Collie Power Station Wastewater Management and Disposal System

Western Power Corporation

Report and recommendations
of the Environmental Protection Authority

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Summary and recommendations

This Bulletin is the Environmental Protection Authority's report and recommendations to the Minister for the Environment on the proposed Collie Power Station Wastewater Management and Disposal System.

A proposal by the proponent Western Power Corporation (formerly the State Energy Commission of WA), to build a new coal-fired power station 8 km north-east of Collie producing a nominal 600 MW of electricity received environmental approval from the Minister for the Environment in June 1991. An Environmental Condition of the approval was that SECWA submit a detailed proposal for **wastewater treatment and disposal** for separate environmental approval.

Accordingly, the proponent put forward a proposal to dispose of saline, industrial liquid and sewage wastewaters from the proposed Collie Power Station in three ways:- saline wastewater to the ocean at the northern end of the Leschenault Peninsula north of Bunbury via a 68 km pipeline, industrial liquid wastewater to a licensed off site facility, and treated sewage via irrigation to an on-site blue gum plantation. This proposal has been assessed by the Environmental Protection Authority at the level of Consultative Environmental Review (CER).

During the assessment the EPA sought expert advice from the Department of Environmental Protection, the Water Authority of WA, the Department of Conservation and Land Management, the Health Department of WA, and the Waterways Commission and concluded that the main environmental issues relating to the proposal were:

- effects of effluents on the marine environment;
- impacts associated with pipeline ruptures;
- impacts from construction of 68 km pipeline
- pipeline route selection to avoid areas of environmental significance;
- possible re-use of wastewater from pipe along route;
- treatment and disposal of sewage and industrial liquid wastes; and
- abstraction of power station water from the Collie Basin.

The Environmental Protection Authority during its assessment has utilised the information given in the Consultative Environmental Review, followed the advice of the above expert agencies, and taken into account additional information supplied by other government agencies, the public and the proponent.

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

Recommendation Number	Summary of recommendations
1	Proposal is acceptable subject to the recommendations in this report, the proponent's commitments, and the Authority's conditions.
2	Proponent to prepare and implement an Environmental Management Programme for: (i) Pipeline: . monitoring quality of saline water from power station into the pipeline; . monitoring of integrity of the pipeline; . management of dust, fire risk, soil erosion and spread of dieback; . construction at Leschenault Inlet in summer to protect wetland area, but avoiding peak bird use times; . revegetation and rehabilitation to land affected by construction of pipeline; . survey of areas for rare and endangered flora, in consultation with CALM; (ii) Ocean Discharge . background monitoring of environmental conditions at and around the ocean outfall; . monitoring at and around the ocean outfall to verify that mixing, interaction with adjacent outfall plumes and transport of effluent discharge is as predicted; . rectification measures should monitoring indicate that effluent discharge mixing, interaction with adjacent outfall plumes and transport at the ocean outfall are not as predicted. (iii) Onsite . monitoring of ponds. . investigates the nutrient absorptive capacity of the land proposed for agro-forestry.
3	The EPA also recommends that the Collie Water Advisory Group consult widely and provide advice from time to time to the EPA on the impact of groundwater extraction in the Collie Basin and its management implications.

1. Introduction and background

1.1 The purpose of this report

This report and recommendations provide the Environmental Protection Authority's advice to the Minister for the Environment on the environmental acceptability of the proposed Collie Power Station Wastewater Management and Disposal System.

1.2 Background

Western Power Corporation (formerly the State Energy Commission of Western Australia, or SECWA) is proposing to build a new coal-fired power station (the Collie Power Station) at a site located 8 km north-east of Collie, Western Australia. A proposal to build a power station producing a nominal 600 MW of electricity received environmental approval from the Minister for the Environment in June 1991. A condition of the approval was that SECWA submit a detailed strategy for water management for separate environmental approval.

Following a review of the State's power needs, the State Government decided to stage the development of the Collie Power Station. The initial stage, which would have a nominal capacity of 300 MW of electricity, is planned to be operational in 1998. Western Power however, wishes to obtain environmental approval for the water management strategy associated with the ultimate (600 MW) development of the proposed Collie Power Station.

In accordance with the provisions of the *Environmental Protection Act 1986*, SECWA referred this aspect of the project to the Environmental Protection Authority (EPA) in August 1994. Subsequently, the EPA determined that the appropriate level of assessment for the water management strategy was a Consultative Environmental Review (CER). The CER document was released for public comment for 4 weeks from 9 January 1995 to 6 February 1995.

1.3 The proposal

The proponent, Western Power, proposes to dispose of about 6700 m^3/d of clear saline water from the Collie Power Station via a 68 km pipeline to the ocean at the northern end of the Leschenault Peninsula north of Bunbury (Figure 1). The saline water to be discharged would have a Total Dissolved Solids (TDS) level of 3,200 to 5,000 g/m^3, and have ambient temperature. The main constituent would be sodium chloride or common salt. This water, although unsuitable for the power station, could be used by other industries where the concentration of salt or silica is not a limiting factor.

Also included in the wastewater management and disposal proposal are methods for managing liquid industrial and sewage wastewaters from the Collie Power Station. Concentrated waste chemicals from boiler cleaning and water treatment, and oily sludges produced from treating rainfall runoff from plant hardstand areas, would be collected by road tankers for disposal at a licensed off-site treatment plant. Treated sewage would be used to irrigate an on-site blue gum plantation.

The 600 MW Collie Power Station would require approximately 28,000 m^3/d of water for its operation. This would be supplied through a combination of mine dewatering, a dedicated borefield and rainfall collected from the plant hardstand areas.

Wastewater would be generated from a variety of processes at the power station. The water management system for the power station would incorporate recycling and reuse of water wherever possible, but approximately 6,700 m^3/d moderately saline water would be produced that could not be recycled or reused without further treatment. This water would consist

primarily of cooling tower blowdown, cooling tower sidestream filter backwash and boiler water treatment plant saline wastes. Blowdown and filter backwash would be discharged to prevent the excessive build-up of dissolved solids, particularly silica, caused by evaporation in the cooling towers. This water would lead to scaling of equipment if it were concentrated further by the evaporative cooling process.

