



Coolimba Power Station Project, Eneabba



Coolimba Power Pty Ltd



**Report and recommendations
of the Environmental Protection Authority**

**Environmental Protection Authority
Perth, Western Australia**

**Report 1350
March 2010**

Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
08/01/08	Level of Assessment set (date appeals process completed)	
28/04/09	Proponent Document Released for Public Comment	68
23/06/09	Public Comment Period Closed	8
17/08/09	Final Proponent response to the issues raised	8
10/03/10	EPA report to the Minister for Environment	29
24/03/10	Appeals Close	2

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Summary and recommendations

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for Environment on the proposal by Coolimba Power Pty Ltd to construct and operate the Coolimba Power Station on a site located approximately 15 kilometres (km) south-south-west of Eneabba, and to establish an approximately 20 km long and 100 metre (m) wide infrastructure corridor that will accommodate the construction and operation of:

- a natural gas pipeline lateral to connect the power station to either the Dampier to Bunbury Natural Gas Pipeline (DBNGP) or the Parmelia Gas Pipeline; and
- a 330 kV electricity transmission line to connect the power station to the external electricity network at the proposed Eneabba Substation.

Section 44 of the *Environmental Protection Act 1986* (EP Act) requires the EPA to report to the Minister for Environment on the outcome of its assessment of a proposal. The report must set out:

- The key environmental factors identified in the course of the assessment; and
- The EPA's recommendations as to whether or not the proposal may be implemented, and, if the EPA recommends that implementation be allowed, the conditions and procedures to which implementation should be subject.

The EPA may include in the report any other advice and recommendations as it sees fit.

The EPA is also required to have regard for the principles set out in section 4A of the EP Act.

Key environmental factors and principles

The EPA decided that the following key environmental factors relevant to the proposal required detailed evaluation in the report:

- (a) Biodiversity;
- (b) Air quality;
- (c) Noise; and
- (d) Greenhouse gas emissions.

There were a number of other factors which were relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

The following principles were considered by the EPA in relation to the proposal:

- (a) The precautionary principle;
- (b) The principle of intergenerational equity;

- (c) The principle of the conservation of biological diversity and ecological integrity;
- (d) Principles relating to improved valuation, pricing and incentive mechanisms; and
- (e) The principle of waste minimisation.

Conclusion

The EPA has considered the proposal by Coolimba Power Pty Ltd to construct and operate the Coolimba Power Station on a site located approximately 15 km south-south-west of Eneabba, and to establish an approximately 20 km long and 100 m wide infrastructure corridor that will accommodate the construction and operation of:

- a natural gas pipeline lateral to connect the power station to either the DBNGP or the Parmelia Gas Pipeline; and
- a 330 kV electricity transmission line to connect the power station to the external electricity network at the proposed Eneabba Substation.

This proposal was determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), sections 18 and 18A (threatened species and communities), and is being assessed under the Bilateral Agreement.

Biodiversity

Flora and vegetation

The project would have a total footprint of approximately 483 hectares (ha). The power station would be constructed on cleared farmland. Construction within the infrastructure corridor would require approximately 48.8 ha of vegetation to be cleared, including up to 30 ha in the South Eneabba Nature Reserve (SENR).

Up to approximately 10% of the surveyed population of the Declared Rare Flora (DRF) species *Tetratheca nephelioides* and up to approximately 2% of the total estimated population of the DRF species *Eucalyptus johnsoniana* (also listed as 'Vulnerable' under the EPBC Act) within and adjacent to the infrastructure corridor, is proposed to be removed during the construction of the gas pipeline lateral and electricity transmission line.

The EPA notes that *Tetratheca nephelioides* and *Eucalyptus johnsoniana* are endemic to Western Australia, have very low population numbers (i.e. < 2,000 individuals each) and are restricted to a very narrow distribution (i.e. the SENR and nearby road reserves). Both species occur in localities near existing, and proposed, development sites for mineral sand mining, which has the potential to further impact these species.

The reproductive ecology, ability to successfully translocate and susceptibility to dieback of both species is currently unknown. These species are also susceptible to impact from other threatening processes such as competition from the introduction of weed species, changed fire regime, introduction of disease, dust deposition and human interference. *Eucalyptus johnsoniana* is particularly vulnerable to fire at various

stages of its growth. These factors create additional challenges in regard to successful rehabilitation of these species.

The EPA also notes that further flora field studies outside the project area and the rehabilitation trials proposed by the proponent would inform the knowledge base on DRF and Priority flora species in the region. However, given the lack of information on the aforementioned factors, it is the view of the EPA that the proposed level of loss of these two species could pose a significant risk to their long-term viability. The Department of Environment and Conservation (DEC) also supports this view.

The EPA considers any loss of *Tetratheca nephelioides* and *Eucalyptus johnsoniana* to be unacceptable. The direct and indirect impacts to DRF can be avoided by not placing project infrastructure inside the SENR. Therefore, the EPA recommends that Condition 6 should be imposed on the proponent to prevent the infrastructure corridor from entering the SENR, and to ensure that there is no loss of DRF species due to implementation of this proposal.

Rehabilitation

The EPA recommends that Condition 7 should be imposed on the proponent to ensure the long term success of rehabilitation.

Dieback and weeds

The EPA considers that Condition 6, which prevents the infrastructure corridor from entering the SENR and requires the proponent to ensure that activities associated with the proposal do not introduce dieback, together with the proponent's proposed dieback and weed management measures, will minimise the potential for dieback and weeds to be introduced into the SENR.

Fauna

Clearing of vegetation within the infrastructure corridor would result in the loss of fauna habitat utilised by several conservation significant fauna species such as Carnaby's Black Cockatoo, Rainbow Bee-Eater, Rufous Fieldwren and Black-striped Snake. Additionally, vegetation clearing activities have the potential to directly impact individual Rufous Fieldwrens and Black-striped Snakes.

The EPA notes that both direct and indirect impacts to fauna and habitat could largely be avoided by not placing project infrastructure inside the SENR.

The EPA has recommended Condition 6 that prevents the infrastructure corridor from entering the SENR largely to prevent impacts DRF. However, this condition also protects fauna and habitat. The EPA also recommends Condition 8 be imposed to ensure that impact to fauna as a result of trenching activities is managed in an environmentally acceptable manner.

Air Quality

The 450 megawatt (MW) coal-fired base-load plant and the 358 MW natural gas-fired peaking-load plant within the Coolimba Power Station would generate approximately 15,000 tonnes of sulphur dioxide (SO₂), 6,600 tonnes of oxides of nitrogen (NO_x), and 630 tonnes of particulates (as PM₁₀) per year.

There are uncertainties associated with the air quality modelling because of the limited availability of meteorological data. However, the predicted ground level concentrations (GLCs) around the power station are likely to be representative and are below the National Environment Protection Measure (NEPM) standards when the power station operates in isolation and at full capacity under normal conditions.

The proposed stack emission concentrations are considerably higher than specified in European Directive 2001/80/EC and, in line with best practice expectations, the EPA considers that Condition 9-1 should be imposed on the proponent to limit the stack emission concentrations from the coal-fired generating plant.

The EPA has also recommended that Condition 9-2 should be imposed on the proponent to limit desulfurisation system downtime to 1% of the time in view of the uncertainties in the air quality modelling. Based on air quality modelling this requirement would be consistent with the NEPM Goal for SO₂ which allows a maximum of one day a year exceedance of the 1-hour standard.

In view of the uncertainties associated with the air quality modelling, the EPA considers that Conditions 9-3, 9-4, and 9-5 should also be imposed on the proponent to:

- develop and implement a meteorological monitoring program that includes the installation of a comprehensive meteorological station, SODAR (sonic detection and ranging) system, and other meteorological instrumentation systems; and
- undertake further meteorological studies to facilitate a review of the air quality modelling and health risk assessment, and the subsequent validation of the air quality modelling and updating of the health risk assessment.

Noise

Construction noise

Construction activities during the three year construction period are not expected to result in significant exceedances of assigned noise levels at nearby residential premises if industry standard noise attenuation measures are employed. The proponent has not examined potential construction noise impacts associated with the proposal in detail. The proponent would be expected to monitor noise levels at nearby residential premises during the construction of the power station, gas pipeline lateral, and electricity transmission line. Should noise monitoring indicate that noise levels at nearby residential premises are exceeding assigned levels, construction activities would need to be undertaken in accordance with Regulation 13 of the *Environmental Protection (Noise) Regulations 1997*.

Operational noise

Operation of the power station is predicted to result in noise levels at the nearest residential premises exceeding several assigned L_{A10} levels prescribed under the *Environmental Protection (Noise) Regulations 1997*.

The proponent would specify suitably attenuated gas turbine generator packages, coal-fired boilers, and cooling towers for the power station in order to ensure that noise levels at the nearest residential premises comply with the *Environmental Protection (Noise) Regulations 1997*.

Should monitoring indicate that noise levels during power station commissioning exceed applicable criteria, the proponent would investigate additional design measures to reduce noise to acceptable levels. However, the EPA recommends that the Department of Environment and Conservation (DEC) should require the proponent to undertake a new noise impact assessment when detailed design information is available, to demonstrate compliance with the *Environmental Protection (Noise) Regulations 1997*, in the Works Approval and Licence which will be required if the proposal is approved.

Greenhouse gas emissions

The Coolimba Power Station would generate about 4.3 million tonnes of carbon dioxide equivalent (CO_{2-e}) per year, of which the coal-fired base-load generation plant would generate approximately 3.8 million tonnes of direct CO_{2-e} emissions per year.

The proponent contends that the proposed generating plants would be designed and constructed to be carbon capture and storage (CCS) ready in general accordance with the International Energy Agency (IEA) definition of carbon capture ready.

The findings of the study of CO_2 geosequestration potential in the Northern Perth Basin indicate that the estimated contingent storage capacity of depleted gas fields in the region could only accommodate between 20.7% and 39.8% of the CO_2 emissions generated by the power station over its estimated 30 year life time. The estimated prospective storage capacity of deep saline formations in the region could potentially accommodate all of the CO_2 emissions captured from the power station during its life time. The proponent intends to verify the availability and suitability of CO_2 transport routes for the project and would complete a number of feasibility studies prior to, and following commissioning, to aid decision making in relation to the conversion to CCS.

As a result, the EPA does not consider that the proponent has demonstrated that the project meets the IEA definition of CCS ready at this time. Additionally, the likelihood that CCS will become technically and commercially viable in the near future is uncertain, and relying on CCS to constrain carbon emissions for this proposal in the future represents considerable risk.

If approved for implementation, the EPA recommends that Condition 10-1 should be imposed on the proponent requiring it to periodically advise the EPA of progress made towards the implementation of CCS. Condition 10-2 would require the

proponent to retrofit carbon capture and storage to the full capacity of the coal fired power station within five years of the EPA concluding that carbon capture and storage is economically and technically proven. The EPA also recommends that Conditions 10-3 and 10-4 should be imposed on the proponent requiring it to achieve best practice thermal efficiency for a coal-fired base-load generation plant and for a greenhouse gas abatement report to be developed. Condition 10-5 sets the effective time frame of Conditions 10-2 to 10-4 as being until such time as it is determined that that these conditions are non-complementary to any Commonwealth greenhouse gas emissions trading scheme that may come into force in Western Australia.

Recommendations

The EPA submits the following recommendations to the Minister for Environment:

1. That the Minister notes that the proposal being assessed is for the construction and operation of the Coolimba Power Station on a site located approximately 15 km south-south-west of Eneabba, and the establishment of an approximately 20 km long and 100 m wide infrastructure corridor that will accommodate the construction and operation of:
 - a natural gas pipeline lateral to connect the power station to either the DBNGP or the Parmelia Gas Pipeline; and
 - a 330 kV electricity transmission line to connect the power station to the external electricity network at the proposed Eneabba Substation;
2. That the Minister considers the report on the key environmental factors and principles as set out in Section 3;
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4, and summarised in Section 4, including the proponent's commitments; and
4. That the Minister notes that the EPA has included a recommended condition that the infrastructure corridors avoid the South Eneabba Nature Reserve and DRF.
5. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Conditions

Having considered the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Coolimba Power Pty Ltd to construct and operate the Coolimba Power Station on a site located approximately 15 km south-south-west of Eneabba, and to establish an approximately 20 km long and 100 m wide infrastructure corridor that will accommodate the construction and operation of:

- a natural gas pipeline lateral to connect the power station to either the DBNGP or the Parmelia Gas Pipeline; and

- a 330 kV electricity transmission line to connect the power station to the external electricity network at the proposed Eneabba Substation;

is approved for implementation. These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

- (a) preventing impacts on Declared Rare Flora (DRF) species;
- (b) rehabilitation;
- (c) preventing impacts on fauna from trenches during gas pipeline construction;
- (d) air quality; and
- (e) greenhouse gas emissions.

Contents

	Page
Summary and recommendations.....	i
1. Introduction and background.....	1
2. The proposal.....	2
3. Key environmental factors and principles.....	9
3.1 Biodiversity.....	10
3.2 Air quality.....	20
3.3 Noise.....	24
3.4 Greenhouse gas emissions.....	26
3.5 Environmental principles.....	31
4. Conditions.....	31
4.1 Recommended conditions.....	31
5. Other Advice.....	31
6. Recommendations.....	33

Tables

Table 1: Summary of key proposal characteristics.....	3
Table 2: Comparison of proposed stack emissions with EC2001/80/EC.....	22

Figures

1. Regional location
2. General location
3. Project layout plan
4. Conceptual power station plant layout plan

Appendices

1. List of submitters
2. References
3. Summary of identification of key environmental factors
4. Identified Decision-making Authorities and Recommended Environmental Conditions
5. Summary of submissions and proponent's response to submissions (attached CD)

1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for Environment on the key environmental factors and principles for the proposal by Coolimba Power Pty Ltd to construct and operate the Coolimba Power Station on a site located approximately 15 km south-south-west of Eneabba, and to establish an approximately 20 km long and 100 m wide infrastructure corridor that will accommodate the construction and operation of:

- a natural gas pipeline lateral to connect the power station to either the Dampier to Bunbury Natural Gas Pipeline (DBNGP) or the Parmelia Gas Pipeline; and
- a 330 kV electricity transmission line to connect the power station to the external electricity network at the proposed Eneabba Substation.

The proposal was referred to the EPA on 5 September 2007, and on 8 January 2008 the level of assessment was set at Public Environmental Review (PER) under section 38 of the *Environmental Protection Act 1986*. The PER document was made available for a public review period of 8 weeks commencing on 28 April 2009 and ending on 23 June 2009.

The EPA's decision to assess the proposal at the level of PER was based on 4 key environmental factors, namely, biodiversity, air quality, noise, and greenhouse gas emissions.

The proposal was determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as it may impact on listed threatened species and communities (sections 18 & 18A) including the Short-billed (Carnaby's) Black-Cockatoo which is listed as Endangered, the Rainbow Bee-Eater which is listed as Migratory, and a range of nationally listed vulnerable and threatened flora species. The EPA is undertaking the environmental impact assessment of the proposal under the bilateral agreement between the Commonwealth and Western Australian Governments.

Further details of the proposal are presented in Section 2 of this report. Section 3 discusses the key environmental factors and principles for the proposal. The Conditions to which the proposal should be subject, if the Minister determines that it may be implemented, are set out in Section 4. Section 5 provides Other Advice by the EPA and Section 6 presents the EPA's Recommendations.

Appendix 5 contains a summary of submissions and the proponent's response to submissions and is included as a matter of information only and does not form part of the EPA's report and recommendations. Issues arising from this process, and which have been taken into account by the EPA, appear in the report itself.

2. The proposal

The Coolimba Power Station proposal involves the construction and operation of:

- a nominal 450 megawatt (MW) coal-fired base-load generation plant consisting of three 150 MW subcritical steam turbine generating units with circulating fluidised bed (CFB) boilers; and
- a nominal 358 MW natural gas-fired peaking-load generation plant consisting of two 179 MW open cycle gas turbine (OCGT) generating units,

on a site located approximately 15 km south-south-west of Eneabba, and the establishment of an approximately 20 km long and 100 m wide infrastructure corridor that will accommodate the construction and operation of:

- a 300 - 400 mm diameter natural gas pipeline lateral to connect the power station to either the Dampier to Bunbury Natural Gas Pipeline (DBNGP) or the Parmelia Gas Pipeline; and
- a 330 kV electricity transmission line with about eighty, 40 m high towers located approximately every 250 m to connect the power station to the external electricity network at the proposed Eneabba Substation.

The location of the various project components are shown on Figures 1, 2, 3, and 4.

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in Section 3 of the PER document (URS Australia Pty Ltd, 2009).

Following the public release of the PER document, the EPA determined that it only included the greenhouse gas emissions from one of the two gas turbine units in the natural gas-fired peaking-load generation plant. Therefore, the total annual greenhouse gas emission figure of approximately 4.008 million tonnes of CO_{2-e} per year provided in Table 8-16 of the PER document should in fact be approximately 4.227 million tonnes of CO_{2-e} per year. This revised figure is reflected in Table 1 above and in Section 3.4 of this report.

The potential impacts of the proposal initially predicted by the proponent in the PER document (URS Australia Pty Ltd, 2009) and their proposed management are summarised in the table provided in the Executive Summary of the proponent's document.

3. Key environmental factors and principles

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

The identification process for the key factors selected for detailed evaluation in this report is summarised in Appendix 3. The reader is referred to Appendix 3 for the evaluation of factors not discussed below. A number of these factors, such as surface water and groundwater and visual amenity, are relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

It is the EPA's opinion that the following key environmental factors for the proposal require detailed evaluation in this report:

- (a) Biodiversity;
- (b) Air quality;
- (c) Noise; and
- (d) Greenhouse gas emissions.

The above key factors were identified from the EPA's consideration and review of all environmental factors generated from the PER document and the submissions received, in conjunction with the proposal characteristics.

Details on the key environmental factors and their assessment are contained in Sections 3.1 - 3.4. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

Table 1: Summary of key proposal characteristics

Element	Description
General	
Operating life of power station	Approximately 30 years.
Project area footprint	Approximately 483 hectares.
Water supply requirement (construction)	65 ML/yr over the 4 year construction period sourced from the Central West Coal (CWC) Project (Cattamarra Aquifer).
Water supply requirement (operations)	Up to 11 GL/yr sourced from the CWC Project mine dewatering. Backup supply of approximately 3 GL/yr sourced from the Yarragadee aquifer.
Evaporation pond area	150 hectares.
Infrastructure corridor	Approximately 20 km long and 100 m wide.
Gas pipeline lateral	A 300 - 400 mm diameter gas pipeline approximately 20 km long that will be connected to either the Dampier to Bunbury Natural Gas Pipeline or the Parmelia Gas Pipeline. The gas pipeline will be located within the infrastructure corridor.
Electricity transmission line	An approximately 20 km long 330 kV electricity transmission line that will be connected to the external network at the proposed Eneabba Substation. The transmission line will be located within the infrastructure corridor and will include about eighty, 40 m high towers located approximately every 250 m.
Coal-fired component	
Coal-fired steam turbine electrical output	Approximately 450 MW net.
Number of generating units	Three.
Nominal unit output	Approximately 150 MW net.
Net plant thermal efficiency (HHV)	32.8% (for each unit).

