements for the preparation of an Environmental Assessment report for the project, pursuant to section 75F(3) of the *Environmental Planning and Assessment Act 1979*. The Proponent submitted a draft Environmental Assessment report to the Director-General in September 2008. The draft report was considered inadequate. Following subsequent draft reports, the Proponent submitted a final amended report in July 2009 (Appendix A) which adequately addressed the Director-General's requirements issued for the Project Application.

The Project Application and accompanying Environmental Assessment were placed on public exhibition from 5 August 2009 until 3 September 2009 at the following locations:

- Department of Planning, Information Centre, Sydney;
- Nature Conservation Council of NSW, Sydney; and
- Wollongong City Council, Wollongong.

The Environmental Assessment was also made publicly available on the Department's website. Submissions were invited in accordance with Section 75H(4) of the Act.

Following the exhibition period, the Director-General directed the Proponent to respond to the issues raised in the submissions. As the Project will require an Environment Protection Licence, a copy of the submissions was also provided to the Department of Environment, Climate Change and Water, pursuant to Section 75H(5) of the Act. The Submissions Report prepared by the Proponent was subsequently made publicly available on the Department's website.

The Department has met all its legal obligations so that the Minister can make a determination regarding the Project.

In accordance with section 75I of the Act, the Department is satisfied that the Director-General's environmental assessment requirements have been complied with.

3.7 Commonwealth Legislation

The Proponent determined that the project would be unlikely to have a significant impact on any matters of national environmental significance. Therefore, a referral to the Commonwealth Department of the Environment, Water, Heritage and the Arts under the *Environment Protection and Biodiversity Conservation Act 1999* was not made.

4. CONSULTATION AND ISSUES RAISED

4.1 Public Submissions

The Department received no public submissions on the Project.

4.2 Submissions from Public Authorities

Ten submissions were received from public authorities: the Commonwealth Department of Defence (DOD); AirServices Australia (ASA); Civil Aviation Safety Authority (CASA); NSW Department of Environment, Climate Change and Water (DECCW); NSW Office of Water (NOW); NSW Roads and Traffic Authority (RTA); Lake Illawarra Authority (LIA); Wollongong City Council (WCC), Shellharbour City Council (SCC) (two submissions). Although none of the agencies objected to the proposal, they did raise a number of issues for the Department's consideration including: noise impacts on existing and future sensitive receivers; impacts on aquatic ecology; water quality impacts; air quality impacts; and impacts on aircraft operations. Comments made by each of the authorities are summarised below.

DOD indicated that it concurred with the Proponent's intention to make an application to the Commonwealth Civil Aviation Safety Authority to assess and determine the plume rise hazard on aircraft operations and that the Authority's assessment would meet its requirements for the project.

ASA stated that the proposed project would impact on aircraft operations at the Illawarra Regional Airport. Development of a combined cycle plant would impact on circling areas and the missed approach procedures and/or minimum descent altitude for aircraft. An open cycle plant would affect all sectors of the missed segment approach (i.e. the lowest altitude which will provide a specified minimum clearance above all obstacles located within a specified area), circling areas and missed approach procedures.

CASA stated that the project would adversely impact on both aviation safety and the usability of the airport in bad weather with there being an increase in aircraft having to divert during bad weather or low cloud conditions.

DECCW indicated concerns with regards to the:

- adequacy of the assessment of biocides and antiscalents and their potential impact on the water quality and aquatic ecology of Lake Illawarra; and
- assessment of operational noise impacts on future residential development within the Tallawarra Lands.

In regards to biocides and antiscalents, the DECCW advised that there were significant errors in the calculations of the proposed discharge concentrations and that the actual concentrations would exceed levels which may be toxic to aquatic organisms in Lake Illawarra. Further, chemicals used in Australia as a biocide must be registered or permitted by the Australian Pesticides and Veterinary Medicines Association. The biocide proposed for use in a combined cycle plant is not registered or approved. Further assessment of this issue was subsequently undertaken by the Proponent and is addressed in section 5.5.

In regards to noise impacts, DECCW argues that as there is now certainty as to the proposed zoning and footprint for residential development in the Tallawarra Lands, the Proponent should undertake a noise assessment with respect to the proposed residential development. The reason for this is that the assessment of the power station project is the most appropriate time to determine the potential noise impacts on future residential development, and whether additional feasible and reasonable source noise controls can be incorporated into the project. If the noise impact assessment on the future residential development is deferred until after determination of the project, the potential for additional "at source" noise controls will be limited.

DECCW has undertaken a preliminary assessment of the potential noise impacts on the future residential development in the Tallawarra Lands as part of its submission. This assessment found that noise levels are likely to exceed impact assessment goals in the southern portions of the residential development proposed to the north of the power station and the eastern portions of the residential development proposed in the central area of the Tallawarra Lands. Further assessment of this issue was subsequently undertaken by the Proponent, DECCW, and the Department, and is discussed in section 5.1.

DECCW recommended amendments to the Statement of Commitments relating to noise and water quality. It also recommended conditions of approval relating to noise limits, noise monitoring, water quality discharges, the assessment of water quality impacts, water quality monitoring, and air quality discharges and monitoring.

NOW provided information on the classification of streams on the Tallawarra Lands site including the minimum widths required to achieve the classified riparian categories, noting that Yallah Creek is a Category 1 watercourse. As a Category 1 watercourse, the Office of Water indicated that Yallah Creek warrants riparian revegetation and protection for a minimum width of 50 metres either side of the waterway, as measured from the top of each bank. NOW recommended a number of management measures including:

- removal of the piped section of Yallah Creek and rehabilitation of the creek to emulate a natural system;
- establishment of a riparian zone consisting of local native plant species in and adjacent to Yallah Creek within the power station site boundary;
- location of any works associated with the project, including the construction of transmission lines, outside the 50 metre riparian zone which extends from the top of the bank of Yallah Creek;
- establishment of a 50 metre wide vegetated riparian corridor along the foreshore area adjacent to the power station site;
- rehabilitation of any watercourses disturbed as a result of the project in a manner which emulates a natural system for aquatic and terrestrial environments;
- construction of watercourse crossings in accordance with the *Guidelines for Controlled Activities Watercourse Crossings* (Department of Water and Energy, 2008);
- preparation of a Vegetation Management Plan which addresses protection of remnant local native riparian vegetation and the restoration of any riparian zones;
- monitoring and maintenance of all riparian zones for a period of at least five years after final planting;
- construction of a permanent physical barrier to prevent inadvertent damage to riparian zones at their landward extent;
- implementation of erosion and sediment control measures; and
- ensuring that any requirements for bushfire asset protection zones do not compromise the extent or function of riparian zones.

The **RTA** stated that it had no objection to the project with respect to the assets that it maintains and recommended that the conditions of approval include requirements for the Proponent to:

- prepare a Traffic Management Plan for the construction phase of the project; and
- apply for a Road Occupancy Licence prior to commencing any works within a classified road reserve or within 100 metres of traffic signals.

The **LIA** noted that the project has the potential to impact on Lake Illawarra and supports the Statement of Commitments which outlines the environmental mitigation, management and monitoring provisions to be implemented during the construction and operation of the project.

WCC raised the following issues:

- noise impacts – intermittent noise from the proposal should be considered as should the impact on future residential development within the Tallawarra Lands and nearby suburbs;
- air quality – measures should be imposed to ensure that the combined nitrogen oxide emissions from both Tallawarra Stage A and B plants do not surpass a limit of 900 tonnes per annum, and that emissions of sulphur dioxide, particulates and unburnt hydrocarbons are limited, as a higher level of emissions and smog generation is expected to be discharged into the Warrawong-Albion Park airshed;
- sewage management – the project site is not sewered and an increase of the existing septic tank effluent system will require approval from Council;
- water usage – the use of potable water will increase pressure on an already constrained freshwater supply;
- thermal impacts on Lake Illawarra – the discharge of blowdown water into the lake may result in thermal pollution with a direct impact on the seagrass bed in the vicinity of the water outlet; and
- flora and fauna – support is given to the Proponent's commitment to carry out further assessment of certain fauna species, however there is concern over possible edge effects on an endangered ecological

community near the project site. The nearest recorded population of the Green and Golden Bell-frog is in the Port Kembla area not the Coomonderry Swamp.

The Council recommended a number of conditions of approval relating to stormwater and flooding including minimum platform levels, storage of equipment and materials above the probable maximum flood level, overflow paths, and emergency flood response planning.

SCC raised concern over the potential visual impact of the project and recommended the use of non-reflective materials and landscaping to screen the power station from view. It also raised concern over the potential for the project to impact on the health of Lake Illawarra and indicated that special consideration should be given to ensure that it is not detrimentally impacted. The Council also indicated that it would be concerned should the project result in an increase in air pollution in its local government area.

In a second submission to the Department, SCC advised that it had carried out a multi-million dollar upgrade of the airport over recent years and expressed concern that the construction of the power station would potentially adversely impact on current aircraft operations and detract from planned future airport expansion. The Council requested that the Department liaise with AirServices Australia to determine if alternate navigational procedures can be put into place to ensure no adverse impacts on aircraft operations.

4.3 Submissions Report

Upon review of the submissions received, the Department directed the Proponent to prepare a Submissions Report to address each of the issues raised. As part of this process, the Proponent reviewed each submission and made specific comment on each of the issues raised. A copy of the Submissions Report is attached as Appendix C. The Submissions Report was prepared as two parts. The first part addressed issues relating to noise, air quality, water quality, lake ecology, drainage and flooding, while the second part focussed on aviation safety.

The Proponent's response to submissions did not lead to any changes to the Project. As such a Preferred Project Report was not prepared. However, the Part 2 Submissions Report acknowledged that the open cycle option could not be constructed at this stage, until further analysis of plume rise and aircraft safety issues is undertaken.

The Submissions Report (including a finalised Statement of Commitments – refer Appendix D) was made publicly available on the Department's website and the relevant government agencies notified. In addition, copies of the draft and final Part 1 Submissions Report were provided for comment to DECCW in light of outstanding issues regarding potential impacts on acoustic amenity and water quality. DECCW reviewed those aspects of the report relevant to its assessment and recommended:

- concentration limits for biocides and antiscalants in the discharge from the cooling tower system in the event a combined cycle plant is constructed; and
- revised noise limits at residences outside the Tallawarra Lands and within the proposed Tallawarra Lands residential areas.

DECCW also requested that the Department consider recommending a condition of approval which required the Proponent to select a gas turbine type that does not have a greater low frequency noise content than that used at the Tallawarra Stage A Power Station.

Information on the outcome of the plume rise assessment was forwarded to SCC by the Proponent. Council advised the Department that it would not oppose a combined cycle gas turbine, but it would oppose an open cycle plant, because of plume impacts on both instrument and visual air navigation in the vicinity of Illawarra Regional Airport.

5. ASSESSMENT OF ENVIRONMENTAL IMPACTS

After consideration of the Environmental Assessment (Appendix A), submissions received, Submissions Report (Appendix C), and Statement of Commitments (Appendix D), the Department has identified the following key environmental issues associated with the proposal:

- noise;
- air quality;
- water quality in Lake Illawarra;
- lake ecology;
- aviation safety; and
- hazards and risks.

The Proponent has also assessed the potential impacts of the project on traffic, visual amenity, terrestrial ecology, Aboriginal and non-indigenous heritage, soils (including erosion and sedimentation), waste generation, and considered the impacts associated with flooding, including sea level rise. These issues are considered to be minor for the subject proposal and although adequately assessed, require consideration and specific conditions of approval. The Department's consideration of these issues is addressed in Section 5.7.

5.1 Noise¹

Issue

Construction Noise

Construction noise will be generated by the operation of trucks, excavators, backhoes, front-end loaders, graders, compressors, scrapers, bulldozers, cranes, compactors, rollers and hand tools required for the construction of the project, including site clearing, bulk earthworks, establishment of site foundations, construction of buildings, plant and pipelines and transmission line installation.

The Proponent did not undertake an assessment of the impact of construction noise arguing that it was not required as the construction activities and consequent noise emissions would be similar to that for the Tallawarra Stage A power station and these were not audible at the nearest sensitive receivers. The Proponent claims that the same distance separation and topographic shielding that provided noise attenuation for the Tallawarra Stage A works would make the construction works associated with the proposed project inaudible at sensitive receivers. Although the Department accepts this argument as valid for existing sensitive receivers, it is not known whether the same would be true for sensitive receivers within the Tallawarra Lands in the event that residential development within the Tallawarra Lands precedes the construction of the power station.

Vibration

A quantitative assessment of ground borne vibration was not undertaken as the Proponent determined that vibration levels, and any associated annoyance or structural damage, would be negligible during construction of the project given the separation distances from these activities to the nearest potentially impacted receivers. In addition, operational activities will not generate vibration at the nearest affected residents or commercial or industrial centres.

Operational Noise

The dominant noise sources associated with the operation of either an open cycle or combined cycle plant are the exhaust stack, air intake, turbine(s) and transformers. The cooling tower associated with a combined cycle plant is also a significant source of noise. All of these components exhibit noise spectra that have a significant

¹ A number of noise descriptors are used in this section, including:

dB – decibels, a unit of sound measurement;

dB(A) and dB(C) – (A) refers to adjustments made to sound measurements to approximate the response of the human ear, while (C) refers to adjustments made to take account of low frequency noise;

L_{Aeq} – essentially the average noise level over a measurement period (commonly 15 minutes);

L_{Amax} – essentially the maximum noise level, and is used to minimise the sleep disturbance risk. The L_{A1} descriptor is also used in this context.

low frequency content, which attenuates at a slower rate than the higher frequencies and can persist over long distances.