Table: 1.1 Illustrative Water Balance (m^3/d).

SOURCE		PROCESS		SINK	
Mine or bore water	28,400	Cooling tower make-up	27,700	Saline discharge	6,700
Station drains	440	Boiler water treatment	1,200	Cooling tower evap.	20,700
		Potable water	24	Ash slurry	400
				Saline sludge	300
				Boiler steam	790
				Sewage	24
TOTAL (rounded)	28,900		28,900		28,900

Based on Figure 2.1 of CER.

The management of this moderately saline water is considered to be the most significant issue associated with the water management strategy for the proposed Collie Power Station. The prime consideration for management of this saline water is to assist the Water Authority of Western Australia (Water Authority) in its long term objective of returning the water in Wellington Dam to potable quality by not discharging water with a salinity greater than 550 g/m^3 total dissolved solids (TDS) into the Wellington Dam catchment.

1.4 Assessment process

A flow chart of the Environmental Impact Assessment process is shown in Appendix 1. The proponent referred the proposal to the Environmental Protection Authority (EPA) on 19 August 1994 for assessment. The EPA set the level of assessment at Consultative Environmental Review (CER). During the environmental assessment of this proposal the EPA utilised information supplied by other government agencies, the public and the proponent.

The CER was prepared in accordance with guidelines issued by the EPA. Public consultation during the preparation of the document helped ensure that interested individuals and groups were aware of the proposal and in a position to provide informed comment. The CER document was released for public review for a 4 week period ending on 6 February 1995. A summary of issues raised in public submissions was prepared and forwarded to the the proponent, and the proponent's responses were taken into account during this EPA assessment.

This EPA Bulletin is provided as advice to the Minister for the Environment and published. After a 14 day appeal period, the Minister sets Environmental Conditions relating to the proposal.

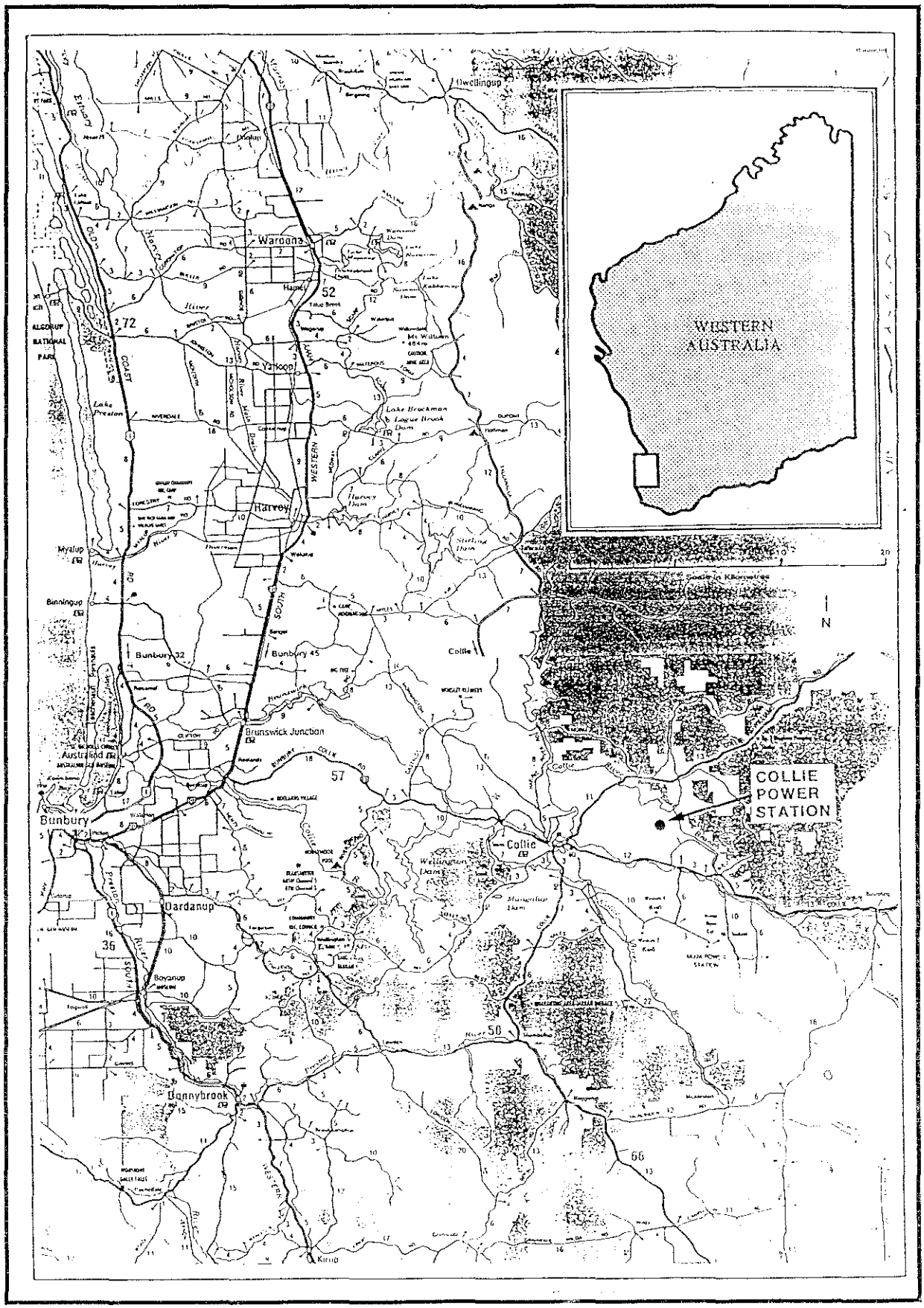

Figure 1. Regional Location Map, (Source: Figure 1.3 of the CER)