Element	Description
Load profile	Base-load with a capacity factor of approximately 95%.
Annual coal consumption	Approximately 2.3 million tonnes of coal from the CWC deposit.
Start up fuel	Natural gas or liquid fuel (diesel).
Liquid fuel storage capacity (for boiler start-up etc)	Up to approximately 300 kL.
Condenser cooling	Water cooled (with possible hybrid optimisations).
Stack details	One 130 m high stack with three flues each with an exit diameter of 3.45 m.
Gas-fired component	
Gas turbine electrical output	Approximately 358 MW net.
Number of generating units	Two.
Nominal unit output	Approximately 179 MW net at Maximum Continuous Rating and ISO conditions.
Net plant thermal efficiency (HHV)	Approximately 33% (for each unit)
Load profile	Peaking-load with a capacity factor of approximately 25%.
Stack details	One 35 m high stack for each unit, each with an exit diameter of 6.5 m.
Annual natural gas consumption	Approximately 9 PJ at 25% capacity factor.
Outputs	
Solid waste	Approximately 820,000 tonnes of fly ash and bottom ash from coal-fired generation and 20,000 tonnes of evaporation pond residue will be generated each year and backfilled into the CWC pit with waste rock.
Wastewater	Approximately 2.36 GL/yr discharged to on-site evaporation ponds.
Sulphur dioxide (SO ₂)	Coal-fired generation: Approx 15,324 t/yr, 511.5 g/s (< 1,100 mg/Nm ³ at standard reference conditions of 6% O ₂ , dry basis for 90% of the time).
Oxides of nitrogen (NO _x) [Note - as nitrogen dioxide (NO ₂) for coal-fired generation]	Coal-fired generation: Approx 6,241 t/yr, 208.32 g/s (500 mg/Nm ³ at standard reference conditions of 6% O ₂ , dry basis). Gas-fired generation: Approx 357 t/yr, 45.24 g/s (25 ppmv dry). Total: Approx 6,598 t/yr.
Particulates (PM ₁₀)	Coal-fired generation: Approx 626 t/yr, 20.9 g/s (50 mg/Nm ³ at standard reference conditions of 6% O ₂ , dry basis).
Greenhouse gas emissions	Coal-fired generation: Approx 3,776,074 tonnes of CO _{2-e} per year. Gas-fired generation: Approx 438,290 tonnes of CO _{2-e} per year. Other sources: Approx 13,068 tonnes of CO _{2-e} per year. Total: Approx 4,227,432 tonnes of CO _{2-e} per year.

Abbreviations

CO_{2-e} carbon dioxide equivalent
GL gegalitres (10⁹ litres)
GL/yr gegalitres per year
g/s grams per second
HHV higher heating value
ISO International Standards Organisation
kL kilolitres
km kilometres
kV kilovolts
m metres

mg/Nm³ milligrams per 'normal' cubic metre
ML megalitres (10⁶ litres)
ML/yr megalitres per year
mm millimetres
MW megawatts (10⁶ watts)
O₂ oxygen
PJ petajoules (10¹⁵ joules)
PM₁₀ particulate matter with an aerodynamic diameter of < 10 micrometres
ppmv parts per million by volume
t/yr tonnes per year

Source: Modified version of Table 3.1 from URS Australia Pty Ltd



Figure 1: Regional location (Source: Figure 1-1 from URS Australia Pty Ltd, 2009)

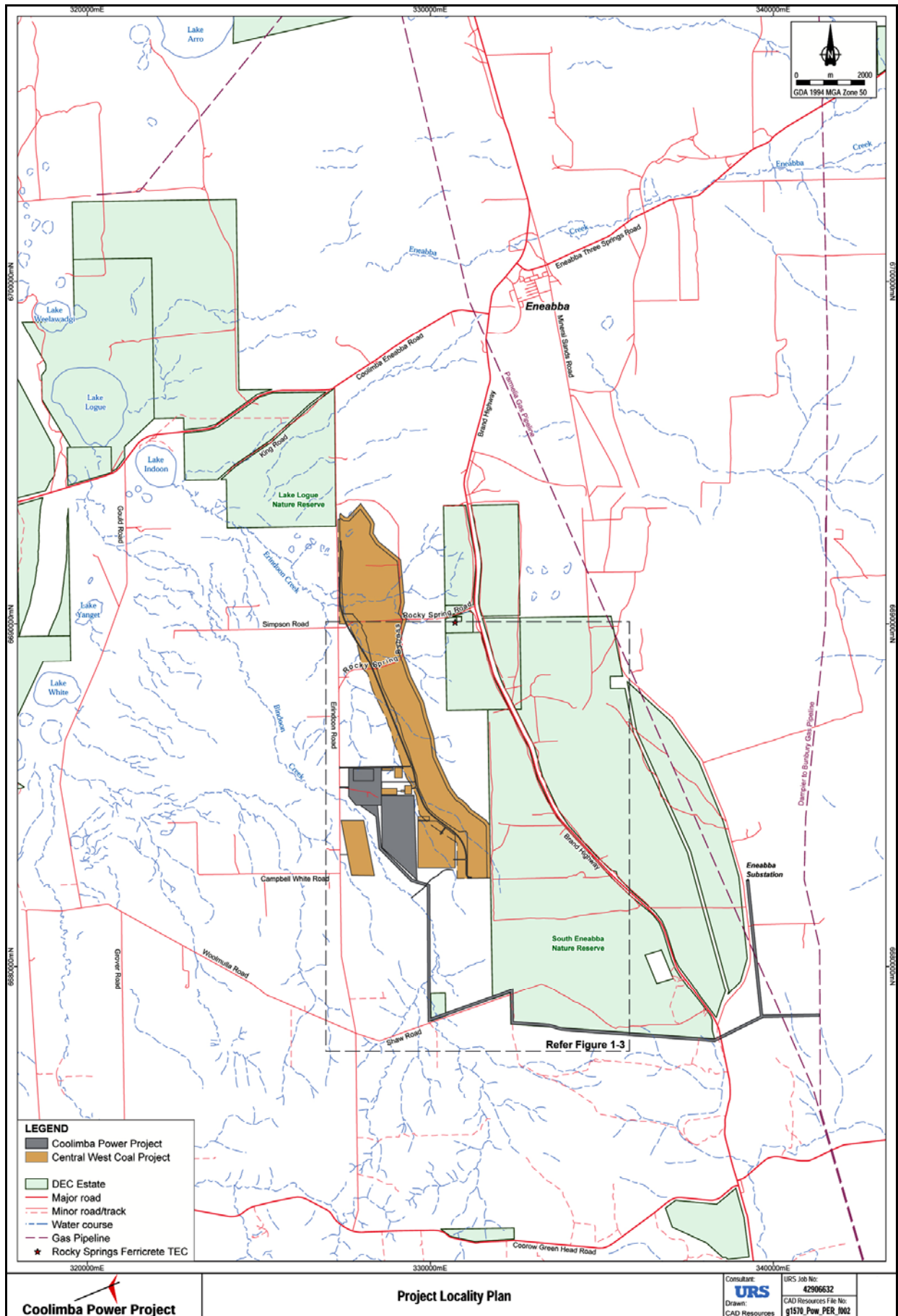


Figure 2: General location (Source: Figure 1-2 from URS Australia Pty Ltd, 2009)

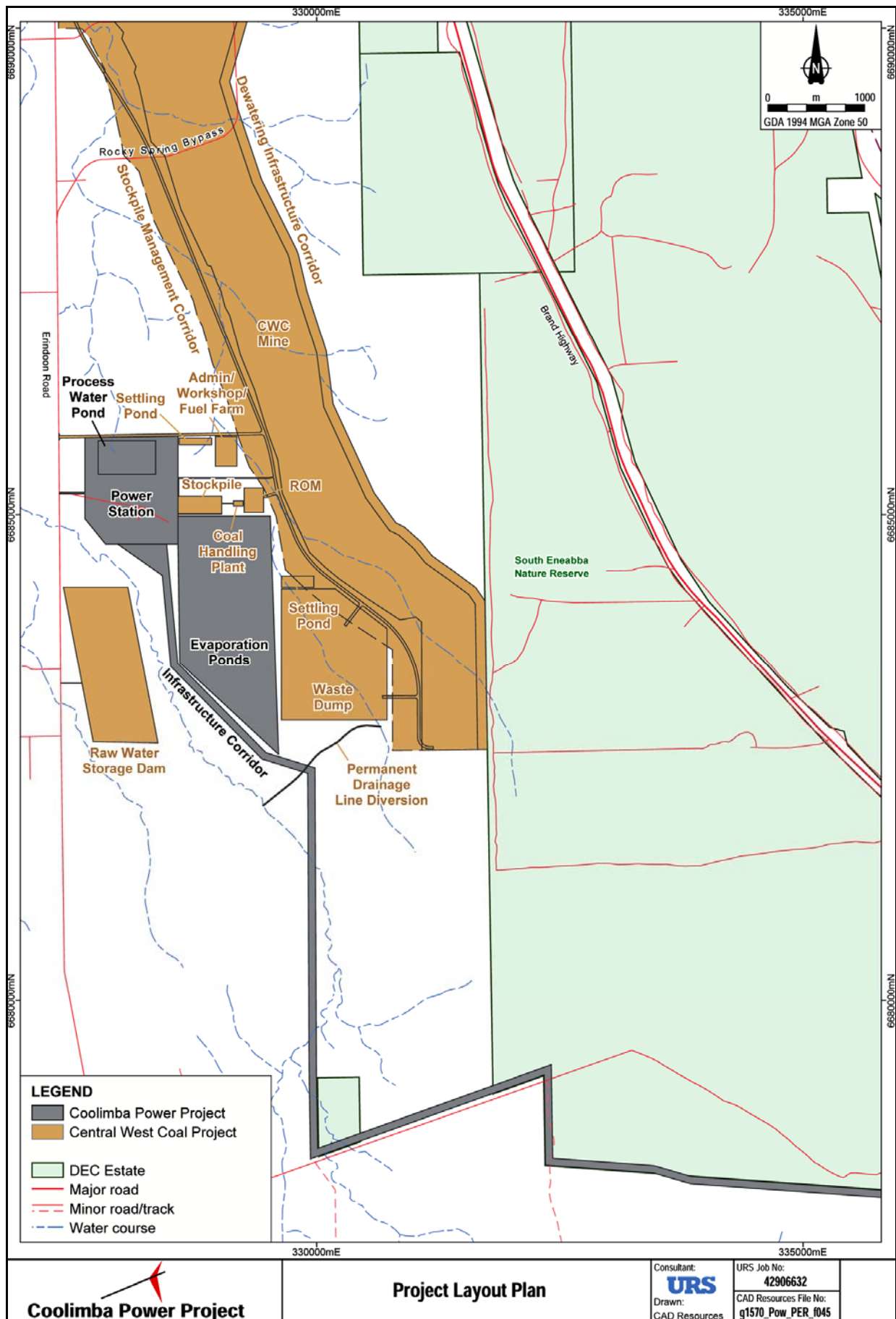


Figure 3: Project layout plan (Source: Figure 1-3 from URS Australia Pty Ltd, 2009)

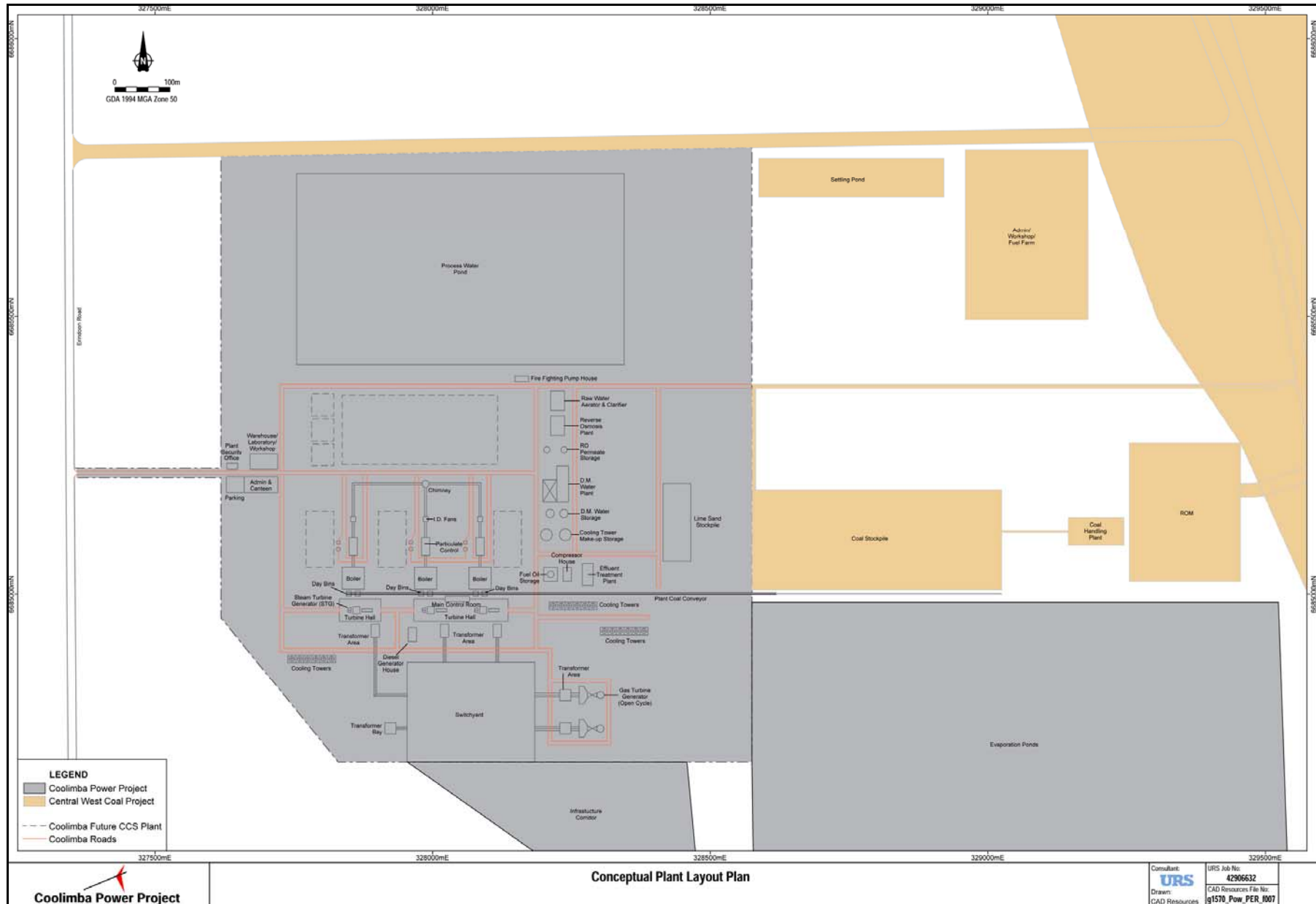


Figure 4: Conceptual power station plant layout plan (Source: Figure 1-4 from URS Australia Pty Ltd, 2009)

The following principles were considered by the EPA in relation to the proposal:

- (a) The precautionary principle;
- (b) The principle of intergenerational equity;
- (c) The principle of the conservation of biological diversity and ecological integrity;
- (d) Principles relating to improved valuation, pricing and incentive mechanisms; and
- (e) The principle of waste minimisation.

4. Key environmental factors and principles

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

The identification process for the key factors selected for detailed evaluation in this report is summarised in Appendix 3. The reader is referred to Appendix 3 for the evaluation of factors not discussed below. A number of these factors, such as surface water and groundwater and visual amenity, are relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

It is the EPA's opinion that the following key environmental factors for the proposal require detailed evaluation in this report:

- (f) Biodiversity;
- (g) Air quality;
- (h) Noise; and
- (i) Greenhouse gas emissions.

The above key factors were identified from the EPA's consideration and review of all environmental factors generated from the PER document and the submissions received, in conjunction with the proposal characteristics.

Details on the key environmental factors and their assessment are contained in Sections 3.1 - 3.4. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

The following principles were considered by the EPA in relation to the proposal:

- (j) The precautionary principle;
- (k) The principle of intergenerational equity;
- (l) The principle of the conservation of biological diversity and ecological integrity;

- (m) Principles relating to improved valuation, pricing and incentive mechanisms; and
- (n) The principle of waste minimisation.

4.1 Biodiversity

Description

Flora and vegetation

The project would have a total footprint of approximately 483 hectares (ha). The power station would be constructed on cleared farmland. Construction within the infrastructure corridor would require approximately 48.8 ha of vegetation to be cleared, including up to 30 ha in the South Eneabba Nature Reserve (SENR). This includes:

- 8.8 ha of Vegetation Community Type E4 - Open Low Woodland of *Eucalyptus todtiana* and *Nuytsia floribunda* over *Banksia menziesii* and *Stirlingia latifolia* on sandy drainage lines;
- 8.4 ha of Vegetation Community Type H3 - Heath or Scrub of *Melaleuca leuropoma*, *Banksia sphaerocarpa* var. *sphaerocarpa*, *Dryandra nivea* subsp. *nivea*, *Eremaea beaufortoides* var. *lachnosanthe* and *Hibbertia subvaginata* on lateritic rises; and
- 31.6 ha of Vegetation Community Type T1 - Scrub or Thicket of *Banksia attenuata*, *Banksia menziesii* over *Banksia sphaerocarpa* var. *sphaerocarpa*, *Adenanthos cygnorum*, *Banksia hookeriana* and *Conospermum triplinervium* on sand.

A total of one Rare, two Priority 3, and three Priority 4 taxa were recorded within the project area during the initial flora surveys.

Vegetation Community Type T1 is regionally significant as it contains *Tetratheca nephelioides*, listed as Declared Rare Flora (DRF) under the *Wildlife Conservation Act 1950* (WC Act). Vegetation Community Types E4 and H3 are locally significant as they contain priority flora species.

Tetratheca nephelioides is a dwarf shrub known from five populations with a total estimated population of 1,667 individuals. This species has a narrow distribution and is restricted to the SENR and road reserves adjacent to the SENR.

Approximately 1,566 individual *Tetratheca nephelioides* were recorded during the flora surveys, of which 706 were recorded within the section of infrastructure corridor that traverses the SENR. The remaining 860 individuals were found outside the infrastructure corridor and within the SENR.

Up to approximately 10% of the surveyed population of *Tetratheca nephelioides* (i.e. approximately 156 individuals) within and adjacent to the infrastructure corridor would be removed during the construction of the gas pipeline lateral and electricity transmission line.

The DRF species *Eucalyptus johnsoniana*, *Eucalyptus impensa*, and *Eucalyptus crispata* are known from historical records to occur within, and in proximity to, the proposed infrastructure corridor. These species are also listed under the EPBC Act, with *Eucalyptus johnsoniana* listed as 'Vulnerable' and *Eucalyptus impensa* and *Eucalyptus crispata* listed as 'Endangered'.

Eucalyptus impensa is known from five populations within the SENR, one population on private property, and has also been recorded in one location within the infrastructure corridor. *Eucalyptus crispata* has been identified from previous records as occurring in the infrastructure corridor, *Eucalyptus johnsoniana* has previously been recorded in the SENR and in road reserves in the Moora District.

These DRF species were not located during the initial flora surveys, however an additional survey undertaken over the proposal area recorded several individuals of *Eucalyptus johnsoniana* inside the proposed infrastructure corridor.

Eucalyptus johnsoniana is a small spreading mallee that forms dense clumps and is known from 36 populations with a total estimated population of 647 individuals. This species has a narrow distribution and mostly occurs on road verges (along the Brand Highway south of Eneabba) and in the SENR.

Approximately 11 individual *Eucalyptus johnsoniana* were recorded during the additional flora survey, of which all would be impacted by development in the proposed infrastructure corridor. The loss of these 11 individuals would reduce the total known population of *Eucalyptus johnsoniana* by approximately 2%.

The Priority 3 taxa *Desmocladius elongates* was recorded at two locations within the infrastructure corridor and at seven other locations within the adjacent SENR on the edges of the corridor. It was also recorded seven times in other vegetation. The Priority 3 taxa *Lepidobolus quadratus* was recorded at one location within the infrastructure corridor and once adjacent to the corridor.

The Priority 4 taxa *Geogeantha hexandra* was recorded at three sites along the infrastructure corridor and four locations within Lake Logue Nature Reserve (LLNR). The Priority 4 taxa *Grevillea rudis* was recorded once within the infrastructure corridor and once near it. It was also recorded five times within the SENR and five times within the nearby LLNR. The Priority 4 taxa *Banksia chamaephyton* was recorded at one location within the infrastructure corridor and in two other locations within the SENR.

