Pinjar Gas Turbine Power Station: Environmental review and proposed combined cycle extensions

Western Power Corporation

Proposed Changes To Environmental Conditions

Report and recommendations of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 773
March 1995

THE PURPOSE OF THIS REPORT

This report contains the Environmental Protection Authority's environmental assessment and recommendations to the Minister for the Environment on the environmental acceptability of this proposal.

Immediately following the release of the report there is a 14-day period when anyone may appeal to the Minister against the Environmental Protection Authority's recommendations.

After the appeal period, and determination of any appeals, the Minister consults with the other relevant ministers and agencies and then issues his decision about whether the proposal may or may not proceed. The Minister also announces the legally binding environmental conditions which might apply to any approval.

APPEALS

If you disagree with any of the assessment report recommendations you may appeal in writing to the Minister for the Environment outlining the environmental reasons for your concern and enclosing the appeal fee of $10.

It is important that you clearly indicate the part of the report you disagree with and the reasons for your concern so that the grounds of your appeal can be properly considered by the Minister for the Environment.

ADDRESS

Hon Minister for the Environment
12th Floor, Dumas House
2 Havelock Street
WEST PERTH WA 6005

CLOSING DATE

Your appeal (with the $10 fee) must reach the Minister's office no later than 5.00 pm. on 6 April 1995.

Environmental Impact Assessment (EIA)

Process Timelines

Date	Timeline commences after receipt of full details of proposal from the proponent	Time (weeks)
4/7/94	Proponent Document Released for Public Comment	4
1/8/94	Public Comment Period Closed	
15/8/94	Issues Raised During Public Comment Period Summarised by EPA and Forwarded to the Proponent	2
30/8/94	Proponent's response to issues raised in public comment period	2
4/11/94	Proponent advised DEP that noise emissions from proposal may be difficult to meet at boundary of proposed 3km buffer.	-
21/3/95	EPA reported to the Minister for the Environment	29

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Contents

Tables

Contents (cont'd)

Summary and recommendations

The proponent, Western Power Corporation (formerly the State Energy Commission of WA), proposed development of the Pinjar gas turbine power station (Pinjar station) in 1988. The proposal called for the installation of eight Frame 6, 37 megawatt (MW) open cycle gas turbines. The Pinjar station was originally proposed as peak load plant, to operate at times of high electricity demand (eg. mid-winter and mid-summer).

In 1990, a second proposal was received for the Pinjar station due to an increase in electricity demand. The proposed expansion included the installation of three Frame 9 (nominally 105MW) gas turbines in open cycle, or two Frame 9 (nominally 105MW) gas turbines in combined cycle with a 100MW steam turbine. The former option was ultimately approved. With this expansion, the Pinjar station was upgraded from a peak load plant to a mid-merit plant. Mid-merit plants are generally started up to meet the rise in demand on weekday mornings and then operated throughout the day.

Following a request from the proponent, the Minister for the Environment asked the Environmental Protection Authority to provide advice and recommendations on a third proposal for this site. This proposal calls for the installation of a fourth Frame 9 gas turbine to operate in combined cycle with the three previously approved Frame 9 gas turbines, and the installation of two steam turbines and associated infrastructure. The potential generating capacity of the Pinjar station would be increased from approximately 575MW to 915MW. With this expansion, the Pinjar station would be upgraded from a mid-merit plant to a combination peak load and base load plant. Base load plants are generally run continuously at close to full capacity.

The environmental issues related to the Pinjar station have been identified in previous assessments and have not changed. They are:

- protection of groundwater quality (from contamination by chemicals used at Pinjar station, and emergency fuel stored for the frame 6 gas turbines);
- impacts of atmospheric emissions (in particular oxides of nitrogen, which are a precursor of photochemical smog formation); and
- noise emissions (controlling noise levels at nearby land uses, especially in urban areas).

These are issues that can be adequately managed through the incorporation of appropriate technology, ensuring the necessary buffer zone is protected and monitoring to demonstrate compliance with environmental standards. These factors are reflected in the Authority's recommendations.

The proponent has demonstrated its ability to manage these issues since the station was commissioned. With continued proper management the current proposal should not have any significant adverse environmental impacts.

The project is environmentally acceptable subject to the proponent's commitments and the Environmental Protection Authority's recommendations in this assessment report.

Recommendation Number	Summary of views and recommendations of the Environmental Protection Authority
1	The combined cycle extension proposal is environmentally acceptable subject to the recommendations in this report and the proponent's commitments (discussed in Section 5). The proposed amendment of previous conditions and commitments on this project is acceptable and could be implemented (discussed in Section 4.5 and Tables 1 and 2).

2	The proponent should meet the requirements of the Gnangara Mound Crown Land Policy, 1992, and comply with the requirements of the Water Authority of WA with respect to groundwater protection issues (discussed in Section 4.1).
3	The proponent should ensure the reasonable management of traffic noise during construction phases (discussed in Section 4.2).
4	The proponent should measure ambient noise levels, and assess the impact(s) from tonal noise associated with the Pinjar station (discussed in Section 4.2).
5	The proponent should prepare a report to the Minister for the Environment on its response to ensuring noise standards will be met in the future at potential noise sensitive premises around the Pinjar station (discussed in Section 4.2).
6	The proponent should meet the following ambient nitrogen dioxide groundlevel concentrations (discussed in Section 4.3): • 1 hour average of 320 micrograms per normal cubic metre (not to be exceeded more than once a month); and • 1 hour average of 308 micrograms per normal cubic metre (not to be exceeded on more than three days in any year).
7	The proponent should fit the fourth frame 9 gas turbine (not planned to be installed until 2000) with a dry low-NOx suppression system, or equivalent NOx reduction system, designed to meet the NOx emission levels that can be reasonably and practicably achieved at the time of installation (discussed in Section 4.3).
8	The proponent should provide a greenhouse gas emissions audit in its annual atmospheric emissions monitoring programme (discussed in Section 4.3).

1. Introduction and background

The proponent, Western Power (previously the State Energy Commission of Western Australia), proposed development of the Pinjar station in 1988. At that time the site was proposed to meet peak power loads and provide emergency power to the grid. The proposal included the installation of eight Frame 6, 37 megawatt (MW) gas turbines in open cycle together with associated infrastructure. The Environmental Protection Authority (EPA) recommended that the proposal was environmentally acceptable (Bulletin 370), and Environmental Conditions were set by the Minister for the Environment on 14 March 1989. Seven of the eight gas turbines have been installed to date. The last 37MW unit will not be installed due to the 1990 expansion proposal.

In 1990, the proponent's electricity demand forecasts showed that additional generating capacity would be required before the then planned Collie Power Station was on line. To meet this demand, the proponent proposed to expand the Pinjar station through the installation of either:

- three Frame 9, 105MW units in open cycle operation - option 1; or
- two Frame 9, 105MW units with waste heat boilers and a 100MW steam turbine in combined cycle - option 2 (the terms 'open' and 'combined' cycle are explained in the Glossary).

In this 1990 expansion proposal, the proponent identified that it would change the operating status of the Pinjar station from a 'peak load plant' to 'mid-merit plant' (the terms 'mid-merit' and 'peak load' plant are explained in the Glossary).

In 1991, EPA recommended that option 1 (the installation of three 105MW units in open cycle operation) was environmentally acceptable (Bulletin 501), and Environmental Conditions were set by the Minister for the Environment on 21 August 1991. Two of the three 105MW gas turbines have been installed to date. A Works Approval application (under the provisions of Part V of the Environmental Protection Act) for the installation of the third 105MW unit was received by EPA in September 1994. The third unit is expected to be installed before the end of 1996.

The combined cycle option was not favoured in the 1991 assessment by the EPA because of a lack of information relating to water resource requirements and wastewater management. Further, the Minister for the Environment's Statement required that any proposal to convert the open cycle units at the Pinjar site to combined cycle, was required to be referred to EPA.

In 1993, the proponent again found its electricity demand forecasts to have underestimated demand. To meet part of this demand the proponent referred a proposal to increase the generating capacity of the Pinjar station by an additional 340MW (from 575MW to 915MW).

The Minister for the Environment requested that EPA, under Section 46 of the Environmental Protection Act 1986, report on the proposed extensions to the Pinjar station. This report contains EPA's recommendations to the Minister for the Environment.

2. Summary description of proposal

The Pinjar station is located approximately 45km north of Perth (Figure 1). The site is located on a Priority 1 groundwater area, which is a principal groundwater resource for drinking water in the metropolitan area. It is located in a comparatively sparsely populated area, and the predominant surrounding land uses are pine plantation and native vegetation. The closest residence to the site is located 4.5km away on Pinjar Road in a south-south-west direction. A 3km buffer zone has been identified around the site, but its long term security has not been established through acquisition or appropriate zoning.

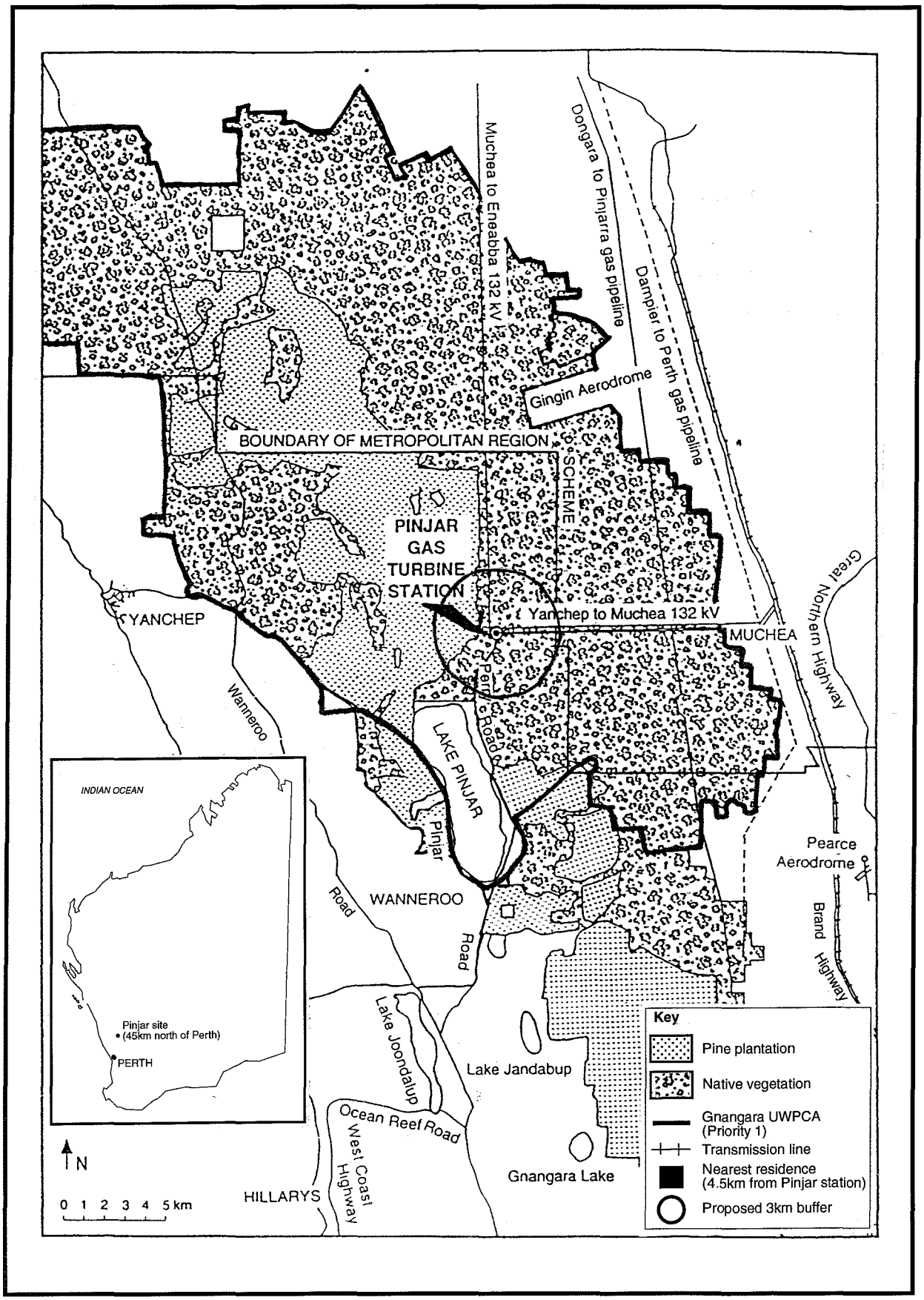


Figure 1. Location of Pinjar gas turbine power station (modified courtesy of proponent's Consultative Environmental Review).

The current proposal is to increase the generating capacity of the Pinjar station by a nominal 340MW. This increased capacity would be provided through the installation of:

- a fourth Frame 9 (nominally 110MW) gas turbine, together with;
- four waste heat boilers and two 115MW steam turbines with associated infrastructure.

This proposal will increase the total potential generating capacity of the Pinjar station from a nominal 575MW (7 times 37MW plus 3 times 105MW) to 915MW (575MW plus 340MW). This would also make the Pinjar station the largest gas turbine operation in Australia. A plan showing existing and planned installations at the Pinjar station is provided as Figure 2.

If approved, the Pinjar station would be designed to operate as a combined peaking (the seven 35MW gas turbines) and base load (the four nominal 110MW gas turbines and two steam turbines) plant.

3. Environmental impact assessment method

This proposal was referred to EPA in January 1994, and has been assessed under the provisions of Part IV (Section 46) of the Environmental Protection Act. The assessment follows the EPA's 'Environmental impact assessment administrative procedures' publication of 1993.

The proponent's "Environmental review and proposed combined cycle extensions, June 1994" report was released for a four week public review period from 4 July 1994 to 1 August 1994. The Department of Environmental Protection (DEP), which administers the environmental impact assessment process for EPA, reviewed all submissions made on this proposal and prepared a list of environmental issues raised in submissions. A list of submitters is provided in Appendix 1. The proponent provided a response to environmental issues raised in submissions (Appendix 2), and a consolidated list of environmental management commitments for the Pinjar station (Appendix 3).

A review (Tables 1 and 2) of Environmental Conditions and Commitments set by the Minister for the Environment on the Pinjar station in 1989 and 1991 (Appendices 4 and 5) has also been completed as part of this assessment. This review, together with consideration of the current proposal, has provided the opportunity for EPA to recommend Environmental Conditions appropriate to all ongoing operations at the Pinjar station (Section 6).

Limitation

This evaluation has been undertaken using information currently available. The information has been provided by the proponent through preparation of the environmental review document (in response to guidelines prepared by DEP), by DEP officers utilising their own expertise and reference material, by utilising experience and information from other State Government agencies, and by contribution from EPA members.

The EPA recognises that further studies and research may affect the conclusions in this report. Accordingly, if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should occur only following a new referral to EPA.

4. Evaluation of environmental issues

The following environmental issues are important at the Pinjar station:

- protection of groundwater quality (from contamination by chemicals used at Pinjar station, and emergency fuel stored for the frame 6 gas turbines);
- impacts of atmospheric emissions (in particular oxides of nitrogen, which are a precursor of photchemical smog formation); and
- noise emissions (controlling noise levels at nearby land uses, especially in urban areas).

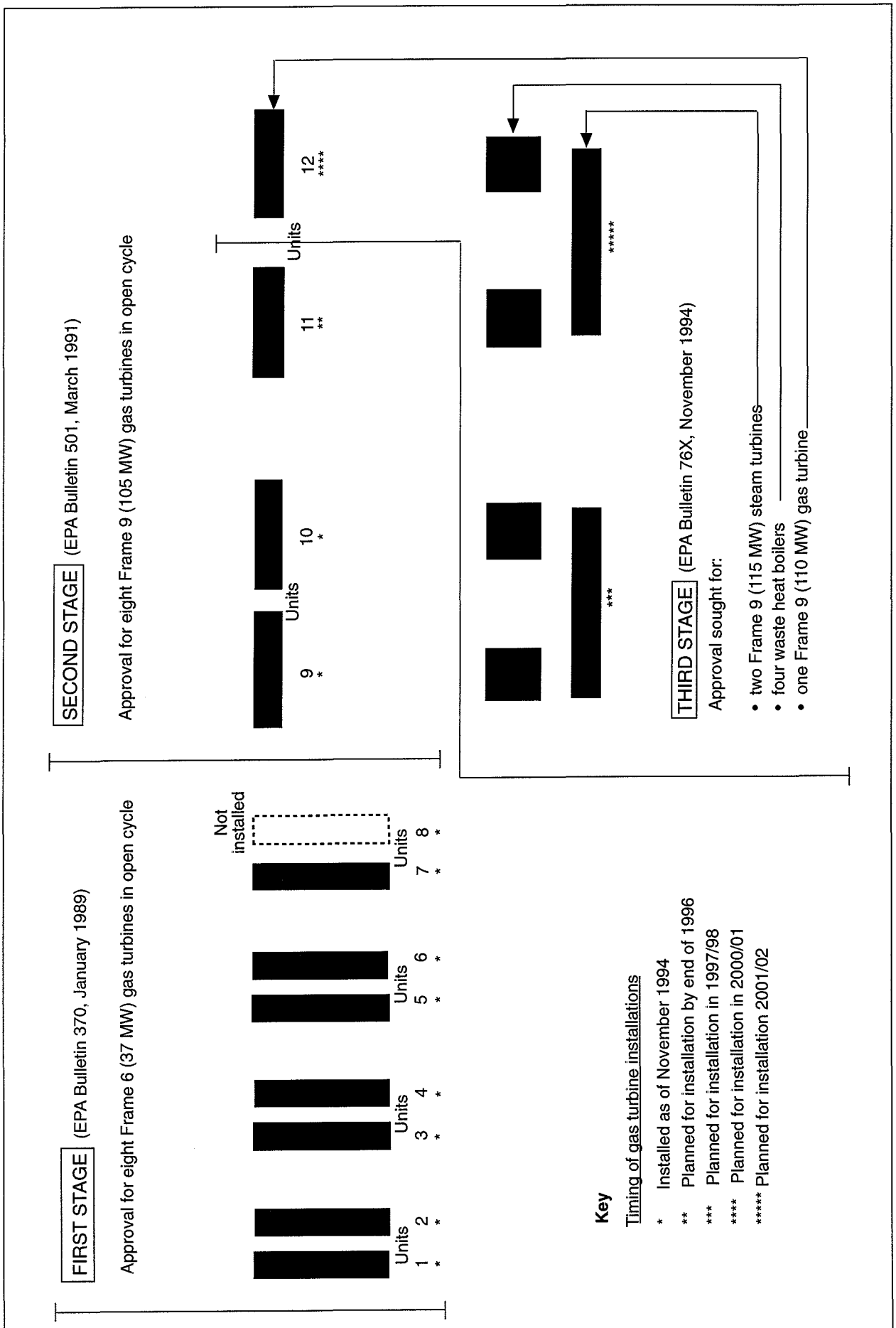


Figure 2. Plan of existing and proposed gas turbine units at Pinjar gas turbine power station (modified courtesy of proponent's Consultative Environmental Review).