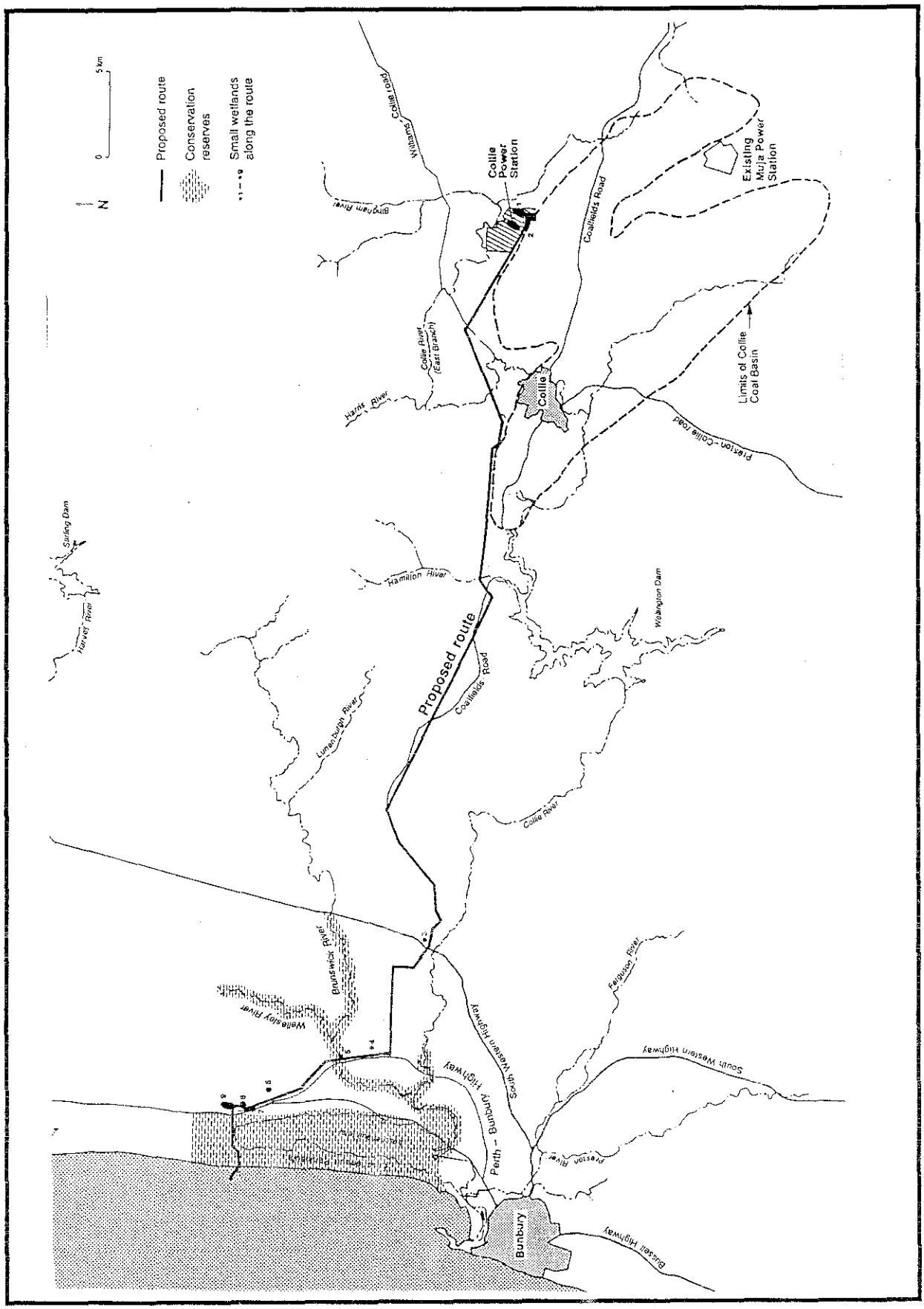

Figure 2. Location Map (Source: Figure 5.1 of the CER)

2. Summary description of proposal

2.1 Need for the proposal

A proposal by the State Energy Commission of WA (now Western Power Corporation), to build a new coal-fired power station 8 km north-east of Collie producing a nominal 600 MW of electricity received environmental approval from the Minister for the Environment in June 1991. A condition of the approval was that SECWA submit a detailed proposal for **wastewater treatment and disposal** for separate environmental approval.

2.2 Summary of proposal.

The proponent, Western Power Corporation, proposes to manage and dispose of wastewaters from the proposed Collie Power Station in three ways:- saline wastewaters to ocean via pipeline, industrial wastewaters to a licensed off-site treatment facility, and treated sewage via irrigation to an on-site blue gum plantation. (Details of the proposal are given in Appendix 4).

Saline wastewaters to ocean via pipeline.

Approximately 6700 m^3/d of clear, saline wastewater at ambient temperature, with a Total Dissolved Solids(TDS) range of 3,200–5,000 mg/L (mainly salt and silica) would be pumped via a 68 km pipeline to the ocean at the northern end of the Leschenault Peninsula north of Bunbury. The pipeline would discharge the saline wastewater into the ocean approximately 710m offshore, 500m away from the existing SCM Chemicals Ltd outfall, and at a depth of approximately 10m.

Before discharge from the power station, the saline wastewater would be lime treated and filtered to remove heavy metals and suspended solids. These solids would be disposed of with ash in the ash diposal area onsite. Skimmers and below surface suction pipes would be used to prevent floating material and oil entering the saline wastewater system. This water, although unsuitable for the power station, could be used by other industries where the concentration of salt or silica is not a limiting factor.

The 300–375 mm diameter pipeline would be constructed of plastic, ductile iron or steel and generally be buried below ground with a minimum soil cover of 600 mm. For river crossings, the pipeline would be enclosed in a steel pipe and supported/suspended across the river or attached to existing road bridges.

From the power station, the pipeline would pass through State Forest and farmland north of Collie, through the outskirts of the townships of Collie and Allanson, and then to the edge of the Darling Scarp. The pipeline would proceed to the township of Burekup and cross the coastal plain to the north of the Leschenault Peninsula mainly through farming properties. The pipeline would mostly follow existing cleared service corridors such as transmission line corridors, access tracks, property boundaries and road reserves.

The route crosses the Collie, Hamilton and Brunswick Rivers and the Leschenault Inlet conservation area, and avoids remnant bushlands and wetlands.

Depending on Water Authority's permission, the route may utilize the existing but largely redundant Wellington to Collie water pipeline. For part of the distance, the pipeline would run alongside the Water Authority's Kemerton Industrial Park water supply pipeline, inside private property.

Other industrial liquid wastewaters to a licensed off site facility.