The PER document does not indicate how many individuals of the above Priority Flora species would be removed during the construction of the gas pipeline lateral and electricity transmission line.

The proponent's proposed management measures to minimise impacts on *Tetratheca nephelioides* and the above Priority Flora species include:

- the infrastructure route within the corridor would be designed in consultation with the Department of Environment and Conservation (DEC) to avoid as many

individuals of *Tetratheca nephelioides* as possible. Priority Flora species would also be avoided wherever possible;

- clearing for the gas pipeline lateral within the SENR would be restricted to a corridor with a maximum width of 20 m. Clearing for the electricity transmission line within the SENR would be restricted to spurs of 50 m length and 10 m width off the cleared gas pipeline access area to the 40 m wide by 40 m long cleared pads for the 10 transmission line towers;
- where it is not possible to avoid the rare flora species, an “application to take” would be submitted for the rare flora at the State level and is likely to be considered a “controlled action” by the Commonwealth;
- seeds and propagules of the rare and Priority flora species would be collected and stored for future research needs to assist in their re-establishment in rehabilitation areas;
- further field studies would be undertaken to assist in locating additional populations of *Tetratheca nephelioides* and Priority Flora species outside the project area, particularly in the conservation estate;
- access to all non-operational areas would be restricted and personnel would remain on designated roads and tracks; and
- topsoil and vegetation would be re-spread as soon as possible to assist rehabilitation, and rehabilitation programs would include trials on Rare, Threatened and Priority flora species.

The proponent proposes to provide an appropriate offset to account for the clearing of DRF within the project area.

Rehabilitation

The infrastructure corridor would be rehabilitated once construction of the gas pipeline lateral and the 330 kV electricity transmission line have been completed. Rehabilitation would be conducted progressively.

Previously vegetated areas would be rehabilitated with a range of similar species to those that existing prior to clearing, including species suitable as a food source for Carnaby’s Black Cockatoo.

Topsoil and vegetation would be re-spread as soon as possible to assist rehabilitation, and rehabilitation programs would include trials on Rare, Threatened and Priority flora species.

Cleared vegetation would be directly returned to rehabilitation areas to help protect seeds, seedlings, and soil against wind erosion, where practical. In order to preserve rootstock in areas that will be rehabilitated, the blade/fork/rake of the bulldozer would be raised slightly above the soil surface.

Land profiles would be stabilised and surface drainage patterns would be restored. Compacted areas would be contour ripped.

Dieback and weeds

The introduction of dieback into the SENR has the potential to severely impact vegetation within it as it can lead to the death of a wide range of flora species. This would affect the abundance, diversity, productivity, and geographical distribution of these flora species.

Dieback assessments conducted within and in the vicinity of the project area found no evidence of dieback (*Phytophthora cinnamomi*) within the project area, but did identify three separate dieback infestations north of Rocky Spring Road, which is located north of the project area. The PER document stated that the risk of dieback spread would be low in view of the annual rainfall in the project area which indicates that the environment is only marginally conducive to the survival of *Phytophthora cinnamomi*.

The proponent's dieback management measures include cleaning project related machinery at a hygiene point at the project area entrance, sourcing fill material from dieback free areas in cleaned vehicles, prohibiting access to nature reserves, discouraging access to non-essential tracks in the project area, and preventing surface water flow across tracks from adjacent dieback infested vegetation.

Twenty six introduced species were recorded within the project area, but none of these are declared weeds listed by the Department of Agriculture and Food. Construction activities within the project area have the potential to introduce and spread weeds which could affect flora and vegetation within the SENR and the success of rehabilitation. The proponent proposes to implement weed hygiene and management measures to minimise this risk. The proponent intends to identify permanent monitoring sites which would be surveyed to map the type, location, extent and density of weed species present within and adjacent to areas that would be disturbed during construction. The proponent would consult with the DEC in regard to weed management.

Fauna

Clearing of vegetation within the infrastructure corridor would result in the loss of fauna habitat and has the potential to impact several conservation significant species including Carnaby's Black Cockatoo, Rainbow Bee-Eater, White-bellied Sea-Eagle, Eastern Great Egret, Cattle Egret, Fork-tailed Swift, Rufous Fieldwren, and the Black-striped Snake listed as occurring in the region.

Carnaby's Black Cockatoo is currently listed as 'Endangered' under the EPBC Act and as a Schedule 1 species under the WC Act. It is estimated that the wild population has declined by 50% in the past 45 years due to habitat fragmentation, clearing of heathland surrounding breeding sites, poaching of eggs and competition from invasive species (i.e. Galah) (Ecologia, 2008).

Carnaby's Black Cockatoo was recorded once in the SENR during the Level 2 (detailed field) survey, and 26 individuals were seen feeding on *Banksia sp.* in the SENR during the Level 1 (reconnaissance) survey. The PER document indicates that as the vegetation in the SENR is similar to the adjacent natural vegetation of the

project area, Carnaby's Black Cockatoos are likely to use both areas for feeding. The PER document also indicates that it is likely that Carnaby's Black Cockatoos are regular seasonal visitors to the local area, feeding in remnant native vegetation after travelling from inland breeding areas to feeding areas closer to the coast.

Kwongan heath is an important feeding resource for the Carnaby's Black Cockatoo. Clearing of native vegetation in the proposal area would remove foraging habitat for Carnaby's Black Cockatoo, however the PER document indicates that approximately 152,000 ha of suitable feeding habitat exists in conservation estate in the region. The proponent has committed to rehabilitate previously vegetated areas with the aim of providing a range of similar species to those existing prior to clearing, to provide a suitable food source for Carnaby's Cockatoo. However, no specific information on when, where and how the rehabilitation works would be undertaken has been provided.

Surveys for Carnaby's Black Cockatoo undertaken by (Johnstone and Kirkby 2007, 2008) in the Eneabba Region found no evidence of breeding or any suitable breeding habitat in the region. The Carnaby's Black Cockatoos that were recorded were non-breeding autumn-winter visitors, and a flock of 300-350 birds was found to remain in the region for the entire autumn-winter period. The birds are also known to forage in both native vegetation and farmland. The PER document surmises that it is unlikely that the Carnaby's Black Cockatoo breeds within the project area or the SENR. The nearest known breeding area is located about 40 km south-east of the project area at Coomallo Nature Reserve (Ecologia, 2008).

The Rainbow Bee-Eater is currently listed as Migratory under the EPBC Act. This species has been recorded in numerous surveys in the Eneabba region, and is commonly found in the region. The Rainbow Bee-Eater migrates within Australia and up to Indonesia and New Guinea and can be found just about anywhere suitable for obtaining insects. Breeding occurs between October and December in both Australia and New Guinea. The Rainbow Bee-Eater nests in burrows which are dug, generally at a slight angle, on flat ground, sandy banks or cuttings, and frequently at the margins of tracks or roads (Ecologia, 2008).

The PER document surmises that it is likely that the individuals recorded during the Level 2 detailed field survey of the project area in Spring 2007 were breeding visitors in view of the timing of the survey and the sandy soils in the region which are suitable for nest burrows.

Clearing of native vegetation in the proposal area would remove suitable habitat for the Rainbow Bee-eater, however the PER document indicates that the bird may be less inclined to use the area for breeding, due to a lack of trees from which to forage. The proponent proposes to monitor sandy areas and embankments for Rainbow Bee-eater presence, and if recorded, nest tunnels would be avoided if possible.

The White-bellied Sea-Eagle, Eastern Great Egret, Cattle Egret, and the Fork-tailed Swift are all currently listed as Migratory under the EPBC Act. However, none of these species were recorded during surveys in the project area.

The White-bellied Sea-Eagle is unlikely to be impacted by the proposal as it is restricted to coastal habitats which do not occur within the project area.

The Eastern Great Egret has been recorded in the region and is commonly found in shallow fresh and saline waters, neither of which are found in the project area (Ecologia, 2008). The PER document surmises that given the lack of suitable habitat, it is unlikely to be present in the project area.

The Cattle Egret has not been previously recorded in the region and the PER document surmises that it is not expected to be impacted by the proposal as suitable habitat areas can be found in surrounding farmland.

The Fork-tailed Swift spends winter in Australia after breeding in China and Mongolia and has been previously recorded in the Lesueur area (Ecologia, 2008). The PER surmises that this species is unlikely to be adversely impacted by the proposal as it is expected to be an infrequent visitor to the project area that would not directly utilise the habitats within it.

The Rufous Fieldwren is currently listed as a Priority 4 species on the DEC Declared Threatened and Priority Fauna List. This species was recorded in kwongan heath in two southern areas of the adjacent Central West Coal project area, and in the SENR. The Rufous Fieldwren breeds between July and October in ground level globular dome shaped nests. This species was once wide spread throughout most of the south-west of Western Australia. However, it is now restricted to remnant vegetation due to clearing (Ecologia, 2008).

Habitat used by the Rufous Fieldwren would be cleared for the project and this species could also be directly impacted during the nesting season between July and January as adults and fledglings may be unable to escape. The proponent proposes to manage potential impacts to individual birds by minimising clearing between July and January wherever possible, and any areas that require clearing during this period be surveyed to determine whether any breeding Rufous Fieldwrens are present. However, the proponent does not indicate what actions would be taken in the event nesting Rufous Fieldwrens are discovered during these surveys.

The Black-striped Snake is currently listed as a Priority 3 species on the DEC Declared Threatened and Priority Fauna List. This species is restricted to the coastal sand plain region from just south of Perth through to Lancelin. It inhabits dunes and sandplains vegetated with heaths and eucalypt/banksia woodlands. The Black-striped Snake was recorded once in the proposal area in kwongan heath on sandplain. One specimen has previously been recorded from Port Denison and the sighting at Eneabba provides a link between this northernmost record and those 200 km further south (Ecologia, 2008).

The PER document has indicated that habitat used by the Black-striped Snake would be cleared for the project, and any individual snakes present during clearing would likely be lost. In some areas this species may be able to take refuge in deeper sands or escape to areas of adjacent, undisturbed vegetation. However, individuals in areas without adjacent vegetation may be lost. The proponent has not proposed any specific actions to manage potential impacts to the Black-striped Snake.

Native fauna could become trapped in open pipeline trenches during construction of the gas pipeline lateral, and fauna mortality may result if trapped fauna are not removed in a timely manner or through drowning in flooded trenches. The proponent proposes to inspect any open gas pipeline trench after sunrise and before sunset to clear and record any trapped fauna. The DEC would be provided with records of trapped fauna.

Other management measures that would be employed by the proponent to minimise impacts on fauna include:

- restricting the area of vegetation to be cleared, and rehabilitating cleared areas as soon as practicable with a range of species that existed prior to clearing;
- relocating fauna found within the infrastructure corridor in the SENR to other areas within the SENR prior to the commencement of clearing;
- preventing fire during construction;
- using directional lighting to minimise light spill beyond the project area;
- placing fencing around ponds in the project area to prevent the entry of fauna; and
- development of a vertebrate fauna monitoring program.

Submissions

The main concerns raised in the submissions related to impacts on DRF, Priority flora, vegetation, and fauna, the introduction of dieback and weeds into the SENR, dieback management, and rehabilitation.

Assessment

The EPA's environmental objective for this factor is to:

- maintain the abundance, diversity, geographic distribution and productivity of flora, vegetation communities, and fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge; and
- protect Declared Rare and Priority Flora, and Specially Protected (Threatened) and Priority Fauna consistent with provisions of the WC Act, and the EPBC Act.

Flora and vegetation

The EPA is aware that the DRF species *Eucalyptus impensa* and *Eucalyptus crispata* were not located within the infrastructure corridor during the flora survey. However, it is noted that due to historical recordings in the area and that *Eucalyptus impensa* grows in association with *Eucalyptus johnsoniana*, there is still the potential for these DRF species to occur within, or in close proximity to, the proposal area.

The EPA notes that up to approximately 10% of the surveyed population of the DRF species *Tetratheca nephelioides* (i.e. approximately 156 individuals) within and

adjacent to the infrastructure corridor would be removed during the construction of the gas pipeline lateral and electricity transmission line.

An additional flora survey recorded the DRF species *Eucalyptus johnsoniana* within the proposed infrastructure corridor. The total population of *Eucalyptus johnsoniana* would be reduced by up to 2% (i.e. 11 individuals) as a result of construction of the gas pipeline lateral and electricity transmission line.

The EPA also notes that *Tetratheca nephelioides* and *Eucalyptus johnsoniana* are endemic to Western Australia, have very low population numbers and are restricted to a very narrow distribution (i.e. the SENR and near-by road reserves).

There is limited specific information available for *Tetratheca nephelioides*. All known populations occur within the vicinity of mineral sand mining operations. The presence of mineral sands mining alone has the potential to threaten the viability of the species and further surveys are required to determine the full extent of its range (Butcher, 2007).

Information available for *Eucalyptus johnsoniana* indicates that the majority of populations are in good condition and are likely to increase in the future, however the main threats to the viability of this species are land clearing, fire, transmission line maintenance, human disturbance and mining (DEC, 2008). *Eucalyptus johnsoniana* is particularly vulnerable to fire in the vegetative and flower phases and too frequent fires can also deplete seed stock in the soil (DEC, 2008). Other populations of this species in the SENR would be potentially impacted by additional proposed developments in the near vicinity (i.e. mineral sand mining).

Advice sought from the DEC regarding the two species stated that the reproductive ecology, translocation success, and susceptibility to dieback of both species is currently unknown. Additionally, these species appear susceptible to impact from other threatening processes such as competition from the introduction of weed species, changed fire regime, introduction of disease, dust deposition and human interference. These factors create additional challenges in regard to successful rehabilitation of these species.

The proponent has recently informed the EPA that with careful placement of infrastructure within the corridor, the impact on *Eucalyptus johnsoniana* could be reduced, possibly down to no impact at all. However, the EPA has received no new information, or a revised proposal to demonstrate this assertion.

The proponent has offered to develop appropriate offsets to account for clearing of DRF within the infrastructure corridor. However, as DRF is a critical asset offsetting the impacts is not considered appropriate, and therefore the DEC advised it has not participated in offset negotiations.

The Mount Lesueur-Eneabba region in which the proposal is located is recognised as one of Australia's 15 National Biodiversity Hotspots as it supports a large number of distinct, species-rich and endemic communities. This region contains more than 250 indigenous plant species, many living in the heaths and scrub-heaths (DEWHA, 2009). The EPA notes that the SENR in which the above DRF species are located is

largely surrounded by cleared farmland and mining operations and is thus vulnerable to further degradation in the future from these and associated threatening processes.

The EPA notes that further flora field studies outside the project area and the rehabilitation trials proposed by the proponent would inform the knowledge base on DRF and Priority flora species in the region. However, given the lack of information on the reproductive ecology, ability to successfully translocate, and susceptibility to dieback in addition to the vulnerability of these species to threatening processes such as altered fire regime, it is the view of the EPA that the proposed level of loss of these two species could pose a significant risk to their long-term viability. The DEC also supports this view.

The EPA considers that any loss of *Tetratheca nephelioides* and *Eucalyptus johnsoniana* to be unacceptable. The EPA notes that both direct and indirect impacts to DRF could be avoided by not placing project infrastructure inside the SENR.

The EPA recommends that Condition 6 should be imposed on the proponent to prevent the infrastructure corridor from entering the SENR, and to ensure that there is no loss of DRF species due to implementation of this proposal.

Rehabilitation

The EPA notes the proposed measures to rehabilitate the infrastructure corridor. The EPA also notes that the criteria for measuring the success of rehabilitation would include targets for species richness and density and Rare and Priority species content which would be determined in consultation with the DEC. In order to ensure the long term success of rehabilitation the EPA recommends that Condition 7 should be imposed on the proponent.

Dieback and weeds

The EPA considers that Condition 6, which prevents the infrastructure corridor from entering the SENR and requires the proponent to ensure that activities associated with the proposal do not introduce dieback, together with the proponent's proposed dieback and weed management measures, would be adequate in terms of minimising the potential for dieback and weeds to be introduced into the SENR.

Fauna

The EPA notes that Kwongan heath would be cleared as a result of the proposal, and that kwongan heath supports a range of conservation significant flora and vegetation and provides habitat for many conservation significant fauna species.

The EPA notes that habitat for Carnaby's Black Cockatoo, Rainbow Bee-Eater, Rufous Fieldwren and Black-striped Snake would be lost as a result of the proposed infrastructure corridor. Additionally, the proposed infrastructure corridor would potentially result in the loss of individual Rufous Fieldwrens and Black-striped Snakes as a direct result of vegetation clearing activities.

Kwongan heath is an important feeding resource for the Carnaby's Black Cockatoo. The *Carnaby's Black-Cockatoo (Calyptorhynchus latirostris) Recovery Plan 2002-2012* (Department of Conservation and Land Management, 2003) recommended retention and increasing of areas of native vegetation suitable for provision of food to Carnaby's Cockatoo, therefore any clearing of Kwongan heath is undesirable.

The proponent has stated that it intends to rehabilitate areas where vegetation has been cleared with species that would serve as a suitable food source, however little information on when, where and how the rehabilitation works would be undertaken has been provided.

The EPA considers that it would be appropriate for the proponent to rehabilitate areas that may have served as a suitable food source on a 6 to 1 basis.

The proponent proposes to monitor sandy areas and embankments for Rainbow Bee-eater presence, and if recorded, nest tunnels would be avoided if possible.

The proponent also proposes to manage potential impacts to individual Rufous Fieldwrens by minimising clearing between July and January where possible, and any areas that require clearing during this period be surveyed to determine whether any breeding birds are present. The proponent does not indicate what actions would be taken in the event nesting Rufous Fieldwrens are discovered during these surveys.

In regard to management of impacts to individual Black-striped Snakes, the proponent has not proposed any specific management actions.

The EPA notes that the above measures/actions proposed by the proponent for management of impacts to the above fauna species and habitat are largely subjective, and that the proponent has offered little information to demonstrate that tangible management of these impacts is achievable. The EPA considers that these proposed measures/actions in their current form would be inadequate.

However, the EPA notes that both direct and indirect impacts to fauna and habitat could largely be avoided by not placing project infrastructure inside the SENR.

Consistent with the EPA's recommendation for protection of DRF species in the proposed infrastructure corridor, the EPA recommends that Condition 6 should be imposed on the proponent to prevent the infrastructure corridor from entering the SENR, thereby protecting fauna and habitat. The EPA also recommends Condition 8 be imposed to ensure that impact to fauna as a result of trenching activities is managed in an environmentally acceptable manner.

Summary

Having particular regard to the:

- (a) predicted loss of up to 10% of the surveyed population of *Tetratheca nephelioides* and up to 2% of the estimated population of *Eucalyptus johnsoniana*;

- (b) risk to the long term sustainability of *Tetratheca nephelioides* and *Eucalyptus johnsoniana* populations;
- (c) management measures that would be used by the proponent to minimise impacts on flora, vegetation, and fauna; and
- (d) EPA's recommended conditions, including a condition to avoid disturbance in the SENR;

it is the EPA's opinion that the proposal can only be managed to meet the EPA's environmental objectives for this factor if the EPA's recommended condition to avoid the SENR is imposed by the Minister for Environment.

4.2 Air quality

Description

The Coolimba Power Station would consist of two generating plants; a 450 MW coal-fired base-load plant and a 358 MW natural gas-fired peaking-load plant. These two plants would generate approximately:

- 15,000 tonnes of sulphur dioxide (SO₂) per year;
- 6,600 tonnes of oxides of nitrogen (NO_x) per year; and
- 630 tonnes of particulates (as PM₁₀) per year.