These issues are discussed below. Also included is a section on 'Other issues', and one on 'Proposed changes to existing Environmental Conditions and Commitments'.

4.1 Groundwater.

4.1.1 Objective.

The Pinjar station is located on the Priority 1 Source Protection Area of the Gnangara Underground Water Protection Area (UWPCA). This zoning is intended to give the area the highest level of protection as a large portion of Perth's drinking water is extracted from here. The EPA's objective is to ensure that the quality of groundwater is kept within acceptable drinking water standards now and in the future. Controls for this area are outlined in the Environmental Protection (Gnangara Mound Crown Land) Policy 1992.

4.1.2 Evaluation framework

The impacts on groundwater quality from Pinjar station were assessed in the original proposal (EPA, 1989) and the expansion proposal (EPA, 1991) of the Pinjar station.

At the time of the original proposal in 1989, groundwater from the Pinjar area was not being extracted for public use. However, this resource was being planned and managed for future drinking water supply. The potential for pollution of this future water source was acknowledged, and this project was not seen by the EPA as setting a precedent for development over significant groundwater resources.

When assessing the proposed expansion of the Pinjar station in 1991, the EPA considered that issues relating to groundwater had not significantly changed and that it was therefore not necessary to reassess them.

The Western Australian Government's State of the Environment Report (1992), indicated that in 1990, groundwater comprised about 40 percent of Perth's public water supply, and about 65 percent of all water used in the metropolitan area. Groundwater is a natural resource that is fully renewable, provided that its quality and quantity are not changed. The EPA has provided comment in numerous assessments on the issue of groundwater protection. Recently, EPA provided advice on groundwater protection issues [ie. Policy and Technical information, Groundwater protection - Public water supply] (EPA, 1994). That advice has been considered in this assessment and is provided as Appendix 6 of this report.

4.1.3 Public submissions

Submittors were concerned that allowing this expansion posed a threat to the quality of Perth's drinking water supply. The City of Wanneroo was concerned about the severe consequences if contamination were to occur; "While acknowledging that the risk of groundwater contamination may be low, the potential consequences of contamination could be regarded as high (especially from hydrazine)". The Coalition for Wanneroo's Environment advised that "Prior to this proposal the measures ostensibly taken to guard against possible contamination are considered pitifully inadequate". Although commending the methods for containment of contaminants, the Coalition was still concerned about contamination from leakage into the groundwater from the evaporation and overflow ponds.

4.1.4 Proponent's response

The proponent has recognised the special status of the Pinjar station in comparison to its other gas turbine sites. Investigations of the clean and dirty water systems at the Pinjar station (1993/94), and subsequent changes proposed to improve these systems environmental performance, demonstrate this.

In response to the questions raised in submissions, the proponent has responded in some detail (Appendix 2, Questions 1.1 to 1.23). Extensive engineering and operational management practices are proposed to minimise the risk of contamination of groundwater. These include off-site disposal of wastes, designs that reduce risks of spillage, emergency response plans, education of Western Power's workforce and close liaison with the Water Authority of WA (WAWA). The concept of nested containment systems introduced at the Pinjar station is also considered to be significant in minimising the potential of contaminants entering the groundwater. In this concept, activities with a high probability of occurrence or a high probability of releasing contaminants are surrounded by a concentric set of containment systems, each one of which is designed to retain the waste if the previous system fails. All areas of the Pinjar station which involve the storage or handling of possible contaminants will be bunded. Any spills would be collected and recycled, or trucked off-site.

The proponent has also advised that "The proposed extensions have been designed in accordance with the Environmental Protection (Gnangara Mound Crown Land) Policy 1992, and the Priority 1 protection level in the Gnangara UWPCA." (SECWA,1994).

The following principles have been proposed by the proponent with respect to the management of wastes at the Pinjar station:

- waste minimisation;
- total containment of chemicals;
- containment of potential spillage within specific plant areas; and
- removal of wastes off site.

4.1.5 Evaluation

The proponent, as part of the 1994 extension proposal, reviewed the performance of the Pinjar station. That review showed that there was a need to upgrade the containment of potential discharges (contaminants) at source. Both the review and planned changes have been overseen by WAWA and DEP.

The WAWA has examined this proposal, and is satisfied that the proponent has addressed all groundwater protection issues raised by the proposal. With this assurance, and the commitments relating to groundwater protection made by the proponent (Appendix 3, Commitments 9, 10, 11 and 14), the EPA considers that this issue has been satisfactorily addressed. The following recommendation will ensure that the significance of the groundwater resource, Environmental Protection (Gnangara Mound Crown Land) Policy 1992, and role of WAWA, are properly recognised.

Recommendation

The proponent should meet the objectives of the Environmental Protection (Gnangara Mound Crown Land) Policy 1992, and reasonable requirements of the Water Authority of WA for groundwater protection consistent with the Environmental Protection Policy (see Recommended Environmental Condition 5 and Procedure 3 in Section 6 of this Report)

The proponent should ensure it continues to recognise the unique nature of the Pinjar station with respect to its location over a Priority 1 groundwater resource area. Approval for the development of this site in the first instance recognised this issue, and the proponent has accepted the ongoing long term responsibility for the site. The DEP's role in this issue will be to oversee the timely implementation and monitoring of the Environmental Conditions and Commitments.

4.2 Noise

4.2.1 Objective

The proposal for expansion involves the installation of mechanical equipment (especially the condensers), which will contribute to the noise output of Pinjar station. The EPA's objective is to ensure that the Pinjar station does not exceed the relevant environmental protection noise standards. In so doing, the health and amenity of surrounding residents should not be unacceptably impacted upon by noise from the Pinjar station.

4.2.2 Evaluation framework

The impacts of noise emissions from Pinjar station were assessed in the original proposal (EPA, 1989) and the expansion proposal (EPA, 1991) of the Pinjar station.

In 1989, the impacts of noise from the Pinjar station were acceptable due to the distance from the nearest residence and because the station would rarely be operating at full capacity (a maximum of 85 hours per year).

In 1991, the noise impacts were also considered to be acceptable due to the distance from the nearest residence, and EPA recommended that the proponent take steps to protect the integrity of the 3km buffer zone it had identified. The changed status of the Pinjar station from a peak load plant to a mid-merit plant was considered in the modelling undertaken for the 1991 expansion proposal.

Since the 1991 approval, further monitoring and meteorological data has been collected and was utilised in the most recent modelling of the 1994 extension proposal (Sound and Vibration Technology, 1994). The DEP has reviewed the modelling results and conclusions, and provided comment on this issue.

4.2.3 Public submissions

The submitters were generally satisfied with the noise management strategies implemented by the proponent to date. The following issues were raised:

- concern over increased traffic noise during the construction phase of the proposal;
- continued management and monitoring of noise emissions; and
- the security of the buffer zone.

4.2.4 Proponent's response

On the concern of increased traffic noise during construction of the extensions, the proponent responded that "SECWA cannot realistically impose construction terms that would significantly diminish the increased noise effects over the relatively short periods of increased traffic activity. However, the bulk of the increased traffic movements due to construction activities would occur during day time, and be minimal at night" (Appendix 2, Question 3.4).

With regard to the security of the buffer zone, the proponent assured that they have "already registered the buffer zone with Department of Planning and Urban Development" and were "...currently investigating further methods of ensuring that residential development does not encroach into this zone, eg vesting, reserve creation, etc" (Appendix 2, Question 5.1).

In the noise modelling work undertaken for the combined cycle extensions, the proponent showed that the draft Noise Regulations 1993 could be met at both the closest residence (4.5km) and boundary of the buffer zone (3km). However, in a meeting with DEP on 4 November 1994, the proponent explained that compliance with the noise standards at the 3km buffer would be very costly. The proponent would need to design and install expensive noise

attenuation equipment. Nonetheless, the proponent has confirmed that it will meet the required noise at the edge of the 3km buffer zone as described in its Consultative Environmental Review document.

The proponent has made commitments (Appendix 3, Commitments 2 and 14) to continue the existing noise management and monitoring programme, and report results annually to DEP.

4.2.5 Evaluation

Noise modelling, undertaken by one of the proponent's consultants (Sound and Vibration Technology Pty Ltd, 1994), has shown that at maximum load (ie. all turbines operating) and with a light wind blowing in the direction of the nearest residence, noise emissions could comply with the draft noise regulations at the proposed buffer zone boundary of 3km from the Pinjar station. Such compliance would however be at a cost for the design and installation of suitable noise control equipment.

Advice of DEP is that the noise impact from construction traffic volume changes (330 to 960 vehicle movements per day) along Ziatus and Perry Roads could be significant. For this reason, reasonable management of traffic noise during the construction stage of the project should be provided for. This may include the imposition of restricted working hours depending upon the outcomes of the construction phase management plan committed to by the proponent (Appendix 3, Commitment 13). The increased traffic noise during the operational phase is not considered environmentally significant.

Recommendation

During the construction stage of the project, the proponent should manage construction traffic noise to ensure the amenity of residences is not unacceptably impacted. Management strategies to achieve this should form part of the construction phase management plan committed to by the proponent (see Recommended Environmental Condition 4-3 in Section 6 of this Report)

The DEP has advised the proponent that ambient noise levels at residences should be determined for the Pinjar station to help verify noise modelling results. The DEP also noted that a more substantial assessment of the impact of tonal noise emitted by the equipment should be provided as part of the Works Approval information required by the DEP. The proponent should undertake this work, and the standard noise condition set for this proposal should be modified to reflect these issues.

Recommendation

The proponent should conduct noise surveys (including baseline measurements) and assessments (including the impact of tonal noise) in consultation with the Department of Environmental Protection (see Recommended Environmental Condition 4-4 in Section 6 of this Report).

Buffer zone

The proponent has identified a 3km buffer zone around the Pinjar station, and has given commitments (Appendix 3, Commitment 4) to work towards improving the buffer's long term security. Protection of this buffer from inappropriate/conflicting land uses is of paramount importance.

Buffer zones are not 'sterilised land'. In general terms appropriate land uses can be accommodated within buffer zones. For example, light industry, general farming, conservation, agro forestry. Urban development (residences) is not considered to be an appropriate land use within a buffer zone. Specifically, for the Pinjar station, and given its location over the Gnangara Priority 1 Groundwater Area, the land use options are more limited for the buffer zone. It is considered that the existing land uses as pine plantation and native vegetation are appropriate.

The proponent has identified that meeting acceptable noise levels at the 3km buffer will be very costly. In response to this information, DEP suggested that the high cost of providing noise attenuation could be reduced by enlarging the buffer zone. Further work is required by the proponent to fully investigate these options.

The proponent will need to meet the relevant environmental protection noise levels at the nearest sensitive premises (usually residences). Given the future potential and actual noise levels, noise attenuation systems are most unlikely to be able to ensure the relevant noise levels can be met at the site boundary. Accordingly, because emissions are predicted to go beyond the site boundary, it is important the proponent secure a buffer against residential or other 'sensitive premises' development. Otherwise, should development intensify, then noise emissions from the Pinjar station would need to be attenuated to maintain acceptable standards.

Recommendation

Within six months of any approval granted for this proposal, the proponent should provide a report to the Minister for the Environment on its response to ensuring that noise standards will be met in the future at potential noise sensitive development sites (see Recommended Environmental Conditions 4-5 and 4-6 in Section 6 of this Report).

The EPA concludes that the proponent should conduct operations at the Pinjar station so that noise emissions do not unreasonably impact on the surroundings. The buffer area proposed by the proponent should be sufficiently large or noise attenuation systems installed, that noise emissions at any noise sensitive premises outside the Pinjar station can meet the required noise standards.

4.3 Atmospheric emissions

4.3.1 Objective

The emissions of concern at the Pinjar station are predominantly oxides of nitrogen (NOx), which contribute to photochemical smog formation. The environmental objectives are to ensure that :

- the ambient concentration of Nitrogen Dioxide does not exceed acceptable levels as defined by the National Health and Medical Research Council (NHMRC) as a one hour average of 320ug/m^3 (not to be exceeded more than once a month), and Victorian Environmental Protection Authority (VEPA) 1 hour objective of 308ug/m^3 (not to be exceeded on more than three days in any year); and
- all reasonable and practicable measures are taken to prevent or minimise the discharge of NOx (typically this would require a commitment to include NOx suppression systems).

Greenhouse gas emissions (eg. carbon dioxide) have also been considered by the EPA.

4.3.2 Evaluation framework

The impacts of atmospheric emissions from Pinjar station were assessed in the original proposal (EPA, 1989) and the expansion proposal (EPA, 1991) of the Pinjar station.

In 1989, NOx emissions were considered acceptable on the basis that the Pinjar station would operate for a small fraction of the time (during peak load hours) at full capacity, and was not expected to be expanded. In addition, suitable NOx suppression equipment was not available in 1989. Modelling showed that the ambient concentration of Nitrogen Dioxide was not expected to exceed acceptable levels (see Section 4.3.1).

In 1991, the proponent proposed to expand the Pinjar station with the addition of three frame 9 gas turbines, rated at 105MW each. At that time, data from EPA's single metropolitan air quality monitoring station at Caversham was revealing that Perth had an emerging photochemical smog problem. In its assessment of the photochemical smog impact potential of the Pinjar station, the proponent was unable to give reliable predictions due to the lack of adequate data for the Perth region on smog precursor emissions, and photochemical smog concentrations. The EPA was reticent to recommend approval of the proposed expansion unless NOx suppression equipment was fitted to the proposed turbines. Suitable equipment was, at that time, not commercially available for the frame 9 gas turbines chosen by the proponent, although it has subsequently become available.

In recognition of the significance of this issue, the proponent offered to undertake a comprehensive study of photochemical smog formation in the Perth region and if the results of that study showed that the Power station could significantly contribute to photochemical smog levels, the proposed frame 9 gas turbines would be retrofitted with NOx suppression systems.

This approach was considered to be acceptable in terms of progressing the assessment of the three frame 9 gas turbines, and highly desirable in terms of providing information on photochemical smog formation across the whole Perth region. Consequently, the proponent's offer was translated into a recommendation and included in the Minister for the Environment's Statement that the proposal may proceed Modelling for the 1991 assessment again showed that the ambient concentration of Nitrogen Dioxide was not expected to exceed acceptable levels (see Section 4.3.1).

EPA's approach to atmospheric emission assessments
In assessing the acceptability of atmospheric emissions, two complementary criteria developed by the DEP are employed (DEP, 1994).

First, discharges of waste must not cause an impact beyond an environmentally acceptable limit. An unacceptable environmental impact is pollution, and pollution of the environment must be prevented or abated. Discharges of waste cause pollution only when their impact on the surrounding environment exceeds an acceptable limit. The limit may be defined as a concentration level in the environment, an accumulation of contaminants to an unacceptable level or an undesirable change to the environment. This principle is provided for in Section 49 of the Environmental Protection Act, 1986. These environmental impacts are normally assessed via computer modelling which relies heavily on meteorological data and needs to be verified against measurements (monitoring data) of the respective air pollutants. The Victorian EPA guidelines are often used as a starting point in the assessment of ambient air quality impacts.

Second, all reasonable and practicable measures should be taken to minimise the discharge of waste into the environment, irrespective of the magnitude of the environmental impact. Waste minimisation is central to ensuring the long term protection of the environment while preventing individual emitters from unnecessarily utilising the environment's capacity to disperse waste thereby limiting future opportunities which may be considered desirable by the community. This principle is provided for in Section 51 of the Environmental Protection Act, 1986. The ANZECC/NHMRC, 'National Guidelines for the Control of Emissions of Air Pollutants from New Stationary Sources (1985)' are directly applicable to this second criterion.

4.3.3 Public submissions

Concern was raised questioning whether NOx suppression equipment would actually be installed. One submission stated that, "It is annoying and upsetting to see the preference to do just what is currently considered enough override the obvious need to reduce emissions as much as possible. The aim, though perhaps not achievable, must be to produce no harmful wastes - ZERO".