Concentrated wastes from boiler cleaning and water treatment containing a variety of chemicals such as hydrochloric, citric, or phosphoric acids, ammonium salts and inhibitors would be

collected by road tankers, for disposal at a licensed off-site treatment plant, such as the Forrestdale facility. Oily sludges produced from treating rainfall runoff from plant hardstand areas would also be disposed of at a licensed off-site facility. The expected volume would be around 300 kl in first year of operation, with similar volumes after several years operation.

Treated sewage would be used to irrigate an on-site blue gum plantation.

Sewage from construction and operation workforce would be treated in a package sewage treatment plant, and treated sewage wastewater may be used, because of its high nutrient content, to irrigate an on-site eucalyptus plantation. During the peak construction phase approximately 90kL/day would be generated, with 20 kL/day during operation.

3. Environmental impact assessment process

3.1 General

Assessment process

The environmental impact assessment for this proposal followed the *Environmental impact assessment administrative procedures 1993*, as shown in the flow chart in Appendix 1. The Department of Environmental Protection (which administers the environmental impact assessment process for the EPA) reviewed all submissions made on this proposal and prepared a list of environmental issues raised in submissions. The summary of submissions and the proponent's response to those submissions appears in Appendix 2, and a list of submitters appears in Appendix 3.

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 issued by the DEP), by DEP officers utilising their own expertise and reference material, by utilising expertise and information from other State government agencies, and by contributions from EPA members.

The EPA recognises that further studies and research may affect the conclusions. Accordingly, the EPA considers that 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 the EPA.

3.2 Public submissions

Comments were sought on the proposal from the public, community groups and local and State Government Authorities. The proponent's CER document was available for public comment for a period of four weeks between 9 January 1995 and 6 February 1995.

There were 15 submissions received, within the following categories:

- 4 individual letter submissions.
- 3 submissions from groups and organisations; and
- 8 submissions from State, local and other government agencies.

The principal environmental issues of concern in the submissions include:

- effects of saline wastewater on the marine environment;
- potential environmental impacts associated with pipeline ruptures;
- impacts from construction of 68 km of pipeline;

- pipeline route selection to avoid areas of environmental significance;
- possible re-use of wastewater from the pipe along the route;
- treatment and disposal of sewage and industrial liquid wastes; and
- impacts of abstraction of groundwater from the Collie Basin.

The EPA has considered the submissions received and the proponent's response as part of the assessment of the proposal.

3.2.1 Synopsis of public submissions

The submissions were primarily concerned with consequences of discharge of industrial wastewaters to the ocean; and the route, construction and possible rupture of the pipe along its 68 km length.

In particular, submissions were concerned with potential impacts on the marine and land environments. The public was concerned with the the quality of water being discharged via the pipe; possible impacts to areas identified as being of conservation value; and the effects on use of private land due to pipeline construction and operation. Government agencies expressed concerns over the use of road reserves and roadside vegetation clearing; impacts on flora; and rehabilitation to areas affected by construction. Concerns were expressed that appropriate engineering design requirements be met for the pipeline, site storage ponds and sewage treatment and disposal system; and that re-use of the saline wastewater be explored further, in the context of the Water Authority strategy of returning the salinity of water supplies from the Wellington Reservoir to levels suitable for domestic use.

Many of the submissions expressed concern with the evaluation of alternative methods for treatment and disposal of saline water from the Collie Power Station. The difference in methods proposed for Muja Power station compared with Collie Power Station was highlighted, Concerns were also raised over impacts of abstraction of groundwater from the Collie Basin.

In considering the issues raised in public submissions for this proposal, the EPA considered that some issues were principally an expression of socio-economic concerns (eg: tourism, employment, compensation for land) or issues not relevant to this proposal. Such issues are considered to be more adequately dealt with in other processes rather than the EPA assessment process, and have therefore not been considered in this report.

Issues raised in relation to socio-economic impacts included the following:

- effect on proposed tourism development near Wellington Dam;
- employment opportunities;
- maintenance of water supply to Allanson/Collie residents if the section of Water Authority pipeline is utilized;
- payments to land owners for pipeline easements;
- maintenance of fencelines and access to private properties; and
- effects on unplanned developments.

4. Evaluation of key issues of concern

The EPA has evaluated the key issues identified in Section 3.2 of this report, based on existing information and advice from key government agencies, viz.:

- effects of saline wastewater on the marine environment;
- potential impacts associated with pipeline ruptures;

- impacts from construction of 68 km of pipeline;
- pipeline route selection to avoid areas of environmental significance;
- possible re-use of wastewater from the pipe along the route;
- treatment and disposal of sewage and industrial liquid wastes; and
- impacts of abstraction of groundwater from the Collie Basin.

4.1 Effects of saline wastewater on the marine environment

4.1.1 Objective

The Environmental Protection Authority's objective is to ensure that no adverse marine ecological impact occurs as a result of wastewater discharge to the ocean.

4.1.2 Evaluation framework

Policy framework

The evaluation of a proposed wastewater discharge into the marine environment should take into account likely impacts on the flora, fauna, aesthetics and beneficial uses of the affected environment. The proposed discharge should meet water quality criteria guidelines outside a designated mixing zone as described in the October 1993 report of the Environmental Protection Authority: *"Draft Western Australian Water Quality Guidelines for Fresh and Marine Waters, Bulletin 711"*. This document outlines environmental values of fresh and marine waters, and sets chemical, physical and biological guideline levels, which, if not exceeded, should result in that environmental value being maintained.

In the case of effluent discharge, the concept of a "mixing zone" (an area around an effluent discharge where certain environmental values are not protected) has been accepted and practised by the Department of Environmental Protection. The concentration and total mass of pollutants within a mixing zone, and its size needs to be determined in each case. Effective discharge controls should ensure that the area of a mixing zone is limited and the beneficial uses (protection of aquatic ecosystem) of the waterbody as a whole are not prejudiced.

Bulletin 711 places all chemical pollutants into two broad groups : biostimulants (primarily the nutrients nitrogen and phosphorus), and toxicants (such as heavy metals, hydrocarbons and PCBs). Guideline values are set for these in Bulletin 711.

Under the Environmental Protection Act 1986, wastewater discharges to the marine environment are able to be licensed if they have the potential to cause pollution.