The Air Pollution Model (i.e. TAPM) was used for the air quality modelling for the proposal. There are uncertainties associated with the air quality modelling because the limited availability of meteorological data for the power station site, particularly at plume height. As a result of these uncertainties, the methodology that was used provided a conservative assessment in which the predicted ground level concentrations (GLCs) at nearby residential premises may not be accurate. However, the range in predicted GLCs in the areas around the power station should adequately represent the expected range in predicted maximum GLCs.

Cumulative air quality modelling indicates that GLCs for NO_x, PM₁₀, CO, and SO₂ would be below the National Environment Protection Measure (NEPM) standards when the power station operates in isolation at full capacity under normal conditions.

The most significant atmospheric emission would be SO₂. The main source of SO₂ would be the 450 MW coal-fired base-load generation plant.

A desulphurisation process would be used to minimise SO₂ emissions via the injection of limestone into the circulating fluidised bed (CFB) boiler furnaces. The estimated SO₂ removal efficiency is approximately 85 to 87.7%.

The SO₂ stack emission concentration would be below 1,100 mg/Nm³ for 90% of the time and between 1,100 - 1,500 mg/Nm³ for 10% of the time, under normal operating conditions (at 6% O₂ reference level). The current European Directive 2001/80/EC SO₂ emission limit for new solid fuelled boilers with a thermal input of greater than 300 MW is 200 mg/Nm³ (at 6% O₂ reference level).

With the power station operating in isolation, modelling predicts that the maximum 1-hour average GLC for SO₂ at any location within the modelled domain would be about 544 µg/m³, which is approximately 95% of the NEPM standard of 570 µg/m³. The predicted maximum 1-hour average GLC for SO₂ is predicted to be between 100 to 400 µg/m³ (i.e. between 17 to 70% of the NEPM standard) near sensitive receptors. The 1-hour average GLC for SO₂ near Eneabba is predicted to be about 200 µg/m³, which is approximately 35% of the NEPM standard.

Modelling predicts that the maximum 24-hour average GLC for SO₂ at any location within the modelled domain would be about 100 µg/m³, which is approximately 43% of the NEPM standard of 230 µg/m³. The predicted maximum 24-hour average GLC for SO₂ is predicted to be between 30 to 60 µg/m³ (i.e. between 13 to 26% of the NEPM standard) near a sensitive receptor. The 24-hour average GLC for SO₂ near Eneabba is predicted to be about 30 µg/m³, which is approximately 13% of the NEPM standard.

Additional air quality modelling was undertaken to assess the effect of the desulphurisation system not operating for 1%, 2%, and 5% of the year. The results indicate that if the desulphurisation system does not operate for 1% or 2% of the year, up to two exceedances per year of the NEPM 1-hour average standard are likely in areas to the north, north-east, east, and west of the power station. There are no predicted exceedances at any nearby sensitive receptors or in the town of Eneabba. However, should the desulphurisation system not operate for 5% of the year the NEPM standard is likely to be exceeded once per year up to 15 km from the power station, and up to five times per year closer to the power station. The NEPM standard is predicted to be exceeded once per year at any nearby sensitive receptors located within 15 km of the power station. There are no predicted exceedances in the town of Eneabba. The NEPM goal for SO₂ allows a maximum of one exceedance of the 1-hour standard per year.

NO_x (as NO₂) and particulate (as PM₁₀) stack emission concentrations from the coal-fired base-load generation plant would be 500 mg/Nm³ and 50 mg/Nm³, respectively, under normal operating conditions (at 6% O₂ reference level). The current European Directive 2001/80/EC emission limits for NO_x (as NO₂) and dust emissions for new plants are 200 mg/Nm³ and 30 mg/Nm³, respectively (at 6% O₂ reference level).

The gas turbine units within the natural gas-fired peaking-load generation plant are proposed to use low NO_x burners that would produce a stack NO_x emission concentration of about 25 ppmv (at 15% O₂ reference level) under normal operating loads.

Submissions

The main concerns raised in the submissions relate to the:

- methodology employed for the air quality modelling;
- need for a comprehensive meteorological station to be installed to enable the air quality modelling and Health Risk Assessment (HRA): to be reviewed;

- need to limit the desulphurisation system downtime to 1% of the time in view of the very large SO₂ emissions without desulphurisation;
- cumulative dust impacts from proposals in the region and the management and monitoring of dust;
- impact of SO₂ emissions on vegetation; and
- monitoring of stack emissions.

Assessment

The EPA's environmental objective for this factor is to ensure that emissions do not adversely affect the environment or health, welfare and amenity of nearby land users by meeting statutory requirements and acceptable standards.

The EPA notes the uncertainties associated with the air quality modelling because of the limited availability of meteorological data. However, the EPA considers that the predicted GLCs around the power station are likely to be representative of the expected range in predicted maximum GLCs.

The EPA also notes that predicted GLCs for NO_x, PM₁₀, CO, and SO₂ would be below the NEPM standards when the power station operates in isolation and at full capacity under normal conditions.

The EPA considers that the estimated SO₂ removal efficiency of the desulphurisation process of approximately 85 to 87.7% is not adequate given that the maximum 1-hour average SO₂ GLC at any location within the modelled domain is predicted to be approximately 95% of the NEPM standard.

Industry establishing in WA should be fitted with best practice pollution control equipment (EPA, 2003).

For large power stations, the EPA considers the European Directive 2001/80/EC to be the appropriate standard.

Table 2: Comparison of proposed stack emissions with EC2001/80/EC

Pollutant	Coolimba coal-fired plant	2001/80/EC
SO ₂	1100 to 1500 mg/Nm ³	200 mg/Nm ³
NO _x (as NO ₂)	500 mg/Nm ³	200 mg/Nm ³
PM ₁₀	50 mg/Nm ³	30 mg/Nm ³

Note: concentrations at 6% O₂ reference level, measurement methods are specified in EC2001/80/EC.

As can be seen from the table above, the proposed Coolimba coal-fired plant falls well short of best practice emission limits.

The EPA considers that Condition 9-1 should be imposed on the proponent to limit the stack emission concentrations from the Coolimba plant to those prescribed in European Directive 2001/80/EC.

The EPA is aware of the potential for exceedances of the SO₂ NEPM 1-hour standard to increase proportionally with desulfurisation system downtime. The EPA considers that Condition 9-2 should be imposed on the proponent to limit desulfurisation system downtime to 1% of the time in view of the uncertainties in the air quality modelling. This requirement would be consistent with the NEPM Goal for SO₂ which allows a maximum of one exceedance of the 1-hour standard per year.

In view of the uncertainties associated with the air quality modelling, and on advice from the DEC Air Quality Management Branch (AQMB), the EPA recommends that Condition 9-3 should be imposed on the proponent to develop and implement, in consultation with the Department of Environment and Conservation, a meteorological monitoring program that includes:

1. the installation of a comprehensive meteorological station for plume dispersion, including a SODAR (sonic detection and ranging) system or better for upper wind measurement at plume height, prior to construction;
2. a program of radiosondes or alternative temperature profiling;
3. anemometers for the Central West Coal Mine and on the escarpment; and
4. two SO₂ monitoring stations with anemometers.

The meteorological station and SODAR system should be installed as soon as possible to facilitate a review of the modelling and the HRA. The EPA also considers that the review of the modelling and the HRA should be completed prior to construction so that the results can be taken into account as necessary in plant design. The EPA considers that Condition 9-4 should be imposed on the proponent to use the data collected by the meteorological station and SODAR system and conduct a review of the air quality modelling and health risk assessment undertaken for the proposal prior to construction, and take the results obtained from the revised air quality modelling and health risk assessment into account as necessary in designing the power station. The EPA also considers that Condition 9-5 should be imposed on the proponent to use the data collected by the instrumentation systems specified in conditions 9-3 (1), (2), (3), and (4) to validate the air quality modelling required by condition 9-4 and update the health risk assessment within two years following commissioning.

The natural gas-fired peaking-load generation plant would use low NO_x burners that would produce stack emission concentrations which are in accordance with EPA Guidance Statement No. 15 - *Emissions of Oxides of Nitrogen from Gas Turbines*. Best practice has progressed since the EPA released its Guidance Statement. The EPA recommends that the DEC requires the gas turbines to meet current best practice NO_x levels at the time of issuing the Works Approval and Licence that will be required if the project is approved.

Stack emissions from both the coal-fired base-load generation plant and the natural gas-fired peaking-load generation plant can be adequately regulated under the requirements of Part V of the *Environmental Protection Act 1986*. The EPA recommends that the DEC require the proponent to: install best practice pollution control equipment; and monitor and report stack emissions.

Summary

Having particular regard to the:

- (a) results obtained from air quality modelling;
- (b) advice provided by the DEC AQMB;
- (c) EPA's recommended conditions requiring best practice emission limits to be met and desulphurisation downtime to be limited to 1%; and
- (d) regulatory measures available to manage the monitoring and reporting of stack emissions under Part V of the *Environmental Protection Act 1986*;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objectives for this factor provided that the EPA's recommended conditions are imposed by the Minister for Environment.

4.3 Noise

Description

Construction noise

Construction activities during the three year period are not expected to result in significant exceedances of the assigned noise levels at nearby residential premises if industry standard noise attenuation measures are employed.

Operational noise

Operation of the power station would generate noise. Noise modelling considered the noise generated by the power station both in isolation, and cumulatively with noise generated by the adjacent Central West Coal Project mine operations.

The modelling predicted that, under worst case meteorological conditions, the night time noise level at the nearest residential premises located approximately 2 km south-west of the power station would be 38.8 dB(A), due solely to the power station. This is 3.8 dB(A) above the assigned L_{A10} level of 35 dB(A) prescribed by the *Environmental Protection (Noise) Regulations 1997*.

Cumulative modelling predicted that, under worst case meteorological conditions, the night time noise level at the nearest residential premises would be 40.6 dB(A). This is 5.6 dB(A) above the assigned night time L_{A10} level of 35 dB(A) and 0.6 dB(A) above the assigned level of 40 dB(A) for Sundays and public holidays between 9:00 am and

10:00 pm and for all days between 7:00 am and 10:00 pm, prescribed by the *Environmental Protection (Noise) Regulations 1997*.

The main contributors of noise are the gas turbines, coal-fired boilers, and the cooling towers. In order to ensure compliance with applicable criteria the proponent has indicated that the gas turbine generator packages would be specified at 105 dB(A) which is a 10 dB less than the sound power level assumed in the noise modelling. The coal-fired boilers would be specified at 106 dB(A) which is 10 dB less than assumed in the noise modelling. Each bank of cooling towers would be specified at 101 dB(A) which is 3 dB less than assumed in the noise modelling.

The required noise reductions could be achieved by using typical noise attenuation measures such as installing acoustic enclosures over the gas turbines, installing high performance silencers on the air inlets, exhausts, and ventilation systems of the gas turbines, using acoustic cladding on the coal-fired boilers, and using low noise fans for the cooling towers and/or variable speed fan drives to enable fan running speeds to be reduced, particularly at night.

Noise levels from the power station would be monitored during commissioning to validate the predictions of the noise modelling. Should noise levels exceed applicable criteria the proponent would investigate additional design measures to reduce noise to acceptable levels.

Submissions

The DEC Noise Regulation Branch recommended that a condition be imposed on the proponent at the works approval and licensing stages requiring the noise impact assessment to be re-done when detailed design information is available, in order to demonstrate compliance with the *Environmental Protection (Noise) Regulations 1997*.

Assessment

The EPA's environmental objective for this factor is to protect the amenity of nearby residents from noise generated by construction activities associated with the proposal and operation of the power station by ensuring that the noise levels meet statutory requirements and acceptable standards.

Construction noise

The EPA notes that construction activities during the three year construction period are not expected to result in significant exceedances of assigned noise levels at nearby residential premises if industry standard noise attenuation measures are employed. The EPA also notes that the proponent has not examined potential construction noise impacts associated with the proposal in detail. The EPA would expect the proponent to monitor noise levels at nearby residential premises during the construction of the power station, gas pipeline lateral, and electricity transmission line. Should monitoring indicate that noise levels are exceeding assigned levels, construction activities would need to be undertaken in accordance with Regulation 13 of the *Environmental Protection (Noise) Regulations 1997*. Regulation 13 places responsibilities on the proponent to carry out activities in accordance with the requirements set out in Section 6 of Australian Standard 2436-1981. These

responsibilities include using the quietest equipment which is reasonably available, undertaking construction activities between 7:00 am and 7:00 pm on any day except Sundays and public holidays, and preparing a noise management plan if construction activities will be undertaken outside these times.

Operational noise

The operating power station is predicted to result in noise levels at the nearest residential premises exceeding several assigned L_{A10} levels prescribed by the *Environmental Protection (Noise) Regulations 1997*.

The EPA notes that the proponent would specify suitably attenuated gas turbine generator packages, coal-fired boilers, and cooling towers for the power station in order to ensure that noise levels at the nearest residential premises comply with the *Environmental Protection (Noise) Regulations 1997*.

The EPA understands that should monitoring indicate that noise levels during commissioning exceed applicable criteria, the proponent would investigate additional design measures to reduce noise to acceptable levels. The EPA recommends that additional noise modelling be undertaken when detailed design information is available, to demonstrate compliance with the *Environmental Protection (Noise) Regulations 1997*, when seeking a Works Approval and Licence with the DEC.

Summary

Having particular regard to the:

- (a) results obtained from noise modelling; and
- (b) management measures that could be used by the proponent to ensure that noise levels at the nearest residential premises comply with applicable noise criteria during construction and when the power station is operating;
- (c) regulatory measures available under Part V of the *Environmental Protection Act 1986* to ensure the proponent implements the management measures,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objectives for this factor.

4.4 Greenhouse gas emissions

Description

The Coolimba Power Station would generate about 4.2 million tonnes of CO_{2-e} per year. The main sources are:

- 3.8 million tonnes of CO_{2-e} per year from the 450 MW coal-fired base-load generation plant;
- 440 thousand tonnes of CO_{2-e} per year from the 358 MW natural gas-fired peaking-load generation plant; and

- 13 thousand tonnes of CO_{2-e} per year from the combustion of liquid fuel (diesel) for the removal and disposal of boiler ash, delivery of limestone for flue gas desulphurisation, and coal and limestone stockpile management.

The proponent contends that the proposed generating plants would be designed and constructed to be carbon capture and storage (CCS) ready. This means that carbon could be captured, transported and stored underground. The proponent intends to make sufficient space available on land immediately adjacent to each of the new generation plants to accommodate carbon capture related plant and equipment when it is technically and commercially viable to do so.

A regional study of the CO₂ geosequestration potential in the Northern Perth Basin surrounding the power station site has been undertaken by the Cooperative Research Centre for Greenhouse Gas technologies (CO₂CRC). The results from this study indicate that several potential sites in depleted gas fields in the region have an estimated contingent storage capacity of 21.1 to 40.5 million tonnes of CO₂. The study also indicated that deep saline formations in the region have an estimated prospective storage capacity of 167 to 512 million tonnes of CO₂.

The proponent intends to verify the availability and suitability of CO₂ transport and storage facilities for the project, and would complete a number of feasibility studies prior to and following commissioning to aid decision making in relation to the conversion to CCS.

The coal-fired base-load generation plant, which consists of three 150 MW units, is expected to have a worst case thermal efficiency of approximately 32.8% [sent-out, higher heating value (HHV)]. The PER document indicates that the applicable world best practice thermal efficiency figure of 37.7% obtained from the Technical Guidelines Generator Efficiency Standards (AGO, 2001) becomes approximately 36% when corrected to account for the properties of the coal that would be used in the power station.

The natural gas-fired peaking-load generation plant's net thermal efficiency of about 33% (HHV) is consistent with the indicative value of 33.1% (HHV) for new open cycle gas turbine (OCGT) units provided in the Technical Guidelines Generator Efficiency Standards (DEH AGO, 2006).

The OCGT units in the natural gas-fired peaking-load generation plant would be converted to base-load units once the power station is ready to convert to CCS.

Submissions

The main concerns raised in the submissions relate to the:

- certainty, feasibility, and timeframe for the implementation of CCS;
- proponent not identifying a geosequestration site with the capacity to store all of the CO₂ generated by the power station over its life time;
- need for the proponent to assess potential routes to geosequestration site(s);
- management of CO₂ emissions prior to the implementation of CCS;

- appropriateness of using coal as a fuel; and
- magnitude and significance of the power station's greenhouse gas emissions with respect to Western Australia's current greenhouse gas emissions.

Assessment

The EPA's environmental objectives for this factor are to:

- minimise greenhouse gas emissions in absolute terms and reduce emissions per unit of product to as low as reasonably practicable; and
- mitigate greenhouse gas emissions, mindful of Commonwealth and State greenhouse gas strategies and programs.

The EPA has previously advised (EPA 1990) that its preference from an environmental perspective in relation to electricity demand is, in declining order of rank:

- conservation and energy improvements;
- renewable energy sources such as wind and solar energy;
- gas, including Combined Cycle Gas Turbines;
- new technology coal plants;
- old technology coal plants; and
- petroleum fuel plants.

It is the EPA's opinion that CCGT power stations represent best practice technology for large scale base-load power generation, and hence represent the benchmark against which other base-load power generation technologies should be compared. The EPA notes that the proposed coal-fired plant would result in greenhouse gas emissions of approximately 50% greater than a CCGT plant of similar capacity.

The EPA is aware of the Federal Government's recent announcement on Global Carbon Capture and Storage Institute and National Low Emissions Coal Fund. The aim of the Institute and the Fund is to facilitate the timely implementation of CCS and other low emission coal technologies in Australia to reduce greenhouse gas emissions, particularly from coal-fired power stations. The EPA understands that the above mentioned Institute and the Fund will operate in conjunction with the Federal Government's proposed Carbon Pollution Reduction Scheme (CPRS). The proponent is expected to participate in the CPRS when it is introduced.

The Queensland Government recently published its new climate change strategy *Climate Q: toward a greener Queensland* in July 2009. Part of the strategy includes the condition that all new coal-fired power stations should utilise world's best practice technology, be carbon capture ready and retrofit carbon capture and storage technology within 5 years of the technology being proven at a commercial scale (Queensland Government 2009). This strategy is similar to an approach adopted by the United Kingdom (UK) Government, which is also proposing that all new coal fired power stations be required to retrofit CCS to their full capacity within 5 years of

the UK Environmental agency concluding that CCS is economically and technically proven (UK Department of Energy and Climate Change, April 2009).

The EPA notes that the proponent contends that the generating plants would be designed and constructed to be carbon capture ready. The EPA is guided by the International Energy Agency (IEA, 2007) definition of carbon capture ready which states that:

“A CO₂ capture-ready power plant is a plant which can include CO₂ capture when the necessary regulatory or economic drivers are in place. The aim of building plants that are capture-ready is to avoid the risk of stranded assets or ‘carbon lock-in’.

Developers of capture-ready plants should take responsibility for ensuring that all known factors in their control that would prevent installation and operation of CO₂ capture have been eliminated.

This might include:

- *A study of options for CO₂ capture retrofit and potential pre-investments*
- *Inclusion of sufficient space and access for the additional facilities that would be required*
- *Identification of reasonable route(s) to storage of CO₂”.*

The IEA guideline further states:

Competent authorities involved in permitting power plants should be provided with sufficient information to be able to judge whether the developer has met these criteria.

The coal-fired base-load generation plant would generate approximately 3.8 million tonnes of direct CO₂ emissions per year through the combustion of coal and the calcination of limestone for flue gas desulphurisation. This equates to approximately 113 million tonnes of direct CO₂ emissions over the power station’s estimated 30 year life time. The EPA understands from the proponent’s Response to Submissions document (Aviva Corporation Ltd, 2009) that about 90% of CO₂ emissions could be captured once CCS is implemented.