Operational noise generated by both types of plant have been assessed in accordance with the *NSW Industrial Noise Policy* (Environment Protection Authority, 2000) and considered intrusive noise impacts and the impact on local noise amenity during the daytime (7.00 am to 6.00 pm), evening period (6.00 pm to 10.00 pm) and night time period (10.00 pm to 7.00 am) under calm/neutral and adverse meteorological conditions. The assessment of impacts also addressed the combined operation of the Tallawarra Stage A and Stage B power stations. Attended noise monitoring was undertaken at three locations with unattended noise monitoring undertaken at four locations (refer Figure 9). The results of the monitoring were supplemented with background noise monitoring data gathered from five locations surrounding the power station site, prior to the operation of the Tallawarra Stage A power station (Figure 10).

Based on the noise assessment, the Proponent determined that under neutral meteorological conditions the daytime, evening and night time noise impacts associated with the operation of either an open cycle gas turbine plant or combined cycle gas turbine plant, are predicted to be compliant with the project specific noise criteria at all existing receiver locations external to the Tallawarra Lands boundary. Table 1 and Table 2 set out the noise goals and predicted noise levels for a combined cycle plant and an open cycle plant, respectively, operating in conjunction with the Tallawarra Stage A power station. These levels include a 5 dB(A) low frequency noise penalty.

Table 1: Predicted Noise Levels for Stage A and Stage B Combined Cycle Plants Operating Simultaneously

Location	Description	Predicted Noise Level Neutral Conditions	Predicted Noise Level Adverse Conditions	Noise Goal
T2	Carlyle St, Koonawara	28 dB(A)	30 dB(A)	43 dB(A)
T4	Wyndarra Way, Koonawara	29 dB(A)	31 dB(A)	36 dB(A)
9	Central Park, Mongurah Pt	31 dB(A)	35 dB(A)	38 dB(A)
10	Boonarah Pt	32 dB(A)	35 dB(A)	37 dB(A)
11	Haywards Bay Estate, Yallah	26 dB(A)	31 dB(A)	44 dB(A)

Table 2: Predicted Noise Levels for Stage A Combined Cycle Plant and Stage B Open Cycle Plant Operating Simultaneously

Location	Description	Predicted Noise Level Neutral Conditions	Predicted Noise Level Adverse Conditions	Noise Goal
T2	Carlyle St, Koonawara	27 dB(A)	28 dB(A)	43 dB(A)
T4	Wyndarra Way, Koonawara	26 dB(A)	27 dB(A)	36 dB(A)
9	Central Park, Mongurah Pt	31 dB(A)	33 dB(A)	38 dB(A)
10	Boonarah Pt	31 dB(A)	33 dB(A)	37 dB(A)
11	Haywards Bay Estate, Yallah	25 dB(A)	28 dB(A)	44 dB(A)

Noise impacts from start up and shut down procedures may be louder than the normal operations of the power station. The Proponent did not assess the noise impacts from these procedures as part of normal operation conditions due to their intermittent nature and potential to be mitigated where necessary but did consider the associated noise impacts in terms of sleep disturbance (refer to below subsection on Sleep Disturbance).

The noise assessment undertaken by the Proponent only addressed potential impacts on the acoustic amenity of existing sensitive receivers, arguing it was premature to set project specific noise criteria for future sensitive receivers at this stage as there are no firm development plans for the site.

At the time of the exhibition of the Environmental Assessment, the proposed zoning for the Tallawarra Lands had been exhibited and the proposed layout of the residential development finalised. Consequently, the Department requested the Proponent to undertake a preliminary noise assessment for the proposed residential developments in the Tallawarra Lands as part of the response to submissions as now is the opportune time to determine whether additional reasonable and feasible source noise controls would be incorporated into the design of the development and hence ensure its compatibility with the proposed land uses. If the assessment was deferred until after the determination of the project, the potential for additional noise source controls could be limited.

In its Submissions Report, the Proponent argued that the potential impact of the project on the acoustic amenity of future residents was addressed in the Environmental Assessment along with indicative criteria, and that further assessment is not warranted as the indicative criteria have been appropriately determined and that any consideration of noise controls is best undertaken in consultation with an equipment supplier.

Figure 9: Noise Monitoring Locations for Tallawarra Stage B Power Station (SKM/TRUenergy, 2009)



Figure 10: Noise Monitoring Locations for Tallawarra Stage A Power Station (SKM/TRUenergy, 2009)



Sleep Disturbance

The emission of peak noise levels for an instant or very short time period may cause sleep disturbance to residents. Sleep disturbance is subjective and not all persons are affected by noise to the same degree. Noise impacts from start up and shut down procedures may be louder than the normal operations of the power station and will create instantaneous noise events. As such, the Proponent undertook an assessment to determine if such operational events would result in sleep disturbance. The assessment was based on a 175 megawatt class open cycle gas turbine plant and is considered to be representative of the worst case for a normal shutdown, with similar events in a combined cycle gas turbine plant expected to occur at similar or lower levels as such operations would occur inside the power station and are attenuated by the building enclosure and silencers. In open cycle gas turbine plants, the operations often occur outside the turbine building. Worst case adverse meteorological impacts were applied in the assessment which was limited to existing residents.

In accordance with the *Environmental Noise Control Manual* (Environment Protection Authority, 1994), the L_{A1} level of any specific noise source should not exceed the background noise level by more than 15 dB(A) when measured outside the bedroom window of the nearest potentially affected receiver. The night-time background noise level has been applied in the assessment by the Proponent as it is considered indicative of the worst case scenario. The results of the modelled predictions for sleep disturbance indicate that, even under adverse meteorological conditions, the sleep disturbance criteria would not be exceeded at the nearest affected existing sensitive receivers. The Environmental Assessment provided no certainty as to whether the criteria would be

exceeded at sensitive receivers within the Tallawarra Lands (once developed), as it did not assess this scenario. However, subsequent to the Environmental Assessment, and Submissions Report, the Proponent submitted additional information on noise issues in the Tallawarra Lands, including the results of a baseline noise survey, with particular reference to the proposed northern residential area. This information has been considered in setting appropriate noise limits, as discussed below.

As construction activities will not be undertaken during the night-time, an assessment of sleep disturbance was not undertaken for construction activities.

Consideration

Construction Noise

The Department concurs with the Proponent's assessment that the construction of the power station is unlikely to pose a significant noise impact to existing receptors due to the distance of the project site from the nearest existing sensitive receivers (approximately 1.2 kilometres away). The Proponent has proposed a number of mitigation measures aimed at minimising any potential impacts of construction noise on nearby sensitive receivers. These measures include the use of silencers on equipment and restricting construction hours for audible construction work. In addition, the Proponent has committed to undertaking noise monitoring to validate predicted noise impacts. Nevertheless, to ensure that the Proponent adheres to these measures, the Department has recommended as a condition of approval restrictions on the hours and days of audible construction to 7:00 am to 6:00 pm Monday to Friday, and 8:00 am to 1:00 pm on Saturdays, with the exception of work that is necessary for emergency or safety reasons.

The Department has also recommended a condition of approval requiring the Proponent to prepare a Construction Noise Management Plan detailing the monitoring measures for assessing construction noise compliance, and all reasonable and feasible measures for minimising and managing construction noise. This is in addition to recommending that the Proponent minimise noise emissions from construction plant and equipment by installing and maintaining where reasonable and feasible, efficient silencers and low-noise mufflers (residential standard). Further, the Department has recommended that the Proponent be required to implement a complaints handling procedure which includes measures for responding to construction noise complaints.

DECCW's *Interim Construction Noise Guideline* (July 2009) indicates that where noise is more than 10 dB above the rating background level, residents are considered to be noise affected and measures should be implemented to reduce the noise. Although the Proponent has indicated that construction noise would be inaudible at the nearest existing sensitive receivers, the Department is of the opinion that a construction noise goal should be applied to protect the amenity of sensitive receivers in the event that noise is audible. In keeping with the *Interim Construction Noise Guideline*, the Department has recommended a condition of approval stipulating that where audible at any sensitive receiver, the $L_{Aeq}(15 \text{ minute})$ should not exceed the rating background level by more than 10 dB.

This condition will also ensure that construction noise levels at sensitive receivers within the Tallawarra Lands are also kept to acceptable levels, in the event that residential development precedes construction of the power station.

Although vibration from construction activities is unlikely to impact on existing sensitive receivers outside the Tallawarra Lands, there is the potential for vibration to be an issue within the Tallawarra Lands. Consequently, the Department has recommended construction vibration goals in the event that residential development within the Tallawarra Lands precedes construction of the power station.

Operational Noise Impacts Outside the Tallawarra Lands

The Department is satisfied that the Proponent has undertaken a conservative and representative assessment of the operational noise impacts resulting from both open and combined cycle plants on existing sensitive receivers outside of the Tallawarra Lands. In considering the Proponent's assessment, the Department has taken into consideration the potential for the proposal to generate cumulative noise impacts at surrounding sensitive receivers by adding to noise levels generated by the Tallawarra Stage A power station.

The Proponent has proposed project specific noise levels at five locations surrounding the power station as set out in Table 1 and Table 2. The predicted noise levels arising from the combined operation of Tallawarra Stage A and Tallawarra Stage B power stations, under adverse meteorological conditions, are illustrated in Figure 11 and Figure 12. As can be seen from the figures, the power station would meet the noise levels whether operating as a combined cycle or open cycle plant, in conjunction with Tallawarra Stage A.

The *NSW Industrial Noise Policy* states that where the Proponent predicts that noise levels from an industrial development would be below the project-specific noise levels, then the noise limits specified in the licence/consent conditions should reflect the noise levels that the Proponent states would be achieved (i.e. the predicted noise levels).

In keeping with this philosophy, DECCW has recommended noise limits of 35 dB(A) $L_{Aeq, 15 \text{ minute}}$ at locations T2, T4 (Figure 9) and 11 (Figure 10) and 38 dB(A) $L_{Aeq, 15 \text{ minute}}$ at locations 9 and 10 (Figure 10) given that the Proponent has indicated that noise emissions not exceeding these levels are achievable. These limits apply to the day, evening and night time periods. These limits have been proposed to:

- ensure that the best-management practices and best available technology described in the noise impact assessment report are actually adopted by the Proponent;
- ensure that the level of achievable performance presented by the Proponent to the public through public documentation (such as an environmental impact assessment) is achieved;
- optimise the opportunity for further industrial development in the Tallawarra Lands without an unacceptable degradation of the acoustic amenity of the area; and
- fulfil a general aim of the environmental assessment process to minimise environmental impacts.

The Department's recommended conditions of approval adopt the noise limits recommended by DECCW.

Figure 11: Noise Contours for Tallawarra Stages A and B Combined Cycle Power Stations Operating Under Adverse Meteorological Conditions (SKM/TRUenergy, 2009)



- Legend**
- Site boundary
 - Tallawarra Lands Structure Plan
 - Large Lot Residential
 - Low Density Residential
 - Noise Levels
 - 35dB(A)
 - 40dB(A)
 - 45dB(A)
 - 50dB(A)
 - 55dB(A)
 - 60dB(A)
 - 65dB(A)

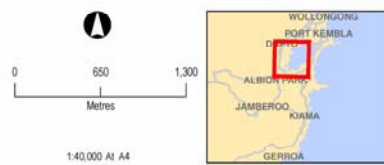


Figure 12: Noise Contours for Tallawarra Stage A Combined Cycle Power Station and Stage B Open Cycle Power Station Operating Under Adverse Meteorological Conditions (SKM/TRUenergy, 2009)



The Department has also recommended conditions of approval requiring the Proponent to prepare and implement the following in consultation with DECCW:

- an Operational Noise Review within 90 days of the commencement of operation of the project, and during a period in which the project is operating under design loads and normal operating conditions, to confirm the noise emission performance of the project; and
- an ongoing noise monitoring programme as a means of ensuring continued compliance.

With respect to low frequency noise, the Proponent has adopted the approach outlined in the *NSW Industrial Noise Policy* (Environment Protection Authority, 2000). This approach involves determining the difference

between C-weighted (dBC) and A-weighted (dBA) sound levels to determine whether the noise generated by the project includes a significant low frequency component. If a difference of 15 decibels exists (which indicates that noise associated with the project is likely to contain a low frequency component), the *NSW Industrial Noise Policy* requires that a correction factor of five decibels be added to the average (L_{Aeq}) operational noise levels predicted to result from the project. As a difference of 15 decibels exists, the Proponent applied the correction factor to the predicted noise levels as part of the assessment process.

To minimise the potential noise impacts associated with start up/shut down processes and consequent potential for sleep disturbance, the Department has recommended a night-time L_{Amax} noise limit of 45 dB(A) at residences outside of the Tallawarra Lands. The L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

The Department notes that the Proponent proposes to investigate and implement mitigation measures to minimise the generation of noise. However, the Proponent has indicated that it is difficult to confirm the specific mitigation measures that will be implemented as the type of gas turbine plant to be built has yet to be finalised. In the event that noise monitoring indicates operational noise levels in excess of the operational noise criterion, the Department is satisfied that engineering solutions exist to reduce noise levels. The exact nature of the engineering solution is a matter that should be left to the Proponent to determine, rather than mandating a particular mitigation strategy through the conditions of approval. Hence, the Department has recommended a condition of approval stipulating that where noise monitoring identifies a non-compliance, the Proponent is to provide an assessment of all reasonable and feasible mitigation measures for reducing noise at the source.