Technical information

According to the proponent, and confirmed by the DEP regional office, the proposed outfall would be located in an area of relatively low conservation value, and the relevant guidelines for water quality in the region adjacent to it would be those listed in *'Summary guidelines for protection of aquatic ecosystems'*, Table 2.2 in EPA's Bulletin No. 711 (EPA 1993b). In areas around the shoreline near the proposed outfall and at distances further seaward, *'Guidelines for the protection of human consumers of fish and other aquatic organisms'* (EPA 1993b), apply.

The proponent upon advice from Kinhill Engineers Pty Ltd stated that the existing seagrass and macroalgae near the outfall are sparse and patchy and that most of the reef, seagrass and algal meadows of the inshore area adjacent to the Leschenault Peninsula provide a poor habitat for flora and fauna. The area does not show any marked variation in species composition and abundance. The inshore waters are not of major significance to commercial or recreational fisheries. Recreational fishing near the proposed outfall is not intense, although some beaches are fished regularly.

The proponent made a commitment in the CER that, prior to construction of the ocean outfall, a baseline survey of the environment in the area near the ocean outfall would be undertaken.

Numerical modelling by Kinhill Engineers Pty Ltd of the outfall discharge indicate that a 100-fold dilution of the saline water is possible within 6 m of the outfall. The outfall area is well mixed due to exposure to high energy wind-driven waves and currents. The hydrodynamics of the coastal waters would ensure adequate mixing, dilution and transport of the saline water away from the nearshore zone.

In Table 7.1 (Appendix 7), the composition of the saline water after a 100-fold dilution with seawater is compared with the composition of seawater, as well as the relevant water quality guidelines. These data indicate that the chemical composition following dilution (including heavy metals) would fall within the water quality criteria used by the EPA for the protection of aquatic ecosystems and human consumers of fish and other aquatic organisms.

The CER provided technical data which indicates that the environmental impact of the temperature of the saline water would be minimal.

SCM Chemicals outfall

The SCM Chemicals outfall located near the proposed Western Power outfall is licensed under the Environmental Protection Act, and licence conditions include: environmental monitoring of the marine waters; parameters such as flow, temperature and pH being continuously monitored whenever wastewaters are being discharged; and wastewater discharge samples taken for analysis on a regular basis. Comprehensive monitoring of the wastewater discharge occurs every six months, and the concentrations of important components are determined by analysis. The proponent may not exceed water quality criteria outside a defined mixing zone around the outfall.

Comments from key government agencies

Leschenault Inlet Management Authority stated that "members resolved that they had no objection to the pipeline proposal or to the discharge of wastewater off Buffalo Beach".

4.1.3 Public Submissions

The issue of protecting the marine environment was discussed in several public submissions received by the EPA, as it was perceived to be one of the most important issues arising from the proposal.

The greatest concern was the possibility of contamination of the marine environment by pollutants including heavy metals. The opinion was expressed that the ocean should not be used as a dumping ground for industrial or residential wastewater. Concerns were raised over potential impacts to the recreational use of the area, such as swimming, fishing and diving.

The proposed annual ocean monitoring process was seen as inadequate. A preference was expressed for monitoring on a monthly basis for the first year, quarterly in years two and three, and six monthly thereafter.

4.1.4 Proponent's response

In response to the issues detailed in the public submissions, the proponent provided the following comments:

> "The disposal of saline water to the ocean meets the stringent requirements set by the EPA for marine environments. This can be demonstrated by reference to Table 6.1 of the CER. The water being disposed is essentially salt water that has been concentrated by the evaporation process within the cooling water circuit...Table 6.1 of the CER compares the saline water after 100 fold dilution with the water quality guidelines for marine environment set by the EPA. The table demonstrates that the chemical

composition (including heavy metals) falls within the limits specified by the EPA for the protection of aquatic ecosystems and human consumption of fish and other aquatic organisms."

"The main source of the metals in the saline water discharged to the ocean is the natural content present in the groundwater abstracted from bores and mine dewatering used to supply the power station. Prior to discharge, the saline water would be treated with lime and by filtration, as described in Section 2.3.1 of the CER. ...The levels of heavy metals would likely be lower than those listed in Table 2.5 (of the CER)."

"Materials classified as "toxic", ie from other operations on site, would be disposed of by commercial disposal contractors."

"... the commitments and procedures that Western Power would follow to monitor and maintain the integrity of the ocean outfall... include periodic inspection and maintenance and a back pressure gauge near the onshore break tank in order to detect any potential rupture of the outfall pipe or diffuser. Additionally there is commitment to annual monitoring of the ocean environment in the vicinity of the outfall."

Commitments made by the proponent

1. The proponent will ensure that the water discharged into the ocean will be clear, moderately saline, at ambient temperature and free of any objectionable or unsightly material, to the satisfaction of the DEP.

20. The proponent will site the ocean outfall off the Leschenault Peninsula in an area of low conservation value to minimize the effects of the discharge on the surrounding environment, to the satisfaction of the DEP.

21. Should monitoring of the ocean near the outfall detect an adverse environmental impact as a result of the saline water discharge (as defined by the EPA), the proponent will review the operation of the saline water management system and implement changes, to the satisfaction of the DEP.

22. As part of the environmental management programme to be prepared for the Collie Power Station, the proponent will submit and subsequently implement a monitoring programme to the satisfaction of the DEP. The monitoring programme will address the following aspects of the water management system:

    - leakage of on-site ponds
    - quality of saline water discharge
    - integrity of the pipeline
    - verification of dispersion at the outfall
    - quality of the ocean-receiving environment.

4.1.5 Evaluation

The EPA has reviewed the data presented by the proponent in the CER and has been advised by the Department of Environmental Protection (DEP) that the discharge should meet the water quality criteria guidelines (*"Draft Western Australian Water Quality Guidelines for Fresh and Marine Waters, Bulletin 711"*) outside the mixing zone because of its buoyancy and discharge velocity.

Accordingly, the EPA finds the proposed discharge environmentally acceptable. (Recommendation 1).