The EPA acknowledges the findings of the study of CO₂ geosequestration potential in the Northern Perth Basin and notes that the estimated contingent storage capacity of depleted gas fields in the region would only accommodate between 20.7% and 39.8% of the CO₂ emissions generated by the power station over its estimated 30 year life time. The EPA also notes that the estimated prospective storage capacity of deep saline formations in the region could potentially accommodate all of the CO₂ emissions captured from the power station during its life time.

The EPA supports the proponent’s intention to verify the availability and suitability of CO₂ transport facilities and to complete feasibility studies on the potential to convert to CCS. The EPA considers however that the proponent has not provided sufficient information to determine whether the proposal is CCS ready.

Accordingly, the EPA recommends that if the proposal is approved for implementation that a number of conditions be imposed. Recommended Condition 10-1 would require the proponent to periodically advise the EPA of progress made towards the implementation of CCS. Condition 10-2 would require the proponent to retrofit carbon capture and storage to the full capacity of the coal fired power station within five years of the EPA concluding that carbon capture and storage is economically and technically proven.

The EPA notes that the worst case thermal efficiency of the coal-fired base-load generation plant is expected to be approximately 32.8% (sent-out, HHV). This is less than the corrected world best practice figure of approximately 36% (sent out, HHV). The EPA considers that best practice subcritical coal-fired technology should be employed in the coal-fired base-load generation plant to maximise its thermal efficiency and minimise its greenhouse gas emissions. Accordingly, the EPA recommends that Condition 10-3 should be imposed on the proponent requiring the coal-fired base-load generation plant to achieve best practice thermal efficiency.

The thermal efficiency of the natural gas-fired peaking-load generation plant is consistent with the indicative value of 33.1% HHV for new OCGT units provided in the current version of Technical Guidelines Generator Efficiency Standards.

With the continued uncertainty over the Commonwealth Government's proposed CPRS, the EPA also recommends that Condition 10-4 be imposed on the proponent requiring a greenhouse gas abatement report to be developed prior to the commencement of the CPRS, which meets the following objectives:

- demonstrates that maximising energy efficiency and opportunities for future energy recovery have been given due consideration in the design of the power station;
- ensures that the “greenhouse gas” intensity (i.e. quantity of CO_{2-e} produced per MWh of electricity produced) is equivalent to, or better than benchmarked best practice; and
- achieves continuous improvement in “greenhouse gas” intensity through the periodic review, and if practicable, adoption of advances in technology and process management.

Condition 10-5 sets the effective time frame of Conditions 10-2 to 10-4 as being until such time as it is determined that that these conditions are non complementary to any Commonwealth greenhouse gas emissions trading scheme that may come into force in Western Australia.

Summary

The EPA has concluded that the proposal can meet its environmental objectives for the factor of green house gas emissions, provided Condition 10 is implemented.

The EPA has provided further information on green house gas emissions and the implications for WA in Section 5 “Other Advice” of this report.

4.5 Environmental principles

In preparing this report and recommendations, the EPA has had regard for the object and principles contained in s4A of the *Environmental Protection Act (1986)*. Appendix 3 contains a summary of the EPA's consideration of the principles.

5. Conditions

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

5.1 Recommended conditions

Having considered the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Coolimba Power Pty Ltd to construct and operate the Coolimba Power Station, is approved for implementation.

These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

- (a) preventing impacts on Declared Rare Flora (DRF) species;
- (b) rehabilitation;
- (c) preventing impacts on fauna from trenches during gas pipeline construction;
- (d) air quality; and
- (e) greenhouse gas emissions.

It should be noted that other regulatory mechanisms relevant to the proposal are:

- Works Approval and Licence under Part V of the *Environmental Protection Act 1986*.

6. Other Advice

Cumulative Impacts on Declared Rare Flora from Multiple Proposals

The EPA notes that, in addition to the Coolimba Power Station proposal, the Central West Coal and Eneabba Mineral Sands proposals have been referred to the EPA. These proposals could introduce further development in, partly in, or adjacent to the SENR.

The EPA considers that the SENR and the conservation significant flora within this region are critical assets which should be protected. The potential cumulative loss of DRF and other conservation significant flora in this region is a significant and

complex issue for the EPA. These projects pose significant risks to these critical assets through clearing, the introduction of dieback, the risk of fire and weed introduction.

When assessing future projects that may impact biodiversity in the Reserve or adjacent to it, the EPA will consider the cumulative impacts and the risks they present to the long-term viability of all conservation significant species. The EPA will take a conservative position in relation to what represents acceptable risk and will focus on avoidance of direct and indirect impacts.

Greenhouse Gas Emissions Targets

The EPA considers it is unlikely that CCS will become technically and commercially viable in Western Australia in the near future. The EPA notes that CCS technology is now technically feasible but the full chain of CCS – capture, transport and storage of carbon dioxide – has yet to be demonstrated for the full capacity of a coal-fired power station in Australia. Various demonstration projects and pilot plants only currently demonstrate part of the CCS chain. Therefore, proponents do not consider CCS technology as commercially feasible.

To achieve substantial reductions in GHG emissions on a global scale, the abatement process must be driven by Governments across a range of existing and future emission sources.

As a party to the Kyoto protocol, Australia is obliged to limit its GHG emissions to no more than 108% of 1990 levels (around 600 Mtpa) up to 2012 and Australia is on track to achieve this.

The Commonwealth Government's long term goal is to achieve a reduction of 60% from 2000 levels by 2050. This would limit Australia to 221 Mtpa in 2050. Based on WA's percentage of Australian emissions in 2007, this target would equate to around 28 Mtpa in 2050 for WA.

The latest data from 2007 (Australian Government 2007) shows WA's emission to be 76.3 Mtpa. Projects with existing environmental approval (but not yet included in the emissions inventory) could add more than 20 Mtpa to this amount. Additionally, there are currently proposals in the EPA assessment process, that if approved and constructed would emit a further 36 Mtpa.

Given potential total emissions in the order of 133 Mtpa, the task of reducing WA's emissions to 26 Mtpa within four decades becomes daunting, especially when the long operational life of these projects is considered.

The EPA has a distinct preference for gas over coal fired power generation, due to its lower GHG intensity. However, the EPA understands that domestic gas availability is limited, at least in the near term. Worldwide, energy requirements are predicted to grow and, even with growth in alternate power supply methods, continued reliance on coal seems unavoidable for some period of time. This situation highlights the importance of promoting the availability of gas to meet domestic requirements and supporting the development of alternative renewable power sources. It also highlights

the importance of a joint Government/Industry focus on developing real options for geo-sequestration of carbon dioxide in Western Australia. In this regard, the EPA recognises that the Commonwealth Government, Western Australian Government and Industry are jointly investing in the Collie South West Hub Geo-sequestration Project, to research and develop carbon sequestration options for coal fired power stations in Western Australia. The EPA encourages this initiative.

7. Recommendations

The EPA submits the following recommendations to the Minister for Environment:

1. That the Minister notes that the proposal being assessed is for the construction and operation of the Coolimba Power Station on a site located approximately 15 km south-south-west of Eneabba, and the establishment of an approximately 20 km long and 100 m wide infrastructure corridor that will accommodate the construction and operation of:
 - a natural gas pipeline lateral to connect the power station to either the DBNGP or the Parmelia Gas Pipeline; and
 - a 330 kV electricity transmission line to connect the power station to the external electricity network at the proposed Eneabba Substation;
2. That the Minister considers the report on the key environmental factors and principles as set out in Section 3;
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4, and summarised in Section 4, including the proponent's commitments; and
4. That the Minister notes that the EPA has included a recommended condition that the infrastructure corridors avoid the South Eneabba Nature Reserve and DRF.
5. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Appendix 1

List of submitters

Organisations:

1. Conservation Council of Western Australia Inc.
2. Department of Environment and Conservation.
3. Department of Environment, Water, Heritage and the Arts.
4. Department of Health.
5. Department of Indigenous Affairs.
6. Department of Water.
7. Greenpeace Australia Pacific.
8. Shire of Coorow.
9. Wildflower Society of Western Australia (Inc).

Individuals:

1. Russell Browne.
2. Desmond Fowler.
3. Peggy Hodgson.

Appendix 2

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Appendix 3

Summary of identification of key environmental factors and principles

Summary of identification of key environmental factors and principles

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
BIOPHYSICAL			
Flora and vegetation	<p>The project will have a total footprint of about 483 ha. The power station will be constructed on cleared farmland. Construction within the infrastructure corridor will require approximately 48.8 ha of vegetation to be cleared, including up to 30 ha in the South Eneabba Nature Reserve (SENR).</p> <p>The vegetation that will be cleared consists of approximately:</p> <ul style="list-style-type: none"> • 8.8 ha of Vegetation Community Type E4 - Open Low Woodland of <i>Eucalyptus todtiana</i> and <i>Nuytsia floribunda</i> over <i>Banksia menziesii</i> and <i>Stirlingia latifolia</i> on sandy drainage lines; • 8.4 ha of Vegetation Community Type H3 - Heath or Scrub of <i>Melaleuca leuropoma</i>, <i>Banksia sphaerocarpa</i> var. <i>sphaerocarpa</i>, <i>Dryandra nivea</i> subsp. <i>nivea</i>, <i>Eremaea beaufortoides</i> var. <i>lachnosanthe</i> and <i>Hibbertia subvaginata</i> on lateritic rises; and • 31.6 ha of Vegetation Community Type T1 - Scrub or Thicket of <i>Banksia attenuata</i>, <i>Banksia menziesii</i> over <i>Banksia sphaerocarpa</i> var. <i>sphaerocarpa</i>, <i>Adenanthos cygnorum</i>, <i>Banksia hookeriana</i> and <i>Conospermum triplinervium</i> on sand. <p>Vegetation Community Type T1 is regionally significant as it contains the Declared Rare Flora (DRF) taxa <i>Tetratheca nephelioides</i>. Vegetation Community Types E4 and H3 are locally significant as they contain priority flora species.</p> <p>A total of one Rare, two Priority 3, and three Priority 4 taxa were recorded within the project area during the flora surveys. There are 18 species of threatened flora that are listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (the EPBC Act) that are known to occur in the region. However, none of these species were recorded in the project area.</p> <p>Approximately 1566 individuals of the DRF taxa <i>Tetratheca nephelioides</i> were recorded during the flora surveys, of which 706 were recorded within the section of infrastructure corridor that traverses the SENR. The remaining 860 individuals were found outside the infrastructure corridor and within the SENR.</p> <p>Up to approximately 10% of the surveyed population of <i>Tetratheca nephelioides</i> (i.e. about 156 individuals from the population of 1566 plants) within and adjacent to the infrastructure corridor will be removed during the construction of the gas pipeline lateral and electricity transmission line.</p> <p>The DRF species <i>Eucalyptus johnsoniana</i>, <i>Eucalyptus impensa</i>, and <i>Eucalyptus crispata</i> are known from historical records to occur within and in proximity to the infrastructure corridor. These DRF species were not located during the flora surveys.</p> <p>The Priority 3 taxa <i>Desmocladius elongates</i> was recorded at two locations within the infrastructure corridor and at seven other locations within the adjacent SENR on the edges of the corridor. It was also recorded seven times in other vegetation. The Priority 3 taxa <i>Lepidobolus quadratus</i> was recorded at one location within the infrastructure corridor and once adjacent to the corridor.</p>	<p>Department of Environment and Conservation</p> <ol style="list-style-type: none"> 1. Locating the infrastructure corridor in South Eneabba Nature Reserve is not compatible with DEC's objectives, or the statutory purpose of the nature reserve "the conservation of flora and fauna". The proponent has not adequately demonstrated that it has exhaustively considered options to establish the infrastructure corridor outside of the South Eneabba Nature Reserve on adjacent cleared private property, a recommendation DEC made to the proponent over 12 months ago. <p>The planned infrastructure corridor has been made considerably longer than it need be in order to specifically traverse, for much of its length, the nature reserve rather than adjacent farmland. DEC is not aware of any technical reason why the proposed corridor needs to be within the nature reserve, or of any justification for the effective loss of the proponent's estimate of 30 hectares of undisturbed native vegetation from the reserve.</p> <ol style="list-style-type: none"> 2. Three vegetation communities E4, H3 and T1 (all of which are classified as locally or regionally significant) will be impacted by this proposal. 3. The DEC considers the impacts and risks to DRF and the South Eneabba Nature Reserve have not been demonstrated to be acceptable for biodiversity conservation, and on those grounds cannot support the proposal in its current form. The project has the potential to impact on four declared rare flora (DRF), two Priority 3 and three Priority 4 species in the South Eneabba Nature Reserve. The infrastructure corridor could potentially impact up to 45.08 percent (706 plants) of the largest known population of DRF <i>Tetratheca nephelioides</i> (Endangered). <p>The infrastructure corridor will also impact on the habitat of the following DRF: <i>Eucalyptus impensa</i> (Critically endangered), <i>Eucalyptus crispata</i> (Endangered) and <i>Eucalyptus johnsoniana</i> (Vulnerable). From the information presented in the PER, it is not possible to determine whether significant groundwater drawdown effects associated with dewatering of the proposed Central West Coal mine would further threaten the habitat and survival of this species. The impact assessment should be presented with further information from targeted survey work to determine the occurrence and the potential impact of the development on these species and their status.</p> <ol style="list-style-type: none"> 4. DEC has identified significant issues relating to survey standards, deficiencies and discrepancies in relation to the flora survey report. There is insufficient information to enable DEC to adequately assess the proposal. 5. DEC is also concerned about the progressive proposed development of key vegetation communities in the Lesueur area and the likelihood that specific vegetation community types may be lost from the cumulative impacts of 	<p>In view of the nature of the concerns that were raised in the comments that were received, the EPA considers that flora and vegetation and environmental offsets are relevant environmental factors. Flora and vegetation and environmental offsets will be considered under the factor of biodiversity.</p>

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	<p>The Priority 4 taxa <i>Geogantha hexandra</i> was recorded at three sites along the infrastructure corridor and four locations within Lake Logue Nature Reserve (LLNR). The Priority 4 taxa <i>Grevillea rudis</i> was recorded once within the infrastructure corridor and once near it. It was also recorded five times within the SENR and five times within the nearby LLNR. The Priority 4 taxa <i>Banksia chamaephyton</i> was recorded at one location within the infrastructure corridor and in two other locations within the SENR.</p> <p>The PER document does not indicate how many individuals of the above Priority Flora species will be removed during the construction of the gas pipeline lateral and electricity transmission line.</p> <p>The proponent's proposed management measures to minimise impacts on <i>Tetradlea nephelioides</i> and the above Priority Flora species are as follows:</p> <ul style="list-style-type: none"> the infrastructure route within the corridor will be designed in consultation with the DEC to avoid as many individuals of <i>Tetradlea nephelioides</i> as possible. Priority Flora species will also be avoided wherever possible; clearing for the gas pipeline lateral within the SENR will be restricted to a corridor with a maximum width of 20 m. Clearing for the electricity transmission line within the SENR will be restricted to spurs of 50 m length and 10 m width off the cleared gas pipeline access area to the 40 m wide by 40 m long cleared pads for the 10 transmission line towers; where it is not possible to avoid the rare flora species, an "application to take" will be submitted for the rare flora at the State level and a "controlled action" at the Federal level; seeds and propagules of the rare and Priority flora species will be collected and stored for future research needs to assist in their re-establishment in rehabilitation areas; further field studies will be undertaken to assist in locating additional populations of <i>Tetradlea nephelioides</i> and Priority Flora species outside the project area, particularly in the conservation estate; access to all non-operational areas will be restricted and personnel will remain on designated roads and tracks; and topsoil and vegetation will be re-spread as soon as possible to assist rehabilitation, and rehabilitation programs will include trials on Rare, Threatened and Priority flora species. <p>The proponent proposes to provide an appropriate offset to account for the clearing of DRF within the project area. The required offset would be determined in consultation with the DEC.</p>	<p>development. In this case, the key risk is to the native vegetation system mapped as 'Lesueur grey'.</p> <ol style="list-style-type: none"> The cumulative impact of this project, in conjunction with Tiwest's Falcon and Iluka's Eneabba Expansion projects, would cause unacceptable loss of biodiversity in the form of a unique vegetation system in the Lesueur Sandplain subregion. The magnitude of the limestone mining should be as part of the overall project footprint, contributing to the cumulative impact of the Coolimba project on the biodiversity and environmental values of the region. DEC will not be in a position to endorse strategies for offsetting impacts given impact on critical assets until the level of significance of the impacts is adequately determined and the EPA has formed a view on the environmental acceptability of the project. <p>Department of Environment and Conservation - Terrestrial Ecosystems Branch</p> <ol style="list-style-type: none"> Clearing from road upgrading is also not included in the PER as four alternatives are being considered. Impacts from each alignment such as clearing native vegetation for road widening, drainage impacts and pathogen vectoring should be considered. Four alternative alignments are presented within the PER, all of which impact the South Eneabba Nature Reserve, no alignments that extend either north or south with no impact to the NR have been considered. This demonstrates a lack of consideration of sensitive environmental values. Specifically, the features of 330 kV transmission line discussed in Section 3.2.2 is reduced to tower spacing and height. No discussion on tower type, foundation type and depth, electrical safety clearance or tower base footprint is presented. Additionally no justification of tower spacing and height is presented to allow assessment of the full alternatives of the 330 kV transmission line. It is not clear what management is associated with the 330 kV transmission line. Actions to reduce construction footprint, such as utilizing cleared areas as access, if not alignment, should be assessed and included in the PER. No demonstrated application of the impact mitigation, adequate justification for the corridor alignment, assessment of regional/local impact or suitable remediation to clear DRF is presented in the PER. <p>Department of Environment and Conservation - Midwest Region</p> <ol style="list-style-type: none"> These projects (Coolimba Power Project and the Central West Coal Mine), in combination with the Iluka expansion and Tiwest Falcon expansion have the potential to significantly impact this area in the long term via the removal of restricted vegetation communities, critical habitat for threatened flora, altered surface and ground water conditions, pollution of groundwater 	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
		<p>and drawdown effects on groundwater dependent ecosystems. The cumulative impact to the regional biodiversity by Aviva's projects and other existing and proposed developments has not been adequately assessed to determine suitable offsets.</p> <p>2. The cumulative impact to the regional biodiversity by Aviva's projects and other existing and proposed developments has not been adequately assessed to determine suitable offsets. In order to determine the appropriateness and adequacy of the proposed offset, the level of significance of the residual impact on critical assets (such as SENR) needs to be known and agreed upon.</p> <p>Department of Environment, Water, Heritage and the Arts</p> <p>1. It is unclear from the PERs how impacts on the EPBC Flora species <i>Grevillea althoferorum</i>, <i>Eucalyptus crispata</i>, <i>Eucalyptus impensa</i> and <i>Eucalyptus johnsoniana</i> will be addressed by the two proponents.</p> <p>Wildflower Society of Western Australia (Inc)</p> <p>1. Whilst it is proposed to build the power station on cleared land it appears 49 ha of vegetation will be cleared for infrastructure leading to a significant loss of vegetation and fauna habitat as well as fauna. Thirty hectares of the vegetation is in the South Eneabba Nature Reserve. This reserve is already severely impacted by mineral sand mining and it is unacceptable to have further impacts when the infrastructure could occupy adjacent cleared land.</p> <p>2. Inadequate consideration of the principles of Environmental Protection as set out in Position Statement No.7.</p> <p>Conservation Council of Western Australia Inc</p> <p>1. CCWA believe that the impact on already fragmented Kwongan Heath vegetation (one of the most species-rich vegetation type anywhere in the world) as are result of extensive clearing associated with the mine site and transmission lines is unacceptable. CCWA understands that a significant proportion of the clearing proposed for the transmission lines will take place in a nature reserve which is a wholly unacceptable outcome for a project of this type.</p>	
Rehabilitation	<p>The infrastructure corridor would be rehabilitated once construction of the gas pipeline lateral and the 330 kV electricity transmission line have been completed. Rehabilitation would be conducted progressively.</p> <p>Previously vegetated areas would be rehabilitated with a range of similar species to those that existing prior to clearing, including species suitable as a food source for Carnaby's Black Cockatoo.</p> <p>Seeds and propagules of <i>Tetratheca nephelioides</i> and Priority Flora species which cannot be avoided would be collected and stored for future research needs to assist in their re-establishment in rehabilitation areas.</p> <p>Topsoil and vegetation would be re-spread as soon as possible to assist rehabilitation, and</p>	<p>Department of Environment and Conservation - Terrestrial Ecosystems Branch</p> <p>1. The completion criteria for rehabilitation presented in Section 7.3 is inadequate and does not represent criteria in any form. Measurable criteria should be presented.</p>	<p>In view of the nature of the concerns that were raised in the comments that were received, the EPA considers that rehabilitation is a relevant environmental factor. Rehabilitation will be considered under the factor of Biodiversity.</p>