In the unlikely event that noise levels in excess of defined operational noise limits are still experienced at sensitive receivers after the implementation of at source controls, the Department considers the Proponent should be required to:

- undertake additional noise mitigation such as building treatments at affected sensitive receivers upon request by the landowner (unless the landowner has applied for land acquisition); and
- acquire property where the noise level exceeds the building treatment criterion by more than three dB(A), where requested by the landowner.

Consequently, the Department has recommended conditions of approval reflecting these requirements.

Operational Noise Impacts Inside the Tallawarra Lands

In its submission, DECCW determined night-time impact assessment goals for the proposed residential areas to the north, west and south-west of the power station within the Tallawarra Lands (refer Figure 2), based on ambient noise monitoring data presented in the noise impact assessment undertaken by the Proponent. Following further discussions with the Proponent, and after consideration of the Submissions Report, DECCW recommended the following noise limits for the day, evening and night time periods:

- proposed northern residential area - $L_{Aeq,15\text{ minutes}}$ 36 dB(A), L_{Amax} 46 dB(A);
- proposed central residential area - $L_{Aeq,15\text{ minutes}}$ 40 dB(A), L_{Amax} 50 dB(A); and
- proposed south-western residential area - $L_{Aeq,15\text{ minutes}}$ 41 dB(A), L_{Amax} 51 dB(A).

However, subsequent to the Submissions Report, the Proponent provided an additional report (prepared by SKM) on noise criteria that would be suitable for proposed residential development within the Tallawarra Lands area. A copy of this report is at Appendix E.

The report took account of the noise limits recommended by DECCW. In particular, the report argued that background noise levels in the northern residential area had increased since the Tallawarra A power station had commenced operation, and this should be considered in setting noise criteria for Tallawarra B. The report recommended that the L_{Aeq} for the northern residential area should be 38dB(A) averaged over day, evening and night time periods, rather than 15 minute periods, and the sleep disturbance criteria should be adjusted to 50 dB(A).

The Department has reviewed the additional information, in consultation with DECCW. The Department notes that inclusion of the noise influence from the Tallawarra A power station is inconsistent with the *Industrial Noise Policy*. However, taking account of existing noise levels and that future residential development is itself likely to influence noise levels within the proposed northern residential area, DECCW indicated it was willing to accept a

background noise level of 35dB(A). It also noted that the report provided a revised estimate of the existing noise influence of the Port Kembla industrial area of 35dB(A).

On this basis, DECCW indicated appropriate criteria for the proposed northern residential area should be $L_{Aeq,15 \text{ minutes}}$ 40 dB(A), L_{Amax} 50 dB(A), but with a $L_{Aeq,night}$ of 38 dB(A).

The Department considers that the DECCW recommended criteria are generally appropriate. However, the Department has some concerns about the application of the criteria to the proposed northern residential area, which does not have the same level of existing background noise as the proposed central and south western residential areas. Based on short term attended noise monitoring undertaken by the Department, there is sufficient doubt that the data presented by SKM for the proposed northern residential area is an accurate representation of the existing noise catchment of the Tallawarra Power Station. In particular, data collected by the Department does not support background noise levels proposed by SKM nor does it support ambient L_{eq} noise levels around the Tallawarra Lands. Therefore, it considers that a more conservative approach is warranted.

The approach proposed by the Department for the proposed northern residential area involves setting two criteria levels. This involves setting a 40 dB(A) level in situations where there is low frequency noise (within the meaning of the *Industrial Noise Policy*) (i.e. 5 dB(A) is added to the modelled noise level), consistent with DECCW's recommendations. However, where a low noise frequency penalty is not required to be added to measured noise levels, a maximum level of 38 dB(A) would apply. If this second criterion was not applied, 40 dB(A) would be permitted in the absence of low frequency noise, which the Department considers may be excessive for this area. DECCW has indicated it has no objection to this approach.

The *Wollongong Local Environmental Plan 2009* was approved in February 2010 providing certainty to the residential zoning within the Tallawarra Lands. In addition, the Proponent has lodged a major project application for the subdivision of the Tallawarra Lands. As there is a high likelihood of the proposed residential development proceeding, the Department is of the opinion that the acoustic amenity of future residential receivers should be afforded the same level of protection as existing residential receivers especially considering they will be located in closer proximity to the power station. Consequently, the Department has recommended the adoption of the above noise limits as conditions of approval.

To protect the acoustic amenity of future residents, in the event that actual operational noise levels are greater than those predicted, the Department has recommended that the conditions of approval relating to the implementation of source controls, building treatment and property acquisition also apply to future landowners in the proposed residential areas within the Tallawarra Lands.

5.2 Air Quality

Issue

Construction Impacts

The Proponent has indicated that dust emissions during construction can be managed through the implementation of standard dust mitigation measures such as wetting of disturbed surfaces, covering of loads and cessation of dust generating activities under adverse wind conditions. The distance to the nearest residential receiver of 1.2 kilometres is such that a sufficient buffer would exist between the construction site and neighbouring land uses to prevent dust nuisance impacts.

Local Air Quality Impacts

The primary atmospheric emissions from the turbines would be nitrogen, oxygen, carbon dioxide, water vapour, oxides of nitrogen, carbon monoxide, low concentrations of sulphur dioxide and particulate matter of less than 10 microns in diameter (PM_{10}). In terms of operational impacts, the Proponent has assessed the local air quality impacts of the proposal in accordance with the *Approved Methods and Guidelines for the Modelling and Assessment of Air Pollutants in New South Wales* (Department of Environment and Conservation, 2005). The scope of the assessment was developed in consultation with DECCW which agreed that the key pollutants to be considered in the case of an open cycle, diesel-fired plant are nitrogen dioxide, sulphur dioxide and particulate matter as these are of principal concern in terms of health effects. The modelling for the open cycle plant

predicted worst-case short-term (hourly average) concentrations for nitrogen dioxide and sulphur dioxide, maximum 24 hour concentrations of particulate matter, and annual average concentrations for all three parameters.

The modelling for a combined cycle plant was restricted to hourly and annual concentrations of nitrogen dioxide as this is the key pollutant of concern from gas-fired power stations. Sulphur dioxide and particulate matter are not generated in any quantities of significance.

A range of worst-case scenarios were modelled considering the combined operation of Tallawarra Stage A and Stage B power stations (operating as an open cycle and combined cycle plant) under full and part load conditions as well as various start-up load operations, as illustrated in Table 3 and Table 4. The modelling excluded the Tallawarra Stage A cold start and Tallawarra Stage B cold start scenario as the Proponent has committed to not cold start both power stations simultaneously as it is possible for this scenario to exceed the air quality criteria. The assessment for an open cycle plant was based on it being diesel fired as this is the worst case scenario. The modelling used emission estimates for two Alstom 13E2 machines for Tallawarra Stage B as it was determined to have higher nitrogen oxide emissions than other possible gas turbine options. A three unit option was also assessed based on emissions generated by a GE LMS1000 aeroderivative machine.

The results of the modelling scenarios are summarised in Table 3 and Table 4 and indicate that the worst case emission concentration levels predicted to occur under various operational scenarios would not exceed relevant impact assessment criteria (as set out in the *Approved Methods and Guidelines for the Modelling and Assessment of Air Pollutants in New South Wales* (Department of Environment and Conservation, 2005)) at sensitive receptors for the pollutants modelled regardless of whether an open cycle or combined cycle plant is constructed.

Selected dispersion contour plots for nitrogen oxides were provided in the Environmental Assessment and the results are summarised below along with that for sulphur dioxide and particulate matter.

Nitrogen Dioxide

Tallawarra Stage A and Tallawarra Stage B Open Cycle Gas Turbine Power Station

- the addition of Tallawarra Stage B power station operating at full load, compared with the Tallawarra Stage A power station operating alone at full load, resulted in no major change in the maximum hourly cumulative concentration of nitrogen dioxide across the modelling domain;
- the addition of Tallawarra Stage B power station operating at full load, compared with the Tallawarra Stage A power station operating alone at full load, resulted in an incremental increase in the annual average nitrogen dioxide concentration of about one percent;
- under all operating scenarios, the combined operation of the Tallawarra Stage A and Tallawarra Stage B power stations showed a peak impact at Dapto South with the incremental one hour averages shown to have cumulative concentrations of nitrogen dioxide below regulatory guidelines;
- locations predicted to be most affected by incremental increases in the one hour maximum nitrogen dioxide concentration extend north west of the power station site, with incremental increases ranging from 80 micrograms per cubic metre to 90 micrograms per cubic metre; and
- locations predicted to receive the highest increment in annual average nitrogen dioxide concentrations extend east of the power station over Lake Illawarra, with incremental increase ranging from 0.1 micrograms per cubic metre to 1.8 micrograms per cubic metre.

Tallawarra Stage A and Tallawarra Stage B Combined Cycle Gas Turbine Power Station

- the addition of Tallawarra Stage B power station operating at full load, compared with the Tallawarra Stage A power station operating alone at full load, resulted in no major change in the maximum hourly cumulative concentration of nitrogen dioxide across the modelling domain;
- compared with Tallawarra Stage A and Tallawarra Stage B operating as an open cycle plant and both at full load, Tallawarra Stage B operating as a combined cycle plant at full load in conjunction with the Tallawarra Stage A power station would result in an incremental increase in the annual average nitrogen dioxide concentration of about one percent;

- locations predicted to be most affected by incremental increases in the one hour maximum nitrogen dioxide concentration extend north-north west and south west of the power station site, with incremental increases ranging from 80 micrograms per cubic metre to 109 micrograms per cubic metre; and
- the location predicted to receive the highest increment in annual average nitrogen dioxide concentrations extends east of the power station over Lake Illawarra, with incremental increases ranging from 0.1 micrograms per cubic metre to 2.6 micrograms per cubic metre.

Sulphur Dioxide

The modelling results showed that the average maximum hourly cumulative predicted concentration of sulphur dioxide at sensitive receivers was eight micrograms per cubic metre with Tallawarra Stage A and Tallawarra Stage B operating under full load. This is well below the one hour impact assessment criteria for sulphur dioxide of 570 micrograms per cubic metre (as set out in the *Approved Methods and Guidelines for the Modelling and Assessment of Air Pollutants in New South Wales* (Department of Environment and Conservation, 2005)). Similarly, the predicted annual concentration of sulphur dioxide (<0.2 micrograms per cubic metre) was below the criteria of 60 micrograms per cubic metre.

Particulate Matter

The maximum predicted cumulative 24 hour average background concentration of particulate matter was shown to be two micrograms per cubic metre which is below the impact assessment criteria of 50 micrograms per cubic metre. In addition, the maximum cumulative annual concentration was well below the impact assessment criteria (as set out in the *Approved Methods and Guidelines for the Modelling and Assessment of Air Pollutants in New South Wales* (Department of Environment and Conservation, 2005)).

Table 3: Tallawarra Stage A Plant and Tallawarra Stage B Open Cycle Plant Summary Modelling Results

Air Pollutant	Emission Scenario - Worst Case Conditions	NSW DEC (2005) Criteria $\mu\text{g}/\text{m}^3$	Maximum Incremental Concentration at Sensitive Receptors (Due to the Power Station)		Maximum Cumulative Concentration at Sensitive Receptors		Maximum Cumulative Concentration across Modelling Domain	
			Conc $\mu\text{g}/\text{m}^3$	% of Criteria	Conc $\mu\text{g}/\text{m}^3$	% of Criteria	Conc $\mu\text{g}/\text{m}^3$	% of Criteria
NO ₂ (1-Hr)	A, B1 & B2 Full Load	246	75 Dapto South	30%	78 Dapto South	31%	151	61%
NO ₂ (Annual)	A, B1 & B2 Full Load	62					17	27%
NO ₂ (1-Hr)	A Full Load B1&B2 Startup	246	75 Dapto South	30%	78 Dapto South	31%	153	62%
NO ₂ (Annual)	A Full Load B1&B2 Startup	62					16	26%
NO ₂ (1-Hr)	A Full Load B1&B2 50% Load	246	75 Dapto South	30%	78 Dapto South	31%	150	61%
NO ₂ (Annual)	A Full Load B1&B2 50% Load	62					16	26%
NO ₂ (1-Hr)	A Hot Start B1&B2 Startup	246	75 Dapto South	30%	78 Dapto South	31%	155	63%
NO ₂ (Annual)	A Hot Start B1&B2 Startup	62					18	29%
NO ₂ (1-Hr)	A Hot Start B1&B2 Full Load	246	75 Dapto South	30%	78 Dapto South	31%	152	62%
NO ₂	A Hot Start	62					18	29%

Air Pollutant	Emission Scenario - Worst Case Conditions	NSW DEC (2005) Criteria $\mu\text{g}/\text{m}^3$	Maximum Incremental Concentration at Sensitive Receptors (Due to the Power Station)		Maximum Cumulative Concentration at Sensitive Receptors		Maximum Cumulative Concentration across Modelling Domain	
			Conc $\mu\text{g}/\text{m}^3$	% of Criteria	Conc $\mu\text{g}/\text{m}^3$	% of Criteria	Conc $\mu\text{g}/\text{m}^3$	% of Criteria
(Annual)	B1&B2 Full Load							
SO ₂ (1-Hr)	A, B1 & B2 Full Load	570			8	2%	26 (increment)	< 5%
SO ₂ (Annual)	A, B1 & B2 Full Load	60			<0.2	<1%	0.2 (increment)	< 1%
PM ₁₀ (24-Hr)	A, B1 & B2 Full Load	50			2	< 5%	4 (increment)	< 8%
PM ₁₀ (Annual)	A, B1 & B2 Full Load	30			<0.1	<1%	0.2 (increment)	< 1%

Note: Cumulative concentrations for 1-hour impacts were derived by adding the highest nitrogen dioxide increment due to the plume (resulting from the ozone limiting method analysis of raw model nitrogen oxide outputs) and background nitrogen dioxide concentration recorded for the corresponding hour at Kembla Grange in corresponding year, modelling year 2002. Annual impacts for nitrogen dioxide were derived by adding the highest incremental annual average concentration across the modelling domain due to the plume (assuming conservatively that all nitrogen oxide output is nitrogen dioxide) and the annual average concentration of 15 $\mu\text{g}/\text{m}^3$ recorded at Kembla Grange for the monitoring year 2002.