There was general concern among the submissions about air pollution problems such as the greenhouse effect and photochemical smog. The feeling expressed in submissions was that these were real and present problems and that not enough was being done to manage them.

4.3.4 Proponent's response

The proponent has committed to install the fourth Frame 9 gas turbine at the Pinjar station with a dry low-NOx system to suppress NOx emissions.

With respect to the three Frame 9 gas turbines approved in 1991 (without NOx suppression systems), the proponent has reaffirmed that, if the Perth airshed study shows it to be necessary, it will retrofit these gas turbines with NOx suppression systems. The Minister for the Environment will receive recommendations from the EPA, based on the results of the study, on the need to retrofit gas turbines at the Pinjar station.

In response to a question asking if the proponent had considered using dry low-NOx systems that could achieve 25ppm NOx, the proponent noted that it had planned to use dry low-NOx systems that could achieve 35ppm NOx, as this was the level manufacturers had advised would be commercially available for the size turbines proposed for use (Appendix 2, Question 2.5). With respect to the fourth frame nine gas turbine proposed for installation in 2000-2001, the proponent identified that "It would be SECWA's intention to select the best available system consistent with proven state of technology at the time and within reasonable economic and commercial constraints" (Appendix 2, Question 2.5).

With regard to reducing greenhouse gas emissions, the proponent has responded by pointing out the 'important caveat' in Australia's National Greenhouse Response Strategy; that they would not be required to implement reduction measures if it should cause any "net adverse economic impacts nationally or on Australia's competitiveness in the absence of similar action by major greenhouse producing countries" (Appendix 2, Question 2.3). The proponent noted that the proposed combined cycle extensions would increase power generation efficiency as well as lower the carbon dioxide emission rate per unit of electricity generated.

4.3.5 Evaluation

The Pinjar station changed its operating status from a peak load plant only in 1989, to mid-merit plant in 1991. The current proposal is based on a design to operate the plant as a combined peak load (the seven frame 6 gas turbines) and base load (the four frame 9 gas turbines and two steam turbines) plant. This change in operating status will consequently increase the impact of NOx emissions overall from the station by virtue of the:

- changed operating status (longer operating hours);
- greater ground level concentrations due to the loss of heat in generating steam, which in turn will make the stack gases less buoyant; and
- additional NOx emissions from the fourth Frame 9 gas turbine.

Oxides of nitrogen (NOx)
With respect to the first criterion explained in Section 4.3.2 (ambient nitrogen dioxide levels), the levels from the Pinjar station are environmentally acceptable. However, in order to ensure that operations at the Pinjar station continue to consider this criterion, the proponent should ensure that the ambient concentration of Nitrogen Dioxide does not exceed the following levels:.

Recommendation

The proponent should ensure that the groundlevel concentration of Nitrogen Dioxide at or beyond the site boundaries meets the following levels:

1 hour average of 320 micrograms per normal cubic metre (not to be exceeded more than once a month); and

1 hour average of 308 micrograms per normal cubic metre (not to be exceeded on more than three days in any year).

(see Recommended Environmental Condition 3-5 in Section 6 of this Report).

With respect to the second criterion, the EPA understands that technology is commercially available to achieve 25ppm NOx emission levels on frame 9 gas turbines (Schorr, 1992). The EPA wrote to the proponent on 28 March 1994 (Appendix 7) promoting consideration of NOx suppression systems on the third 105MW gas turbine planned for installation before 1996. In response to this letter (Appendix 8), the proponent has released tenders for the third gas turbine which includes two extra options apart from the standard burner system. These options are:

- factory fitted dry low-NOx burners; and
- a design facilitating ready retrofit of such burner.

The EPA has taken this opportunity to review its advice on previous assessments of the Pinjar station (particularly considering improvements made in NOx suppression technologies). Factors such as the:

- changing status of the Pinjar station from a peaking plant in 1989 (with no projection of expansion) to the largest gas turbine site in Australia; and
- current availability of dry low-NOx systems for the frame 9 gas turbines,

has lead EPA to consider it appropriate that the third frame nine gas turbine approved in 1991 should be fitted with a dry low-NOx suppression system. This action would be in keeping with industry best practice and the Environmental Protection Act requirements (Section 51) to take all reasonable and practicable measures to minimise the discharge of waste into the environment.

EPA notes that the proponent has argued that this decision should not be taken before the results of the Perth airshed study have been considered (Appendix 8). The study is planned to be completed before the end of August 1995. Therefore, **EPA has concluded that the option for fitting or retro-fitting the third Frame 9 gas turbine with a dry low NOx suppression system should be preserved by the proponent.** This is consistent with the Environmental Conditions set by the Minister for the Environment on the Pinjar station in 1991 (Appendix 5, Environmental Condition 5). This condition has also been included in the recommended Environmental Conditions in Section 6 of this Report (Environmental Condition 3-2).

With respect to the fourth Frame 9 gas turbine proposed for the Pinjar station, the proponent will install a NOx suppression system to it. Given that the unit is not required for some years, and that NOx suppression technologies are rapidly advancing (Schorr, 1992), the following recommendation is considered appropriate.

Recommendation

The proponent should fit the fourth Frame 9 (nominally 115MW) gas turbine (referred to in the combined cycle extensions document of June 1994) with a dry low-NOx suppression system, or equivalent NOx reduction system, designed to meet the lowest NOx emission level reasonably and practicably achievable at the time of its installation (see Recommended Environmental Condition 3-3 in Section 6 of this Report).

Greenhouse gases

Combined cycle operation will create less greenhouse gases per unit of electricity produced than open cycle operation, and the use of natural gas creates less emissions than other fossils fuels. However with the proposed expansion, and taking into account that the Pinjar station design will be base-load plant as well a peak-load plant, the total amount of greenhouse gases will be increased.

For this reason, the proponent should ensure that it provides an inventory of greenhouse gases from the Pinjar station in its periodic reporting. The inventory should be developed consistent with the "Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks, Energy, Workbook for Fuel Combustion Activities (Stationary Sources). National Greenhouse Gas Inventory Committee, Workbook 1.0 1994."

Recommendation

The proponent should provide an audit of greenhouse gas emissions from the Pinjar station in its annual atmospheric emissions monitoring programme (see Recommended Environmental Condition 3-6 in Section 6 of this Report).

Dispersion modelling
Finally, advice from DEP is that the proponent's dispersion modelling did not include the effect of building wakes. Although DEP's expectation is that this is unlikely to be a problem, the proponent should include the effects of building wakes in its dispersion modelling. The proponent has advised that this work will be undertaken in order to determine the height of the stacks. This work and other final design details would be managed under the Works Approval and Licence provisions of the Environmental Protection Act.

4.4 Other issues

4.4.1 Monitoring

Concerns were raised in submissions about the monitoring and reporting of results to relevant authorities. Monitoring of environmental impacts is important to gauge the effectiveness of management strategies, and to identify problems early and begin immediate repairs. A commitment is made by the proponent to continue monitoring programs for groundwater, atmospheric emissions and noise to the satisfaction of EPA and WAWA. The proponent will undertake the relevant management actions if monitoring indicates their environmental commitments or recommendations are not being met. Results will be reported to these authorities as required. It is noted that monitoring programmes have been undertaken by the proponent since the site was first approved in 1989.

The WAWA will primarily be responsible for management of the Pinjar station with reference to groundwater issues. The proponent is currently reviewing the adequacy of its existing Pinjar station monitoring bores and will implement the results of that review to meet the requirements of WAWA (Appendix 2, Question 1.5) The DEP will ensure noise and air emission issues are properly managed.

The proponent should recognise that the issues of groundwater protection, air emissions (NOx and noise) are significant concerns. **The proponent should ensure that the results of the monitoring and management plans for these issues are publicly available.** Discussion of the results and any changes proposed to address unacceptable environmental impacts should be clearly explained. With respect to the issue of groundwater, the proponent should recognise that WAWA may impose additional conditions if necessary. Further, DEP will need to consider amending the existing Licence (issued under Part V of the Environmental Protection Act) on the Pinjar station in view of the proposed changes.

4.4.2 Waste disposal

With Pinjar station being located in a Priority 1 groundwater area, it is important that wastes are disposed of in a manner that does not pose a threat to the quality of the groundwater. The proposal states that all liquid and solid wastes will be collected and either recycled or trucked off-site for disposal. Forrestdale Industrial Wastewater Treatment Plant and Kelvin Road waste disposal site have been identified as possible methods of disposal. This approach is acceptable and **the proponent should ensure close liaison with DEP's Division of Waste Management**.

4.4.3 Construction & operation management plans

Finer details of the proposal such as final stack height have not been included in the proponent's document. The proponent has committed to prepare construction and operation management plans prior to the commencement of each relevant stage, in consultation with and to the satisfaction of DEP and WAWA. Approval for stack heights would be required under Works Approval requirements.

4.4.4 Chemical handling, storage and spill management

Concern was raised in the submissions over precautions to be taken to prevent and manage spills. All chemicals on-site will be stored within bunded areas which can hold at least 100% of the contents stored. These areas will also be roofed to prevent rainfall from mixing and adding to the volume. Vehicles delivering or picking up chemicals will load or unload within bunded areas. Absorbent and neutralising materials are to be stored on-site for immediate access in cleaning up spills. The resulting neutralised material will be removed off-site for disposal. These measures are considered to be acceptable. Further, the **DEP would expect a waste inventory to be included in the operation management plan, a chemicals storage inventory and contingency plans for the transport of potential contaminants over the groundwater mound**.

4.5 Proposed changes to environmental conditions and commitments

In order to provide a single Statement of Environment Conditions from which the environmental performance of this proposal can be managed and assessed, DEP has reviewed the statements issued in 1989 and 1991.

Tables 1 and 2 in this report identify the original conditions set in 1989 and 1991, together with proposed changes. Some conditions are recommended for deletion as they are no longer relevant to the proposal, others have been updated and replaced. Where a condition has been fully met by the proponent, this condition is also recommended to be cleared.

The Recommended Environmental Conditions in Section 6 of this report are the result of this review exercise, and the assessment of the Pinjar station combined cycle extensions proposal.

A number of new standard conditions and procedures have also been recommended. These include: an implementation and auditing system which requires the proponent to advise the Authority on how it has met the requirements of the environmental conditions and commitments of the project; and a condition which provides for alterations which are not environmentally significant or have positive effects on the environmental performance of a project (ie. non-substantial changes) to be provided for. These are included as Environmental Conditions 10 and 2 respectively in Section 6 of this report.

At the same time as DEP was reviewing the Environmental Conditions set on this proposal, the proponent was asked to review its commitments and provide a single set of up to date commitments. The proponent's revised set of Environmental Management Commitments for the Pinjar station is provided as Appendix 3 in this report.

5. Conclusion and recommendation

The environmental issues associated with the Pinjar station have not altered in type since the original assessment in 1989 but have altered in magnitude. Groundwater beneath the site remains an important drinking water resource to be protected. Oxides of nitrogen emissions remain an important component in the continuing assessment of photochemical smog and acceptable groundlevel concentrations. The control of noise emissions from the site is recognised as requiring ongoing management. The proponent has expanded the commitments that addressed these issues in the Minister for the Environment's Statements issued in 1989 and 1991. The consolidated list of commitments has been reviewed, and those commitments which should be actively audited have been identified as a 'Schedule' to the Environmental Conditions recommended in this report.

The opportunity has also been taken in this assessment to review all Environmental Conditions associated with the Pinjar station, and a single set of Conditions (Section 6 of this report) have been proposed for the ongoing implementation and monitoring of the Pinjar station.

The EPA has taken into account the fact that the Pinjar station has undergone a significant change in both its generating capacity (280MW in 1989 to 915MW in 1994), and purpose (peak load to peak and base load plant) since the 1989 and 1991 assessments. From the information provided, the proponent has demonstrated the commitment to manage the environmental issues associated with the Pinjar station.

The proponent has recognised the special status of the Pinjar station in comparison to its other gas turbine sites. Investigations of the clean and dirty water systems at the Pinjar station, and subsequent changes proposed to improve the systems environmental performance show this. The DEP and WAWA have, in their administration of the Minister for the Environment's Statement, also provided important guidance to the proponent in the management of the Pinjar station.

Following consideration of environmental issues evaluated in Section 4 of this report, a review of the previous conditions set on this proposal, the implementation of those conditions and performance of the Pinjar station to date, EPA considers that the proposed increase in generating capacity of the Pinjar station is environmentally acceptable and that the Minister's Statements be amended accordingly.

Recommendation

The proponent's proposal to increase the generating capacity of the Pinjar Gas Turbine Power Station (by a nominal 340 megawatts) via the installation of a fourth large (110 megawatt) gas turbine, and connection of the Frame 9 gas turbines in combined cycle operation, is environmentally acceptable, subject to:.

- **the Recommendations in this report (Sections 4 and 5);**
- **the proponent's consolidated list of environmental management commitments (Appendix 3); and**
- **the revised Environmental Conditions and Commitments.**

In reaching this conclusion the Environmental Protection Authority has considered the following environmental issues:

- **groundwater protection;**
- **air emissions (NOx - photochemical smog);**
- **noise (buffer zone);**
- **monitoring programmes;**
- **hemical handling and storage;**
- **waste disposal; and**
- **construction and operation management plans.**

6. Recommended environmental conditions

The following Recommended Environmental Conditions, and Schedule of commitments for periodic auditing, are considered appropriate to provide for the ongoing environmental performance of the Pinjar gas turbine power station. The recommendations in Sections 4 and 5 have been considered in the development of these conditions.

PINJAR GAS TURBINE POWER STATION PROJECT

PROPOSALS:	280MW Gas Turbine Power Station, Pinjar (174)
	Expansion of Pinjar Turbine Power Station (357)
AMENDMENT:	Environmental Review and Combined Cycle Extensions (866)
PROPONENT:	Western Power Corporation
CONDITIONS SET:	14 March 1989
	20 August 1991

The implementation of these proposals is now subject to the following conditions which replace all previous conditions:

1 Proponent Commitments

The proponent has made a number of environmental management commitments in order to protect the environment.

1-1 In implementing the proposals (including the combined cycle extensions reported on in Environmental Protection Authority Bulletin 773), the proponent shall fulfil the commitments made during the assessments in 1989 and 1991, and those made in documentation provided in connection with the combined cycle extensions, all of which are revised and consolidated as Appendix 3 in Bulletin 773; provided that the commitments are not inconsistent with the conditions or procedures contained in this statement.

A schedule of environmental management commitments which will be audited by the Department of Environmental Protection is attached.

2 Implementation

Changes to the proposals which are not substantial may be carried out with the approval of the Minister for the Environment.

2-1 Subject to these conditions, the manner of detailed implementation of the proposals shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposals. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

3 Atmospheric Emissions

3-1 The proponent shall take all reasonable and practicable measures to reduce atmospheric emission levels from the Pinjar power station to maintain acceptable air quality.

3-2 The proponent shall continue the study of the Perth airshed. (The Perth Airshed Study is planned to be completed by the end of August 1995). Following completion of the study the Environmental Protection Authority will make recommendations, based on the results of that study, on the need to retrofit gas turbines at the Pinjar power station with dry low-NOx suppression systems, or equivalent NOx reduction systems, to the Minister for the Environment.

3-3 The proponent shall fit the fourth Frame 9 (nominally 115MW) gas turbine (referred to in the combined cycle extensions document of June 1994) with a dry low-NOx suppression system, or equivalent NOx reduction system, designed to meet the lowest NOx emission level reasonably and practicably achievable at the time of installation, to the requirements of the Department of Environmental Protection.

3-4 Failing either the completion of the study referred to in condition 3-2 or the adequate implementation of the study, as determined by the Minister for the Environment, the proponent shall retrofit the two Frame 9 (nominally 105MW) gas turbines already constructed with dry low-NOx suppression systems, or equivalent NOx reduction systems, designed to meet the lowest NOx emission level reasonably and practicably achievable at the time of installation.

3-5 The proponent shall ensure that the groundlevel concentration of Nitrogen Dioxide at or beyond the plant boundary meets the following levels:

- 1 hour average of 320 micrograms per normal cubic metre (not to be exceeded more than once a month); and
- 1 hour average of 308 micrograms per normal cubic metre (not to be exceeded on more than three days in any year).

3-6 The proponent shall provide an audit of greenhouse gas emissions in the annual reporting of the atmospheric emissions monitoring programme.

4 Noise

4-1 The proponent shall conduct operations so that noise emissions do not unreasonably impact on the surroundings.

4-2 The proponent shall ensure that noise emissions from those activities which are of concern to occupiers of noise-sensitive premises do not exhibit tones, amplitude and frequency modulation, and impulsiveness of a nature which increases the intrusiveness of the noise. The presence of tones, amplitude modulation, frequency modulation and impulsiveness shall be determined using the following tests:

- tones shall be deemed to be present in the noise emission where the difference between the $L_{Aeq.T}$ in any one-third octave band and the arithmetic average of the $L_{Aeq.T}$ levels of the two adjacent one-third octave bands is greater than 3 dB where T is not less than 15 minutes;

- frequency modulation shall be deemed to be present in the noise emission where the frequency of a tone changes in a regular, cyclic manner by more than one one-third octave;

- amplitude modulation shall be deemed to be present in the noise emission where the level of the emission, measured under slow dynamic response conditions, changes in a regular, cyclic manner by more than 3 dB $L_{A\ slow}$; and

- impulsiveness shall be deemed to be present in the noise emission where a difference in the level of the noise of more than 15 dB L_A is observed when the noise is measured under $L_{A\ peak}$ and $L_{A\ slow}$ dynamic response conditions.