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	<p>rehabilitation programs would include trials on Rare, Threatened and Priority flora species.</p> <p>Cleared vegetation would be directly returned to rehabilitation areas to help protect seeds, seedlings, and soil against wind erosion, where practical. In order to preserve rootstock in areas that will be rehabilitated, the blade/fork/rake of the bulldozer would be raised slightly above the soil surface.</p> <p>Land profiles would be stabilised and surface drainage patterns would be restored. Compacted areas would be contour ripped.</p>		
Dieback and weeds	<p><i>Dieback</i></p> <p>The introduction of dieback into the SENR has the potential to severely impact vegetation within it as it can lead to the death of a wide range of flora species. This would affect the abundance, diversity, productivity, and geographical distribution of these flora species.</p> <p>Dieback assessments conducted within and in the vicinity of the project area found no evidence of dieback (<i>Phytophthora cinnamomi</i>) within the project area, but did identify three separate dieback infestations north of Rocky Spring Road, which is located north of the project area. The PER document stated that the risk of dieback spread would be low in view of the annual rainfall in the project area which indicates that the environment is only marginally conducive to the survival of <i>Phytophthora cinnamomi</i>.</p> <p>The proponent's dieback management measures include cleaning project related machinery at a hygiene point at the project area entrance, sourcing fill material from dieback free areas in cleaned vehicles, prohibiting access to nature reserves, discouraging access to non-essential tracks in the project area, and preventing surface water flow across tracks from adjacent dieback infested vegetation.</p> <p><i>Weeds</i></p> <p>Twenty six introduced species were recorded within the project area, but none of these are declared weeds listed by the Department of Agriculture and Food. Construction activities within the project area have the potential to introduce and spread weeds which could affect flora and vegetation within the SENR and the success of rehabilitation. The proponent proposes to implement weed hygiene and management measures to minimise this risk. The proponent intends to identify permanent monitoring sites which would be surveyed to map the type, location, extent and density of weed species present within and adjacent to areas that would be disturbed during construction. The proponent would consult with the DEC in regard to the weed management.</p>	<p>Department of Environment and Conservation</p> <ol style="list-style-type: none"> 1. There is an unacceptable risk of the introduction of Phytophthora dieback and weeds into South Eneabba Nature Reserve from the construction of the infrastructure corridor. <p>Department of Environment and Conservation - Terrestrial Ecosystems Branch</p> <ol style="list-style-type: none"> 1. A complete dieback management plan should be created including wash downs locations, wastewater management and procedures for breach of hygiene. 	<p>In view of the nature of the concerns that were raised in the comments that were received, the EPA considers that dieback and weeds is a relevant environmental factor. Dieback and weeds will be considered under the factor of Biodiversity.</p>
Fauna	<p>Clearing of vegetation within the infrastructure corridor will result in the loss of fauna habitat.</p> <p>This proposal was determined to be a controlled action under the EPBC Act due to the potential for it to impact on the Carnaby's Black Cockatoo, Rainbow Bee-Eater, White-bellied Sea-Eagle, Great Egret/White Egret, Cattle Egret, and the Fork-tailed Swift.</p> <p>Carnaby's Black Cockatoo is currently listed as Endangered under the EPBC Act and as a Schedule 1 species under the <i>Wildlife Conservation Act 1950</i>. Carnaby's Black Cockatoo was recorded once in the SENR during the Level 2 (detailed field) survey, and 26 individuals were seen feeding on Banksia sp. in the SENR during the Level 1 (reconnaissance) survey. The PER document indicated that as the vegetation in the SENR is similar to the adjacent natural vegetation of the project area, Carnaby's Black Cockatoos are likely to use both areas for feeding. Hence, it is likely that Carnaby's Black Cockatoos are regular seasonal visitors to the</p>	<p>Department of Environment and Conservation</p> <ol style="list-style-type: none"> 1. The potential impact of relocating fauna to adjacent 'occupied territories' needs to be assessed by a suitably qualified ecologist prior to implementation. 2. The proposal has the potential to significantly impact on Carnaby's Black-Cockatoo (<i>Calyptorhynchus latirostris</i>) foraging habitat. <p>Department of Environment and Conservation - Terrestrial Ecosystems Branch</p> <ol style="list-style-type: none"> 1. The PER fails to adequately assess the fauna assemblage in a regional 	<p>In view of the nature of the concerns that were raised in the comments that were received, the EPA considers that fauna is a relevant environmental factor. Fauna will be considered under the factor of Biodiversity.</p>

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	<p>local area, feeding in remnant native vegetation after travelling from inland breeding areas (such as Three Springs and Carnamah) to non-breeding, feeding areas closer to the coast.</p> <p>Surveys for Carnaby's Black Cockatoo undertaken by (Johnstone and Kirkby 2007, 2008) in the Eneabba Region found no evidence of breeding or any suitable breeding habitat in the region. The Carnaby's Black Cockatoos that were recorded were non-breeding autumn-winter visitors, and a flock of 300-350 birds was found to remain in the region for the entire autumn-winter period. The birds are also known to forage in both native vegetation and farmland. The PER document indicated that it is unlikely that the Carnaby's Black Cockatoo breeds within the project area or the SENR. The nearest known breeding area is located about 40 km south-east of the project area at Coomallo Nature Reserve.</p> <p>Kwongan heath is an important feeding resource for the Carnaby's Black Cockatoo. The small area of kwongan heath that will be cleared for the proposal will not significantly reduce available food resources or impact local populations as large areas of kwongan heath are also found in conservation estate in the region, such as the Beekeepers, Coomallo, Drovers, and Lesueur nature reserves. About 152,000 ha of suitable feeding habitat exists in conservation estate in the region. Clearing of vegetation for the proposal, including up to 30 ha in the SENR, is not anticipated to result in any significant direct or indirect adverse impact to the Carnaby's Black Cockatoo.</p> <p>The Rainbow Bee-Eater is currently listed as Migratory under the EPBC Act. This species has been recorded in numerous surveys in the Eneabba region, and is commonly found in the region. The Rainbow Bee-Eater migrates within Australia and up to Indonesia and New Guinea, and is found just about anywhere suitable for obtaining insects. Breeding occurs between October and December in both Australia and New Guinea. The Rainbow Bee-Eater nests in burrows which are dug, generally at a slight angle, on flat ground, sandy banks or cuttings, and frequently at the margins of tracks or roads.</p> <p>It is likely that the individuals recorded during the Level 2 detailed field survey of the project area in Spring 2007 were breeding visitors in view of the timing of the survey and the sandy soils in the region which are suitable for nest burrows. The removal of vegetation for the proposal, including up to 30 ha in the SENR, is not expected to significantly impact on the Rainbow Bee-Eater.</p> <p>The White-bellied Sea-Eagle, Eastern Great Egret (Great Egret), Cattle Egret, and the Fork-tailed Swift are all currently listed as Migratory under the EPBC Act. However, none of these species were recorded during surveys in the project area.</p> <p>The White-bellied Sea-Eagle is unlikely to be impacted by the proposal as it is restricted to coastal habitats which do not occur within the project area. The Eastern Great Egret has been recorded in the region and is commonly found in shallow fresh and saline waters, neither of which are found in the project area. Given the lack of suitable habitat it is unlikely to be present in the project area. The Cattle Egret has not been previously recorded in the region and it is not expected to be impacted by the proposal as suitable habitat areas can be found in surrounding farmland. The Fork-tailed Swift spends winter in Australia after breeding in China and Mongolia and has been previously recorded in the Lesueur area. This species is unlikely to be adversely impacted by the proposal as it is expected to be an infrequent visitor to the project area that would not directly utilise the habitats within it.</p> <p>The Rufous Fieldwren is currently listed as a Priority 4 species on the DEC Declared Threatened and Priority Fauna List. This species was recorded in kwongan heath in two southern areas of</p>	<p>context. This is mainly compounded by major errors in the regional fauna data provided in Appendix C. For example the dataset ascribed to Dell et al. (1979) is not from this data source and includes an assemblage with many arid distributed species. All other data sets in this table need to be checked for accuracy and likely occurrence of species in the region of the project area.</p> <p>2. Until the fauna data is revised and corrected the Terrestrial Ecosystems Branch is not able to assess the likely impacts on the fauna of the project area.</p> <p>Department of Environment, Water, Heritage and the Arts</p> <p>1. It is unclear from the PERs, how impacts on the Carnaby's Black Cockatoo will be mitigated. Further clarification of the impact on the Carnaby's Black Cockatoo is required to allow the Minister to be able to make a decision on approval of the projects. This should include mitigation measures and whether off-sets for loss of Carnaby's Black Cockatoo foraging habitat will be proposed.</p> <p>2. It is unclear from the PERs how impacts on the EPBC species Rainbow Bee-eater will be addressed.</p>	

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	<p>the adjacent Central West Coal project area, and in the SENR. The Rufous Fieldwren breeds between July and October in ground level globular dome shaped nests. This species was once wide spread throughout most of the south-west of Western Australia. However, it is now restricted to remnant vegetation due to clearing. Habitat used by the Rufous Fieldwren will be cleared for the project and this species could be directly impacted during the nesting season between July and January as adults and fledglings may be unable to escape.</p> <p>Native fauna could become trapped in open pipeline trenches during construction of the gas pipeline lateral, and fauna mortality may result if trapped fauna are not removed in a timely manner or through drowning in flooded trenches.</p>		
POLLUTION			
Air quality	<p>The Coolimba Power Station would consist of two generating plants; a 450 MW coal-fired base-load plant and a 358 MW natural gas-fired peaking-load plant. These two plants would generate approximately:</p> <ul style="list-style-type: none"> • 15,324 tonnes of sulphur dioxide (SO₂) per year; • 6,598 tonnes of oxides of nitrogen (NO_x) per year; and • 626 tonnes of particulates (as PM₁₀) per year. <p>The Air Pollution Model (i.e. TAPM) was used for the air quality modelling for the proposal. The PER document indicates that there are uncertainties associated with the air quality modelling due to the limited availability of meteorological observations for the power station site, particularly at plume height. As a result of these uncertainties, the methodology that was used provided a conservative assessment in which the predicted ground level concentrations (GLCs) at nearby residential premises may not be accurate, but the range in predicted GLCs in the areas around the power station should adequately represent the expected range in predicted maximum GLCs.</p> <p>Cumulative air quality modelling indicates that GLCs for NO_x, PM₁₀, CO, and SO₂ would be below the National Environmental Protection Measure (NEPM) standards when the power station operates in isolation at full capacity under normal conditions.</p> <p>The most significant atmospheric emission would be SO₂. The main source of SO₂ would be the 450 MW coal-fired base-load generation plant.</p> <p>A desulphurisation process would be used to minimise SO₂ emissions via the injection of limestone into the circulating fluidised bed (CFB) boiler furnaces. The estimated SO₂ removal efficiency is approximately 85 to 87.7%.</p> <p>The SO₂ stack emission concentration would be below 1,100 mg/Nm³ for 90% of the time and between 1,100 - 1,500 mg/Nm³ for 10% of the time, under normal operating conditions (at 6% O₂ reference level). The current European Directive 2001/80/EC SO₂ emission limit for new solid fuelled boilers with a thermal input of greater than 300 MW is 200 mg/Nm³ (at 6% O₂ reference level).</p> <p>With the power station operating in isolation, modelling predicts that the maximum 1-hour average GLC for SO₂ at any location within the modelled domain would be about 544 µg/m³, which is approximately 95% of the NEPM standard of 570 µg/m³. The predicted maximum 1-hour average GLC for SO₂ is predicted to be between 100 to 400 µg/m³ (i.e. between 17 to 70%</p>	<p>Department of Environment and Conservation - Air Quality Management Branch</p> <ol style="list-style-type: none"> 1. We have looked at the new Appendix N only to the extent of being satisfied that Katestone has made all the agreed changes and the associated conclusions are valid. Significant excerpts from the appendix are (underlines and bolding added): <p>Page 24 - Due to the <u>limited availability of meteorological observations for the power station site, particularly at plume height, the validation assessment is not conclusive</u>. The model used for this assessment, TAPM, has been validated in many situations and has been proven as a suitable model for modelling tall stack sources. However, there is insufficient information at the site to conclude that the local phenomena exclusive to the CPP site are adequately characterised by the model. <u>Due to these uncertainties this assessment presents a range in possible impacts in general areas and has assessed compliance with the maximum exposure regardless of location</u>.</p> <p>Page 30 - This methodology will provide a conservative assessment as the uncertainties in the modelling should be outweighed by the relaxation of spatial constraints. That is, the exact predictions at key receptors may not be accurate, but the range in predictions in the general areas should adequately represent the expected range in predicted maximum ground level concentrations due to the operation of the power station. <u>Prior to commissioning of the power station additional studies should be conducted to verify the model predictions</u>.</p> 2. Commitment 7 relates to the installation of a meteorological station and review of the modelling using onsite met data. The commitment fails to include the critical point, namely the need to measure upper winds (plume height winds) in order to test and improve model validity. <p>Commitments 8 and 9 are vague and inadequate. AQMB recommends, in light of the uncertainty caused by inadequate information, that if the project is to proceed, the proponent be required to conduct a program which will include:</p> <ul style="list-style-type: none"> • a comprehensive meteorological station for plume dispersion, including a sodar or better for upper wind measurement (plume height); 	In view of the nature of the concerns that were raised in the comments that were received, the EPA considers that air quality is a relevant environmental factor.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	<p>of the NEPM standard) near sensitive receptors. The 1-hour average GLC for SO₂ near Eneabba is predicted to be about 200 µg/m³, which is approximately 35% of the NEPM standard.</p> <p>Modelling predicts that the maximum 24-hour average GLC for SO₂ at any location within the modelled domain would be about 100 µg/m³, which is approximately 43% of the NEPM standard of 230 µg/m³. The predicted maximum 24-hour average GLC for SO₂ is predicted to be between 30 to 60 µg/m³ (i.e. between 13 to 26% of the NEPM standard) near a sensitive receptor. The 24-hour average GLC for SO₂ near Eneabba is predicted to be about 30 µg/m³, which is approximately 13% of the NEPM standard.</p> <p>Additional air quality modelling was undertaken to assess the effect of the desulphurisation system not operating for 1%, 2%, and 5% of the year. The results indicate that if the desulphurisation system does not operate for 1% or 2% of the year, up to two exceedances per year of the NEPM 1-hour average standard are likely in areas to the north, north-east, east, and west of the power station. There are no predicted exceedances at any nearby sensitive receptors or in the town of Eneabba. However, should the desulphurisation system not operate for 5% of the year the NEPM standard is likely to be exceeded once per year up to 15 km from the power station, and up to five times per year closer to the power station. The NEPM standard is predicted to be exceeded once per year at any nearby sensitive receptors located within 15 km of the power station. There are no predicted exceedances in the town of Eneabba.</p> <p>NO_x (as NO₂) and particulate (as PM₁₀) stack emission concentrations from the coal-fired base-load generation plant would be 500 mg/Nm³ and 50 mg/Nm³, respectively, under normal operating conditions (at 6% O₂ reference level). The current European Directive 2001/80/EC emission limits for NO_x (as NO₂) and dust emissions for new plants are 200 mg/Nm³ and 30 mg/Nm³, respectively (at 6% O₂ reference level).</p> <p>The gas turbine units within the natural gas-fired peaking-load generation plant would use low NO_x burners that would produce a stack NO_x emission concentration of about 25 ppmv (at 15% O₂ reference level) under normal operating loads, which is in accordance with EPA Guidance Statement No.15 - Emissions of Oxides of Nitrogen from Gas Turbines.</p>	<ul style="list-style-type: none"> • a program of radiosondes or alternative temperature profiling (after commissioning); • anemometers for mine and on escarpment; • and two SO₂ monitoring stations with anemometers. <p>The comprehensive meteorological station and sodar should be installed ASAP for a review of modelling and HRA, which should be completed prior to construction so the results can be taken into account as necessary in plant design.</p> <p>3. Given the demonstrated potential for exceedances of the SO₂ NEPM standard to increase proportionally with desulfurisation downtime, there is a need for the proponent to operate the power station so as to limit desulfurisation downtime to say 1% of the time. The emissions of SO₂ without desulphurisation are very large.</p> <p>Department of Environment and Conservation - Terrestrial Ecosystems Branch</p> <p>1. Were dust issues from the proposal assessed in light of the Iluka operations to the east of the proposal area? Cumulative impact from dust may pose an unacceptable scenario.</p> <p>Department of Health</p> <p>1. Dust exceedances at nearby receptors remain a concern with both projects. The proponent should ensure that the proposed dust management and monitoring plans are implemented in a timely fashion and comply with DEC reporting requirements. It would be appropriate for DEC to develop strategies which can provide feedback to DOH on the implementation of the Dust Management Plan and should circumstances arise where health standards may be breached, to include DOH in response processes.</p> <p>Conservation Council of Western Australia Inc</p> <p>1. CCWA is concerned about the impacts of sulfur emissions from the power station on this local and regional vegetation in the form of localised acid-rain.</p> <p>Public</p> <p>1. The, release of pollutants from the burning of the coal in the power station needs to be managed and monitored to ensure no adverse impacts in the local area. Please provide more detail on operational monitoring plan for stack emissions.</p> <p>This area is an international biodiversity hotspot any emissions from the power station/mine should be minimised to reduce impact on the natural ecosystem.</p>	