Table 4: Tallawarra Stage A Plant and Stage B Combined Cycle Plant Summary Modelling Results

Air Pollutant	Emission Scenario - Worst Case Conditions	NSW DEC (2005) Criteria $\mu\text{g}/\text{m}^3$	Maximum Incremental Concentration at Sensitive Receptors (Due to the Power Station)		Maximum Cumulative Concentration at Sensitive Receptors		Maximum Cumulative Concentration across Modelling Domain	
			Conc $\mu\text{g}/\text{m}^3$	% of Criteria	Conc $\mu\text{g}/\text{m}^3$	% of Criteria	Units	% of Criteria
NO ₂ (1-Hr)	A & B Full Load	246	68 Yallah	28%	83 Dapto South	34%	161	65%
NO ₂ (Annual)		62					18	29%
NO ₂ (1-Hr)	A Full Load + B Cold Start Hr 1	246	116 Yallah	47%	127 Yallah	52%	199	81%
NO ₂ (Annual)		62					23	37%
NO ₂ (1-Hr)	A Full Load + B Warm Start Hr 1	246	97 Yallah	39%	113 Yallah	46%	14	60%
NO ₂ (Annual)		62					20	32%
NO ₂ (1-Hr)	A Warm Start Hr 1 + B Cold Start Hr 1	246	93 Mt Warrigal	38%	98 Mt Warrigal	40%	205	83%
NO ₂ (Annual)		62					20	32%

Note: Cumulative concentrations for 1-hour impacts were derived by adding the highest nitrogen dioxide increment due to the plume (resulting from the ozone limiting method analysis of raw model nitrogen oxide outputs) and background nitrogen dioxide concentration recorded for the corresponding hour at Kembla Grange in corresponding year, modelling year 2002. Annual impacts for nitrogen dioxide were derived by adding the highest incremental annual average concentration across the modelling domain due to the plume (assuming conservatively that all nitrogen oxide output is nitrogen dioxide) and the annual average concentration of 15 $\mu\text{g}/\text{m}^3$ recorded at Kembla Grange for the monitoring year 2002.

Regional Ozone Levels

The Proponent undertook an assessment of the potential impacts of nitrogen oxide emissions on ozone formation in the Illawarra airshed, and used the concentrations as a measure of photochemical smog. The assessment took into account days conducive to photochemical smog formation and the extent, duration and size of regional nitrogen oxide and ozone exposure. Ozone is a photochemical oxidant and the major component of smog. Ozone is not emitted directly into the atmosphere but is formed through a chemical reaction between precursor emissions of volatile organic compounds and nitrogen oxides which are stimulated by sunlight and temperature.

Modelling was only conducted for Tallawarra Stage A operating in conjunction with Tallawarra Stage B operating as an open cycle plant. This is considered the worst case scenario when considering that base load nitrogen oxide emissions for Tallawarra Stage B operating as an open cycle, diesel-fired plant as assessed in terms of photochemical smog impact are of the order of 270 kilograms/hour whereas Tallawarra Stage B as a gas fired combined cycle plant will have emissions in the order of 105 kilograms/hour.

Based on the results of the regional scale photochemical modelling (and assuming the worst case scenario of a diesel fired open cycle gas turbine), the Proponent concluded that additional emissions from Tallawarra Stage B operating in conjunction with Tallawarra Stage A would not result in any significant change in high ozone plume duration events and that there would be no significant increase, at most two parts per billion, to the average ozone concentration. However, it was predicted that there would be a small number of hours where there was an increased duration of high ozone plume concentration events. Nevertheless, the relative difference in the ozone concentrations in the modelled base case compared to the test case indicated that the change in the risk of ozone exposure in populated areas due to nitrogen oxide emissions from the combined operation of Tallawarra Stages A and B is minimal.

Consequently, the Proponent has indicated that the operation of Tallawarra Stage B will have no adverse effects on regional concentrations of ozone and nitrogen oxides and will not result in any additional exceedences of air quality criteria.

The assessment also considered stack emission standards against the requirements of the *Protection of the Environment Operations (Clean Air) Regulation 2002*. The Regulation establishes nitrogen oxide levels of:

- 35 parts per million by volume (70 milligrams per cubic metre) for a gas fired turbine with a generation capacity of greater than 30 megawatts; and
- 45 parts per million by volume (90 milligrams per cubic metre) for any turbine operating on a fuel other than gas with a generation capacity greater than 30 megawatts.

The Proponent has indicated that the proposed open cycle plant or combined cycle plant will meet the emission limits with the proposed dry low nitrogen oxide combustion technology providing for nitrogen oxide emissions in the order of 25 parts per million by volume during natural gas firing. For the open cycle plant, water injection into the gas turbine exhaust under diesel firing will provide for nitrogen oxide emission rates in the order of 42 parts per million by volume.

DECCW requires that the combined nitrogen oxide emissions of Tallawarra Stages A and B are below the 900 tonnes per annum as specified in the development consent for the Tallawarra Stage A power station. This may be achieved by incorporating best available control technology or undertaking offsite projects in the Illawarra airshed to offset nitrogen oxide emissions from the Stage B power station. Based on initial calculations, the Proponent has indicated that the total nitrogen oxide load from Stages A and B will be within the load limit where:

- Tallawarra B is configured as a combined cycle plant; or
- Tallawarra B is configured as an open cycle plant operating up to 35 percent capacity factor.

Consideration

Construction

The Proponent has committed to implementing standard on-site measures (such as the wetting down of disturbed areas, stabilising of stockpiles, and covering of vehicle loads) to minimise the potential for fugitive dust emissions during construction. The Department also recommended conditions of approval requiring the Proponent to:

- undertake all works with the objective of preventing visible dust emissions;
- implement dust control measures, including cessation of works, in the event of visible dust emissions; and

- detail the measures to manage dust in a Construction Environmental Management Plan.

Operation

The Department considers that the Proponent has undertaken an adequate assessment of the potential impacts of the project on local and regional air quality based on worst case modelling scenarios. In terms of local air quality impacts, the Department is satisfied that the emissions generated by the power station (whether an open or combined cycle plant) are unlikely to significantly affect ambient air quality in the area, noting that the pollutant concentrations predicted to be generated by the project are less than the established air quality impact assessment criteria for the protection of the environment and human health.

The range of parameters to be assessed by the Proponent was developed in consultation with DECCW. The Department acknowledges that, as agreed to by DECCW, the air quality assessment did not address carbon monoxide and volatile organic carbons. The Department accepts that such modelling was not performed as natural gas is the cleanest fuel and sampling and modelling from other gas fired plants has demonstrated that such emissions are well below the relevant air quality criteria. Nevertheless, to confirm the emissions performance of each turbine and ensure that the power station and its equipment is operated according to standards, the Department has included a condition of approval requiring the Proponent to undertake monitoring for carbon monoxide, volatile organic compounds and other substances during the commissioning of the power station.

In terms of regional air quality, the Department notes that the Environmental Assessment indicated that there would be no increase to the average ozone concentrations as a result of the operation of the power station and consequently there would be no adverse impact on photochemical smog as a result of the project's operation. The plume from the operation of the power station would not significantly impact on high ozone plume duration events within the region. However, there would be a small number of hours with a predicted increased or decreased duration of plume concentration events.

Given the importance of air quality within the Illawarra airshed, and the need to ensure the power station is designed and operated to meet best practice air quality standards, the Department has recommended a number of specific conditions of approval for the project related to air quality. The recommended conditions of approval include the establishment of strict nitrogen oxide emission limits at the exhaust stacks, requirements for performance verification and the preparation and implementation of an operational air quality management plan. These conditions are consistent with the recommendations of DECCW regarding air quality.

The NSW State Plan 2010 – Investing in a Better Future identifies cleaner air and progress on greenhouse gas reductions as priorities. It includes a target of achieving a 60% cut in greenhouse gas emissions by 2050. Former State Plans and the Action for Air 2009 Update (DECCW, 2009) include a goal to meet national air quality goals as identified in the National Environmental Protection Measures for Ambient Air Quality. The Illawarra region has exceeded the ozone goal for the past 13 years. Consequently, DECCW has recommended a mass limit for nitrogen dioxide of 900 tonnes per annum to be applied to the combined emissions from the Tallawarra Stage A and Stage B power stations. The Department considers this a reasonable measure for ensuring that nitrogen oxide emissions do not adversely impact on local and regional air quality and has thus incorporated the load limit into the recommended conditions of approval.

The Proponent has indicated that the load level can be achieved as the existing mass load from Tallawarra Stage A is only in the order of 450 tonnes per annum. Tallawarra Stage B configured as a combined cycle plant similar to Tallawarra Stage A would achieve similar mass loads. Therefore, the total load would be within the site limit. Assuming diesel firing at a rate of one percent of all operating hours, and an operational capacity up to 35 percent, the annualised nitrogen oxide emissions for an open cycle plant would also be below an annual tonnage of 450.

The Department has also recommended that the Proponent ensure that fuel burning equipment will meet air emission requirements when operational, for example by submitting to DECCW a manufacturer's performance guarantee stating equipment compliance with air emission limits.

Whilst such controls and the Proponent's mitigation measures are effective methods for ensuring a standard of air quality, air quality performance should be regularly monitored and reported to ensure that local air quality is maintained. The Proponent has committed to install and operate a continuous nitrogen oxide monitoring system

at the site. The Department has reinforced the Proponent's commitment as a recommended condition of approval requiring that an air quality monitoring programme be maintained throughout the operation of the project. Air quality monitoring programme results, demonstrating compliance with performance criteria stipulated in the recommended approval, would be required to be submitted to the Department annually. In the event that monitoring indicates point source emissions in excess of the recommended emission limits, the recommended conditions of approval mandate that the Proponent implement remedial measures to reduce point source emissions.

Diesel-fired gas turbines emit higher concentrations and quantities of nitrogen oxides and produce emissions of sulphur dioxide, particulate matter and volatile organic compounds. To limit such emissions, the Department has recommended a condition of approval limiting the use of diesel fuel in an open cycle plant only to instances where there are fuel (gas) capacity or network system constraints and cessation of operation would lead to a loss or reduction in electricity necessary to maintain network supply security. Natural gas is the only fuel recommended for firing a combined cycle plant.

The Department considers that provided the Proponent's mitigation measures are implemented and the recommended Instrument of Approval is adopted, the project can be managed in compliance with regulatory and best practice standards.

5.3 Greenhouse Gas Emissions

Issue

The Environmental Assessment included an assessment of the greenhouse gases predicted as a result of the operation of the power station. Major sources of greenhouse gases associated with the operation of the project include natural gas extraction, transportation of natural gas and combustion of natural gas at the power station. Should Tallawarra Stage B be configured as an open cycle plant, the extraction, transportation and combustion of diesel fuel would also be sources of greenhouse gases. In undertaking the assessment, the Proponent used the methodologies outlined in the Department of Climate Change and Energy Efficiency (2009) *National Greenhouse Accounts (NGA) Factors* to calculate greenhouse gas emissions. Greenhouse gas emissions associated with the construction of the project were not assessed as the Proponent considered these to be relatively short term and minimal compared to the operation phase of the project.

Consideration

When operating as a combined cycle plant at 95 percent capacity, the emission intensity would be approximately 465 tonnes of carbon dioxide equivalents per gigawatt hour. The emission intensity for an open cycle plant operating at 35 percent capacity would be 750 tonnes of carbon dioxide equivalent per gigawatt hour. On a comparison basis, brown coal-fired power stations in Australia can produce up to 1,500 tonnes of carbon dioxide equivalent per gigawatt hour. Assuming a 30 year life time, the power station configured as a combined cycle plant would generate greenhouse gas emissions ranging from 14.8 to 46.7 million tonnes of carbon dioxide equivalent for the plant operating at average capacities ranging from 30 percent to 95 percent. Greenhouse gas emissions over a 30 year life time with the power station configured as an open cycle plant were estimated by the Proponent to range from 1.05 to 18.4 million tonnes of carbon dioxide equivalent for average operating capacities ranging from two percent to 35 percent. Assuming the worst case scenario (i.e. combined cycle plant operating at 95 percent capacity), this equates to 1.5 million tonnes of carbon dioxide equivalent per annum.