In this conclusion, the EPA has recognised the proponent's commitments to perform baseline studies and ongoing monitoring of water quality characteristics, marine fauna and flora, and dispersion of the saline water, at and around the ocean outfall. The EPA concludes that the most appropriate manner to present this information is in the form of an Environmental Management

Programme (EMP). This EMP should include rectification measures should monitoring indicate that effluent discharge mixing, interaction with adjacent outfall plumes and transport at the ocean outfall are not as predicted. The EMP should meet the requirements of the DEP.

4.2 Integrity of Pipeline - impacts associated with pipeline ruptures

4.2.1 Objective

The Environmental Protection Authority's objective is to ensure that the pipeline should be designed, constructed, operated, monitored and maintained to the highest engineering and environmental requirements, so as to minimise ecological risk and potential impacts on land traversed by the pipeline.

4.2.2 Evaluation framework

Existing policy framework

Environmental Protection (Swan Coastal Plain) Policy 1992.

Since European settlement, more than two thirds of the lakes on the Swan Coastal plain have been destroyed or severely degraded (EPA 1992). This has lead to the implementation of a policy to ensure that the remaining wetlands on the Swan Coastal Plain have some protection from activities which may cause their destruction or degradation.

The policy, referred to as the Environmental Protection (Swan Coastal Plain) Policy, was proclaimed following extensive consultation with community groups and private landholders. The Lakes EPP prohibits unauthorised filling, mining, drainage or effluent discharge into nominated lakes. Lakes listed in the policy have the highest level of protection under the Environmental Protection Act and there is a presumption against approving developments that are likely to breach the intent of the policy; that is maintenance of genetic diversity within the wetlands in the policy area. Authorisation under the Environmental Protection Act to disturb an EPP lake generally requires the approval of the Minister for the Environment, on advice from the Environmental Protection Authority, after a proposal has been assessed.

System 6 Red Book Areas

The proposal potentially affects two areas recommended for conservation and recreation in the System Six report. The areas of Recommendations C66 (Leschenault Inlet) and C67 (the Collie, Brunswick and Wellesley Rivers) may be affected by the pipeline construction and operation.

In 1972, the Environmental Protection Authority established the Conservation Through Reserves Committee to make recommendations for the reservation of land for conservation and recreation purposes. The State was divided into 12 regions or Systems with the most intensively used areas in and around the Perth metropolitan area included in the Darling System, known as System Six (Environmental Protection Authority, 1983 a & b). In addition, the System Six Report recommends that many rivers in the State be made into regional parks, which includes the Collie River up to the Wellington Dam.

Recommendation C66 covers the Leschenault Inlet and recognises that the whole area is under increasing pressure from urban development, recreation and industrial development. The shallower waters of the inlet are an important nursery area for commercial species of fish.

Recommendation C67 comprises the Brunswick River downstream from Brunswick Junction, the Wellesley River downstream from about one kilometre north of its intersection with Wellesley Road and the Collie River from its mouth in the Leschenault Inlet to approximately four kilometres upstream.

Effect of proposal

According to the proponent, none of the wetlands subject to the Environmental Protection (Swan Coastal Plain) Policy 1992 or the EPA System Six Red book would be disrupted during construction of the pipeline.

Technical information

The proponent intends to design and construct the pipeline according to current Australian standards and good engineering practice. The route would be marked above ground with appropriate signs, and a visible tape placed in the trench above the pipe. In sensitive areas such as near wetlands, the pipeline would be enclosed within another pipe. In the event of a rupture, the presence of pressure break tanks and check valves would limit the volume of saline water draining out. Slow leaks would be detected by routine inspection of the pipe.

The consequences of a pipeline rupture or leak depend on the proximity of the rupture to sensitive environments, and the volume and composition of saline wastewater discharged, and the exposure time.

Comments from key government agencies

Water Authority commented on pipeline design and inspection:

> "Western Power will need to conduct a detailed engineering design for the pipeline, including factor of safety determination for water hammer caused by valve closures."
>
> "Patrol of the pipeline should occur on a quarterly basis. After six months if no problems are detected, (including testing in situ of safety devices for successful operation under a range of pressure conditions), then biannual or annual patrol would be acceptable."

4.2.3 Public Submissions

Concerns were expressed at the possible impacts of a leak from the pipe, with undiluted wastewater containing heavy metals and nutrients flowing into wetland areas. There was interest in ensuring that adequate emergency backup systems would be in place.

4.2.4 Proponent's response

1. The proponent provided the following comments in the CER in relation to impacts of a pipeline rupture or slow leak:

> "...the impact of a pipeline rupture or slow leakage into...wetlands is likely to be minor."
>
> "The impact of a pipeline rupture or slow leak on vegetation is likely to be minor and short lived....Many plants can be irrigated with moderately saline water, provided that the water drains into the soil relatively rapidly and the soil does not become waterlogged. The vegetation along the proposed pipeline route would therefore be able to tolerate one-off applications or slow leaks of moderately saline water, provided that the water drained quickly. There might be some temporary leaf burn or stunted growth, but this would be reversed rapidly once the wastewater was flushed from the soil by drainage, rain or fresh water."
>
> "...many plants can tolerate one-off applications or slow leaks of moderately saline water...many species of Australian freshwater flora and fauna appear to be tolerant of a wide range of salinities."
>
> "In the rare event of a pipeline rupture or major leak, SECWA would repair any damage to the surrounding environment. This could include collecting any standing saline water, applying fresh water to the area affected to flush out any remaining saline water, or applying lime or gypsum to clay soils in order to flush

sodium from the saline water off the clays to prevent them becoming impermeable and to assist drainage."

Precautions proposed by the proponent to prevent rupture and minimise impacts included: automatic control and flow-metering of the pipeline, with shutdown of pumping if a significant difference in flow is detected between any of the flowmeters.