4-3 During construction, the proponent shall manage construction traffic noise to protect the amenity of residences. Management strategies to achieve this shall form part of the construction phase management plan committed to by the proponent (see commitment 6 in the attached schedule).

4-4 The proponent shall conduct noise surveys (including baseline measurements) and assessments (including the impact of tonal noise) in consultation with the Department of Environmental Protection.

4-5 Within 6 months of the formal authority issued to decision making authorities under Section 45(7) of the Environmental Protection Act, the proponent shall provide a report to the Minister for the Environment detailing how noise standards will be met in the future at potential noise sensitive development sites.

4-6 The proponent shall subsequently conduct operations in a manner consistent with the report required by Condition 4.5.

5 Groundwater Protection

5-1 The proponent shall ensure that the groundwater quality of the Gnangara Mound is not diminished as a consequence of the proposal (see also procedure 3 below).

6 Dieback Management

6-1 The proponent shall conduct all land clearing operations, and shall manage transport in or adjacent to areas subject to *Phytophthora* species dieback, to the requirements of the Department of Environmental Protection on advice of the Department of Conservation and Land Management.

7 Decommissioning and Rehabilitation

7-1 The proponent shall achieve the satisfactory decommissioning and rehabilitation of the site and its environs.

7-2 At least six months prior to decommissioning, the proponent shall prepare a decommissioning and rehabilitation plan to achieve the objectives of condition 7-1.

7-3 The proponent shall implement the plan required by condition 7-2.

8 Proponent

These conditions legally apply to the nominated proponent.

8-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

9 Time Limit on Approval

The environmental approvals for the proposals are limited.

9-1 The proponent shall substantially commence construction of the combined cycle extensions within five years of the date of this statement. The Minister for the Environment shall determine any question as to whether the combined cycle extensions have been substantially commenced.

Any application to extend the period of five years referred to in this condition shall be made before expiration of that period, to the Minister for the Environment by way of a request for a change in the condition under Section 46 of the Environmental Protection Act. (On expiration of the five year period, further consideration of the matter can only occur following a new referral to the Environmental Protection Authority).

10 Compliance Auditing

To help determine environmental performance, periodic reports on the implementation of the proposals are required.

10-1 The proponent shall submit periodic 'Progress and Compliance Reports', in accordance with an audit programme prepared by the Department of Environmental Protection in consultation with the proponent.

Procedure

1 Unless otherwise specified, the Department of Environmental Protection is responsible for assessing compliance with the conditions contained in this statement and for issuing formal clearance of conditions.

2 Where compliance with any condition is in dispute, the matter will be determined by the Minister for the Environment.

3 The proponent will be required to operate the Pinjar power station to meet the objectives of the Environmental Protection (Gnangara Mound Crown Land) Policy 1992, and also to meet reasonable requirements of the Water Authority of Western Australia for groundwater protection.

Notes

1 The proponent shall hold a licence under the provisions of the Environmental Protection Act for the operation of the Pinjar power station.

2 This statement is issued on the understanding that the proponent is committed to taking all reasonable and practicable measures to reduce atmospheric emissions from all future gas turbines in the metropolitan and near metropolitan areas.

3 The Progress and Compliance Reports required by Condition 10 should include the results of monitoring programmes, discussion of the results against suitable criteria and recommendations for changes to the monitoring programmes or operations, as appropriate.

4 The attention of the proponent is drawn to Section 47 (1) of the Environmental Protection Act which states:
"A proponent on whom a statement has been served under section 45 (5) and who does not ensure that any implementation of the proposal to which the statement relates is carried out in accordance with any conditions and procedures set out in the statement commits an offence."

Schedule of proponent's environmental management commitments to be audited by the Department of Environmental Protection

Noise

1. Western Power will continue to take opportunistic measurements of noise close to equipment, at the gas turbine station boundary, at the buffer zone boundary and at the nearest residences during the initial years of operation of the combined cycle extensions to establish the noise characteristics that result from various load and weather conditions. The monitoring programme will be developed in conjunction with, and to meet the requirements of, the Department of Environmental Protection (DEP), and Western Power will report the results of monitoring to DEP on an annual basis.

Buffer Zone

2. Western Power will continue to liaise with other government agencies and local government to improve security of the buffer zone around the Pinjar station. The status of the buffer will be reported in the periodic Compliance Reports required by DEP, or as otherwise agreed.

Atmospheric Emissions

3. The atmospheric emissions monitoring programme, which has been prepared and implemented as part of the existing development, will be extended to incorporate the combined cycle extensions.

Groundwater Management

4. The expanded groundwater monitoring programme, which is being implemented as part of the existing development, will incorporate additional groundwater monitoring bores, if required by the Water Authority (WAWA). Western power will conduct analyses of monitor bore samples and underdrain samples from the evaporation pond and distillate storage area on a quarterly basis, using sampling and analysis procedures agreed by WAWA. Western Power will report the results to DEP and WAWA on an annual basis or sooner if results indicate unacceptable water quality.

Monitoring and Management Programmes

5. Western Power will develop monitoring programmes for groundwater, atmospheric emissions and noise to the satisfaction of DEP and WAWA (as appropriate). These programmes will contain periodic reporting requirements to each of these authorities.

Construction and Operation Plans

6. Prior to the construction of the combined cycle extensions, Western Power will prepare a construction management plan. In addition, prior to the operation of the first stage of the combined cycle extensions, Western Power would prepare an operations management plan.

These plans would ensure the continuing protection of the groundwater in the area, and would be prepared in consultation with, and meet the requirements of, WAWA and DEP. These plans would address the following issues:

- water and wastewater management practices;
- control and management of waste production;
- spill management practices and procedures;
- staff and contractor obligations and practices; and
- public information and education.

7. References

Department of Environmental Protection, 1994, *Business Plan 1994 to 1995*, Pollution Prevention Division, Perth, Western Australia.

Environmental Protection Authority, January 1989, *280MW Gas Turbine Power Station at Pinjar,* Bulletin 370, EPA, Perth, Western Australia.

Environmental Protection Authority, March 1991, *Proposed Power Supply: Expansion of Pinjar Turbine Power Station,* Bulletin 501, EPA, Perth, Western Australia.

Environmental Protection Authority, December 1993, *Environmental Impact Assessment -Administrative Procedures 1993*, EPA, Perth, Western Australia.

Environmental Protection Authority, September 1994, *Metropolitan Region Scheme Amendment 950/33 and North-East Corridor Structure Plan,* Bulletin 754, EPA, Perth, Western Australia.

Schorr, Marvin. 1992, *NOx Emission Control For Gas Turbines: A 1992 Update On Regulations And Technology*, IGTI Vol 7, American Society of Mechanical Engineers.

Sound and Vibration Technology, March 1994, *Environmental Noise Assessment of the Proposed Combined Cycle Upgrade at the Pinjar Site for SECWA Australia*, SVT, Perth, Western Australia.

State Energy Commission of WA, June 1994, *Proposed Changes to Environmental Conditions, Pinjar Gas Turbine Power Station (BD 94/38)*, SECWA, Perth, Western Australia

Western Australia, Government 1992, *State of the Environment Report*, December 1992, Perth, Western Australia.

Table 1

Department of Environmental Protection's review of environmental conditions and commitments set by the Minister for Environment on 14 March 1989 (original 280MW proposal), and proposed changes

Table 1: Department of Environmental Protection's review of environmental conditions and commitments set by the Minister for the Environment on 14 March 1989 (280MW original proposal), and proposed changes

Environmental Condition	Original	Comment
1	Adhere to the proposal as assessed by the EPA and fulfil commitments attached to Minister's Statement	This condition will be updated and replaced by Condition 1 in the Recommended Environmental Conditions in Section 6 of this Report
2	Prepare plan for powerline route according to details mentioned in Minister's Statement, condition 2 and submit to EPA. Implement the plan for powerline route.	This condition will be deleted as it is no longer relevant to the proposal. Construction of the powerline was referred separately to the EPA and has been dealt with in EPA Bulletin 420.
3	Prepare detailed plan for containment and disposal of petroleum products, solvents, transformer fluids and other potential contaminants, Prepare plans to minimise and cleanup spills and leaks of substances having the potential to pollute the groundwater resource, Prepare a plan to prevent and monitor pollution of groundwater, to the satisfaction of the Water Authority of Western Australia.	Completed to the satisfaction of the Water Authority of Western Australia, 10/10/91. The implementation of this plan is still valid and the SECWA has incorporated the intentions of the plan in its more recent groundwater protection commitments (Appendix 3, Commitments 9,10 and 11). This condition will be updated and replaced by Condition 5 and Procedure 4 in the proposed Recommended Environmental Conditions in Section 6 of this Report.
4	The proponent shall obtain the approval of the Department of Conservation and Land Management for any clearing and construction works associated with this proposal on lands managed or proposed to be managed by that Department	This condition will be updated and replaced by Condition 6 in the Recommended Environmental Conditions in Section 6 of this Report
5	Decommission and rehabilitate the site	This condition will be updated and replaced by Condition 7 in the Recommended Environmental Conditions in Section 6 of this Report .
6	Prepare a decommissioning and rehabilitation plan at least 6 months prior to decommissioning.	This condition will be updated and replaced by Condition 7 in the Recommended Environmental Conditions in Section 6 of this Report .

Table 1: Department of Environmental Protection's review of environmental conditions and commitments set by the Minister for the Environment on 14 March 1989 (280MW original proposal), and proposed changes

Proponent's Commitment	Original	Comment
5-1	Monitor noise in the peripheral environment, Take opportunistic measurements of noise during the initial years of operation.	This commitment has been updated and replaced by Commitments 1,2 and 3 in Appendix 3 of this Report .
5-2	Liaise with the EPA in regard to additional emission monitoring that may be technically useful, Prepare and implement plan to measure NOx concentration in the stack emissions from each turbine, Supply monitoring results to the EPA.	This commitment has been updated and replaced by Commitments 5 and 6 in Appendix 3 of this Report .
5-3	Install a monitor bore to enable measurement of unconfined groundwater quality down-gradient of the site, Position bore, Conduct a major ion analysis annually and a total hydrocarbon analysis quarterly using a bulked sample representative of groundwater over the depth of bore penetration, Prepare contingency plans.	Complied with to the satisfaction of the Water Authority of Western Australia up to 1994. This commitment has been updated and replaced by Commitments 9,10 and 11 in Appendix 3 of this Report .
5-4	Conduct a dieback survey, Mark out areas found to be infected and treat separately during site preparation, Develop a handling procedure in event that dieback infestation is identified within the proposed power station site, Wash down all earthmoving machinery off-site and get equipment inspected by CALM representatives prior to entry into State Forest areas, Limit vehicular movement through adjacent vegetation, Conduct dieback surveys along road access routes and service easements.	This commitment has been updated and replaced by Commitment 16 in Appendix 3 of this Report .
5-5	Maintain firebreaks around the station, Maintain firefighting equipment, Establish heavy vehicle crossing at one kilometre intervals along the entire length of the gas pipeline and strengthen pipeline at these locations, Provide firefighting equipment to CALM in the event of a fire emergency, Compensation will be available in relation to machinery usage for fire fighting remote from the station.	This commitment has been updated and replaced by Commitment 17 in Appendix 3 of this Report .

Table 2

Department of Environmental Protection's review of environmental conditions and commitments set by the Minister for Environment on 20 August 1991 (315MW expansion proposal), and proposed changes

Table 2: Department of Environmental Protection's review of environmental conditions and commitments set by the Minister for the Environment on 20 August 1991 (315MW expansion proposal), and proposed changes

Proponent's Commitment	Original	Comment
1	Landscape the site	This commitment has been updated and replaced by Commitment 15 in Appendix 3 of this Report .
2	Monitoring of operational noise will be conducted by SECWA. Direct reading sound pressure level meters will be used to measure noise from the turbines following commissioning, and on an annual basis thereafter. Opportunistic measurements will be taken close to the turbines, at Pinjar Station boundary, at the buffer zone boundary and at the nearest residences, during the initial years of operation to establish the noise characteristics that result from various load and weather conditions. The noise monitoring program will be conducted to the specifications agreed by the EPA and will be reported on an annual basis.	This commitment has been updated and replaced by Commitments 1, 2 and 3 in Appendix 3 of this Report .
3	Monitor and report stack gas analysis for NOx	This commitment has been updated and replaced by Commitments 5 and 6 in Appendix 3 of this Report .
4	Extensive specifications for the safe handling of liquid substances that are potential groundwater contaminants have been developed by SECWA and have been incorporated into the design and working procedures for both construction and operation phases of the project. SECWA will manage potential groundwater contaminants at Pinjar Station according to specifications set out by the Water Authority of Western Australia. SECWA will conduct analyses of monitor bore samples and underdrain samples from the evaporation pond and distillate storage area on a quarterly basis, using procedures for sampling and analysis agreed by the Water Authority of Western Australia. SECWA will report the results to the EPA and the Water Authority of Western Australia on an annual basis.	This commitment has been updated and replaced by Commitment 9 in Appendix 3 of this Report .

Table 2: Department of Environmental Protection's review of environmental conditions and commitments set by the Minister for the Environment on 20 August 1991 (315MW expansion proposal), and proposed changes

Environmental Condition	Original	Comment
1	This approval relates only to the acceptance of Scenario 1 in the CER and allows for the installation and operation of up to three open frame 9 (105MW) gas turbines.	This condition has been superseded with the current combined cycle extensions proposal. Nonetheless, the approval for three 105MW gas turbines is still in place.
2	In implementing the proposal, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made in the proponents Consultative Environmental Review and additional commitments made following the State Energy Commission of WA's response to questions and issues raised in public submissions.	This condition will be updated and replaced by Condition 1 in the Recommended Environmental Conditions in Section 6 of this Report .
3	Implement the proposal as approved, Seek approval to change the implementation of the proposal.	This condition will be updated and replaced by Condition 2 in the Recommended Environmental Conditions in Section 6 of this Report .
4	Scenario 2 in the proponents CER shall be separately referred to the EPA should the proponent further consider its application at the Pinjar site.	This condition can be deleted as it has been met through the referral of the combined cycle extensions and assessment in this Report.
5	The proponent shall undertake a Perth airshed study to the satisfaction of the Environmental Protection Authority that shall be substantially completed to the Environmental Protection Authority's satisfaction within four years of this approval for the expansion of the Pinjar gas turbine power station. Following completion of the study, the Environmental Protection Authority will make appropriate recommendation(s) (based on the results of that study as it relates to the need or otherwise to retrofit the proposed frame 9 and any existing gas turbines) to the Minister for the Environment.	This condition will be updated and replaced by Condition 3 in the Recommended Environmental Conditions in Section 6 of this Report.
6	Retrofit the frame 9 gas turbines with oxide of nitrogen suppression systems if necessary.	This condition will be updated and replaced by Condition 3 in the Recommended Environmental Conditions in Section 6 of this Report.

Table 2: Department of Environmental Protection's review of environmental conditions and commitments set by the Minister for the Environment on 20 August 1991 (315MW expansion proposal), and proposed changes

Environmental Condition	Original	Comment
7	Apply for a licence under Part V of the EPA Act	SECWA applied for a Works Approval under Part V of the Environmental Protection Act on 1 September 1994. This condition will be updated and replaced by Procedure 3 in the Recommended Environmental Conditions in Section 6 of this Report.
8	Take all reasonable and practicable measures to reduce atmospheric emissions.	This condition will be updated and replaced by Condition 3 in the Recommended Environmental Conditions in Section 6 of this Report.
9	Prepare a decommissioning and rehabilitation plan, Implement the plan.	This condition will be updated and replaced by Condition 7 in the Recommended Environmental Conditions in Section 6 of this Report .
10	Seek approval for transfer of proponent	This condition will be updated and replaced by Condition 8 in the Recommended Environmental Conditions in Section 6 of this Report .
11	To substantially commence the project within five years of the date of approval, to apply to extend approval for the project.	This condition will be updated and replaced by Condition 9 in the Recommended Environmental Conditions in Section 6 of this Report ..

Table 2: Department of Environmental Protection's review of environmental conditions and commitments set by the Minister for the Environment on 20 August 1991 (315MW expansion proposal), and proposed changes

Proponent's Commitment	Original	**Comment**
5	Maintain a distillate spillage contingency plan.	This commitment has been updated and replaced by Commitment 12 in Appendix 3 of this Report .
6	Maintain control of operations, equipment and procedures to minimise the risk of jarrah dieback disease infection	This commitment has been updated and replaced by Commitment 16 in Appendix 3 of this Report .
7	Facilitate fire management practices	This commitment has been updated and replaced by Commitment 17 in Appendix 3 of this Report .
8	Establish, coordinate and fund a study of the Perth Airshed	This commitment has been updated and replaced by Commitment 7 in Appendix 3 of this Report ..
9	SECWA undertake to retrofit low NOx burners to the proposed GE Frame 9 gas turbines at Pinjar after the conclusion of the study if results show that emissions from Pinjar contribute significantly to Perth airshed problems.	This commitment has been updated and replaced by Commitment 8 in Appendix 3 of this Report .