The *Australian National Greenhouse Account: Quarterly Update of Australia's National Greenhouse Gas Inventory September Quarter 2009* (Department of Climate Change, 2010) indicates that total greenhouse gas emissions in Australia, as carbon dioxide equivalents, were estimated to be 550 million tonnes of carbon dioxide equivalent in 2008, decreasing to 539 in 2009. The proportions contributed by electricity generation were 205 and 203 million tonnes of carbon dioxide equivalent for 2008 and 2009, respectively. The dominant influence on the negative annual emission generation has been attributed to the international and national economic slowdown.

In the context of the 2009 greenhouse gas emissions, the Department has calculated the percentage impact of the proposal would be an approximate increase of 0.28 percent in the total Australian greenhouse gas emissions, assuming the worst case scenario. This figure is relatively low when compared to other recently approved power

stations which have been estimated to result in an increase in greenhouse gas emissions of up to 2.1 percent. The relatively low emission is compliant with the action contained in the *National Greenhouse Strategy* which aims to lower the emission intensity associated with electricity production.

The Department has also compared the emission intensities against the NSW Pool Coefficient. This is an indicator of the average emissions intensity of electricity sourced from the NSW electricity grid. It represents the emissions of greenhouse gases in tonnes of carbon dioxide equivalent per megawatt hour of electricity supplied from the pool of major power stations serving the NSW electricity grid. For 2009, the NSW Pool Coefficient is 0.967 tonnes of carbon dioxide equivalent per megawatt hour. For comparison purposes the greenhouse gas emissions intensity for existing coal (black) fired power stations in NSW ranges from 0.950 to 1.070 tonnes of carbon dioxide equivalent per megawatt hour. The emissions intensities for Tallawarra Stage B operating as an open cycle plant and closed cycle plant are 0.750 and 0.465 tonnes of carbon dioxide equivalent per megawatt hour, respectively. Both of these values are less than the current NSW Pool Coefficient.

The Proponent has committed to monitoring greenhouse gas emissions and reporting these over the life of the project as well as ensuring regular maintenance of all equipment and the use of up-to-date technology to maintain greenhouse gas emissions. In addition, the Proponent is a member of the Commonwealth Government's *Greenhouse Challenge Plus* programme which is designed to enable Australian companies to work with the Government in improving energy efficiency and reducing greenhouse gas emissions. The Proponent has also purchased agreements for renewable energy with wind farms as well as Renewable Energy Certificates. These management measures have been implemented to contribute towards offsetting the Proponent's greenhouse gas emissions from its operations.

As noted in Section 2.2 of this report, electricity demand in New South Wales is predicted to rise and exceed existing reserves unless new generation capacity is installed. While renewable energy generation, demand management and energy efficiency measures may meet some of the predicted shortfall, there remains a risk that these options by themselves will not be sufficient to address the potential demand-supply imbalance predicted to occur in the next decade. While there would be a minimal increase in the total greenhouse gas emissions in NSW from the project, the impact of these emissions must be balanced against the risks associated with a generating shortfall and the social and economic impacts to the State should such a situation eventuate. Consequently, the Department is satisfied that the project is justified as an important and necessary component of a suite of capacity generating measures to secure the State's energy supplies in the medium and longer term.

5.4 Aviation Safety

Issue

Exhaust plumes from combustion sources (such as stack emissions from power stations) have the potential to impact on aviation safety by causing turbulence and affecting aircraft handling. The proposed Tallawarra B power station is located approximately five kilometres to the north-east of Illawarra Regional Airport (Wollongong aerodrome) and the Proponent has determined that the plume rise heights will be above the obstacle limitation surface for the airport (i.e. 52 metres Australian Height Datum). Consequently, the Proponent has undertaken a plume rise assessment in accordance with CASA's (2004) *Advisory Circular Guidelines for Conducting Plume Rise Assessments* to assess the potential impacts of the project on aviation safety in air space above the power station. This guideline requires that where the plume rise associated with a combustion source exceeds a critical vertical velocity of 4.3 metres per second (i.e. the velocity that is likely to affect aircraft) at the heights which are frequented by aircraft (i.e. the obstacle limitation surface or at approximately 110 metres above ground level outside of an aerodrome), it must be assessed for potential hazards to aircraft operations.

The proposed open-cycle configuration has the potential to result in greater plume rise impacts than the combined cycle configuration because under open-cycle operations the hot gas is released from stacks at a higher temperature than under a combined cycle configuration where the hot gases are diverted through an additional steam generation process and ultimately released at lower temperatures.

The Environmental Assessment presented the results of a plume rise assessment based on the existing Tallawarra power station and the proposed closed and open cycle options. For the open cycle plant option, the

assessment considered the use of diesel fuel. Diesel fuel would create a greater plume rise than gas, and hence this provided a conservative assessment.

The results of the assessment indicate that under the worst case scenario, the maximum vertical extent of the plume associated with an open cycle plant would be 1,179 metres above ground level. The height at which point the critical velocity criterion is exceeded less than 1 percent of the time is 586 metres and 877 metres for an exceedence of less than 0.1 percent. The average plume velocity would decrease to below the critical vertical velocity by 200 metres above ground level.

The maximum vertical extent of the plume associated with a combined cycle plant operating in conjunction with Tallawarra Stage A would be 506 metres above ground level. The height at which point the critical velocity criterion is exceeded less than 1 percent of the time is 193 metres and 305 metres for an exceedence of less than 0.1 percent. The average plume velocity would decrease to below the critical vertical velocity by 98 metres above ground level.

The assessment found that horizontal displacement of the peak plumes is minimal, with the plumes' lateral extent being confined to above the Tallawarra site.

As the plume rise will exceed the critical criterion velocity and the plume will infringe on the obstacle limitation surface for Wollongong Airport, regardless of the type of gas turbine used, the Proponent is required to make an application to CASA for an aircraft operational assessment.

Consideration

Aeronautical Impact Assessments for both the open cycle and open cycle options were prepared by the Ambidji Group, on behalf of the Proponent, subsequent to the exhibition of the Environmental Assessment, and submitted to CASA. These documents are the main component of the part 2 Submissions Report.

The documents indicated that CASA has confirmed that the assessment of the effect of the plume is only required to the theoretical height at which the velocity of a plume will be less than 4.3m/sec for 99.9% of the time.

For the closed cycle option, the 99.9% level is 308.1 metres AHD (or 305 m above ground level). The CASA assessment concluded that the closed cycle option should not pose any significant problems for PANSOPS (i.e. Procedures for Air Navigation Services – Operations) surfaces and related instrument approaches.

A revised assessment was undertaken for the open cycle plant. This analysis resulted in the 99.9% level reducing by 145 metres to 735.1 metres AHD (or 732m above ground level), compared to the assessment presented in the Environmental Assessment. The CASA assessment concluded that the open cycle option will restrict IFR (i.e. Instrument Flight Rules) operations and any declaration of danger or restricted area will also affect VFR (i.e. Visual Flight Rules) operations. It indicated that bad weather operations are likely to be severely affected at the airport. CASA has also advised that as the obstacle limitation surfaces are penetrated by both the stacks and plumes, the stacks will need to be marked and lit.

SCC has indicated that, on the basis of the CASA assessment, it does not oppose the development of a closed cycle plant. However, it is concerned about the implications of the open cycle plant for both instrument and visual air navigation in the vicinity of Illawarra Regional Airport. On this basis, it opposes the open cycle plant.

The Department is satisfied, on the basis of the information presented, that the plume rise associated with the closed cycle plant would not pose an unacceptable risk to aircraft or unreasonable limitations to the operation of Illawarra Regional Airport.

The revised plume rise assessment for the open cycle plant shows that, although the plume rise will be substantially lower than that predicted in the Environmental Assessment, it will still be well over double the height of the closed cycle plant plume rise prediction. At this height, the plume could significantly affect aircraft operations at the airport. Consequently, the Department does not consider it appropriate that the open cycle plant be permitted, at this stage. However, the Department's assessment has not identified any other reasons that should preclude development of the open cycle option. As such, the Department considers that the option

should be provided for the Proponent to subsequently provide technical evidence to demonstrate the plume rise can be managed so that it does not have an adverse impact on aircraft operations.

The Department recommends a condition that any stacks are marked and lit in accordance with CASA requirements. The Department also recommends a condition that prevents the construction and operation of the open cycle gas turbine plant, unless the Proponent has submitted a report to the Director-General for approval, which demonstrates that its operation will not have an adverse impact on aviation safety. This report must be prepared in consultation with SCC, and its conclusions and recommendations must have been agreed to by the CASA prior to submission to the Director-General.

5.5 Water Quality and Ecology of Lake Illawarra

Issue

Should the Proponent decide to construct a combined cycle plant, waste water from the cooling process (blowdown) will be discharged into Lake Illawarra after being mixed with the cooling water discharge from the Tallawarra Stage A plant. Closed cooling water systems, such as that proposed for Tallawarra Stage B, require chemicals or other treatment methods to control corrosion, scaling and biofouling which occur due to evaporation, resulting in increased concentrations of impurities remaining in the water. To assist in controlling corrosion, scaling and biofouling, the Proponent intends to employ the use of chemicals as a supplementary control. The chemicals include an antiscalent, a biocide for biofilm control, and polyacrylate for deposit control. All of these chemicals have the potential to leave residues in the blowdown water.

The Proponent undertook a qualitative assessment of the impact of discharging blowdown water into Lake Illawarra using the results of discharge modelling and existing water quality data for the Lake, as part of the environmental assessment process. The discharge modelling was based on the discharges from Tallawarra Stages A and B being mixed prior to flowing into Lake Illawarra via the existing Tallawarra Stage A outlet canal and assessed a range of operating scenarios including design output, hot day output and cold day output. The initial assessment addressed the impacts of the biocide DegacleanR 150 and the antiscalent HEDP. Based on the modelling results, the Proponent concluded that:

- there would be a slight increase in the concentration of total nitrogen (about three micrograms per litre) in the discharge water when compared to the mean input lake water due to evaporation, but no change to the nitrogen load as no nitrogen is added to the blowdown;
- total phosphorus and filterable reactive phosphorus concentrations in the discharge water will increase by approximately 8.1 micrograms per litre and 6.4 micrograms per litre respectively, due to the addition of HEDP however this will not adversely impact on water quality due to the small increase;
- salinity, dissolved oxygen, turbidity and chlorophyll-A concentrations would be within natural variations and hence not impact on water quality;
- a low residual of HEDP acid (0.010 - 0.016 milligrams per litre) will occur in the discharge water;
- a low residual concentration of DegacleanR 150 (less than a one hundredth of the concentration shown to have a negative effect on 50 percent of observed test organisms) will occur in the combined discharge water;
- there would be less than a 0.1 degree Celsius increase in the temperature of the combined discharge for the design and cold day scenarios and less than 0.1 degree Celsius decrease in the temperature of the combined discharge for the hot day scenario; and
- there will be no change in the relative density of the combined discharge under low lake salinity conditions and less than a 0.02 percent increase under high lake salinity conditions for all operating scenarios.

Contrary to the results presented by the Proponent in the Environmental Assessment, an analysis of the data by DECCW indicated that there are errors in the calculations used to estimate the concentration of DegacleanR 150 in the discharge waters and that the residual concentrations will in fact be significantly higher than those estimated by the Proponent. Consequently, the Proponent recalculated the concentrations and presented the results in the Submissions Report.

In addition, chemicals used as a biocide in Australia must be registered or permitted by the Australian Pesticides and Veterinary Medicines Association. DegacleanR 150 is not registered and hence its use is not currently permitted. Consequently, the Department advised the Proponent that an alternative approved product or

treatment technology for biofilm control would need to be presented as a preferred option and the worst case impacts associated with its use assessed as part of the Submissions Report. This has been done with the Proponent assessing the use of Hydrex 2470 as the preferred treatment chemical. An alternative treatment programme based on the use of the paracetic acid biocide Proxitane has also subsequently been assessed. Based on the modelling results, the Proponent determined that a low residual concentration of Hydrex 2470, DegacleanR 150 and Proxitane (less than a one hundredth of the concentration shown to have a negative effect on 50 percent of observed test organisms as relevant for each product) would occur in the combined discharge water.

Consideration

Biological control agents will be added to the cooling tower system of the combined cycle plant to minimise growth of nuisance macro-organisms (e.g. mussels and barnacles) and to minimise biofilm growth. As previously noted, the Proponent proposes to use Hydrex 2470 as the preferred treatment method for biofilm control with the paracetic acids DegacleanR 150 and Proxitane proposed as alternative treatments. The Department is satisfied with the Proponent's assessment of the potential impacts of residual concentrations of all three biocides in the blowdown water on the ecology of Lake Illawarra and accepts the Proponent's conclusion that they will have no significant impact if used for biological control as the residual concentrations will be less than lowest acceptable EC₅₀ value (i.e. concentration resulting in a 50 percent effect reduction within a specified time). DECCW has also indicated its satisfaction with the assessment and concurs with the results.

Nevertheless, in order to protect the aquatic flora and fauna in Lake Illawarra, the Department has recommended a concentration limit of 0.1 milligrams per litre for both Hydrex 2470 and the two paracetic acids in the cooling water discharge. This value is based on ecotoxicity data and the Proponent's evaluation of set doses over a range of evaporation and blowdown flow rates and dilution factors.