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		<p>2. Emissions from the power station stack will need to be frequently monitored as easterly winds blow directly from the site over the township of Leeman.</p> <p>Why are there no monitoring sites for dust, particulates and air borne emissions in Leeman?</p>	
Noise	<p><i>Construction noise</i></p> <p>The PER document indicated that construction activities during the three year construction period are not expected to result in significant exceedances of applicable noise criteria at nearby residential premises if industry standard noise attenuation measures are employed. However, no information was provided to confirm that this would be the case.</p> <p><i>Operational noise</i></p> <p>Operation of the power station would generate noise. Noise modelling considered the noise generated by the power station both in isolation, and cumulatively with noise generated by the adjacent Central West Coal Project mine operations.</p> <p>The modelling predicted that, under worst case meteorological conditions, the night time noise level at the nearest residential premises located approximately 2 km south-west of the power station would be 38.8 dB(A), due solely to the power station. This is 3.8 dB(A) above the applicable L_{A10} level of 35 dB(A) assigned under the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p>Cumulative modelling predicted that, under worst case meteorological conditions, the night time noise level at the nearest residential premises would be 40.6 dB(A). This is 5.6 dB(A) above the applicable night time L_{A10} level of 35 dB(A) and 0.6 dB(A) above the applicable level of 40 dB(A) for Sundays and public holidays between 9:00 am and 10:00 pm and for all days between 7:00 am and 10:00 pm, assigned under the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p>The main contributors to the predicted exceedances at the nearest residential premises are noise from the gas turbines, coal-fired boilers, and the cooling towers. In order to ensure compliance with applicable criteria the proponent has indicated that the gas turbine generator packages would be specified at 105 dB(A) which is a 10 dB less than the sound power level assumed in the noise modelling. The coal-fired boilers would be specified at 106 dB(A) which is 10 dB less than assumed in the noise modelling. Each bank of cooling towers would be specified at 101 dB(A) which is 3 dB less than assumed in the noise modelling.</p> <p>The required noise reductions could be achieved by using typical noise attenuation measures such as installing acoustic enclosures over the gas turbines, installing high performance silencers on the air inlets, exhausts, and ventilation systems of the gas turbines, using acoustic cladding on the coal-fired boilers, and using low noise fans for the cooling towers and/or variable speed fan drives to enable fan running speeds to be reduced, particularly at night.</p> <p>Noise levels from the power station would be monitored during commissioning to validate the predictions derived from the noise modelling. Should noise levels exceed applicable levels the proponent would investigate additional design measures to reduce noise to acceptable levels.</p>	<p>Department of Environment and Conservation - Noise Regulation Branch</p> <p>1. Noise Branch would again recommend the condition at the works approval and licensing stages that the proponent redo the noise impacts assessment and demonstrate the noise compliance when the detailed design information is available.</p>	<p>In view of the predicted exceedance of applicable night time noise level criteria and the DEC comments, the EPA considers that noise is a relevant environmental factor.</p>
Greenhouse gas emissions	<p>The Coolimba Power Station would generate about 4,227,432 tonnes of CO_{2-e} per year. The main sources are:</p> <ul style="list-style-type: none"> 3,776,074 tonnes of CO_{2-e} per year from the 450 MW coal-fired base-load generation plant; 	<p>Department of Environment and Conservation - Office of Climate Change</p> <p>1. A combined-cycle gas turbine has a lower GHG emission intensity and therefore is considered best practice technology for gas-fired power stations.</p>	<p>In view of the nature of the concerns that were raised in the comments that were received, the EPA considers that greenhouse gas</p>

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	<ul style="list-style-type: none"> • 438,290 tonnes of CO_{2-e} per year from the 358 MW natural gas-fired peaking-load generation plant; and • 13,068 tonnes of CO_{2-e} per year from the combustion of liquid fuel (diesel) for the removal and disposal of boiler ash, delivery of limestone for flue gas desulphurisation, and coal and limestone stockpile management. <p>The power station will be designed and constructed to be carbon capture and storage (CCS) ready in general accordance with the IEA definition of carbon capture ready as follows:</p> <p><i>“A CO₂ capture-ready power plant is a plant which can include CO₂ capture when the necessary regulatory or economic drivers are in place. The aim of building plants that are capture-ready is to avoid the risk of stranded assets or ‘carbon lock-in’.</i></p> <p><i>Developers of capture-ready plants should take responsibility for ensuring that all known factors in their control that would prevent installation and operation of CO₂ capture have been eliminated.</i></p> <p><i>This might include:</i></p> <ul style="list-style-type: none"> - <i>A study of options for CO₂ capture retrofit and potential pre-investments</i> - <i>Inclusion of sufficient space and access for the additional facilities that would be required</i> - <i>Identification of reasonable route(s) to storage of CO₂” (IEA, 2007).</i> <p>A regional study of the CO₂ geosequestration potential in the Northern Perth Basin surrounding the power station site has been undertaken by the Cooperative Research Centre for Greenhouse Gas technologies (CO₂CRC). The results from this study indicate that several potential sites in depleted gas fields in the region have an estimated contingent storage capacity of 21.1 to 40.5 million tonnes of CO₂. The study also indicated that deep saline formations in the region have an estimated prospective storage capacity of 167 to 512 million tonnes of CO₂.</p> <p>The proponent will verify the availability and suitability of CO₂ transport and storage facilities for the project, and will complete a number of feasibility studies prior to and following commissioning to aid decision making in relation to the conversion to CCS.</p> <p>The coal-fired base-load generation plant, which consists of three 150 MW units, is expected to have a worst case thermal efficiency of approximately 32.8% [sent-out, higher heating value (HHV)]. The PER document indicates that the applicable world best practice thermal efficiency figure of 37.7% obtained from the Technical Guidelines Generator Efficiency Standards (AGO, 2001) becomes approximately 36% when corrected to account for the properties of the coal that would be used in the power station.</p> <p>The natural gas-fired peaking-load generation plant’s net thermal efficiency of about 33% (HHV) is consistent with the indicative value of 33.1% (HHV) for new open cycle gas turbine (OCGT) units provided in the Technical Guidelines Generator Efficiency Standards (DEH AGO, 2006).</p> <p>The PER document indicates that the OCGT units in the natural gas-fired peaking-load generation plant will be converted to base-load units once the power station is ready to convert</p>	<p>The Coolimba power station project should be required to adopt best practice technology; otherwise, strong justification needs to be provided.</p> <ol style="list-style-type: none"> 2. The OCC supports the proponent's efforts to ensure that the plant is made CCR as carbon dioxide capture and geosequestration holds the largest potential for GHG mitigation for a coal fired power station. 3. The OCC recommends that the proponent be required to assess its pre-investment options against the guidance outlined in Sections 7 to 10 of the International Energy Agency's CO₂ Capture Ready Plants. The section(s) relevant to the proponent's preferred technology for carbon capture should be used. Decisions on the adoption or otherwise of each pre-investment option are to be justified. 4. A plant that is carbon capture ready is pointless without the identification of a suitable geosequestration site capable of sequestering the captured carbon dioxide gas. The OCC is concerned that the proponent has yet to identify a site with the capacity to sequester the total captured carbon dioxide. The three depleted gas reservoirs have a total capacity of 40 million (tonnes, translating to approximately 12 years of the coal fired power plant's carbon dioxide emissions. Although the study concludes that there are several deep saline reservoirs with total capacity of 500 million tonnes, the PER does not provide details on the capacity of each reservoir. <p>Using multiple geosequestration sites is likely to increase the cost of carbon capture and storage (CCS). The proponent should identify one or a few suitable storage sites each capable of storing all of the coal-fired power plant's captured carbon dioxide gas over its lifespan. Once the preferred site(s) is identified, the proponent's decision should be peer-reviewed by an independent third party.</p> <ol style="list-style-type: none"> 5. The proponent has yet to identify a site with the capacity to sequester the total captured carbon dioxide. 6. The proponent should also assess potential route(s) to preferred geosequestration site(s) and identify any potential barriers to using their preferred site(s). 7. The proponent should be required to submit the feasibility study and any updates to the EPA for approval and inclusion in the EPA's assessment of the economic and technical feasibility of CCS. If a fully functional emissions trading scheme is not in place when CCS is judged feasible by the EPA, the proponent should be required to retrofit CCS to the project's full capacity within a set timeframe. 8. Prior to CCS implementation, the OCC recommends that the proponent refer the proposal to the EPA to ensure that all environmental impacts have been adequately addressed and monitoring and contingency plans are adequate. 9. The proponent should indicate when the CCS technology will be available and applied to the project. 	<p>emissions is a relevant environmental factor.</p>

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	to CCS.	<p>10. The proponent should also explain how the plant's CO₂ emissions during the interim period (from start-up to post CCS application), will comply with the Australian Government's objective to reduce carbon emissions.</p> <p>Department of Environment and Conservation - Terrestrial Ecosystems Branch</p> <ol style="list-style-type: none"> 1. It is also not clear if line losses from transmission is included in the GHG calculation. This is a cumulative amount that should be calculated to fully assess the project impact. 2. Only a staged process to investigate the potential for geosequestration is presented as GHG mitigation, many other actions are available to reduce carbon impact and should be investigated and adopted by the proponent. <p>Conservation Council of Western Australia Inc</p> <ol style="list-style-type: none"> 1. The appropriateness of the fuel being used. 2. CCWA is opposed to the development of the Central West Coal Project and the Coolimba Power Station Project by Aviva Corporation Ltd due to the dangers of greenhouse gas pollution generated by the coal mine and power station. 3. The Central West Coal Mine and the Coolimba Power Station will generate 4.05 Mt CO₂ per year which is approximately 5% of WA's current greenhouse gas emissions and 27% of the State's emissions from electricity generation. These figures represent significant contributions to the level of Western Australia's greenhouse gas pollution. The Coal feedstock that is proposed is significantly more emissions intensive than WA benchmark Collie coal, and the subsequently, the emissions intensity of the proposed power station (approx 1315 kg/MW hour) will be significantly worse than, for example, Collie A power station (951 kg CO₂-e/MW hr) and significantly worse than the average emissions intensity for the SWIS (910 kg CO₂-e/MW hr). 4. The proponent has indicated that the project will be Carbon Capture and Storage (CCS) 'ready', but has failed on several points to provide certainty that the CCS technology will ever be implemented. The proponent has failed to adequately address the following fundamental factors that would be necessary at a minimum to provide certainty to claims about the viability of CCS for this project: <ol style="list-style-type: none"> a) Whether Carbon Capture and Storage (CCS) is actually feasible in this location, including whether suitable geological formations exist to permanently store CO₂; b) Exactly what circumstances would provide the 'trigger point' for moving to full CCS operation; c) In the event that CCS is not feasible, what other options for offsetting emissions from the power station will be used. 	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
		<p>Greenpeace Australia Pacific</p> <ol style="list-style-type: none"> The appropriateness of the fuel being used. <p>Wildflower Society of Western Australia (Inc)</p> <ol style="list-style-type: none"> The fact that it will be constructed so that it will be ready for carbon capture and storage is a nonsense as this technology is still being researched and it may never be available during the life of the power station and almost certainly would not be economic to install and operate even if it is technically feasible. <p>Public</p> <ol style="list-style-type: none"> The need to burn coal to produce power with current Greenhouse gas concerns. Gas fired stations are generally much more efficient and cleaner. These could also be located closer to where the power is needed, reducing transmission losses. The proponent states that in the event of CCS coming on line, there will be 'provision for additional generation capacity to supply the considerable energy load of a CCS plant' establishing the firm possibility of increased power costs for the consumer. Is there a plan for the gradual introduction of CCS, is the idea practical or just conceptual at this stage? Is CCS being tested, demonstrated or modelled anywhere at present? Who holds the intellectual property rights for CCS? 	
Surface water and groundwater	<p><i>Surface water</i></p> <p>The power station is located within the Erindoon Creek and Bindoon Creek drainage lines. The infrastructure corridor traverses the Bindoon Creek and Erindoon Creek drainage lines and enters the Hill River Catchment.</p> <p>The power station and associated evaporation pond area will result in surface water run-off within the upper Erindoon Creek drainage line catchment being isolated and obstructed. This is likely to result in water ponding along the southern edge of this catchment. Surface water run-off will be diverted around the power station into the Bindoon Creek drainage line via a 2 km long drain that will run adjacent to the southern end of the power station evaporation pond area.</p> <p>The power station and associated evaporation pond area will withhold approximately 0.73% of the water (rainfall) that would normally be captured within the Erindoon Creek drainage line catchment and subsequently enter Erindoon Creek.</p> <p>The modification of the regional surface water run-off regime has the potential to impact on the Lake Logue-Indoon System which is listed on the directory of Important Wetlands in Australia. Due to the relatively small size of the power station site and associated evaporation pond area, the impact is expected to be negligible.</p> <p><i>Groundwater</i></p> <p>The power station will require approximately 11 GL of water per year. The majority of this</p>	<p>Department of Environment and Conservation</p> <ol style="list-style-type: none"> No assessment of actual or potential acid sulphate soils that may be encountered during transmission tower foundation construction has been included. If foundations extend to 8 meters and include dewatering, issues may be encountered or created. <p>Department of Environment and Conservation - Midwest Region</p> <ol style="list-style-type: none"> The long term potential risk of AMD requires kinetic testing for accurate results. The currently available information from the proponent does not demonstrate that the potential risks to the mentioned GDEs are environmentally acceptable. <p>Department of Water</p> <ol style="list-style-type: none"> The PER provides a water balance for the project, however it lacks details relating to the water quality required for the various power plant uses. The water supplied from dewatering is expected to have an average salinity of 2,500 mg/L. The PER has not explained how potential increases in the salinity of the water from the mine can be tolerated in these power plant uses or will be managed. This may have implications for water licensing and the 	The EPA considers that the concerns that were raised have been adequately addressed by the responses provided by the proponent. In view of the above, the EPA considers that this environmental factor does not require further evaluation.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	<p>water will be obtained from dewatering activities at the adjacent Central West Coal Mine. Mine dewatering is predicted to provide only about 8 GL of water per year. The remaining portion of the annual water requirement (i.e. 3 GL per year) will be sourced by abstracting groundwater from the nearby Yarragadee or Cattamarra aquifers.</p> <p>The evaporation ponds will be lined in order to prevent wastewater from seeping into groundwater.</p>	<p>proponent is encouraged to fully consider the water requirements for the power station and how this will be managed. The proponent must consider having contingency measures in place should water sources fail to meet their needs.</p> <p>Public</p> <ol style="list-style-type: none"> 1. In the event of this cleaned mine water being insufficient quantity the proponents intend to abstract 3 GL/a from the Yarragadee aquifer. Approval for any abstraction from this important aquifer has not been addressed. When is this likely to occur? 2. Particular care should be taken to monitor groundwater for depth changes and pollutant to reduce the impact the mine/power station will have in lowering the GW levels in the area. 	
<p>Liquid and solid waste disposal</p>	<p>Liquid and solid wastes that will be produced by the power station include saline wastewater, coal combustion ash (i.e. bottom ash and fly ash), saline solids from the evaporation ponds, scrap metal, tyres, wood, paper, various hydrocarbons, waste reagents, and domestic wastes.</p> <p>The bottom ash, fly ash, and saline solids from the evaporation ponds will be removed from the power station site and will be disposed of into the Central West Coal Mine void.</p>	<p>Department of Health</p> <ol style="list-style-type: none"> 1. There are general requirements for AVIVA - Central West Coal Project and the Coolimba Power Project to control pests (weeds, plant pathogen, vermin, vectors, feral animals etc) on the site. AVIVA's proposal has identified the presence of weeds, dieback and feral animals at the site and highlighted the issues related to clearing of the land (vegetation), and that increased activity around the power station and surrounding area from personnel and vehicles will increase feral animals, vermin and the spread of weed and dieback. AVIVA has drafted an Environmental Management Plan to implement controls to deal with these pests. <p>It is expected that any treatment and application of pesticides must be applied in accordance with the Health (Pesticides) Regulations 1956. In addition, contractors, persons who are applying the pesticides for reward must be appropriately trained and hold a current Pesticide License and be employed by a Registered Commercial Pest Firm. However, if the proponent company wishes its own employees to apply pesticide(s) as part of their Pest Management Program, then the employees should be provided with sufficient knowledge, skills, training and the personal protective equipment to safely apply the pesticide(s). Furthermore the need to adequately store handle pesticides on site should adhere to the AS 2507:1998 Australian Standard for the storage and handling of agricultural and veterinary chemicals.</p> <p>AVIVA's Environmental Management Plan should include development, implementation, monitoring and evaluating processes for the prevention and control of pests (such as weeds weed pathogens, vectors, vermin, Feral animals etc) and must include education of all employees, contractors, visitors and the public to the site.</p> <p>Education should cover proper disposal of waste material, limiting access to nonessential tracks and ensure good hygiene practices are used to prevent pests being conveyed and attracted to operational site activities.</p>	<p>The EPA considers that the concerns that were raised have been adequately addressed by the responses provided by the proponent. In view of the above, the EPA considers that this environmental factor does not require further evaluation.</p>

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
		<p>Public</p> <ol style="list-style-type: none"> If the 150 hectare ponds are bunded and lined where are the monitoring practices outlined in the environmental review? How safe are these ponds in the event of a 50 or 100 year weather events? How will the underground aquifers and adjoining creeks be monitored over the life of the project? Fluidized Gas Boilers will produce an unspecified amount of organic sulphur particulates which are to be buried in the spoil. 	
SOCIAL SURROUNDINGS			
Visual amenity	The proposed power station and associated 330 kV electricity transmission line will be visible to nearby residents and transient receptors travelling along local roads and the Brand Highway.	<p>Department of Environment and Conservation</p> <ol style="list-style-type: none"> The proposal does not address impacts on landscape and visual amenity. <p>Department of Environment and Conservation - Terrestrial Ecosystems Branch</p> <ol style="list-style-type: none"> No assessment is given to the visual impact of the transmission line. Given that this is a low vegetative form and gently undulating landscape, 40 m towers would pose a significant visual impact, particularly where they cross a major tourist road. 	The EPA considers that the concerns that were raised have been adequately addressed by the responses provided by the proponent. In view of the above, the EPA considers that this environmental factor does not require further evaluation.
Heritage	<p>An aboriginal heritage survey did not identify any features of ethnographic significance within the project area..</p> <p>No European heritage features were identified within the project area.</p> <p>The South Eneabba Nature Reserve is listed on the Australian Heritage Places Database.</p>	<p>Department of Indigenous Affairs</p> <ol style="list-style-type: none"> Locations, which have been identified as significant to the Aboriginal community in the report, need to be submitted on site forms and sent to the Registrar of Sites in DIA. Should cultural material be discovered during the project, work should cease immediately and the site should be recorded and the DIA notified. 	The EPA considers that the concerns that were raised have been adequately addressed by the responses provided by the proponent. In view of the above, the EPA considers that this environmental factor does not require further evaluation.
Traffic	Construction and operation of the proposed power station would result in an increase in traffic movements on local roads in the area.	<p>Shire of Coorow</p> <ol style="list-style-type: none"> The Shire of Coorow disputes that the roads would have the spare capacity to carry this volume of traffic with out a major reconstruction or sealing of the Penn and Erindoon Roads with in the Shire of Coorow. These roads have been only constructed to small traffic volumes of 30 to 45 vehicles per day. The current materials make these roads slippery during the winter months and the Penn road intersection is closed annually due to heavy rainfall events washing out the access. Council would have made its current traffic counts available to the consultants if requested. <p>The Shire of Coorow would like a commitment that the proponents would assist Council in lifting the quality of these roads to a bitumen standard as the road would not require upgrading without the expected level of traffic movements.</p>	The EPA considers that the concerns that were raised have been adequately addressed by the response provided by the proponent. In view of the above, the EPA considers that this environmental factor does not require further evaluation.

PRINCIPLES		
Principle	Relevant Yes/No	If yes, Consideration
<p>1. The precautionary principle <i>Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In application of this precautionary principle, decisions should be guided by -</i></p> <p>a) <i>careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and</i></p> <p>b) <i>an assessment of the risk-weighted consequences of various options.</i></p>	Yes	The proposal has the potential to impact flora, vegetation, and fauna. Therefore, monitoring and management measures should be implemented to detect changes and avoid significant impact. The EPA has recommended that a number of conditions be imposed on the proponent to manage the impacts on flora, vegetation, and fauna.
<p>2. The principle of intergenerational equity <i>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.</i></p>	Yes	The EPA has considered the impact of the proposal on the health, diversity and productivity of the environment. Biodiversity is a relevant environmental factor in this EPA assessment report. The EPA has recommended that a number of conditions be imposed on the proponent to manage the impacts on flora, vegetation, and fauna.
<p>3. The principle of the conservation of biological diversity and ecological integrity <i>Conservation of biological diversity and ecological integrity should be a fundamental consideration.</i></p>	Yes	The proposal would result in the loss of approximately 49 ha of remnant/native vegetation and has the potential to affect biological diversity and ecological integrity. Biodiversity is a relevant environmental factor addressed in this report.
<p>4. Principles relating to improved valuation, pricing and incentive mechanisms</p> <p>(1) <i>Environmental factors should be included in the valuation of assets and services.</i></p> <p>(2) <i>The polluter pays principles - those who generate pollution and waste should bear the cost of containment, avoidance and abatement.</i></p> <p>(3) <i>The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.</i></p> <p>(4) <i>Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solution and responses to environmental problems.</i></p>	Yes	The proponent would be required to manage the gaseous and particulate emissions (including greenhouse gases), noise emissions, and liquid and solid wastes generated by the proposed development. The proponent should bear the costs associated with meeting their obligations in this regard.
<p>5. The principle of waste minimisation <i>All reasonable and practicable measures should be taken to minimize the generation of waste and its discharge into the environment.</i></p>	Yes	The proposal would generate gaseous, particulate, liquid and solid wastes. Hence, the proponent would be expected to address the waste hierarchy and minimise the generation of unavoidable wastes. The EPA has recommended that a number of conditions be imposed on the proponent to minimise gaseous and particulate emissions (including greenhouse gases).