Appendix 1

List of submitters

City of Wanneroo

Coalition for Wanneroo's Environment

Water Authority of Western Australia

Department of Conservation and Land Management

Appendix 2

Proponent's response to issues raised in submissions

RESPONSES TO QUESTIONS RAISED IN THE PUBLIC SUBMISSION PERIOD FOR THE ENVIRONMENTAL REVIEW AND PROPOSED COMBINED CYCLE EXTENSIONS AT THE PINJAR GAS TURBINE STATION

1. GROUNDWATER PROTECTION

Q1.1 *What measures has SECWA taken to ensure this site is not operated like a normal ground water facility given its location over a Priority One groundwater mound?*

A SECWA is very conscious of the location of the Station over the recently declared Priority One groundwater mound reserve. Consequently it has addressed the issue of risk to the ground water by extensive engineering and operational management practices. These include:

* Ensuring that any process wastes posing a hazard to the groundwater are disposed of off site.
* Building of nested containment systems to safeguard against even minor or highly unlikely spillage of process materials.
* Selection of designs that lessen risks, eg use of air cooled condensers.
* Special procedures for any work conducted on site, including environmental emergency response plans.
* Clean-up of even minor spillage from equipment and removal off site.
* Education of SECWA's workforce about the environmental sensitivity of the area.
* Ensuring contractor practices and obligations are consistent with the environmental sensitivity of the area.
* Intensive liaison with the Water Authority on all aspects of design and operations.

Q1.2 *Would the proponent please give an indication of the environmental hazard that each of the chemicals/oils listed in Section 3.4 (page 3-10) would pose in relation to water resource impacts?*

A The environmental "hazard" that the chemicals/oils to be used at the site would pose to the water resources needs to be considered against the likelihood of these materials entering the groundwater beneath the site. This likelihood is minimised due to the design of the Station incorporating several levels of containment systems and safeguards:

* Primary containment to trap any foreseen leakage during operation, and comprising:
  - a piped collection system around specific items of

equipment, and

- a bunded collection system housing larger equipment and draining to specific sumps.

* Bunds around major items of plant for unforeseen and emergency spills.
* The Bunded Drainage System - normally collecting rainwater from the above, but also providing containment in the event of a major rupture of tanks containing process fluids.

All use of the chemicals/oils would be within this nested containment system. Even if any materials should escape this system, they would be cleaned up for disposal off-site. Furthermore, any leakage into the ground would require the material to traverse 20m of soil before reaching the groundwater table.

The hazard to the water resource is essentially the impact of the material on use of the groundwater, particularly for potable purposes by the Water Authority.

Under the hypothetical scenario of uncontrolled discharge of the materials into groundwater, the following is a brief description of impacts.

Hydrocarbons (distillate, lubricating, transformer oils)

Ingestion of dissolved hydrocarbons is dangerous to health. However this is unlikely to occur since oils cause objectionable tastes and odours at concentrations well below those dangerous to health. The draft Australian Drinking Water Guidelines, 1994 (ADWG) do not set a maximum level for hydrocarbons, though it is desirable not to exceed 0.2mg/l.

Sulphuric acid, hydrochloric acid, citric acid

Acids decrease the pH of water and any natural alkalinity, as well as adding their anions to the chemical composition, thereby increasing Total Dissolved Solids (TDS) content. Low pH (<3.9) water can have a sour taste, and be corrosive to some materials. Acids also mobilise elements from the soil matrix (eg aluminium) to undesirable levels. A pH range of 6.5 to 8.5 is normally desirable for most water uses.

Caustic soda, trisodium phosphate, sodium bicarbonate

Caustic soda and trisodium phosphate both increase the pH and alkalinity of waters, which affects taste, and if too high can cause gastrointestinal irritation. At very high pH the water may be corrosive, and affect the nutrient uptake of plants. Trisodium phosphate would increase phosphate nutrient levels in water.

Sodium bicarbonate is mildly alkaline and thus poses no significant

impact on water apart from raising alkalinity and TDS.

Hydrazine

In its concentrated form, hydrazine is a powerful reducing agent, and is highly toxic via oral, inhalation and dermal routes. Due to the rapid degradation of hydrazine in the environment, there is little information about its effects at low concentrations, and it is not listed in water use standards for control.

Nitrite

Nitrites and nitrate are frequently ingested by large numbers of the population in drinking water and foods. They are natural ingredients of water and many vegetables such as spinach and rhubarb, and widely used as food additives in processed meats. Nitrites are rapidly oxidised to nitrates in the environment.

However, high levels of nitrites in water are of concern due to association with methaemoglobinanaemia in infants. The ADWG limit nitrite to 3mg/l and nitrate to 50mg/l in drinking water.

Sulphite

At high concentrations, sulphite solutions are reducing agents and pungent due to release of sulphur dioxide. At lower concentrations sulphite (or formed from SO_2) is used as a preservative in foods and beverages. In the environment sulphite reacts with oxygen to produce sulphates and is not usually mentioned in water use standards.

Organic amines

Organic amines in water are responsible for a taste or odour, and may be toxic in high concentrations. In the environment they tend to degrade to ammonia (qv).

Ammonia

Ammonia causes no physiological damage in the amounts normally found in natural or polluted waters. Its odour threshold has been reported as 0.04mg/l, and taste threshold at 34mg/l. High levels may corrode copper pipework. The ADWG set a value of 0.5mg/l for aesthetic purposes.

Sodium hypochlorite

Sodium hypochlorite is a powerful oxidising agent and is used for the purification of waters. It is rapidly degraded in the environment to form common salt, and thus would add to the TDS of receiving

waters. It reacts rapidly with ammonia to form chloramines. This is a normal process in water purification.

Alum

Alum is an aluminium sulphate salt that is widely used in water purification processes. A level of residual aluminium of 0.2mg/l is set by the ADWG on aesthetic grounds.

Lime

Lime can be either:

- calcium carbonate which is a natural constituent of soils and has no significant impact on water resources, or
- calcium hydroxide which is alkaline (see effects of caustic soda, etc).

Q1.3 *Are oil leaks etc from parked cars collected in storm-water drains which discharge to the unlined storm-water pond, and if so how does SECWA justify allowing these leaks to soak directly into the ground?*

A Currently the Station is unmanned, so there are no regular parking facilities. A regular workforce will be on site once the combined cycle extensions are completed. Part of the project would be to provide a covered parking area for this workforce. The area will have raised edges so that any leaks will collect in a corner sump for disposal.

Q1.4 *Is the water quality entering the un-lined storm-water pond measured? If not, how can SECWA be confident that:*

(i) contaminants are not reaching the groundwater via the storm-water pond and

(ii) the potential for contamination via the storm-water pond has been minimised?

A Discharges into the storm water ponds have been monitored for hydrocarbons over the past 15 months. To date no hydrocarbon contamination has been detected.

Q1.5 *Will SECWA install monitoring bores adjacent to/downstream of the unlined storm-water ponds?*

A Although the necessity for monitoring of these areas is not envisaged, the adequacy of existing monitoring bores to detect pond leakage and other potential contamination is under review by a hydrogeological

consultant. The results of the review will be implemented to the Water Authority's requirements.

Q1.6 *The consequences of groundwater contamination of the Gnangara ground water mound, particularly from hydrazine are quite severe. How does SECWA justify allowing run off to go directly to the ground?*

A The run-off from paved (bituminised) areas of the site is clean rainwater and consequently would be allowed to flow directly to the ground. In areas immediately around equipment where there is a possibility of leakage of process materials there would be a system of containment bunds and spill interception.

Containment of areas beneath the boiler water system is not proposed since the risk of contamination of groundwater is insignificant:

* Boiler water would be high purity water, containing only small amounts of an inhibitor (eg hydrazine).
* The likelihood of massive water loss is small.
* Hydrazine reacts rapidly in contact with air at high temperatures, and relatively rapidly in the environment (half life of several days).
* SECWA has modelled a scenario of a large hydrazine leak, and the study concluded that impact on the groundwater underlying the site is unlikely to occur.

Q1.7 *In Section 6.1.5 it is stated that "Traces of any oil that was washed offsite by rainfall would either adsorb to the sand in the soil above the groundwater table, or would undergo biological degradation by natural bacteria in the soil". How much oil can the sand adsorb and would an accumulative effect arise and result in contamination of groundwater? Have any experiments been undertaken to show that the natural bacteria in the soil can actually break down those specific hydrocarbons?*

A Adsorption of oil to soil is a well known phenomenon and is utilised as the primary technique in soaking up large oil spills for disposal. On sites that have had oil spillage in the past, it is not uncommon to find oil levels of up to several percent in the surface soils.

The natural bacteria present on the Pinjar site have not been tested for hydrocarbon biodegradation potential. However there is much evidence in the scientific literature to show that such bacteria are ubiquitous in the general environment.

Q1.8 *How can the proponent be sure that there is sufficient manganese oxides present in the soil to come in contact with and oxidise any leakages of hydrazine before it reaches the water table?*

A Hydrazine degrades rapidly in the natural environment (half life of several days depending on conditions). The primary reaction is with oxygen in the air, and is catalysed by heavy metals. In soil, minerals contain such metals, and the example of manganese oxides was given since it is common in coastal sands in Western Australia.

Q1.9 *If there is a spill on the bitumen, such as outlined in Section 6.2.2, would it be possible for the drainage system (which collects normally clean run-off) to be diverted to the oil separator to ensure absolute minimal contamination of groundwater, even after clean up with sand and/or chemical neutralisers?*

A It is generally not possible to divert drainage from the paved area of the site into the bunded drainage system, which contains the oil separators. However the potential for spills on the paved area is very low, and the likely quantities of spilled material are very low. The areas where materials would be handled would be bunded. The bituminised area is impervious to spills which would be cleaned up before they enter normal soil and/or are able to penetrate the ground to any significant depth.

Q1.10 *Will SECWA or another authority conduct the groundwater monitoring? Will all groundwater monitoring results be made publicly available? If so, how and where?*

A SECWA will conduct the groundwater monitoring according to procedures and programmes that are endorsed by the Water Authority. The results of the monitoring will be reported periodically to the Water Authority and the EPA, from whom they will be publicly available.

Q1.11 *What are the causes of the leaking evaporation ponds?*

A The evaporation ponds are lined with two layers of high density polyethylene sheet. Such liners are the most impermeable that are available, but do contain pinholes from manufacture, and can develop small holes from the process of installation, particularly at seams.

The rate of leakage is driven by the head of water above each liner. The system is so designed that the water that passes the top liner is pumped out from between the liners, thus ensuring very little head of water to drive leakage through the second liner.

The USEPA standard for such lined systems is a leakage rate of

between 49 and 189 litres/hectare/day through the top liner. Industry advice is that only 1% of this penetrates the bottom liner.

SECWA has proposed a value of 50 litres/hectare/day for the top liner in its systems, before remedial action is required.

Q1.12 *How does the monitoring system on the lined evaporation pond work? Does it ensure no contaminants get into the soil beneath the evaporation ponds?*

A The water collected between the liners gravitates to a sump and is pumped out automatically. The volume is recorded and a chemical analysis of the water is performed at suitable intervals.

See also the answer to Question 1.11.

Q1.13 *Will SECWA consider installation of horizontal monitoring bores below the lined evaporation ponds to allow rapid detection of any contaminants, and if not, why not?*

A It is not understood what is meant by "horizontal monitoring bores".

A simple installation of a horizontal pipe or pipework under the evaporation ponds would be either ineffective as a sampling device or will require a catchment layer to direct permeate to a pipework for monitoring.

This aspect of monitoring is already addressed in the construction of the double liner system which collects top layer permeate. This water is monitored as described in the answer to Question 1.12.

The hydrological review currently underway will also address the possibility of innovative ways of early detection of groundwater contamination.

Q1.14 *Will SECWA install monitoring bores adjacent to/downstream of the lined evaporation ponds?*

A SECWA has already installed seven monitoring bores around the site to detect any groundwater contamination. These are located down gradient of the existing evaporation ponds. The need for additional monitoring bores will be determined in conjunction with the Water Authority and, if required, installed to Water Authority requirements.

Q1.15 *SECWA states that "if there were any leaks from the ponds into the underlying groundwater, the nitrate concentration in*

the groundwater would be less than the NHMRC guide-line" (pg 6-5). The nitrogen concentrations in sewage waste water for both the treated and untreated waste water however, are estimated to be higher than the NHMRC guide-line for drinking water (pg 6-6). Could SECWA explain this apparent contradiction?

A The nitrogen concentrations given in Table 6.1 are those in the wastewater stream, discharging at an average rate of 4 m^3/d (see Section 3.73). The ponds collect water at the average rate of 77m^3/d (see Section 3.3), so the concentration of nitrogen in pond water would be lower by a factor of almost 20.

To this consideration must be added the degradation processes of plant uptake, bacterial reduction and the dilution effects of the receiving groundwater. All these factors reduce the final concentration in the event of even a major leakage.

Q1.16 *Why doesn't SECWA pipe the wastewater away from the Priority One Groundwater mound?*

A The combined wastewater (15-56m^3/d) is too small a volume for viable economic disposal by a pipeline. A pipeline would also increase the environmental risk to groundwater in a greater portion of the groundwater area. It is more cost effective to remove the concentrates by road as proposed.

It should be noted that the water collected in the evaporation ponds is rainfall run-off, and thus good quality water.

Q1.17 *What steps have been taken by SECWA with regard to the development of a water recycling and reduction plan on site?*

A SECWA has engaged a water treatment specialist consultant to examine the feasibility and engineering designs for reuse of the rainfall run-off that would be collected in the evaporation pond system.

Q1.18 *Does SECWA plan to continue storage on-site of 3 tanks?*

A Yes. Three tanks are required for distillate use at Pinjar in the event of an extended disruption to the natural gas supply, for the operational purposes of taking delivery, settling of moisture content and feed of distillate to gas turbines.

Under normal circumstances a minimum of fuel would be stored, and not in all tanks.

Q1.19 *Does SECWA need to have three large above ground storage tanks on-site?*

A See Question 1.18.

Q1.20 *Are the tanks specially designed, given that a failure of the tanks could cause a significant problem to the groundwater?*

A The tanks are designed and built to comply with the following codes and requirements:

* BS 2654-1984. Vertical Steel Welded Storage Tanks for the Petroleum Industry
* AS 1554-1985. SAA Structural steel Welding Code (Category SP)
* AS 1940-1988. SAA Flammable and Combustible Liquids Code
* Western Australian Flammable Liquids Regulation (1989)
* Western Australian Oil Pipelines Act

The tanks are bunded, and the bunds connected to the Bunded Drainage System. An impervious membrane underlays the bunds.

Q1.21 *What special measures have been taken with regard to transport of fuel to the Gas Turbine Plant? For example what would happen if a tanker lost its load along Perry Road?*

A SECWA's contract with suppliers of fuel requires the submission of an Emergency Response Plan to the Water Authority for its approval.

Part of such a Plan requires the immediate dispatch of a pollution control/spill equipment unit to an accident site, and the safe rehabilitation of the affected area.

Q1.22 *Please explain the discrepancy between Table 3.2 which indicates that 3 tonnes of lime would be permanently stored on-site and Table 3.3 which indicates that 3 tonnes of lime needed for acid cleaning of waste heat boilers would be delivered to site as required.*

A The lime stored on site as shown in Table 3.2 is that which is required for an emergency response to neutralise a spillage of acidic material, eg the sulphuric acid. It needs to be held on site for rapid action to prevent penetration of the acidic material into the soil or damage to structures.

Table 3.3 lists materials that would be required for the initial (and once only) clean of each boiler immediately after construction. The lime is required to neutralise the acids used in the cleaning process, for safe handling and transport off site for disposal. This lime would be brought onto site for the purpose, and its reaction products removed after completion of the cleaning process.

Q1.23 *Will the caustic soda and sulfuric acid storage tanks described in Section 6.2.1 (page 6-6) be enclosed or in the open? The concern is that if the latter, then the bunded area would need to hold the full volume of the tanks plus direct rainfall.*

A The caustic soda and sulphuric acid storage tanks would be sited outside the water treatment building for purposes of safety. They would be bunded to fully contain total rupture of the tanks. The tank structures would be roofed to ensure that bunds do not accumulate rainwater.

2. GASEOUS EMISSIONS

Q2.1 *What effect could the findings of the Perth Airshed Study have on this facility once the Study is completed?*

As part of seeking environmental approvals for the expansion of Pinjar gas turbine Station in 1991, SECWA has committed to retrofit NO_x controls to the major gas turbines if the Study shows that the Station emissions contribute significantly to photochemical smog formation in Perth air. It is also a ministerial condition of these environmental approvals that following the completion of the study, the Environmental Protection Authority will recommend on the need to retrofit these controls.

Q2.2 *Given SECWA's policy #7 (SECWA A Statement of Environmental Policy, pg 8) "to maintain effective controls over the discharge of gaseous and particulate emissions from SECWA sites" as well as the principles of waste management to which the EPA is committed - will SECWA undertake to fit NO_x suppression equipment to the third Frame 9 turbine during installation?*

A Approval for the third Frame 9 gas turbine without NO_x controls was given by the Minister for the Environment in 1991, on the conditions that SECWA undertakes a major Perth Photochemical Smog Study, and the requirement for retrofit with controls is assessed on the results of the Study.

This $3 million Study is due for completion in mid 1995.

The EPA's waste minimisation policy, as presented for instance in the Pollution Prevention Division Business Plan (1994-1995) is based on Section 5(b) of the Environmental Protection Act 1986. This section requires all *reasonable* and *practical* measures to be taken to minimise discharge of waste.