Whereas both Hydrex 2470 and Proxitane are permitted for use by the Australian Pesticides and Veterinary Medicines Association as biological control agents for organisms in water used in cooling systems, with Hydrex 2470 having been approved for use at the Munmorah Power Station, DegacleanR 150 is not. The Proponent has indicated a preference for its use in the event that the necessary permit for use is approved by the Australian Pesticides and Veterinary Medicines Association. Degaclean R 150 does not bioaccumulate and has a very short half life (minutes) in seawater systems. The Proponent states that the residual in the blowdown water would decay to non-detectable (<0.1 milligrams/litre) in a maximum of 60 minutes. In addition, in its Submissions Report, the Proponent presented a recalculation of the concentration of DegacleanR 150 in the blowdown water which demonstrates that the residual concentrations do not exceed levels which may be toxic to aquatic organisms in Lake Illawarra. Consequently, to allow the Proponent flexibility in biofilm control, the recommended conditions of approval provide for the use of this product should it be approved for use.

A scale control agent will be dosed to prevent the formation of hardness and silica scales on the heat exchange surfaces of the condenser and cooling tower. With regards to the proposed antiscalent HEDP, the Proponent concluded that under the worst case scenario the residual concentration in the discharge would be 0.016 milligrams per litre. The potential consequence of HEDP use is the addition of phosphate to the process water and hence to the discharge water and receiving environment. Algae are particularly sensitive to HEDP with quoted LC₅₀ doses (i.e. the median lethal dose) in the range of 10-50 milligrams per litre. This is considerably higher than the concentration expected in the discharge from the power station (worst case scenario concentration of 0.016 mg HEDP per litre). Even with an assessment factor of a one hundredth applied to the lowest EC₅₀ value, the resultant value is 0.03 milligrams per litre. In light of this, and the fact that HEDP biodegrades into carbon dioxide, water and simple orthophosphate photochemically in sunlit water, and it has been found not to pose a bioaccumulation risk, the Department is of the opinion that the residual concentration would not pose a toxicity risk.

In regards to thermal pollution, the Tallawarra Stage B blowdown would be mixed with that from Tallawarra Stage A plant. This would result in the addition of a nominal nine megawatt thermal load to the lake, or less than four percent of the 240 megawatt thermal load discharged by Tallawarra Stage A. Consequently, the Department concurs with the Proponent's conclusion that addition of blowdown water from the Tallawarra Stage B plant is unlikely to significantly further impact on water temperature. Nevertheless, to minimise the potential effects of thermal pollution, the Department has recommended a condition of approval requiring the temperature of the

combined cooling water discharge into the outlet canal, downstream of the attemperation mixing zone not to exceed 35 degrees Celsius. The Department has also recommended conditions of approval requiring the Proponent to:

- manage operations, including limiting the temperature of the blowdown water discharge to 35 degrees Celsius, to avoid the net loss of seagrass beds in the receiving waters of Lake Illawarra;
- prepare and submit to the Director-General a report detailing any net loss of seagrass beds (should this occur) and the proposed measures for minimising and offsetting any loss; and
- undertake benthos monitoring.

5.6 Hazards and Risks

Issue

The proposed power station is potentially hazardous, the main hazards arising from the potential loss of containment of the gas supplying the power station (e.g. through rupture of the pipeline) and its subsequent ignition and the storage and handling of dangerous goods (natural gas, diesel, lubricating oil and transformer oil) on the site. Consequently, the Proponent undertook a preliminary hazards analysis to identify whether off-site impacts are likely to occur. The assessment involved a detailed hazard identification process for all site operations to determine where there was a potential offsite impact and whether the proposed safeguards would be adequate to control the hazard. Where an incident was identified to have an offsite impact, and safeguards would not minimise the impact, a detailed consequence and frequency analysis was conducted. Based on the assessment, the Proponent identified two hazards with potential offsite impacts:

- ignition of a rupture in the high pressure gas pipeline; and
- gas leak into the gas turbine enclosure resulting in ignition and an explosion.

The Proponent concluded that the incident risk for both hazards will not exceed the risk criteria specified in the *Hazardous Industry Planning Advisory Paper No.4: Risk Criteria for Land Use Safety Planning* and hence the facility is classified as potentially hazardous but not actually hazardous as defined in *State Environmental Planning Policy No.33 Hazardous and Offensive Developments*. Therefore, the facility would be permitted and appropriate within the land zoning. Notwithstanding this, the Proponent has proposed a number of mitigation measures aimed at reducing the potential for hazardous events to arise including regular fitting line and equipment inspections and the preparation of a fire safety study, hazard and operability study, and emergency response plan.

Consideration

The Department's Major Hazards Unit (MHU) reviewed the preliminary hazards analysis report prepared by the Proponent. The MHU indicated that the report adequately addressed the potential for offsite impacts and agreed with the Proponent's conclusion that the proposed power station may be classified as potentially hazardous but not actually hazardous and hence is permissible.

To ensure that the proposal caters for the safe management of all hazards, the Department has recommended a condition of approval requiring the Proponent to prepare the following studies prior to the commencement of construction:

- Hazard and Operability Study;
- Fire Safety Study;
- Final Hazard Analysis; and
- Construction Safety Study.

The Department has also recommended that the Proponent develop and implement an Emergency Plan and comprehensive Safety Management System covering all site operations prior to commissioning of the power station.

Further, the Department has recommended a condition requiring the Proponent to carry out a comprehensive and independent Hazard Audit consistent with the Department's *Hazardous Industry Planning Advisory Paper No.5, Hazard Audit Guidelines* 12 months after the commencement of operation and every three years thereafter.

The Department is of the opinion that the project can operate under acceptable safety levels, provided that the Proponent implements all the nominated safety measures and undertakes/implements the above mentioned studies, plan and audits.

5.7 Other Issues

The Proponent has assessed the potential impacts of the project on flora and fauna, hydrology, traffic and transportation, visual amenity, indigenous heritage, and soils (erosion and sediment control). In addition, an assessment has been undertaken of waste generated during construction and operation. The Proponent has committed to implementing a number of measures to minimise any associated impacts during the construction and operation of the project. The Department is satisfied with the assessment and the management measures proposed by the Proponent and its detailed consideration of these issues is provided in Table 5.

Table 5: Department's Consideration of Other Environmental Issues

Issue	Department's Consideration
Terrestrial Ecology	<p>Much of the Tallawarra Lands has been previously cleared as a result of past land use with remnant vegetation found in localised parts of the site including along Yallah Creek which is located immediately to the north of the proposed power station site. This vegetation includes Lowland Dry-Subtropical Rainforest which is part of the Illawarra Subtropical Rainforest in the Sydney Basin Bioregion, and the Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions. Both of these communities are listed as an endangered ecological community under the <i>Threatened Species Conservation Act 1995</i>.</p> <p>The Tallawarra Lands also provide habitat for several threatened fauna species (as listed under the <i>Threatened Species Conservation Act 1995</i>) including but not limited to the Green and Golden Bell Frog (<i>Litoria aurea</i>), Common Bent-wing Bat (<i>Miniopterus schreibersii</i>), Southern Myotis (<i>Myotis macropus</i>), Yellow-bellied Sheathtail-bat (<i>Saccolaimus flaviventris</i>) and Glossy Black Cockatoo (<i>Calyptorhynchus latham</i>).</p> <p>No threatened flora is known to occur on the proposed site of the Tallawarra Stage B power station.</p> <p>Although a number of threatened species and endangered ecological communities occur in the local area, the Proponent has advised that none of these will be impacted by the development as the power station will be located within the footprint of the previously cleared site. The proposed Tallawarra Stage B power station will be located on a hardstand area associated with the decommissioned coal-fired power station with other auxiliary components such as the additional gas fitting line and water storage tanks located within the Tallawarra Stage A pipeline corridor and hardstand area. As such, the facility would be unlikely to result in the clearing of native vegetation. In addition, the Proponent has indicated that removal of redundant transmission lines traversing the Tallawarra Lands site should be limited to minor, short-term ground disturbance at the base of existing towers within a grassed easement. Nevertheless, to ensure that there is minimal clearing of native vegetation, the Department has recommended a condition of approval to this effect. Further, the Department has recommended a condition of approval requiring that the Proponent develop an offset plan to compensate for the removal of any native vegetation, should clearing be required.</p> <p>New transmission lines are proposed to traverse the endangered ecological community (Illawarra Subtropical Rainforest in the Sydney Basin Bioregion) adjacent to Yallah Creek. However, the Proponent has advised that there should be no clearing of the community with any new transmission towers located on previously cleared land. To ensure this commitment is fulfilled, the Department has recommended a condition of approval requiring the Proponent to mark the areas of the endangered ecological community with flagging tape or similar prior to commencing construction to ensure that there is no incursion into, or clearing of, the area. In addition, the recommended conditions require the Proponent to take all reasonable and feasible measures to avoid clearing any threatened flora species and endangered ecological</p>

	<p>communities.</p> <p>In its submission, WCC noted that the proposal will not directly impact on any endangered ecological communities. However, it raised concern that some stands of the communities may suffer edge effects as a result of the development and consequently recommended that an assessment of significance be prepared. The Department considers that such an assessment is not warranted as the proposal will not involve the removal of any part of the communities and it is unlikely to have an adverse impact on the extent of the community or modify its composition such that its local occurrence is likely to be placed at risk of extinction. The major threat to the community is weed invasion which is already threatening the fragmented remnants adjoining the project site. Consequently, the Department has recommended that the Proponent detail the weed management practices to be implemented during construction as part of the Construction Flora and Fauna Management Plan for the project and monitor and manage any weed infestations throughout the life of the project.</p> <p>The proposed Tallawarra Stage B power station is located on the western foreshore of Lake Illawarra, immediately south of Yallah Creek. Yallah Creek is considered to be a Category 1 – Environmental Corridor under the stream classification system used in the <i>Riparian Corridor Management Study</i> (Wollongong City Council, 2004). This system recommends the watercourse should be afforded a minimum riparian zone width of 40 metres along both sides and a 10 metre vegetated buffer (i.e. 50 metre protection zone). Taking this into consideration, the submission from the Office of Water recommended that the Proponent establish and maintain a riparian zone extending a minimum of 50 metres on both sides of the creek consisting of local native plant species.</p> <p>However, there is only a 35 metre buffer between the creek and the site of the proposed power station. As such it is unrealistic to provide a 50 metre riparian zone along that side of the creek fronting the power station. Consequently, the Office of Water has recommended a condition that the Proponent establish and maintain a riparian zone with a minimum width of 50 metres where practicable, within the boundaries of the project site.</p> <p>The Department has not adopted the recommendation from the Office of Water for a 50 metre wide vegetated corridor, where practicable. The reason for this is that the Proponent has already dedicated a corridor along the lake edge which has since been developed for recreational purposes by the Lake Illawarra Authority.</p> <p>The Department believes that provided the Proponent implements nominated environmental commitments and the Department's recommended management measures defined in the conditions of approval, the construction and operation of the project will avoid significant ecological impacts.</p>
Hydrology	<p>NOW recommended that the piped section of Yallah Creek be removed and rehabilitated to emulate a stable natural watercourse system comprising meanders, pool and riffle sequences and suitable aquatic and terrestrial habitat. In this way, the project would improve the watercourse rather than just maintain its current state.</p> <p>The Proponent has advised that the construction of the project would not involve any disturbance to or realignment of Yallah Creek. The power station would be constructed on the existing hardstand area and Yallah Creek would continue to be piped under the north-west section of the existing hardstand area before discharge to Lake Illawarra. In addition, the removal of the piped section would require extensive earthworks in the form of a system of dams and swales. The Department accepts the Proponent's argument that the work is not reasonable and feasible considering the project does not involve disturbance to the creek.</p> <p>No flood studies have been undertaken specifically for Yallah Creek. However, based on the outcomes of a floodplain risk management study for the Tallawarra Lands, topographic data</p>

	<p>and hydrological data for the creek, the Proponent has indicated an estimated flood height of 2.3 metres Australian Height Datum and flood width of approximately 20 metres for Yallah Creek for the one percent annual exceedence probability event. The site of the proposed power station is outside of this inundated area and hence the risk of flooding is considered to be minimal. The likelihood of flooding is minimised by the diversion of flow down the creek into a 0.32 hectare artificial wetland. This wetland effectively acts as a detention basin during periods of high rainfall.</p> <p>The flood studies for the Tallawarra Lands have taken into effect the impact of climate change and based on these, it was concluded that it is unlikely that climate change will lead to increased flooding on the site.</p> <p>In its submission, Wollongong City Council recommended a number of conditions of approval relating to stormwater and flooding and the Department concurs with the majority of these and has consequently recommended them as conditions of approval. However, rather than imposing minimum platform levels and restrictions on construction materials as proposed by Council, to protect against the Probable Maximum Flood, the Department has recommended that the project be designed, sited and constructed so that it is not subject to inundation by floodwaters at a level of the Probable Maximum Flood of 3.24 metres Australian Height Datum. This allows the Proponent the flexibility to construct the power station to meet operational requirements whilst safeguarding it from flooding rather than have flood safeguards possibly imposing unreasonable requirements on design and operations. The Department has recommended that the Proponent consult Council in the design of stormwater and flood mitigation measures.</p>
Visual Amenity	<p>The Proponent has undertaken a visual assessment to establish the visual impact of the power station considering both the degree of visual modification resulting from the construction of the power station and the visual sensitivity of the surrounding areas including residential and recreational areas as well as local and major roads. The new structures that would impact on the visual environment include the structure housing the gas turbine generators and ancillary plant, high voltage switchyard, gas receiving station, distillate tanks and above ground diesel storage tanks, the most visually prominent structure being the exhaust stack(s). The tallest component of the power station (the stacks) would be approximately 60 metres above ground level in the case of a combined cycle gas turbine facility and 40 metres above ground level in the case of an open cycle gas turbine facility.</p> <p>The Proponent's visual impact assessment indicates that the power station would be obscured from view from the south by the Tallawarra Stage A power station. In addition, Mount Brown would screen views of the power station from the existing residential areas to the north of the site. Due to its foreshore location, properties along the Lake Illawarra shoreline would have distant background views of the plant and recreational users on the lake would also have distant views of the site. However, the vegetation surrounding the proposed power station would provide significant screening. Consequently, the Proponent concluded that the visual impact of the power station would be low to moderate for existing residents and recreational users of the local area.</p> <p>Proposed residences to the north, associated with the development of the Tallawarra Lands, would be slightly elevated above the power station and hence would have direct views down to the facility. Future industrial developments to the south-west would also have views of the site but are considered to be less sensitive to the view of the power station.</p> <p>Based on the outcomes of the visual assessment, the Department concurs with the Proponent's conclusion the proposal would not result in significant visual impacts as in most cases, the visibility of the facility would be moderated by distance and screening vegetation. In addition, views of the power station are unlikely to be significantly different from that which exist with the Tallawarra Stage A power station and co-location has helped to reduce the</p>