2. In response to the issues detailed in the public submissions, the proponent provided the following comments:

> "By its very nature a buried pipeline is a highly reliable engineered structure. Western Power proposes to incorporate a number of design and construction features to minimise the likelihood of damage to the pipeline. These range from the use of distinctive above ground and below ground markers to the installation of safety devices and automatic shut down valves."
>
> "The pipeline is considered to be a significant and integral part of the power station. As such it will be subject to intensive engineering design. Western Power proposes to engage an experienced consulting engineering firm with appropriate QA procedures to ensure that the highest engineering design standards are employed. The design will take due account of all design conditions and loads, including water hammer. The precise location of valves, break tanks etc cannot be determined at this stage. It is Western Power's intention to locate scour valves away from sensitive water resources."
>
> "Western Power recognises that in the unlikely event of a rupture of the pipeline the most significant effect would be on any wetlands in the vicinity of the rupture. Consequently Western Power has undertaken a review of wetlands in proximity of the pipeline and the impact upon them in the event of a major rupture. The effect of heavy metals and nutrients in the saline water would be negligible because of their low concentrations. Section 6.2.2 of the CER which incorporates Commitment 15 details the expected impacts and appropriate remedial strategies."
>
> "Western Power proposes to implement a regular monitoring programme to detect any impacts on the environment, in the vicinity of the power station, along the pipeline route and at the ocean outfall. Routine maintenance inspections will be undertaken on a regular basis to ensure that valves and metering facilities are functioning properly."

Commitments made by the proponent

2 If a failure of the saline water disposal system should occur, the proponent will direct the saline water to the saline water disposal pond until the fault is rectified, to the satisfaction of the DEP.

13 The proponent will install safety devices to reduce the potential for and impact of pipeline rupture. These devices will be installed to the satisfaction of the DEP and on the advice of the Water Authority.

14 The proponent will conduct periodic inspections of the pipeline and its components and undertake periodic maintenance to ensure system integrity, to the satisfaction of the Water Authority.

15 The proponent will institute measures so that an alarm will be raised and the pumps shut down automatically if a significant leak in the pipeline was detected. These measures will be to the satisfaction of the DEP and on the advice of the Water Authority.

16 The proponent will repair any damage to the surrounding environment in the event of a pipeline rupture or leak, to the satisfaction of the DEP.

4.2.5 Evaluation

The EPA considers that WAWA is the expert government agency dealing with wastewater pipeline construction. WAWA has advised the EPA that provided that the pipeline is constructed to current Australian standards, good engineering practice and specific WAWA requirements, the proposal is acceptable. The proponent has advised that the pipeline will be constructed to WAWA's requirements.

Accordingly the EPA concludes that the potential for rupture of the pipe will be managed, and hence finds the proposal environmentally acceptable with respect to integrity.

The EPA notes the commitments made by the proponent and considers that detailed design and ongoing monitoring of the operational integrity of the pipeline should ensure that potential impacts on environmentally sensitive areas as a result of pipeline ruptures or leaks would be minimised. The EPA concludes that the proponent should present details of its design and ongoing monitoring measures in the form of an Environmental Management Programme (EMP). This EMP should describe rectification measures should monitoring indicate that adverse impacts have occurred.

4.3 Impacts of construction of pipeline and wastewater management system.

4.3.1 Objective

The Environmental Protection Authority's objective is to ensure that the impacts associated with construction of the pipeline and the wastewater management system are environmentally acceptable.

4.3.2 Evaluation framework

Technical information

Pipeline

The proponent has indicated that the pipeline would be completed progressively by construction in discrete sections which would involve excavation, installation, pressure testing, backfilling and progressive rehabilitation. Typical periods of disturbance are expected to be 1-3 weeks for individual pipeline sections. Construction of the entire pipeline would take about 6 months. By burying the pipeline wherever possible, there are no impediments expected by the proponent to agricultural activity or stock and traffic movements after construction, and negligible visual impact is expected.

Onsite wetlands

The proponent has indicated that construction of clay lined storage ponds for raw water and saline wastewater would convert a large part of an existing wetland on the Collie Power Station site into permanent lakes. The ecological value of the wetland would be maintained by establishing fringing vegetation around the perimeter of the reservoirs.

During the ongoing assessment of proponent's compliance with 12 June 1991 Environmental Conditions of implementation for the Collie Power Station, the Minister for the Environment advised Western Power on 25 February 1995 that further commitments concerning those wetlands should be met (refer to letter in Appendix 6). The requirements of the Minister for the Environment were that the proponent commit to further landscaping of the power station site, creating an alternative pond habitat of the raw water pond, and monitoring the wetlands.

Comments from key government agencies

Department of Conservation and Land Management (CALM) stated that:

"the commitments contained in the document are generally adequate, however the following areas need attention...:

. rehabilitation to manage visual impacts on CALM managed estate will need to be to CALM satisfaction."

Water Authority of WA asked how the proponent would monitor seepage rates from the containment structures at the power station, and referred to permeability of clay-lined ponds.

4.3.3 Public Submissions

Concerns were expressed that strict hygiene measures be imposed to prevent the spread of dieback disease. Concerns were also expressed that the properties to be affected by construction and operation of the break tanks had not been identified. Erosion problems could occur in steep areas of some properties. Concerns were also raised that trees be avoided, and that rehabilitation occur along the route.

4.3.4 Proponent's response

The proponent provided the following responses to the concerns expressed in the above public submissions:

Pipeline

"Among specific commitments made by Western Power are:

- Construction would occur during summer to reduce the risk of soil erosion and spread of dieback. This will also maximise the opportunity for rehabilitation of disturbed areas.
- Strict fire precautions will be implemented during the construction of the pipeline.
- Dust suppression measures will be employed to minimise dust nuisance.
- Vehicle movements will be confined to predefined access routes."

"Western Power will ensure that, where practical, the pipeline would pass through existing cleared service corridors and avoid remnant bushlands, wetlands and other environmentally sensitive areas. Western Power will consult extensively with both the EPA and CALM through the planning, design and construction phases. "

"The proposed route has been chosen to minimise the extent of vegetation clearing. The pipeline follows existing road reserves (avoiding road side vegetation), cleared farmland, existing services corridors and an existing pipeline."

"Where necessary, Western Power will provide alternative access for stock movement to ensure disruption to farming activities is minimised. Western Power will liaise with individual land owners as required."

"Western Power is committed to restoring areas disturbed by construction activities progressively and as soon as possible after the completion of a portion of the construction. Disturbed areas will be revegetated with appropriate species. Particular attention will be paid to the rehabilitation on coastal sands, near wetlands and in areas that may be susceptible to erosion."