SECWA's intention is to complete the installation of this approved plant in 1996.

Low NO_x burner controls available for the GE gas turbines that would most likely be installed are a significant added expense, have not been extensively trialled in commercial applications and the environmental impact benefits in the Pinjar region are not demonstrateably major.

However, SECWA has called tenders for this unit with the option of a factory fitted low NO_x burner, as well as a standard configuration facilitating future retrofit.

The decision regarding a requirement for the NO_x controls on this unit will be made once the results of the Study are known, and the tenders are assessed.

Q2.3 *Given Australia's commitment to "stabilise greenhouse gas emissions.... based on 1988 levels, by the year 2005" (National Greenhouse Response Strategy), what steps is SECWA taking, not simply to comply with guidelines but to actually reduce emissions to as low as is possible?*

A Australia's interim planning target for stabilising greenhouse gas emissions based on 1988 levels, by the year 2000 and to reduce these emissions by 20% by the year 2005, has an important caveat - ie it is subject to Australia not implementing response measures that would have net adverse economic impacts nationally or on Australia's trade competitiveness, in the absence of similar action by major greenhouse producing countries (National Greenhouse Response Strategy, 1992).

SECWA has and is taking important steps towards such a target in keeping with the so-called "no regrets" policy on which Australia's greenhouse response is based. These include:

* the introduction of natural gas into the State, and its use for power generation,
* wind generated power at Esperance, and planned photovoltaic generation at Kalbarri, hydro power in the Ord,
* purchase tariff incentives for power from renewable energy sources,
* promotion of third party co-generation of power,
* a demand management programme,

* efficiency upgrades of existing power station systems, and
* electricity tariff reforms that better reflect the costs of supply.

The extension of Pinjar Gas Turbine Station to combined cycle operation of the major gas turbines is a further step in this regard.

Q2.4 *Will all air emission monitoring results be made publicly available? If so, how and where?*

A Atmospheric emissions monitoring as described in Section 7.2 will be conducted to requirements and reporting regimes established with the EPA. The results would be publicly available from the EPA.

Q2.5 *Is SECWA committed to using dry low-NO_x systems which are designed to achieve 25ppm NO_x at 50-100% load, not 35ppm as in Table 3.4?*

A In Table 3.4, the emissions of 35ppm are considered since it is SECWA's understanding from manufacturers, that such burner systems are to be commercially available for the gas turbine size required.

Since unit 12 is planned for commissioning in 2000-2001, it is possible that lower emission systems will be commercially available at that time. It would be SECWA's intention to select the best available system consistent with proven state of technology at the time and within reasonable economic and commercial considerations.

Q2.6 *Will the operation of the plant as a combined cycle result in air emissions other than oxides of nitrogen? Have these emissions been considered?*

A Operation of gas turbines in the combined cycle mode would result in gaseous emissions no different to those from open cycle operation. The values given in Table 3.4 apply to both modes.

The characteristics of the flue gas emitted that would be changed are a decrease in temperature and exit velocity.

There would be no other gaseous emissions from other parts of the plant.

Q2.7 *Were effects of building wakes taken into account in the modelling of NO_x concentrations to obtain minimum stack height?*

A Building wakes were not considered in the modelling reported since this effect is dependent on the final dimensions of plant and buildings

that would be installed.

However, SECWA has engaged consultants to determine the minimum stack height requirements based on building wake effects in the detailed engineering design phases of the project.

3. NOISE EMISSIONS

Q3.1 *Does SECWA plan to have turbines operating continuously through the night, and if so, would this comply with current and proposed noise regulations?*

A Combined cycle gas turbines are operated most economically as base load plant, so that at least some of the units may run continuously through the night.

Noise impacts at the limit of the buffer zone and at the nearest residence were modelled on the assumption that *all* units at the Station would be running continuously. Under even these extreme conditions noise levels were within the current draft noise regulations.

Q3.2 *What noise impact would the increase in vehicle movement on Ziatus and Perry Roads during the construction phase have on nearby residents?*

A The increase in vehicle movement on Ziatus - Perry roads above the current traffic of 330 vehicle movements/day is estimated (from Section 6.6.2 of the Reviw Document) to be:

Due to construction at peak: 400 - 450 vehicle movements/day
Due to operational commuters: 180 vehicle movements/day

The noise impact due to the increased operations due to the extension of Pinjar is judged to be insignificant.

However the anticipated increase in traffic volume from the current level of 330 to a total of 960 vehicle movements/day, which includes the construction phase at peak, is 6dB(A) in the L_{10} (18hr) noise level. The effect of this increase on a house located 30m from the road would result in an average L_{10} (18hr) of less than 58dB(A).

This level is less than the level recommended by the Main Roads Department of Western Australia, ie 63dB(A) - see Section 6.6.4 of the Review Document.

Q3.3 *What would the ambient noise levels at the nearest residence be in*

the absence of the power station?

A The ambient noise levels to be expected at the nearest residence in the absence of Pinjar gas Turbine Station would be variable and dependent on the atmospheric conditions.

Measurements taken in May 1994 about 1.5km from the Station, at night, indicate L_{90} levels of between 27dB(A) and 30dB(A). At the times of measurement the Station was not operating and these levels would be indicative of background in the area.

Other measurements over 1990 - 1992 at the nearest residence during testing of gas turbine operations gave results in the range of 28dB(A) to 55dB(A). During all these measurements the turbines were not audible, with the higher results being attributed to wind noise. This range may be taken as indicative of the ambient condition in the area.

Q3.4 *Would the proponent manage the noise generated by extra vehicle movement during the construction phase and make a commitment to that effect?*

SECWA cannot realistically impose construction terms that would significantly diminish the increased noise effects over the relatively short periods of increased traffic activity. However, the bulk of the increased traffic movements due to construction activities would occur during daytime, and be minimal at night.

Q3.5 *Would the proponent make specific commitments to install the noise control measures which are assumed in the modelling?*

This commitment is made in Section 8.2 of the Review Document (Commitment 2).

4. MONITORING

Q4.1 *Will the monitoring undertaken as described in Section 7 be reported periodically, and who will those reports be sent to?*

A The monitoring programmes of Section 7 will be developed to the satisfaction of the EPA and Water Authority. These will contain periodic reporting requirements to each of these authorities.

Q4.2 *How does the proponent intend to deal with complaints, and will complaints received be included in the monitoring reports?*

A Complaints about the operation of the Gas Turbine Station could arise either direct from the general public or through such authorities as the EPA. In either instance, SECWA will respond to any problem that is raised through the general process of contacting the complainant, assessment of the details of any claim, and investigating the underlying cause.

5. BUFFER ZONE

Q5.1 *What steps does SECWA plan to take to ensure that residential development does not encroach into the 3km buffer zone?*

A SECWA has already registered the buffer zone requirements with the Department of Planning and Urban Development. It is currently investigating further methods of ensuring that residential development does not encroach into this zone, eg vesting, reserve creation, etc.

6. CONSTRUCTION

Q6.1 *With reference to Section 3.1 (page 3-2) of the document, what exactly constitutes "major components associated with the proposed extensions", and would SECWA make a commitment to design and construct those to Australian earthquake code requirements?*

A The major components would include all structures and civil works that would be prone to earthquake effects, eg foundations, structural supports, dams, pipework, drains, buildings, transmission lines etc. As stated in the Review Document, these would be constructed in accordance with the requirements of the appropriate Australian earthquake code.

7. WASTES

Q7.1 *Does a brine concentrate result from the water demineralisation using the ion exchange process, and if so why is this waste not included in the list of potential wastes in Section 6.3 (page 6-7)?*

A The effluent from regeneration of ion exchange plant consists of an acidic and an alkaline stream which would be mixed and neutralised to produce a saline wastewater.

This combined stream is part of the "wastewater produced regularly by equipment" category of Section 6.3, and is mentioned specifically in Section 3.7.3.

Appendix 3

Proponent's consolidated list of environmental management commitments (1995)

Western Power Corporation
formerly the
State Energy Commission of WA

Consolidated list of Environmental Management Commitments
for the Pinjar gas turbine power station
(February 1995)

Noise

1. Western Power will install plant for the combined cycle extensions to minimise tonal noise and conform with the sound power levels used in predicting environmental noise impacts surrounding the gas turbine station.

2. Monitoring of operational noise will be conducted by Western power. Direct reading sound pressure level meters will be used to measure noise from the turbines following commissioning, and on an annual basis thereafter.

3. Western Power will continue to take opportunistic measurements of noise close to equipment, at the gas turbine station boundary, at the buffer zone boundary and at the nearest residences during the initial years of operation of the combined cycle extensions to establish the noise characteristics that result from various load and weather conditions. The monitoring program would be developed in conjunction with, and to meet the requirements of, the Department of Environmental Protection (DEP), and Western Power would report the results of monitoring on an annual basis.

Buffer Zone

4. Western Power will continue to liaise with other government agencies and local government to improve security of the buffer zone around the Pinjar station. The status of the buffer will be reported in the periodic compliance reports required by DEP, or as otherwise agreed.

Atmospheric Emissions

5. Stack gas analysis for oxides of nitrogen will be conducted at Pinjar station by Western Power using standard methods for sampling and chemical analysis. Following the testing of emission quality at commissioning, measurements of oxides of nitrogen concentrations in the stack emission of each turbine will be conducted annually, according to the specifications agreed by DEP. The results of monitoring will be reported to DEP on an annual basis. Western Power will liaise with DEP regarding the requirement for additional emissions monitoring (eg. ground level).

6. The atmospheric emissions monitoring programme, which has been prepared and implemented as part of the existing development, will be extended to incorporate the combined cycle extensions.

Perth Airshed Study

7. Western Power agree to establish, coordinate and fund a Perth airshed study, the aim of which is to elucidate and understand the factors governing photochemical activity in the urban area. The study will have the following major elements:

- Compilation of an emissions inventory of photochemical precursors;
- Establishment of a series of monitors to secure data on ambient levels of photochemical oxidants and precursors, together with relevant meteorological data;

- Development of a model of photochemistry and meteorology relevant to Perth; and
- Assessment of Pinjar station emissions' impact on urban photochemical oxidant formation.

Retrofit for oxide of nitrogen Reductions

8. Western Power undertake to retrofit low oxide of nitrogen burners to the GE Frame 9 (105 megawatt) gas turbines at Pinjar, after the conclusion of the study, if results show that emissions from Pinjar contribute significantly to Perth airshed problems.

Groundwater Management

9. Extensive specifications for the safe handling of liquid substances that are potential groundwater contaminants have been developed by Western Power and have been incorporated into the design and working procedures for both construction and operation phases of the project. Western Power will manage potential groundwater contaminants at Pinjar station according to specifications set out by WAWA.

10. All wastes that have the potential to pollute the groundwater either by virtue of their nature or the concentration of substances, including wastewater produced during periodic operations such as acid cleaning of boilers, would be removed to a suitable location off site for disposal.

11. The expanded groundwater monitoring program, which is being implemented as part of the existing development, would incorporate additional groundwater monitoring bores, if required by WAWA. Western Power will conduct analyses of monitor bore samples and underdrain samples from the evaporation pond and distillate storage area on a quarterly basis, using sampling and analysis procedures agreed by WAWA. Western Power will report the results to DEP and WAWA on an annual basis or sooner if results indicate unacceptable water quality.

Distillate Delivery to Pinjar

12. Western Power will arrange for the Fuel Supply Contractor to maintain a distillate spillage contingency plan consistent with the Western Australian Hazardous Materials Emergency Management Scheme according to the requirements of WAWA.

Construction and Operation Plans

13. Prior to the construction of the combined cycle extensions, Western Power will prepare a construction management plan.

In addition, prior to the operation of the first stage of the combined cycle extensions, Western Power would prepare an operations management plan.

These plans would ensure the continuing protection of the groundwater in the area, and would be prepared in consultation with, and meet the requirements of, WAWA and DEP. These plans would address the following issues:

- water and wastewater management practices;
- control and management of waste production;
- spill management practices and procedures;
- staff and contractor obligations and practices; and
- public information and education.

Monitoring and management Programmes

14. Western Power will develop monitoring programmes for groundwater, atmospheric emissions and noise to the satisfaction of DEP and WAWA (as appropriate). These programmes will contain periodic reporting requirements to each of these authorities.

Landscape Management

15. Western Power will continue to conduct landscaping site works to soften the visual profile of Pinjar station and enable it to blend with the surrounding landscape to the greatest practical extent.

Dieback Management

16. Western Power will continue to maintain control of operations, equipment and procedures to minimise the risk of jarrah dieback disease infection in the vicinity of Pinjar station and associated linear services according to the requirements of the CALM District Manager, Wanneroo.

Fire Management

17. Western Power will facilitate fire management practices in the region of Pinjar station through the continued maintenance of established fire breaks, in conjunction with controlled burning programs conducted by the WA Bush Fires Board.

Appendix 4

Environmental conditions and commitments set 14 March 1989

Ass # 174

Bull # 370

State # 061

MINISTER FOR ENVIRONMENT

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

280 MW GAS TURBINE POWER STATION, PINJAR

STATE ENERGY COMMISSION

This proposal may be implemented subject to the following conditions:

1. The proponent shall adhere to the proposal as assessed by the Environmental Protection Authority and shall fulfil the commitments made in the Notice of Intent (copy of commitments attached).

2. The proponent shall construct the powerlines from the proposed power station to the State Energy Commission's northern terminal to follow the broadly defined north-south route passing between the electromagnetic interference exclusion zones around the Royal Australian Air Force Base at Pearce and the Overseas Telecommunications Commission (Australia) station at Gnangara. The proponent shall refer details of the proposed route to the Environmental Protection Authority for assessment.

3. To protect the water resource in the vicinity of the power station from contamination by petroleum products, solvents, transformer fluids and other potential contaminants, the proponent shall, prior to the commencement of each stage of construction, provide detailed plans for the containment and disposal of these substances to the Water Authority of WA for approval.

   Plans to minimise and clean up spills and leaks of substances having the potential to pollute the groundwater resource, both at the power station site and during transport, shall be approved by the Water Authority of WA, prior to these substances being brought onto the site. These plans shall cover normal operation and emergencies.

Published on 15 MAR 1989

Prior to the commissioning of the power plant, monitoring systems to prevent and monitor pollution of groundwater shall be established by the proponent, to the satisfaction of the Water Authority of WA.

4. The proponent shall obtain the approval of the Department of Conservation and Land Management for any clearing and construction works associated with this proposal on lands managed or proposed to be managed by that Department.

5. The proponent shall be responsible for decommissioning the plant and rehabilitating the site and its environs to the satisfaction of the Environmental Protection Authority.

6. The proponent shall, at least six months prior to decommissioning, prepare a decommissioning and rehabilitation plan to the satisfaction of the Environmental Protection Authority.

Bob Pearce, MLA
MINISTER FOR ENVIRONMENT

14 MAR 1989

5.0 ENVIRONMENTAL MANAGEMENT AND MONITORING COMMITMENTS

The results of environmental evaluation, as discussed in Section 4.0, indicate that environmental management and monitoring will be necessary in the areas outlined below.

5.1 Noise

Monitoring of operational noise in the peripheral environment will be conducted at commissioning, and on an annual basis thereafter. Monitoring stations will be established at appropriate locations along the power station site boundary. The results of sound level measurement will be mathematically interpolated to provide noise levels at the buffer zone boundary.

Opportunistic measurements will also be taken at a number of locations within the station and buffer zone during the initial years of operation to establish the noise characteristics that result from the various load and weather conditions that will be typically experienced.

5.2 Atmospheric Emissions Monitoring

Stack gas analysis for NO_x will be the primary method of monitoring atmospheric emissions from the power station. The Commission will liaise with the EPA in relation to additional emission monitoring that may be technically useful.

Following initial testing of emission quality at commissioning, measurement of NO_x concentration in the stack emissions from each turbine will be conducted annually according to a method and procedure approved by the EPA. Results of monitoring will be supplied annually to the EPA.

5.3 Groundwater Management

A monitor bore will be installed at the Power Station to enable measurement of unconfined groundwater quality down-gradient of the site. Groundwater flow in

the area is west-south-westerly, therefore the most appropriate location for the monitor bore will likely be along the southern part of the western boundary fence.

The bore will penetrate the upper two thirds of the unconfined aquifer and will be constructed from PVC tubing within a gravel pack. The PVC tubing will be slotted for the full distance below the water table.

A major ion analysis will be conducted annually, whilst total hydrocarbon analysis will be conducted quarterly, using a bulked sample representative of groundwater quality over the depth of bore penetration. The results of monitoring will be provided to the Water Authority on an annual basis.

A contingency plan that details procedures to be followed in the event of an accidental distillate spillage from a fuel tanker or fuel storage facility within the Gnangara Groundwater Pollution Control Area, will be developed in consultation with the Water Authority of Western Australia.

5.4 Dieback Management

Dieback is known to be present in State Forest No. 65, therefore disease protection measures will need to be instituted for both construction and operational phases of the project. Dieback management will be conducted in consultation with CALM's District Manager Wanneroo and will include the following measures.

i) A dieback survey will be conducted at the proposed site and within the pipeline corridor and access routes prior to commencement of construction.

ii) Areas that are found to be infected will be marked out on site and will be separately treated during site preparation. A handling procedure will be developed in consultation with CALM in the event that dieback infestation is identified within the proposed power station site.

iii) All earthmoving machinery will be washed down off-site and will be inspected by CALM representatives prior to entry into State Forest areas.

iv) Vehicular movements through adjacent vegetation will be limited to those required by essential services such as gas pipeline inspection and fire break maintenance.

v) Dieback surveys along road access routes and service easements will be conducted at appropriate intervals.