	<p>potential spread of visual impacts through the duplication of ancillary infrastructure. In regards to future residential developments, residents would be aware (from the information contained in the Environmental Assessment) that the approved power station would be visible from the dwellings and that the structure forms part of the visual characteristic of the landscape rather than having visual impacts imposed on them. They should also be aware that the land is zoned SP2 Infrastructure.</p> <p>The Proponent has proposed a range of mitigation measures to reduce the visual impacts of the project including:</p> <ul style="list-style-type: none"> • consistency in design of the facility with the Tallawarra Stage A power station; • use of appropriate colouring to minimise contrast with the natural setting; • additional screen planting along all boundaries of the site; and • increasing the embankment height to the east of the site to further screen the power station from residences along the foreshore. <p>These measures are reinforced in the Department's recommended conditions of approval along with a requirement that low reflectivity surfaces be used in the design of the facility.</p>
Indigenous Heritage	<p>No sites of Aboriginal cultural heritage significance have been identified within the Tallawarra Stage B site. This site has been subject to extensive previous disturbance, including excavation, as it is the site of a decommissioned coal fired power station. However, there are areas of high Aboriginal significance in close proximity to the site associated with Yallah Creek and the foreshore of Lake Illawarra.</p> <p>In particular, four sites are located in the vicinity of Yallah Creek to the north of the site of the proposed Tallawarra Stage B power station. These sites are listed on the Aboriginal Heritage Information Management System database. Three of the sites are open camp sites, while the fourth comprises a midden and open camp site. All sites contain artefact scatters.</p> <p>The proposed transmission line associated with the power station would cross Yallah Creek and be in close proximity to one of the sites. However, the Proponent has advised that the transmission line poles would be located to avoid disturbance of the site.</p> <p>To ensure that known Aboriginal sites are protected, the Department has recommended a condition of approval requiring the Proponent to identify the location of known objects/sites on transmission line route alignment sheets required as part of the Construction Environmental Management Plan and avoid impacting on these. Further, the Department has recommended that the Proponent develop site-specific mitigation measures to ensure that known objects, and any other objects uncovered during construction, are not impacted by construction or operation of the project.</p> <p>If the Proponent becomes aware of any previously unidentified Aboriginal objects during the course of construction, the Department has recommended a condition of approval requiring the Proponent to immediately cease all work that is likely to affect the objects and inform DECCW in accordance with the <i>National Parks and Wildlife Act 1974</i>. A condition of approval requiring the Proponent to develop an Aboriginal Cultural Education Programme has also been recommended to ensure the appropriate induction of all construction personnel and their obligations with respect to the management of Aboriginal objects and cultural heritage values.</p> <p>The Department considers that the Proponent's commitment to avoid known indigenous heritage sites and erect physical barriers around them in conjunction with the recommended conditions of approval would ensure that the project would not significantly affect Aboriginal cultural heritage objects.</p>
Traffic and	<i>Construction Traffic</i>

Transportation	<p>Construction of the power station would involve the mobilisation and demobilisation of construction plant/equipment to the project site and the delivery of equipment, plant and materials required for operation of the power station. This would involve heavy vehicles accessing the site via the Princes Highway or Southern Freeway and then along Yallah Bay Road which intersects with the Princes Highway.</p> <p>The Proponent estimates that the total number of light vehicle trips per day would be in the order of 320. There would be several trailer loads of plant/equipment/materials delivered to the site over the construction period. However, no details have been provided on the number of heavy vehicle movements.</p> <p>The Department acknowledges that there would be a short-term increase in traffic movements on Princes Highway, Southern Freeway and Yallah Bay Road during construction. However, the proposed traffic increases on major roads resulting from haulage of plant, equipment and materials are unlikely to significantly affect motorists as they would only represent a small increase in the overall traffic volume. In addition, the existing road network is considered sufficient to accommodate the increased construction traffic movement. The impact on traffic volumes and flow along Yallah Bay Road is unlikely to be significant as the road is primarily used by employees, contractors and delivery vehicles to gain access to the power station site. Although there may be times when large items of plant and equipment (for example, the gas turbines) would need to be transported to the site which may cause minor traffic impacts, these occurrences would be infrequent and not unduly impact on road users.</p> <p>The Southern Freeway currently terminates immediately after Yallah Bay Road. Consequently, the majority of the traffic continuing along this stretch of the freeway comprises employees, contractors and delivery vehicles associated with the operation of the Tallawarra Stage A power station. Hence, the potential for adverse impacts on traffic flows at the intersection of the freeway and Yallah Bay Road is limited.</p> <p>The Proponent has committed to preparing a Construction Traffic Management Plan. To ensure that this commitment is fulfilled, the Department has recommended a condition requiring the Proponent to detail the measures for the control and management of construction-related traffic in the Construction Environmental Management Plan for the project. The Traffic Management Plan is to detail the estimated construction vehicle volumes including heavy vehicle movements, and provide details on the number of oversized vehicle movements and proposed access routes for the haulage of oversized loads (such as the gas turbines).</p> <p>The Department acknowledges that heavy vehicle movements along Yallah Bay Road have the potential to damage the road surface. To ensure the safety of persons using the road (including employees, delivery drivers and the general public), the Department has included a condition requiring the Proponent to repair any deterioration attributable to such traffic on completion of the project.</p> <p>The Department is satisfied that the recommended conditions of approval should provide the necessary measures for managing construction traffic impacts to an acceptable level.</p> <p><u>Operational Traffic</u></p> <p>The Department notes that operational traffic associated with the proposal would be limited to occasional deliveries with a maximum of 20 additional staff required to operate the power station. As such, operation of the power station would not have a significant impact on the surrounding road network.</p>
Erosion and Sediment	The project will involve excavation and building works in close proximity to Lake Illawarra and Yallah creek. Consequently, there is a high risk of erosion and sedimentation impacts arising

Control	<p>during construction until exposed areas are stabilised.</p> <p>The Proponent has committed to implementing standard erosion and sediment controls, consistent with the principles set out in Landcom's <i>Managing Urban Stormwater: Soils and Construction</i> (the Blue Book) to mitigate this impact. The Department considers this an appropriate measure and has recommended it as a condition of approval along with the requirement to detail the proposed measures for the control and management of erosion and in the Construction Environmental Management Plan for the project.</p>
Waste	<p>Both construction and operation of the Tallawarra Stage B power station would result in the generation of waste. Construction waste streams would include demolition waste, green waste (from clearing) and general construction waste. Operational wastes would include sewage, used oils, packaging, oil drums, and office wastes. The Proponent has committed to managing all wastes in accordance with the relevant guidelines and the principles of waste avoidance, reduction, reuse and recycling and developing a Waste Management Plan. The Department is satisfied with this approach and has recommended a condition of approval to ensure that this commitment is implemented.</p>

6. CONCLUSIONS AND RECOMMENDATIONS

The Department has undertaken a detailed assessment of the Tallawarra Stage B Gas-Fired Power Station project, having regard to the Proponent's Environmental Assessment, Response to Submissions Report and Statement of Commitments as well as the issues raised in the submissions received and the technical advice provided by DECCW.

Based on its assessment, the Department is satisfied that there is a clear justification for the proposal in terms of contributing to the State's energy supply capacity over the medium and longer term. In addition, the Proponent has undertaken a robust and conservative assessment of the impacts of the project, and demonstrated that the project can be constructed and operated within acceptable environmental limits. The key environmental impacts associated with the proposal relate to the operational performance of the power station on air quality, noise, aviation safety (from exhaust plumes), and the water quality and ecology of Lake Illawarra.

Although some residual impacts may result, the Department considers the project to be on balance justified given its benefits to provide a reliable supply of electricity. The Department has drafted a recommended instrument of approval incorporating stringent environmental requirements that provide a comprehensive framework for the management, monitoring and reporting on the environmental performance of the project.

In addition, in response to issues raised by the Civil Aviation Safety Authority (CASA) and Shellharbour City Council regarding impacts of an open cycle plant on aviation safety, the Department recommends that the open cycle plant not be permitted to proceed unless the Proponent is able to demonstrate to the satisfaction of CASA that it will not pose an unacceptable risk to aviation safety.

In order to protect the water quality and ecology of Lake Illawarra in the event a combined cycle power station is constructed, the Department has not only recommended maximum pollutant concentrations for biocides in the cooling water discharge, but also upper limits on the temperature of the discharge water. In addition, the recommended conditions of approval include requirements for discharge water quality monitoring as well as monitoring of the benthos and seagrass beds in Lake Illawarra.

Overall, the Department is satisfied that with the implementation of the proposed mitigation measures, as well as the additional measures outlined as part of the recommended conditions of approval, the potential impacts would be appropriately mitigated and/or managed to an acceptable level of environmental performance. Consequently, the Department recommends that the Minister approve the Tallawarra Stage B Gas Turbine Power Station project, subject to the recommended conditions of approval.

Chris Wilson
Executive Director,
Major Projects Assessments

Richard Pearson
Deputy Director General
Development Assessment and Systems Performance

Sam Haddad
Director General

APPENDIX A – ENVIRONMENTAL ASSESSMENT

APPENDIX B – RECOMMENDED CONDITIONS OF APPROVAL

APPENDIX C – RESPONSE TO SUBMISSIONS

APPENDIX D – STATEMENT OF COMMITMENTS

Environmental Management Commitments – Design and Construction

Objective	Action
<i>Environmental Management</i>	
Manage hours of construction work	<ul style="list-style-type: none"> ■ Proposed hours of construction for the project site are: <ul style="list-style-type: none"> - Monday to Friday – 7am to 6pm; - Saturday – 7am to 1pm if inaudible at residential premises, otherwise 8am to 1pm; and - No work on Sundays or public holidays. ■ The Construction EMP will outline the procedures that need to be complied with before any work can be carried out on the project site outside these hours (e.g. approval of relevant authorities and notification of local residents).
Minimise impact of construction on surrounding area	<p>A construction environmental management plan (CEMP) will be prepared and implemented to guide construction activities. The CEMP will cover the following areas:</p> <ul style="list-style-type: none"> ■ traffic and transport; ■ air quality; ■ water; ■ noise and vibration; ■ heritage; ■ ecology; ■ hazards and risk; ■ visual; ■ waste management; and ■ communication. <p>Any plans and strategies contained in the CEMP will be developed in consultation with the relevant agencies.</p>
Maintain public foreshore access	The Tallawarra Stage B project will not result in any permanent reduction or alteration of the existing foreshore access arrangements in the vicinity of the site
<i>Traffic and Transport</i>	
Minimise impact of construction traffic on surrounding road network	<ul style="list-style-type: none"> ■ Subject to availability, the construction works will use the new temporary area to the north east of the power station site, adjacent to the squash courts/ basketball courts. Access will be via the southern access and service road, minimising the interaction between construction vehicles and other vehicles. ■ Consultation with the relevant roads authority will be undertaken before the commencement of works that may affect public roads or traffic. ■ Traffic and transport mitigation measures and safeguards implemented for the construction of the Tallawarra Stage A plant will be reinstated for the construction of the Tallawarra Stage B power station. In particular, warning signs for the general public and employees will be re-installed and regular inspections of Tallawarra Road's surface condition will continue to be carried out. ■ A traffic management plan will be developed as part of the CEMP.
<i>Air</i>	
Minimise dust generation during construction	<p>The following dust control procedures will be implemented during the construction phase of the project if there is a possibility of wind-blown dust affecting residential areas:</p> <ul style="list-style-type: none"> ■ In dry, windy conditions, water carts will be used to dampen soils prior to excavation and handling. Exposed surfaces and stockpiles will be watered, sprayed and covered if required. ■ Vehicles will only be loaded to their carrying capacity and loads of fill will be covered or dampened during transport. Any soil adhering to the undercarriage and wheels of the trucks will be removed prior to departure