Appendix 4

Identified Decision-making Authorities and Recommended Environmental Conditions

Identified Decision-making Authorities

Section 44(2) of the *Environmental Protection Act 1986* (EP Act) specifies that the EPA's report must set out (if it recommends that implementation be allowed) the conditions and procedures, if any, to which implementation should be subject. This Appendix contains the EPA's recommended conditions and procedures.

Section 45(1) requires the Minister for Environment to consult with decision-making authorities, and if possible, agree on whether or not the proposal may be implemented, and if so, to what conditions and procedures, if any, that implementation should be subject.

The following decision-making authorities have been identified for this consultation:

Decision-making Authority	Approval
1. Department of Environment and Conservation	Works Approval and Licence under Part V of the <i>Environmental Protection Act 1986</i> .
2. Shire of Carnamah	Decision maker for permits and development approvals
3. Shire of Coorow	Decision maker for permits and development approvals.
4. Minister for Indigenous Affairs	Aboriginal Heritage Act - Section 18 clearances.
5. Minister for Mines and Petroleum	Construction and operation of gas pipeline lateral.
6. Minister for Water	Water abstraction licence under the <i>Rights in Water and Irrigation Act 1914</i> .
7. Coordinator of Energy	Energy policy.

Note: In this instance, agreement is only required with DMA's 4-6 since these DMA's are Ministerial DMA's.

RECOMMENDED ENVIRONMENTAL CONDITIONS

**STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
(PURSUANT TO THE PROVISIONS OF THE
ENVIRONMENTAL PROTECTION ACT 1986)**

**COOLIMBA POWER STATION PROJECT
SHIRE OF CARNAMAH AND SHIRE OF COOROW**

Proposal: The proposal is for the construction and operation of a power station comprising of a nominal 450 MW coal-fired base-load generation plant and a nominal 358 MW natural gas-fired peaking-load generation plant on a site located approximately 15 km south-south-west of Eneabba. The proposal also involves the establishment of an approximately 20 km long and 100 m wide infrastructure corridor that will accommodate the construction and operation of a natural gas pipeline lateral to connect the power station to either the Dampier to Bunbury Natural Gas Pipeline or the Parmelia Gas Pipeline, and a 330 kV electricity transmission line to connect the power station to the external electricity network at the proposed Eneabba Substation.

The proposal is further documented in Schedule 1 of this statement.

Proponent: Coolimba Power Pty Ltd

Proponent Address: Suite 4, Level 3, South Shore Centre, 83-85 The Esplanade, SOUTH PERTH WA 6151

Assessment Number: 1697

Report of the Environmental Protection Authority: 1350

The proposal referred to in the above report of the Environmental Protection Authority may be implemented. The implementation of that proposal is subject to the following conditions and procedures:

1 Proposal Implementation

1-1 The proponent shall implement the proposal as documented and described in schedule 1 of this statement subject to the conditions and procedures of this statement.

Published On

2 Proponent Nomination and Contact Details

- 2-1 The proponent for the time being nominated by the Minister for Environment under sections 38(6) or 38(7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal.
- 2-2 The proponent shall notify the Chief Executive Officer (CEO) of the Office of the Environmental Protection Authority of any change of the name and address of the proponent for the serving of notices or other correspondence within 30 days of such change.

3 Time Limit of Authorisation

- 3-1 The authorisation to implement the proposal provided for in this statement shall lapse and be void five years after the date of this statement if the proposal to which this statement relates is not substantially commenced.
- 3-2 The proponent shall provide the CEO of the Office of the Environmental Protection Authority with written evidence which demonstrates that the proposal has substantially commenced on or before the expiration of five years from the date of this statement.

4 Compliance Reporting

- 4-1 The proponent shall prepare and maintain a compliance assessment plan to the satisfaction of the CEO of the Office of the Environmental Protection Authority.
- 4-2 The proponent shall submit to the CEO of the Office of the Environmental Protection Authority the compliance assessment plan required by condition 4-1 at least 6 months prior to the first compliance report required by condition 4-6, or prior to ground disturbing activity, whichever is sooner. The compliance assessment plan shall indicate:
 - 1 the frequency of compliance reporting;
 - 2 the approach and timing of compliance assessments;
 - 3 the retention of compliance assessments;
 - 4 the method of reporting of potential non-compliances and corrective actions taken;
 - 5 the table of contents of compliance assessment reports; and
 - 6 public availability of compliance assessment reports.
- 4-3 The proponent shall assess compliance with conditions in accordance with the compliance assessment plan required by condition 4-1.

- 4-4 The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the CEO of the Office of the Environmental Protection Authority.
- 4-5 The proponent shall advise the Chief Executive Officer of the Office of the Environmental Protection Authority of any potential non-compliance within seven days of that non-compliance being known.
- 4-6 The proponent shall submit to the CEO the first compliance assessment report fifteen months from the date of issue of this Statement addressing the twelve month period from the date of issue of this Statement and then annually from the date of submission of the first compliance report. The compliance assessment report shall:
- 1 be endorsed by the proponent's Managing Director or a person delegated to sign on the Managing Director's behalf;
 - 2 include a statement as to whether the proponent has complied with the conditions;
 - 3 identify all potential non-compliances and describe corrective and preventative actions taken;
 - 4 be made publicly available in accordance with the approved compliance assessment plan; and
 - 5 indicate any proposed changes to the compliance assessment plan required by condition 4-1.

5 Performance Review and Reporting

- 5-1 The proponent shall submit to the CEO of the Office of the Environmental Protection Authority a Performance Review Report at the conclusion of the first, second, fourth, sixth, eighth and tenth years after the start of implementation and then at five yearly intervals which addresses:
1. the major environmental risks and impacts; the performance objectives, standards and criteria related to these; the success of risk reduction/impact mitigation measures and results of monitoring related to management of the major risks and impacts;
 2. the level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology; and
 3. improvements gained in environmental management which could be applied to this and other similar projects.

5-2 The Performance Review Reports shall be to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority.

6 Infrastructure Corridor

6-1 The proponent shall not establish the infrastructure corridor within the South Eneabba Nature Reserve.

6-2 The proponent shall ensure that there is no loss of plants of Declared Rare Flora (DRF) species due to construction activities within the project area.

6-3 Prior to construction, the proponent shall provide details of a revised infrastructure route and associated environmental impacts to the satisfaction of the CEO of the Office of the Environmental Protection Authority, on advice of the Department of Environment and Conservation.

6-4 Construction of infrastructure within the revised corridor shall not be implemented until approved by the CEO of the Office of the Environmental Protection Authority.

6-5 The proponent shall ensure that activities associated with the proposal do not introduce *Phytophthora cinnamomi* (dieback) into areas of remnant native vegetation or into the South Eneabba Nature Reserve.

7 Rehabilitation

7-1 The proponent shall undertake rehabilitation to achieve the following outcomes:

1. The project area shall be non-polluting and shall be constructed so that its final shape, stability, surface drainage, resistance to erosion and ability to support local native vegetation are comparable to natural landforms within the local area.
2. Native vegetation areas disturbed through implementation of the proposal, shall be progressively rehabilitated with vegetation composed of native plant species of local provenance (defined as seed or plant material collected within 10 kilometres of the proposal).
3. Areas not currently supporting native vegetation shall be revegetated to the original land use or a use approved by the CEO of the Office of the Environmental Protection Authority.
4. The percentage cover of living vegetation in all rehabilitation areas shall be comparable with that of nearby undisturbed land of the same land use type.
5. No new species of weeds (including both declared weeds and environmental weeds) shall be introduced into the area as a result of the implementation of the proposal.

6. The coverage of weeds (including both declared weeds and environmental weeds) within the rehabilitation areas shall not exceed that identified in baseline monitoring undertaken prior to the commencement of operations, or exceed that existent on comparable, nearby land which has not been disturbed during implementation of the proposal, whichever is less.
- 7-2 Rehabilitation activities shall continue until such time as the requirements of condition 7-1 are demonstrated by inspections and reports to have been met, for a minimum of five years to the satisfaction of the CEO of the Office of the Environmental Protection Authority on advice of the Department of Environment and Conservation.

8 Fauna

- 8-1 The proponent shall limit the length of open trenches associated with the construction of the gas pipeline lateral to a maximum of 2.5 kilometres at any time.
- 8-2 Fauna refuges are to be placed in the trenches at intervals not exceeding 50 metres.
- 8-3 The proponent shall employ at least two “fauna-clearing people” to remove fauna from the trenches.
- 8-4 Inspection and clearing of fauna from trenches by fauna clearing people shall occur at least twice daily and not more than half an hour prior to backfilling of trenches, with the first daily inspection and clearing to begin no later than 3.5 hours after sunrise, and the second inspection and clearing begin daily between the hours of 3:00 pm and 6:00 pm.
- 8-5 In the event of rainfall, the proponent shall, following the clearing of fauna from the trenches, pump out any pooled water in the open trenches (with the exception of groundwater) and discharge it via a mesh (to dissipate energy) to adjacent vegetated areas.
- 8-6 Within 14 days following completion of the construction of the gas pipeline lateral, the proponent shall provide a report on fauna found, both dead and alive, within the gas pipeline corridor to the CEO of the Office of the Environmental Protection Authority.

9 Air Quality

- 9-1 The proponent shall limit the sulphur dioxide (SO₂), oxides of nitrogen (NO_x) (as nitrogen dioxide (NO₂)) and particulate (as PM₁₀) stack emission concentrations from the coal-fired base-load generation plant to the respective limits of 200 mg/Nm³, 200 mg/Nm³, and 30 mg/Nm³ (at 6% O₂ reference level) prescribed in European Directive 2001/80/EC.

- 9-2 The proponent shall limit the downtime of the desulphurisation system in the coal-fired base-load generation plant to a maximum of 1% of the time that the plant is operating.
- 9-3 The proponent shall develop and implement, in consultation with the Department of Environment and Conservation, a meteorological monitoring program that includes:
1. the installation of a comprehensive meteorological station for plume dispersion, including a SODAR (sonic detection and ranging) system or better for upper wind measurement at plume height, prior to construction;
 2. a program of radiosondes or alternative temperature profiling;
 3. anemometers for the Central West Coal Mine and on the escarpment; and
 4. two SO₂ monitoring stations with anemometers.
- 9-4 Prior to construction, the proponent shall use the data collected by the instrumentation systems specified in condition 9-3 (1) and conduct a review of the air quality modelling and health risk assessment undertaken for the proposal (Katestone Environmental Pty Ltd (2009) Air Quality Impact Assessment for the Proposed Coolimba Power Project, Western Australia), and take the results obtained from the revised air quality modelling and health risk assessment into account as necessary in designing the power station. A report on the revised air quality modelling and health risk assessment shall be submitted to the CEO of the Office of the Environmental Protection Authority for consideration on advice of the Department of Environment and Conservation and the Department of Health, prior to construction.
- 9-5 Within two years following commissioning of the coal-fired base-load power station, the proponent shall use the data collected by the instrumentation systems specified in conditions 9-3 (1), (2), (3), and (4) to validate the air quality modelling required by condition 9-4 and update the health risk assessment. Within 30 months following commissioning, a report on the air quality modelling validation and updating of the health risk assessment shall be submitted to the CEO of the Office of the Environmental Protection Authority for consideration on advice of the Department of Environment and Conservation and the Department of Health.

10 Greenhouse Gas Abatement

- 10-1 The proponent shall carry out a feasibility study for carbon capture and storage implementation and advise the CEO of the Office of the Environmental Protection Authority of progress made towards the implementation of carbon capture and storage one year prior to commissioning of the coal fired power station, five years after commissioning and every three years after that.
- 10-2 The proponent shall retrofit carbon capture and storage to the full capacity of the coal fired power station within five years of the Environmental Protection

Authority concluding that carbon capture and storage is economically and technically proven.

10-3 The proponent shall design the coal-fired base-load generation plant to achieve best practice thermal efficiency in accordance with the Australian Greenhouse Office Technical Guidelines Generator Efficiency Standards, Version 2.1 (Australian Greenhouse Office, 2001) or any later revisions current at the time of the construction.

10-4 The proponent shall prepare and submit to the CEO of the Office of the Environmental Protection Authority a Greenhouse Gas Abatement Report, prior to the start of construction, which meets the following objectives:

1. demonstrates that maximising energy efficiency and opportunities for future energy recovery have been given due consideration in the design of the proposal;
2. ensures that the “greenhouse gas” intensity [i.e. quantity of carbon dioxide equivalents (CO_{2-e}) generated per MWh of electricity produced] is equivalent to, or better than benchmarked best practice; and
3. achieves continuous improvement in “greenhouse gas” intensity through the periodic review, and adoption of advances in technology and process management.

10-5 Conditions 10-2 to 10-4 continue to have effect and condition the implementation of the proposal until such time as it is determined that that they are non-complementary to any Commonwealth greenhouse gas emissions trading scheme in force in Western Australia and the Minister provides notice in writing of concurrence with this determination.

11 Decommissioning

11-1 Prior to undertaking ground-disturbing activities, the proponent shall:

1. describe the rationale for the siting and design of plant and infrastructure as relevant to environmental protection;
2. prepare a conceptual plan of the final landform at closure;
3. prepare a plan for a care and maintenance phase; and
4. prepare an initial plan for the management of noxious materials following closure.

11-2 At least six months prior to the anticipated date of closure, the proponent shall meet the following decommissioning criteria:

1. removal or, if agreed in writing by the appropriate regulatory authority, retention of plant and infrastructure agreed in consultation with relevant stakeholders;
2. rehabilitation of all disturbed areas to a standard suitable for the new land use(s) as agreed pursuant to condition 11-2(1); and
3. identification of contaminated areas, including provision of evidence of notification and proposed management measures to relevant statutory authorities.

Procedures

1. Where a condition states “on advice of the Office of the Environmental Protection Authority”, the Office of the Environmental Protection Authority will provide that advice to the proponent.
2. The Minister for Environment will determine any dispute between the proponent and the Office of the Environmental Protection Authority over the fulfilment of the requirements of the conditions.

Schedule 1

The Proposal (Assessment No. 1697)

The proposal is for the construction and operation of:

- a nominal 450 MW coal-fired base-load generation plant consisting of three 150 MW subcritical steam turbine generating units with circulating fluidised bed (CFB) boilers; and
- a nominal 358 MW natural gas-fired peaking-load generation plant consisting of two 179 MW open cycle gas turbine (OCGT) generating units,

on a site located approximately 15 km south-south-west of Eneabba, and the establishment of an approximately 20 km long and 100 m wide infrastructure corridor, the location of which is yet to be determined, that will accommodate the construction and operation of:

- a 300 - 400 mm diameter natural gas pipeline lateral to connect the power station to either the Dampier to Bunbury Natural Gas Pipeline (DBNGP) or the Parmelia Gas Pipeline; and
- a 330 kV electricity transmission line with about eighty, 40 m high towers located approximately every 250 m to connect the power station to the external electricity network at the proposed Eneabba Substation.

The location of the various project components is shown on Figures 1, 2, 3, and 4.

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in Section 3 of the PER document (URS Australia Pty Ltd, 2009).

Table 1: Summary of key proposal characteristics

Element	Description
General	
Entire project area footprint	Up to 483 hectares.
Water supply requirement (construction)	65 ML/yr over the 4 year construction period sourced from the Central West Coal (CWC) Project (Cattamarra Aquifer).
Water supply requirement (operations)	Up to 11 GL/yr mainly sourced from the CWC Project mine dewatering. Backup supply of approximately 3 GL/yr sourced from the Yarragadee aquifer.
Evaporation pond area	150 hectares.
Infrastructure corridor	Approximately 20 km long and 100 m wide.
Gas pipeline lateral	A 300 - 400 mm diameter gas pipeline approximately 20 km long that will be connected to either the Dampier to Bunbury Natural Gas Pipeline or the Parmelia Gas Pipeline. The gas pipeline will be located within the infrastructure corridor.
Electricity transmission line	An approximately 20 km long 330 kV electricity transmission line that will be connected to the external network at the proposed Eneabba Substation. The transmission line will be located within the infrastructure corridor and will include about eighty, 40 m high towers located approximately every 250 m.
Coal-fired component	
Coal-fired steam turbine electrical output	Approximately 450 MW net.
Number of generating units	Three.

Element	Description
Nominal unit output	Approximately 150 MW net.
Load profile	Base-load with a capacity factor of approximately 95%.
Annual coal consumption	Approximately 2.3 million tonnes of coal from the CWC deposit.
Start up fuel	Natural gas or liquid fuel (diesel).
Coal-fired component (Continued)	
Liquid fuel storage capacity (for boiler start-up etc)	Up to approximately 300 kL.
Condenser cooling	Water cooled (with possible hybrid optimisations).
Stack details	One 130 m high stack with three flues each with an exit diameter of 3.45 m.
Gas-fired component	
Gas turbine electrical output	Approximately 358 MW net.
Number of generating units	Two.
Nominal unit output	Approximately 179 MW net at Maximum Continuous Rating and ISO conditions.
Net plant thermal efficiency (HHV)	Approximately 33% (for each unit)
Load profile	Peaking-load with a capacity factor of approximately 25%.
Stack details	One 35 m high stack for each unit, each with an exit diameter of 6.5 m.
Annual natural gas consumption	Approximately 9 PJ at 25% capacity factor.
Outputs	
Solid waste	Approximately 820,000 tonnes of fly ash and bottom ash from coal-fired generation and 20,000 tonnes of evaporation pond residue will be generated each year and backfilled into the CWC pit with waste rock.
Wastewater	Approximately 2.36 GL/yr discharged to on-site evaporation ponds.
Greenhouse gas emissions	Coal-fired generation: No more than 3,776,074 tonnes of CO _{2-e} per year. Gas-fired generation: Approx 438,290 tonnes of CO _{2-e} per year. Other sources: Approx 13,068 tonnes of CO _{2-e} per year. Total: Approx 4,227,432 tonnes of CO _{2-e} per year.

Abbreviations

CO _{2-e}	carbon dioxide equivalent	mg/Nm ³	milligrams per 'normal' cubic metre
GL	gigalitres (10 ⁹ litres)	ML	megalitres (10 ⁶ litres)
GL/yr	gigalitres per year	ML/yr	megalitres per year
g/s	grams per second	mm	millimetres
HHV	higher heating value	MW	megawatts (10 ⁶ watts)
ISO	International Standards Organisation	O ₂	oxygen
kL	kilolitres	PJ	petajoules (10 ¹⁵ joules)
km	kilometres	PM ₁₀	particulate matter with an aerodynamic diameter of < 10 micrometres
kV	kilovolts	ppmv	parts per million by volume
m	metres	t/yr	tonnes per year

Source: Modified version of Table 3.1 from URS Australia Pty Ltd

Figures (attached)

Figure 1: Regional location (Source: Figure 1-1 from URS Australia Pty Ltd, 2009)

Figure 2: General location (Source: Figure 1-2 from URS Australia Pty Ltd, 2009)

Figure 3: Project layout plan (Source: Figure 1-3 from URS Australia Pty Ltd, 2009)

Figure 4: Conceptual power station plant layout plan (Source: Figure 1-4 from URS Australia Pty Ltd, 2009)

Note - The above mentioned Figures 1 to 4 are as included in the main body of this report.

Appendix 5

Summary of Submissions and Proponent's Response to Submissions