5.5 **Fire Management**

Maintenance of firebreaks around the station will be conducted in consultation with CALM. Fire fighting equipment will be maintained on site to deal with accidental fires within the station.

Heavy vehicle crossing points will be established at one kilometre intervals along the entire length of the gas pipeline. The pipeline will be strengthened at these locations to enable heavy vehicles involved in forestry activities or fire fighting to safely cross.

Fire fighting equipment within the station will be available to CALM in the event of a fire emergency. Compensation will be applicable to machinery usage for fire fighting remote from the station.

Appendix 5

Environmental conditions and commitments set 20 August 1991

Ass # 357

Bull # 501

State # 171

WESTERN AUSTRALIA

MINISTER FOR THE ENVIRONMENT

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

PROPOSED POWER SUPPLY EXPANSION OF PINJAR TURBINE POWER STATION (357)

STATE ENERGY COMMISSION OF WESTERN AUSTRALIA

This proposal may be implemented subject to the following conditions:

1. This approval relates only to the acceptance of Scenario 1 in the proponents Consultative Environmental Review and allows for the installation and operation of up to three open cycle frame 9 (105MW) Gas Turbines

2. In implementing the proposal, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made in the proponents Consultative Environmental Review and additional commitments made following the State Energy Commission of WA's response to questions and issues raised in public submissions. (A copy of the consolidated commitments is attached).

3. Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

4. Scenario 2 in the proponents Consultative Environmental Review shall be separately referred to the Environmental Protection Authority should the proponent further consider its application at the Pinjar site.

5. The proponent shall undertake a Perth airshed study to the satisfaction of the Environmental Protection Authority that shall be substantially completed to the Environmental Protection Authority's satisfaction within four years of this approval for the expansion of the Pinjar gas turbine power station. Following completion of the study, the Environmental Protection Authority will make appropriate recommendation(s) (based on the results of that study as it relates to the need or otherwise to retrofit the proposed frame 9 and any existing gas turbines) to the Minister for the Environment.

6. Failing the adequate implementation or completion of the study referred to in condition 5, as determined by the Minister for the Environment on advice from the Environmental Protection Authority, the proponent shall retrofit the frame 9 gas turbines with oxide of nitrogen suppression systems to the satisfaction of the Environmental Protection Authority.

7. The proponent shall apply for a licence under Part V of the Environmental Protection Act for the on-going development and operations of the Pinjar gas turbine power station.

Published on

21 AUG 1991

8. The proponent shall take all reasonable and practicable measures to reduce atmospheric emission levels from future gas turbine installations to the satisfaction of the Environmental Protection Authority for metropolitan or near-metropolitan installations.

9. The proponent shall be responsible for decommissioning and removal of the plant and installations and rehabilitating the site and its environs, to the satisfaction of the Environmental Protection Authority. Prior to decommissioning, the proponent shall prepare and subsequently implement a decommissioning and rehabilitation plan, to the satisfaction of the Environmental Protection Authority.

10. No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

11. If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced. Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period, to the Minister for the Environment by way of a request for a change in the condition under Section 46 of the Environmental Protection Act. (On expiration of the five year period, further consideration of the proposal can only occur following a new referral to the Environmental Protection Authority).

Bob Pearce, MLA
MINISTER FOR THE ENVIRONMENT

20 AUG 1991

Pinjar Gas Turbine Power Station

SUMMARY OF ENVIRONMENTAL MANAGEMENT COMMITMENTS

1. Landscape Management

SECWA will continue to conduct landscaping site works to soften the visual profile of the power station and to enable it to blend with the surrounding landscape to the greatest practical extent.

2. Noise Monitoring

Monitoring of operational noise will be conducted by SECWA. Direct reading sound pressure level meters will be used to measure noise from the turbines following commissioning, and on an annual basis thereafter.

Opportunistic measurements will be taken close to the turbines, at the power station boundary, at the buffer zone boundary and at the nearest residences, during the initial years of operation to establish the noise characteristics that result from various load and weather conditions.

The noise monitoring programme will be conducted to specifications agreed by the Environmental Protection Authority and will be reported on an annual basis.

3. Atmospheric Emissions Monitoring

Stack gas analysis for NO_x will be conducted at the power station by SECWA using standard methods for sampling and chemical analysis.

Following the testing of emission quality at commissioning, measurements of NO_x concentration in the stack emission of each turbine will be conducted annually, according to specifications agreed by the Environmental Protection Authority. The results of monitoring will be reported to EPA on an annual basis. SECWA will liaise with the EPA regarding the requirement for additional emissions monitoring.

4. Groundwater Management

Extensive specifications for safe handling of liquid substances that are potential groundwater contaminants have been developed by SECWA and have been incorporated in design and working procedures for both the construction and operation phases of the project. SECWA will manage potential groundwater contaminants at the power station according to specifications set out by the Water Authority of WA.

SECWA will conduct analyses of monitor bore samples and underdrain samples from the evaporation pond and distillate storage area on a quarterly basis, using procedures for sampling and analysis agreed by the Water Authority of WA. SECWA will report the results to EPA and the Water Authority of WA on an annual basis.

5. Distillate Delivery to Pinjar

SECWA will arrange for the Fuel Supply Contractor to maintain a distillate spillage contingency plan consistent with the Western Australian Hazardous Materials Emergency Management Scheme according to the requirements of the Water Authority of WA.

6. Dieback Management

SECWA will continue to maintain control of operations, equipment and procedures to minimize the risk of jarrah dieback disease infection in the vicinity of the power station and associated linear services according to the requirements of the CALM District Manager, Wanneroo.

7. Fire Management

SECWA will facilitate fire management practices in the region of the power station through the continued maintenance of established fire breaks, in conjunction with controlled burning programmes conducted by the WA Bush Fires Board.

8. Perth Airshed Study

SECWA agree to establish, coordinate and fund a Perth Airshed study, the aim of which would be to elucidate and understand the factors governing photochemical activity in the urban area. The study would have the following major elements:

- Compilation of an emissions inventory of photochemical precursors.
- Establishment of a series of monitors to secure data on ambient levels of photochemical oxidants and precursors, together with relevant meteorological data.
- Development of a model of photochemistry and meteorology relevant to Perth.
- Assessment of Pinjar Power Station emissions' impact on urban photochemical oxidant formation.

The study will be well designed, with input from foremost Australian experts and officers of EPA. The design phase is envisaged to take several months. A target date for completion of this stage may well be mid-1991, at which stage the study would be initiated.

9. Retrofit for NO_X Reductions

SECWA undertake to retrofit low NO_X burners to the proposed GE Frame 9 gas turbines at Pinjar after the conclusion of the study if results show that emissions from Pinjar contribute significantly to Perth airshed problems.

Appendix 6

Policy and technical information: Groundwater protection — Public water supply

(copied from EPA Report, Bulletin 754 — September 1994, on the Metropolitan Region Scheme Amendment 950/33 and North-East Corridor Structure Plan)

Policy and technical information

Groundwater protection - Public water supply

Policy framework

Water Authority of Western Australia policy on catchment protection to maintain the quality of drinking water supplies

The Board of the Water Authority adopted the policy on catchment protection to maintain the quality of drinking water supplies in April 1991, and it forms the basis for catchment protection review and proposed re-writing of by-laws.

The current policy adopts a "differential protection" approach which allows development of protection objectives which include consideration of factors such as tenure, zoning, community expectations and existing land-uses. Under this approach, the Water Authority has identified three priority classifications for its present and future public water supply catchments, namely Priority 1, 2 and 3 source protection areas.

Priority 1 source protection areas are the most important for public water supplies, where water resource protection must have the highest priority in land planning and management. Priority 2 source protection areas are catchments where water production has a high priority, but is not necessarily the primary consideration for land planning. Priority 2 areas are usually in private ownership. Priority 3 source protection areas are catchment areas where other land use values predominate over water production and land use management.

* Figure 2 in the main text of this Bulletin shows the Priority groundwater areas, the general location and shape of the groundwater mound and existing public water supply production bores in the North-East Corridor.

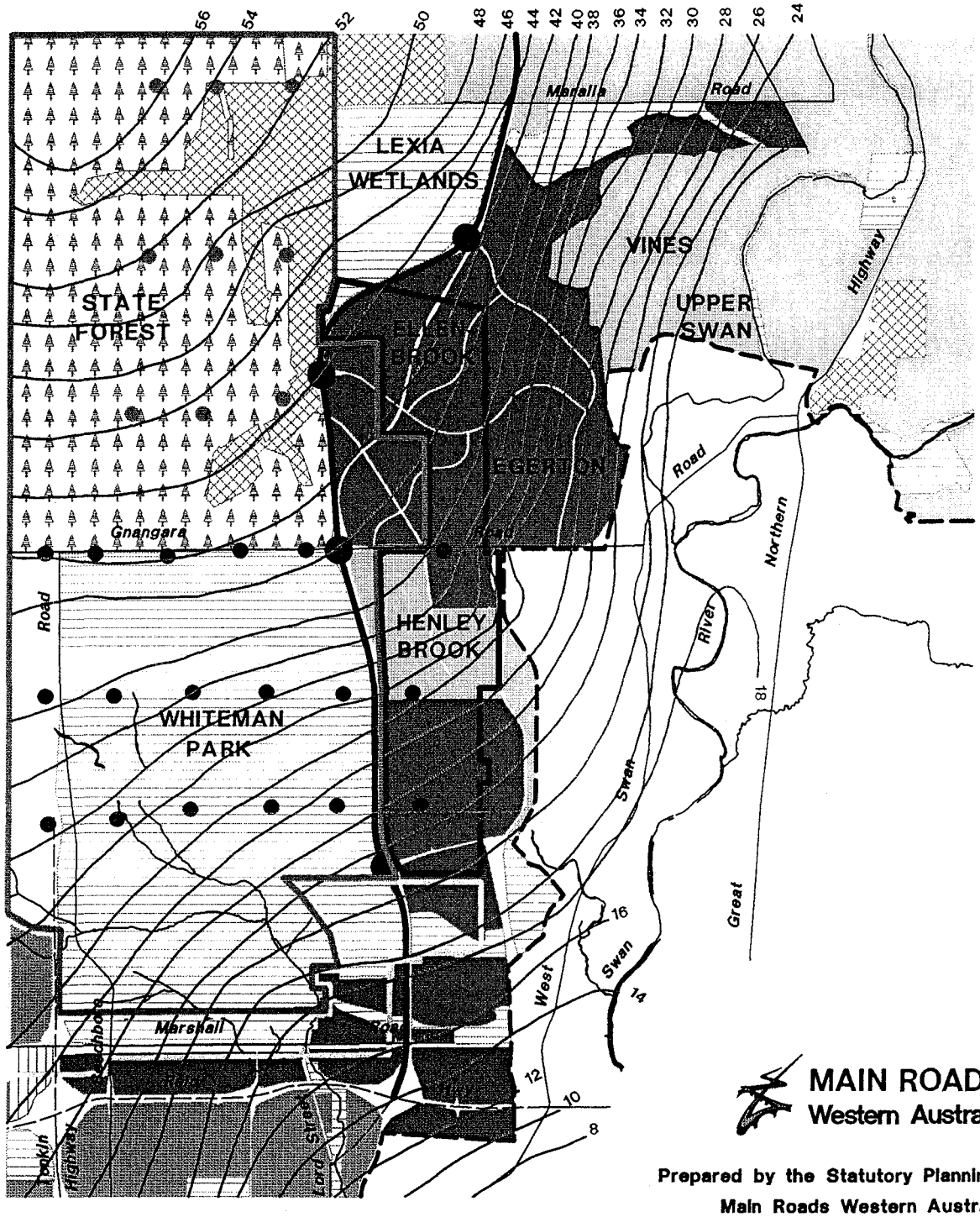
Points to note from this Figure include;

- Groundwater flows perpendicular to the groundwater contour lines. Assuming a uniform aquifer, any contamination which occurred would be expected to form a teardrop shape perpendicular to the groundwater contours;
- The Priority areas focus on cadastral rather than hydrological boundaries; and
- There are two existing public water supply bores located in the Priority 2 groundwater area which would be zoned urban deferred by the North-East Corridor Amendment.

As the North-East Corridor Amendment proposes urbanisation over Priority 2 groundwater areas, the following extract from the Water Authority policy is provided.

> *... The Water Authority will oppose any intensive or inappropriate land use development unless the development complies with a land and water management plan for the area.*
>
> *Priority 2 source protection areas recognise existing land zoning and tenure. The Water Authority accepts that some contamination may exist and there is a risk of further contamination.*
>
> *Management of Priority 2 source protection areas will primarily be effected through restrictions on land uses aimed at ensuring the level of risk of pollution in these areas is*

* A black and white copy of the colour figure is provided on the next page.



MAIN ROADS
Western Australia

Prepared by the Statutory Planning Branch
Main Roads Western Australia
AUGUST 1994

LEGEND

- Urban
- Urban Deferred
- Rural (including Special Rural)
- Open Space
- State Forest
- Industrial
- Basic Raw Materials

- Gnangara Water Mound Priority 1 Source Area
- Gnangara Water Mound Priority 2 Source Area
- Gnangara Water Mound Priority 3 Source Area
- Possible Interchanges
- Existing Production Wells
- Proposed Production Wells (Lexia Scheme)
- Preferred Route Presented in the Public Environmental Review
- 18 — Groundwater Contours
- Boundary of Swan Valley Policy Area (Draft Review , August 1991)

SCALE

0 1 2 3 4

Kilometers

N-E CORRIDOR STRUCTURE PLAN AND GROUNDWATER RESOURCES

FIGURE 2

not unduly increased. Where possible the risks should be reduced through the reservation of parks and recreation areas. Urban development is not a preferred land use in Priority 2 Source protection areas. However, limited and properly managed urban (residential) development may occur in appropriate sectors of the landscape in these areas without unduly affecting the level of risk or contamination in them.

Environmental Protection (Gnangara Mound Crown Land) Policy 1992

The Environmental Protection (Gnangara Mound Crown Land) Policy 1992 boundaries generally reflect the Priority 1 source protection area boundaries nominated by the Water Authority of Western Australia. The policy was developed to protect the level and quality of groundwater and native vegetation and wetlands within the policy area. The policy specifies beneficial uses, environmental quality criteria and certain activities in the policy area that require authorisation under the Environmental Protection Act.

It should be noted that the policy applies to land held freehold by the State Planning Commission, on both sides of the existing Beechboro Road.

The policy is implemented by a number of mechanisms, including the Statement of Planning Policy noted below.

Statement of Planning Policy No. 3 Gnangara Mound Crown Land

A Statement of Planning Policy is prepared under Section 5AA by the State Planning Commission and issued with the approval of the Minister for Planning and His Excellency the Governor. The boundaries of the policy area are similar as for the Environmental Protection (Gnangara Mound Crown Land) Policy 1992.

The policy objectives are;

- to protect the quality and quantity of groundwater resources for public water supply;
- to promote sustainable use of groundwater,
- to protect wetlands and natural vegetation; and
- to encourage recharge of the groundwater resource.

The State Planning Commission and local authorities are required to give effect to the Policy. Proposals involving the use or development of land which are not in accordance with the objectives of the policy are subject to referral to the Environmental Protection Authority.

Draft Environmental Protection Policy for Gnangara Mound Private Land Groundwater 1993

The Environmental Protection Authority published the Draft Environmental Protection Policy for Gnangara Mound Private Land Groundwater in September 1993 and is currently considering public submissions about the policy before formulating a recommendation to the Minister for the Environment.

The draft policy has a similar structure to the Environmental Protection (Gnangara Mound Crown Land) Policy 1992.

In the section of the draft policy which applies to the North-East Corridor, Policy Area 2 coincides with the Water Authority Priority 2 source protection area.

In Policy Area 2, the draft policy essentially,

- recognises urban development as an activity which can cause groundwater to be degraded;

- puts the onus on public authorities to prevent or control activities which can cause groundwater to be degraded and to have due regard for declared beneficial uses when making land-use decisions; and
- seeks to protect beneficial uses by appropriate land management by land holders in the policy area.

Transport of goods over Priority 1 areas

In 1992 is was agreed to restrict dangerous goods from being carried along Gnangara Road across the Priority 1 Underground Pollution Control Area (which coincides with the Priority 1 source protection area). Routes used by vehicles carrying dangerous goods are approved under regulations administered by the Department of Minerals and Energy.

Select Committee of the Legislative Assembly of the Parliament of Western Australia - Metropolitan Development and Ground Water Supplies

The terms of reference for the above committee are;

1. That a select committee be appointed to inquire into and report on to what extent and in what manner development should be permitted on or around groundwater reservoirs in the Perth Metropolitan Region with particular regard to protecting underground water supplies whilst maximising the potential to zone and develop land for its optimum and best use inclusive of urban development;
2. That the committee have the power to send for persons and papers, to sit on days over which the House stands adjourned, to move from place to place and report from time to time; and
3. That the Committee finally report by no later than 30 November 1994.

In addition to the Terms of Reference the Committee has identified a need to

(a) assess the impact of existing land uses on environmental resources within the declared groundwater mound of the Perth Metropolitan Region including quality and quantity of groundwater;

(b) investigate the potential for future land use on the ground water mounds and provide a framework in which change in land use could occur; and

(c) identify the most appropriate mechanisms and processes that Government should use to protect future ground water supplies.