Objective	Action
	<p>from the site.</p> <ul style="list-style-type: none"> ■ Any long-term stockpiles of soil will be stabilised using fast-seeding grass or synthetic cover spray. <p>In addition, construction plant and equipment used on the site for the project will be well maintained and regularly serviced so that emissions from construction plant and vehicles remain within applicable air quality guidelines and standards.</p>
Water	
Prevent increased sedimentation of nearby waterways	<ul style="list-style-type: none"> ■ All applicable activities will be carried out in a manner that minimises erosion and sedimentation. These measures will be carried out in accordance with the applicable principles and practices contained in 'Soils and Construction' (Landcom, 2006).
Noise	
Minimise construction noise impact on surrounding residences	<ul style="list-style-type: none"> ■ Construction will be carried out during the hours specified above under 'Environmental Management - Manage hours of construction work'. ■ Practical measures will be used to manage noise from construction equipment, particularly in instances where extended hours of operation are required. ■ Noise compliance monitoring will be carried out for all major equipment and activities on site and investigative monitoring of noise will be carried out in response to specific complaints. ■ Contractors will be required to comply with applicable noise criteria in the construction of the proposed plant. Noise limits will be given to suppliers of plant equipment so that the equipment can be designed to comply with project specific noise goals. ■ Suppliers of construction equipment will be required to comply with Australian Standard AS 2436-1981 <i>Guide to Noise Control on Construction, Maintenance and Demolition Sites</i>. All equipment used on-site will need to demonstrate compliance with the noise levels recommended within AS 2436-1981.
Aboriginal Heritage	
Protection of recorded Indigenous Heritage items	<ul style="list-style-type: none"> ■ The location of existing Aboriginal heritage sites close to the proposed works will be noted. A suitable buffer will be physically marked and construction staff will be made aware of their responsibilities and obligations under the <i>National Parks and Wildlife Act 1974</i>.
Protection of Indigenous Heritage relics if uncovered	<ul style="list-style-type: none"> ■ All construction personnel will be inducted on the potential to find previously unrecorded Aboriginal items. ■ If an item (or suspected item) of Aboriginal heritage is discovered during works, all work likely to affect the discovery will cease. DECC will be informed and further investigation will be undertaken by an archaeologist before recommencement of work.
Ecology	
Management of terrestrial vegetation and habitats	<ul style="list-style-type: none"> ■ The proposed disturbance footprint will be clearly defined on-ground, using temporary fencing, to avoid unnecessary vegetation and habitat removal. ■ Appropriate weed management strategies will be implemented during construction to ensure they are not spread throughout the study area.
Minimise likelihood of impacts on aquatic and riparian habitats	<ul style="list-style-type: none"> ■ Sediment and erosion controls will be adopted to minimise the impact on water quality. Appropriate measures to store and manage fuels and oils on the project site will be adopted and spill containment equipment will be available on site at all times to prevent and contain accidental spills near local waterways.
Hazards and Risks	
Ongoing assessment of hazards and risks	<p>The following studies will be completed as part of the ongoing assessment of hazards and risks prior to commencement of operations:</p> <ul style="list-style-type: none"> ■ fire safety study, in accordance with Hazardous Industry Planning Advisory Paper (HIPAP) No. 2; ■ hazard and operability study, in accordance with HIPAP No. 8;

Objective	Action
	<ul style="list-style-type: none"> ■ emergency response planning, in accordance with HIPAP No. 1; ■ construction safety study, in accordance with HIPAP No. 7; and ■ safety management system assessment, in accordance with HIPAP No. 9.
<i>Visual</i>	
Minimise visual impacts during design	<ul style="list-style-type: none"> ■ Plant will be designed to be consistent with adjacent structures, including Tallawarra Stage A. ■ The design and colour scheme chosen for the built components will be selected to ensure they do not stand out within the natural settings.
Minimise visual impacts during construction	<ul style="list-style-type: none"> ■ Revegetation of earthwork areas will be conducted as soon as practicable during the construction phases.
<i>Waste Management</i>	
Minimise waste generated and maximise re-use and recycling. Waste disposal to be undertaken when re-use and recycling is not possible	<ul style="list-style-type: none"> ■ A waste management plan (WMP) will be developed for incorporation into the CEMP. ■ The WMP will include: <ul style="list-style-type: none"> ■ procedures for the management of construction wastes from the site; ■ an inventory of all waste types anticipated; and ■ the preferred options for re-use, recycling or disposal. ■ The WMP will seek to ensure that all waste generated at the site is recorded to help achieve waste minimisation. ■ Waste for disposal will be removed by a licensed waste contractor and disposed of at a licensed landfill facility. ■ Where required, any asbestos, contaminated soil and spoil generated from the power station site and the previous power station foundations (subsurface) will be retained and contained on site in the existing DECC approved site asbestos repository established as part of the Tallawarra A approval.
<i>Communication</i>	
Establish effective communication with community and relevant agencies	<p>A construction communications plan will be prepared and implemented. This plan will include:</p> <ul style="list-style-type: none"> ■ continuation of the existing community liaison group that was established in 2003 for Tallawarra Stage A and the Tallawarra Lands planning process; ■ establishment of a basis for liaison with the community to deal with construction issues; ■ maintenance of phone/fax/website to provide opportunity for community input; and ■ implementation of an effective complaints handling procedure to address and respond to issues raised by the community.

Environmental Management Commitments – Operational

Objective	Action	
Environmental Management		
Minimise impact of operations on surrounding area	<p>An operational environmental management plan (OEMP) will be prepared and implemented to guide operational activities. The OEMP will cover the following areas:</p> <ul style="list-style-type: none"> ■ environmental management; ■ air and greenhouse; ■ noise; ■ hazard and risk; ■ water; ■ heritage; ■ ecology; ■ landscape and visual; ■ traffic and transport; ■ waste management; and ■ emergency response. <p>Any plans and strategies contained in the OEMP will be developed in consultation with the relevant agencies.</p>	
General	<ul style="list-style-type: none"> ■ The OEMP will require that regular monitoring and periodic performance reviews be undertaken of key performance criteria for noise during the operation of the site. Performance reviews will be undertaken against noise performance parameters established in the OEMP. The examination and interpretation of the results of such reviews will be undertaken by a suitably qualified professional and any agreed actions implemented within a reasonable timeframe. ■ The plant's hours of operation will be 24 hours 7 days per week. ■ The site will preferentially use natural gas fuel for firing the power station turbines. Diesel fuel (OCGT only) shall only be used to manage fuel capacity or network system constraints, in the event of failure of existing major electricity generating facilities, failure of natural gas supplies, a State or regional system shutdown situation; if cessation of operation would otherwise lead to a loss or reduction in electricity necessary to maintain the required network supply security/reliability or at the direction of the National Electricity Market Operator. 	
Maintain public foreshore access	The Tallawarra Stage B project will not result in any permanent reduction or alteration of the existing foreshore access arrangements in the vicinity of the site	
Air and Greenhouse		
Minimise emissions from plant and equipment	<p>OCGT Plant</p> <ul style="list-style-type: none"> ■ The air and greenhouse proposal for the Stage B OCGT plant will be designed and implemented to ensure that the NSW DECC criteria for each pollutant identified in Tables 7-1 and 7-2 are not exceeded. As is the case with Tallawarra A (Tallawarra A Air Quality Management Plan), in the event of exceedences, DECC will be notified and remedial action undertaken. 	<p>CCGT Plant</p> <ul style="list-style-type: none"> ■ The air and greenhouse proposal for the Stage B CCGT plant will be designed and implemented to ensure that the NSW DECC criteria for each pollutant identified in Tables 8-1 and 8-2 are not exceeded. As is the case with Tallawarra A (Tallawarra A Air Quality Management Plan), in the event of exceedences, DECC will be notified and remedial action undertaken.
	<ul style="list-style-type: none"> ■ In order to determine the annual NO_x load, TRUenergy propose to install and operate a continuous NO_x monitoring system at the site. ■ The need or otherwise for offsets will be determined based on the annual monitoring results. Additionally the need or otherwise will also be determined by; the actual operating data from Tallawarra A, the predicted operating data from Tallawarra B and finally by the actual operating data from Tallawarra B. ■ TRUenergy has committed to avoid simultaneous cold starts of both Tallawarra A and Tallawarra B CCGTs as a potential exceedance of air emission parameters is indicated from the modelling of this operational scenario with currently available data. TRUenergy reserves the right to remodel and seek the ability to carry out this scenario in the event that improved emissions data becomes available. 	

	<ul style="list-style-type: none"> ■ Ongoing monitoring of greenhouse gas emissions will be undertaken and reported in the proponent's Annual Environmental Report. ■ The proponent will continue to meet its requirements under the 'Greenhouse Challenge Plus Programme' by maintaining its emissions inventory reporting and continuing development and implementation of action plans to achieve cost effective abatement. 	
Noise		
<p>Minimise operational noise impact on surrounding residences</p>	<p>OCGT Plant</p> <ul style="list-style-type: none"> ■ The project noise goals listed in Table 7-17, developed in accordance with the Industrial Noise Policy (INP), will be adhered to during the operation of the Stage B OCGT plant. ■ Additionally the OCGT plant will be designed such that noise limits specified in the project approval documents are able to be achieved during plant operations 	<p>CCGT Plant</p> <ul style="list-style-type: none"> ■ The project noise goals listed in Table 8-16, developed in accordance with the Industrial Noise Policy (INP), will be adhered to during the operation of the Stage B CCGT plant. ■ Additionally the CCGT plant will be designed such that noise limits specified in the project approval documents are able to be achieved during plant operations.
	<ul style="list-style-type: none"> ■ Any future development within the Tallawarra Lands area will need to consider the operational noise emissions of the plant and implement design measures (either at the plant, in the transmission pathway and/or at the receiver) to minimise the impact of such emissions. Operational noise emissions monitoring will be undertaken during the operational phase. ■ The start up and shut down activities will be managed through the Operational Environmental Noise Management Plan developed for Tallawarra A, Ref 7142-037-02-01 Rev 2. 	
Hazards and Risks		
<p>Reduce the potential risks associated with the operation of the plant</p>	<ul style="list-style-type: none"> ■ The fitting line will be situated on an above ground pipe rack, with markers that are in accordance with the national standard, as was required for the Tallawarra Stage A plant. ■ The distance between the marker signs located along the fitting line route will be no more than 50m apart, irrespective of clear visibility along a straight flat section of the fitting line route. ■ A safety management system element will be developed specifically for the fitting line. This element should include regular fitting line route and equipment inspections and inspection and checking of the impressed current corrosion protection system. ■ A site first flush retention pond, designed to contain a minimum of 216m³ of water, will be installed to ensure fire water is retained on site. ■ A hazard audit, in accordance with HIPAP No. 5, will be conducted within 12 months of the commencement of operations. 	
Water		
<p>Manage water quality in Lake Illawarra</p>	<p>CCGT Plant</p> <p>If a CCGT configuration is chosen for the plant, the CCGT will:</p> <ul style="list-style-type: none"> ■ be designed to utilise wet mechanical draft cooling towers, in preference to once-through cooling, to minimise the amount of water required and the thermal effects of the outlet discharge; ■ use attemperation water (additional intake water to lower the discharge water temperature) to maintain the temperature of cooling water below 35°C. 	

	<ul style="list-style-type: none"> ■ The existing comprehensive routine monitoring programme (as required for Tallawarra Stage A) will be used to monitor the water quality in Lake Illawarra. ■ The use of treated sewage effluent by the proponent for spray irrigation at the site will be managed in accordance with the existing environment protection licence conditions. ■ Runoff water quality will be improved through the use of specially designed traps which will remove oil and grit from runoff water. This will enable recycling of the captured oil, and offsite disposal of the solids. The continued use of the existing constructed wetlands will further improve runoff water quality through removal of excess nutrients and toxicants. ■ Settling basins will be used to remove coarse material from runoff water and minimise further sedimentation in Lake Illawarra. The settling basins provided for Tallawarra Stage A may need to be enlarged or duplicated to cater for the increased runoff. ■ The oil skimmer booms that are in place for the Tallawarra Stage A plant will be used on the outlet canal to provide extra protection in the event of an oil spill. ■ Subject to any future development of Tallawarra Lands and the availability of sewer TRUenergy intent to connect to this system
Ecology	
Maintenance of revegetated areas	<ul style="list-style-type: none"> ■ Monitoring of the revegetated areas will be undertaken to ensure they are functioning as designed.
Aboriginal Heritage	
Maintenance of items on site	<ul style="list-style-type: none"> ■ Any identified or potential Aboriginal heritage sites remaining on the proponent's site will be protected in consultation with the relevant Local Aboriginal Land Council (LALC).
Visual Amenity	
Minimise impacts on residential amenity	<ul style="list-style-type: none"> ■ The existing landscape planting for Tallawarra Stage A will be enhanced at key locations around the site. ■ The existing earth mound to the east of the site will be elevated to screen the proposed power stations. ■ Native vegetation will be planted on the mound. Vegetation will be retained on the north side of the site and planting will be maximised to reduce views of the site from the Tallawarra Lands area.
Waste	
Minimise waste generated and maximise re-use and recycling. Waste disposal to be undertaken when re-use and recycling is not possible.	<ul style="list-style-type: none"> ■ Waste management will be a component of the Operational EMP for the operational phase of the facility. It will ensure that initiatives for the sustainable management of waste are given consideration, including: <ul style="list-style-type: none"> ■ recycling facilities being provided to encourage the separation and recycling of all paper, aluminium, glass, and plastic products used during the operation of the site; and ■ domestic waste being collected regularly and disposed of at licensed facilities as appropriate. ■ Where required, any asbestos, contaminated soil and spoil generated from the power station site and the previous power station foundations (subsurface) will be retained and contained on site in the existing DECC approved site asbestos repository established as part of the Tallawarra A approval.

APPENDIX E – ADDITIONAL INFORMATION ON NOISE CRITERIA WITHIN THE TALLAWARRA LANDS AREA