The following points from synopsis of the Department of Environmental Protection's submission to the above are relevant to the Environmental Protection Authority assessment of this proposal.

- Water, particularly groundwater, is an essential resource for the community of Perth. It is required for domestic, commercial, and industrial water supply; it is used for social and recreation purposes, and supports a range of ecological systems including wetlands, remnant native vegetation and rare flora and fauna species. Approximately 40% of Perth's potable water supplies come from groundwater, with even more being used for other purposes such as garden irrigation and commercial pursuits.
- Perth overlies a vast groundwater resource which because of its shallowness and the nature of the soils overlying it, is susceptible to pollution.
- The protection of current and proposed groundwater source areas is essential for Perth's continued development.
- The wider benefits to the community of maintaining quality of life and standard of living from retention and protection of groundwater quality and quantity, are of

greater economic, social and strategic value than those to be gained from inappropriate development.

- Mixed land use over groundwater areas currently exists in Perth.
- The existing groundwater and environmental protection, and associated land use planning system, in which the Water Authority of WA prioritises and identifies protection objectives for groundwater areas, where the Environmental Protection Authority and the Department of Environmental Protection focus their attention on the recharge areas of the Gnangara and Jandakot Mounds, and the Department of Planning and Urban Development prepares land use management plans is supported. There is scope and need for improvement to this system.
- The Government processes for protection of the groundwater resource and the ecological systems which rely upon them, are limited in their control of and application to proper land use planning in general either because they are statutorily inadequate, cannot adequately take cumulative impacts into account, or because of lack of acceptance by some sections of the development and planning community (as in the case of Environmental Protection Policies).
- The system for groundwater protection and optimising opportunities for land development can be improved by allowing for the preparation of statutory land use and water management plans. These plans should be prepared for the entire hydrologic unit being considered, should take into account objectives for groundwater management and environmental protection, and should afford strong protection for the main recharge areas of the mounds (in line with surface water catchment protection).
- The Department of Environmental Protection believes that development can take place in areas with groundwater provided it:
    - is in accordance with the objectives of the Priority the area has been allocated;
    - takes into account the principles of ecologically sustainable development;
    - defines and minimises risk of degradation of the groundwater; and
    - devises practical and implementable solutions to any problems which may arise.
- The continuation of many of the mixed land uses which exist over groundwater areas is acceptable in terms of the level of groundwater protection required, but it must be recognised that some existing and proposed land uses are not appropriate for specific parts of the groundwater mounds because of the risk of contamination associated with them.
- There are definite trends apparent from the information available as to the effect of certain uses on groundwater, both within and outside Underground Water Pollution Control Areas. Specifically, urban, horticultural and industrial uses have significant unacceptable potential impacts.
- Uses on groundwater recharge areas such as dryland grazing at low stocking densities, recreation, forestry, conservation, protection of remnant vegetation, and controlled Special Rural Zones are generally acceptable.
- Special Rural Zones should not lead to the loss of remnant vegetation and should not replace more benign land uses such as reserves or undeveloped vegetation.
- Given the information available and the valuable nature of the groundwater resource, the precautionary principle and avoidance and minimisation of risk should be employed in any future decisions on land uses over groundwater areas. Risk of groundwater contamination from certain land uses must be considered not only in terms of immediate impacts, but also in terms of long term cumulative impacts.

- Further scientific studies should be undertaken into the specific risks presented by different land uses so that knowledge can be improved, and with this management of the groundwater resource and the land uses which overly it.

Technical information

The following information is largely drawn from the Department of Environmental Protection submission to the Select Committee. Information regarding the potential impacts has been provided for Rural and Special Rural land-uses which occur in the Priority 2 source protection area and for Urban land-use which is proposed by the North-East Corridor Amendment. Information about the potential impacts of roads is also provided.

Existing land-use in the Priority 2 source protection area is rural and the area is substantially cleared of native vegetation. Urban land use is proposed.

Rural land-use

Grazing, fertilising and pest control activities on agricultural land can potentially affect the groundwater quality.

Impacts on groundwater quality from intensive rural uses such as horticulture is well documented (See for example (Sharma 1990) (Gerritse 1990), (McPharlin 1990), and these activities can be prevented or controlled by local authority town planning schemes.

A study by Dames & Moore for the Water Authority of nitrate levels in groundwater within the Jandakot Underground Water Pollution Control Area (UWPCA) in 1989 assessed the annual fertiliser nitrogen application rates for various irrigated rural land uses to be approximately as follows (GRC-Dames & Moore 1990):

- cabbages and onions - 928kgN/ha;
- turf farms - 280 to 600kgN/ha;
- pasture and lucerne - 280kgN/ha;
- floriculture - 450kgN/ha; and
- other irrigated land (orchards, nurseries) - 200kgN/ha.

The high levels of nitrogen load from land use are not currently represented in the quality of the groundwater, being at least an order of magnitude less than predicted. The study concluded, together with the results of (Gerritse, et al. 1988), that the low levels of nitrate currently in Jandakot UWPCA are principally due to bacteriological denitrification. This is a common finding of researchers of nitrogen concentrations worldwide, but the capacity for denitrification is limited by a number of factors and the process is not fully understood; consequently nitrogen loads may exceed a threshold value beyond which nitrogen concentrations increase rapidly. This is commonly referred to as the nitrate 'time-bomb' effect.

Nitrate contamination of groundwater has already occurred within the Water Authority borefield at Gwelup. One of the main sources of nitrogen in the groundwater is believed to be horticultural fertilisers (Barber *et al,* 1993).

Beneath dry-land grazing of leguminous (nitrogen-fixing) pastures, significant leaching of nitrate has been observed. This is associated with nitrogen in manure and urine from livestock. Nitrate accumulates in the soil profile as a result of oxidation of organic nitrogen over the summer when the annual pasture is inactive. During winter rainfall-recharge the nitrate, which is very mobile, may be leached downwards faster than the rate of uptake by growth (Dillon 1993).

In agricultural areas of Europe where nitrogenous fertilisers are used extensively, it has become clear that optimum (economic) application rates for production often result in the exceedance of drinking water guidelines for nitrate(Dillon 1993).

Urban land-use

Urbanisation as a land use has the potential to impact on the quality of the underlying groundwater via the following sources:

- effluent and cleaning fluids from septic tanks;
- domestic garden fertiliser application;
- pesticides applied to buildings for termite protection, and to gardens for pest control;
- uncontrolled disposal of small quantities of solvent, paint, oils and other household materials and wastes;
- disposal of stormwater run-off, which may be contaminated with a variety of substances;
- excessive pumping from private bores causing saline intrusion or migration of contaminated water;
- chemical spills from vehicles using residential streets;

As urbanisation of the North-East Corridor is proposed to be sewered, the issue of impacts from septic tanks is not considered further here.

Domestic garden fertiliser can result in a significant nutrient input to groundwater. Atwood and Barber 1988) estimated that 5,000 tonnes of fertiliser is applied annually to Perth gardens. Of that, an estimated 250 tonnes of nitrogen and 100 tonnes of phosphorus infiltrate into the groundwater (Whelan 1987). A CSIRO study of groundwater contamination at Gwelup found that groundwater downgradient of sewered urban areas developed in the mid 1970's would be expected to show full impact from garden fertilisers in the next century (Barber *et al.*, 1993). Studies in Long Island found that nitrate concentrations in groundwater increased over time despite replacement of septic systems with sewer service ((Flipse, et al. 1984) in (Harper, et al 1992)).

Special rural land-use

Special Rural Zones allow for a semi-rural land use which is structured for people who prefer low density housing on blocks usually of no less than one to two hectares.

Special Rural Zones can be considered to be a relatively low impact land use in terms of groundwater quality. However, the following activities may contribute to their potential to degrade the quality of underlying groundwater:

- clearing of native vegetation, although limited in extent;
- irrigation, fertilising and use of pesticide on a limited amount of non-commercial horticulture;
- lawn watering and fertilising similar to an urban block;
- keeping of stock and other animals (e.g. poultry), usually limited by local by-laws (e.g. maximum of two horses); and
- use of septic systems for household effluent disposal.
- other uses associated with rural small holdings where businesses are operated from home (e.g. trucking businesses, earth moving machinery).

The cumulative effect of these activities results in a potentially significant impact on groundwater quality, particularly with respect to nutrients. The total nitrogen load for Special Rural Zone properties, for instance, has been estimated at 82kg per property per year, or 41kg/ha/year based on some assumptions regarding irrigated area, animal numbers and so on (GRC-Dames & Moore 1990). Although relatively low compared with more intensive land use, this load represents a potential maximum nitrogen concentration in the groundwater

recharge of in excess of 20mg/L if all the nitrogen were to leach. Whilst only a proportion of the nitrogen would leach, the load is significant.

Roads

As new roads have been proposed over Priority 1 source protection areas the technical information relating to chemical spills and stormwater run-off from roads is relevant.

Chemical spills are a potential point source of groundwater contamination of which there is a significant risk in urban environments. In spills involving vehicular accidents, groundwater pollution results from either material loss via stormwater facilities or direct spillage onto permeable ground. Petroleum hydrocarbons, pesticides and other toxic chemicals are the most likely pollutants to enter the groundwater from these sources.

The West Australian Fire Brigade Annual Report (1992/93) indicates that several hundred spills of liquid occur each year.

The Water Authority has advised that the contaminants of most concern are dense organic liquids with low solubility. Spills of such liquids sink to the bottom of the aquifer, stratify and provide a continuos source of low level toxicity within the groundwater over decades. The removal of these substances from the groundwater is very difficult, if not impossible.

In addition, there is concern regarding the constant low level pollution associated with the normal use of the road, as expressed by the Ecologically Sustainable Working Groups.

> *In addition, the run-off from transport infrastructure is polluted by the emissions from vehicles and by surface and tyre degradation. The fine particulates, the unburnt oil, lead and asbestos dust from the emissions can be washed into surface water streams or can leach into ground water. The volume of traffic has a direct bearing on the degree of contamination of water systems* (Ecologically Sustainable Development Working Groups 1991).

Stormwater run-off from roads carrying high traffic loads (e.g. more than 40 000 vehicles per day) can carry contaminants of concern.

A study in Perth in 1990 found that infiltration basins adjacent to a major road contained high levels of lead (in excess of 3 500 ppm) and heavy metals. These substances were found to be confined to the surface soils of the basins in the short to medium term. It is not known if they could break through in the long term (Appleyard 1994).

Appendix 7

EPA's letter to State Energy Commission of WA dated 28 March 1994

→ file pls

Environmental Protection Authority

AN ENVIRONMENT WORTH PROTECTION

Mr D Eiszele
Commissioner and Chief Executive Officer
STATE ENERGY COMMISSION OF WA

Your ref:
Our ref:
Enquiries: 6/85/1 4/13/91

Dear Mr Eiszele

OXIDES OF NITROGEN FROM PINJAR GAS TURBINES

The Environmental Protection Authority has had a preliminary briefing on a proposal by SECWA to install, at the Pinjar station, an additional Frame 9 gas turbine and to convert the four Frame 9 turbines into two combined cycle units.

My purpose for writing is to express the EPA's reservations about the continuing incremental growth of the emissions of oxides of nitrogen (NOx) from the station. The current study of photochemical smog being funded by SECWA is revealing that NOx may be the key to controlling the maximum smog levels over the metropolitan area and beyond. In particular it is apparent that emissions from the Kwinana area play a significant role in causing high smog concentrations. The contribution of Pinjar emissions is not yet clear but there are plausible scenarios in which this contribution could be significant.

I am pleased to hear that SECWA proposes to fit NOx control equipment to the fourth Frame 9 turbine. The proposal will nevertheless significantly increase NOx emissions overall due to:

- increased total emissions from the combined cycle units since, with their high efficiency, they will probably be run as base load plant;
- greater ground level concentrations due to the loss of heat in generating steam which in turn will make the stack gases less buoyant; and
- NOx emissions from the fourth turbine (relatively low).

I recognise that the first three Frame 9 gas turbines have been approved without NOx suppression equipment and that the first two of these have been installed. I am also aware that dry low-NOx systems are now commercially available for Frame 9 turbines, which was not the case at the time of approval (August 1991). Had the second stage expansion comprised two Frame 9 turbines in combined cycle with a steam turbine, which was the alternative being considered by SECWA in 1991, it is almost certain that both the third and fourth Frame 9 turbines would have been fitted with NOx suppression equipment. The EPA notes that the Pinjar station has grown from a relatively small "peak lopping" station, with no projection for expansion (refer Notice of Intent, 1988), to a large power station under the current proposal.

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In view of the incremental impact of the proposed expansion, the EPA suggests SECWA include a dry low-NOx system with the third Frame 9 turbine.

The EPA would be pleased to discuss this request with you if you so desire.

Yours sincerely

SIGNED : R K STEEDMAN

R K Steedman
CHAIRMAN

28 March 1994

Appendix 8

State Energy Commission of WA's response to EPA letter of 28 March 1994

Norman A. White
Commissioner and
Chief Executive

State Energy Commission
of Western Australia
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SECWA

15 September 1994

Dr R K Steedman
Chairman
Environmental Protection Authority
Westralia Square
141 St George's Terrace
PERTH WA 6000

Dear Ray

NO_X CONTROLS ON PINJAR GAS TURBINE UNIT 11

I am writing in response to your letter of 28 March 1994 which suggests that SECWA should install the third Frame 9 gas turbine at Pinjar Gas Turbine Station with a factory fitted dry low NO_x burner system, even though it is approved for installation without NO_x controls.

SECWA is conscious of the fact that this gas turbine was approved for installation without NO_x controls by the Minister for the Environment (August 1991). The installation was subject to retrofit of low NO_x burners if Pinjar gas turbine emission impacts were shown to be significant by the findings of the Perth Photochemical Smog Study.

In the 1991 environmental impact assessment of extensions to Pinjar Gas Turbine Station, SECWA contended that the impact of the extensions was within guidelines and hence acceptable. One uncertainty raised by the EPA at the time was the possibility of some specific atmospheric movements in Perth air in which Pinjar emissions could contribute significantly to photochemical oxidants in the metropolitan region. Since the base line meteorological and dispersion data for such assessment has never been available for Perth, SECWA agreed to provide this with the $3 million Perth Photochemical Study, as well as assessing the impact of Pinjar emissions.

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The Study has progressed with this intent and will be completed in mid 1995 within the agreed timeframes. It is a joint exercise with the EPA, and there is no doubt that this world class study is of importance to air quality in Perth, and will be of great benefit to the community.

Although some preliminary information is becoming available from observations during the Study to date, it is premature to infer any impacts from Pinjar Gas Turbine Station at this time. This includes their significance in any conceptual atmospheric movement scenarios which themselves have unknown significance of impact.

We are aware of several uncertainties in regard to available dry low NO_x burners for Pinjar Unit 11 which, due to the size requirement (120MW), is likely to be a General Electric machine, namely:

- Dry low NO_x burners for this type of gas turbine have only been commercially available for a short period of time. We have no information as yet about their performance in the field. There are no comparable installations in Australia.

  Since the status of the Station is currently that of a remotely operated facility, and will remain so for some time, SECWA needs to be certain that this technology can operate reliably with little requirement for manned intervention. With a tight generation capacity to meet increasing demand in the State, SECWA cannot afford to be the testing ground for new technology.

- Current planning expectations are that combined cycle operation of Unit 11 would not be implemented before 2002. Up to that time Unit 11 would most likely serve as peaking plant, with only a moderate NO_x output.

- Dry low NO_x burner technology is likely to improve significantly in future years. For instance the developing DLN II (25ppm NO_x) burner system should be commercially available for GE Frame 9 machines. Certainly the current DLN I (35ppm) systems will have been proven in commercial application.

In view of the above, we have called tenders for Unit 11 gas turbine which included two extra options apart from the standard burner system:

- factory fitted dry low NO_x burners, and
- a design facilitating ready retrofit of such burners.

We have given the matter of dry low NO_x burners for Pinjar Unit 11 careful consideration. SECWA has a strong preference to make the decision about whether or not to fit dry low NO_x burners to Unit 11 after assessment of the information arising from the tender process and consideration of the results of the Perth Photochemical Smog Study.

Yours sincerely

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Abbreviations

SECWA	State Energy Commission of WA
EPA	Environmental Protection Authority
WAWA	Water Authority of WA
DEP	Department of Environmental Protection
MW	Megawatt(s)
km	Kilometre(s)
NOx	Oxides of nitrogen
ppm	Part per million
NHMRC	National Health and Medical Research Council
ANZECC	Australian and New Zealand Environment and Conservation Council
VEPA	Victorian, Environmental Protection Authority

Glossary

Gas turbine	A generating unit in which an air/fuel mixture is burnt and the resulting hot air/gas mixture is used to drive a turbine. A gas turbine drives a generator to produce electrical energy.
Open cycle	The operation of a gas turbine with no recovery of waste heat.
Combined cycle	The operation of a combination of gas and steam turbines, in which gas turbines generate electricity and the hot exhaust gases are redirected through boilers to produce steam, which generates additional electricity.
Peak load plant	Electricity-generating equipment that supplies peak loads above the baseline load, which varies with the time of day.
Mid-merit plant	Electricity-generating equipment that supplies intermediate loads above the baseline load (typically during weekdays from morning to evening), which varies with the time of day.
Base load plant	An industry term that refers to the portion of the total electricity requirements that is effectively constant throughout the year.