"Both the contractor and Western Power will employ stringent quality assurance and inspection procedures to ensure that the highest standards are maintained through all stages of the project. Western Power will consult with landowners and the appropriate government bodies (CALM, Department of Agriculture, EPA) to ensure that appropriate construction and rehabilitation measures are put into place."

"Western Power are proposing to construct an on-site storage facility to contain the saline water in the event that a shut down of the pipeline is necessary for maintenance or

repairs. The saline water storage facility will provide a six day storage capacity. This will cater for any foreseeable outage...Western Power is committed...to prepare and implement a monitoring programme to the satisfaction of the EPA and WAWA."

Commitments made by the proponent

3 The proponent will construct and line on-site storage ponds to limit seepage into local groundwater systems, to the satisfaction of the DEP and on the advice of the Water Authority.

4 If any of the on-site storage ponds is found to leak and cause an environmental impact (as defined by the EPA), the proponent will implement procedures to identify the reasons for the leakage and prevent a recurrence, to the satisfaction of the DEP and on the advice of the Water Authority.

7 The proponent will implement policies to eliminate the possible spread of dieback and weeds during construction from infected areas to disease-free and weed-free areas, to the satisfaction of CALM.

8 The proponent will implement strict fire precautions during pipeline construction to the satisfaction of CALM.

9 The proponent will ensure that disruption to access and stock movement during construction is of minimal practical duration.

10 The proponent will utilize dust suppression measures, such as water sprays from tankers, to minimize dust generation during pipeline construction, to the satisfaction of the DEP.

11 The proponent will minimize the impact of blasting by limiting blasting to daylight hours and calm conditions, and by using the minimum charge required, to the satisfaction of the Department of Minerals and Energy.

12 The proponent will develop site-specific mitigation or management plans by negotiating with individual land owners before commencing construction of the pipeline.

17 The proponent will restore areas disturbed by construction activities progressively and as soon as possible after the completion of a portion of the construction. Disturbed areas will be re-vegetated with appropriate species. Particular attention will be paid to the rehabilitation of coastal sands, near wetlands and areas that may be susceptible to erosion.

18 The proponent will arrange for the rehabilitation of land on CALM managed estates to a condition that existed prior to construction. The rehabilitation shall be to the satisfaction of CALM.

4.3.5 Evaluation

Following advice from CALM and WAWA, (Appendix 6) and the proponents' response to questions raised (Appendix 2), the EPA considers that construction of the pipeline and wastewater management system could be carried out in an environmentally acceptable manner. The EPA notes the commitments made by the proponent to minimise construction impacts and rehabilitate land.

Notwithstanding the above, the EPA concludes that the proponent should present details of the following in an EMP (Recommendation 2):-

- plans to manage impacts from construction, including dust suppression, fire risk in vegetated areas, soil erosion and spread of dieback;
- monitoring of the integrity of onsite storage ponds;
- measures to revegetate and rehabilitate land affected by construction;

- rectification measures should monitoring indicate that adverse impacts have occurred.

4.4 Pipeline Route Selection

4.4.1 Objective

The Environmental Protection Authority's objective is to ensure that the route minimises potential environmental impacts on ecologically sensitive areas.

4.4.2 Evaluation framework

Existing policy framework

Environmental Protection (Swan Coastal Plain) Policy 1992.

Refer to Section 4.2 above.

System 6 Red Book Areas

Refer to Section 4.2 above.

Technical information

According to the proponent, none of the wetlands subject to the Environmental Protection (Swan Coastal Plain) Policy 1992 or the EPA System Six Red book would be disrupted during construction of the pipeline. Several deviations from the most direct route along cleared service corridors have been made to avoid a number of wetlands. Where additional wetlands exist directly in the route, the pipeline would pass around them where possible.

The preferred route for the pipeline was chosen by the proponent following an evaluation of the construction and access requirements, and the land environment along possible routes. Alternative routes considered following railway lines or other roads would require extensive clearing and preparation of service roads for pipeline inspection and maintenance. The preferred option minimises the number of landowners affected, with the route passing close to property boundaries wherever possible. The preferred option also minimises the number of irrigation ditches and drainage channels which need to be crossed by the pipeline.

The route affects the Leschenault Inlet Red Book area C66. The pipeline crosses approximately 3 km of coastal dunes and samphire, sedgeland and woodland communities at the northern end of Leschenault Inlet. The inlet represents an important water-bird habitat, particularly the northern end which is used as a refuge by several species of water-fowl during mid and late summer (DCE 1983). The shallow waters of the inlet are saline and provide an important nursery ground for numerous commercial species of fish and crustaceans. The samphire flats at the top of Leschenault Inlet are connected to the inlet and would periodically contain moderate to high salinity estuarine water.

To support their preference for putting the pipeline through the Reserve, the proponent committed to minimising the environmental impact by:

- choosing a pipeline easement through the Reserve which is acceptable to the Leschenault Inlet Management Authority;
- the pipeline would utilise an existing cleared track and partly revegetated pipeline route through the dunes at the northern end of Leschenault peninsula and terminate adjacent to SCM Chemicals' existing outfall;
- achieving final rehabilitation objectives as agreed with the Department of Conservation and Land management, which reflect the purpose of the conservation area.

The route potentially affects Recommendation C67 because of the need for the pipeline to cross the Brunswick River which is protected by the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992. The EPA in its assessment of the Water Authority Kemerton Industrial Park Water Supply proposal considered that by suspending the pipeline beneath the Brunswick River bridge on the Australind Bypass, any impacts on the Brunswick River or the lake gazetted for protection by the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 would be limited.

A population of Priority 3 flora species *Acacia semitrullata* is located within the Australind Bypass road reserve and could be affected by the proposed pipeline alignment. The rare flora species *Aponogeton hexapetalus* is known to be found in swamps in the area.

Comments from key government agencies

CALM reviewed the CER and stated that:

> "the commitments contained in the document are generally adequate, however the following areas need attention...
>
> - Significant Flora - SECWA will need to engage a competent botanist to check specific areas for rare or priority species. The areas will need to be determined in consultation with CALM."

Leschenault Inlet Management Authority (LIMA) stated that :

> "members resolved that they had no objection to the pipeline proposal or to the discharge of wastewater off Buffalo Beach".

4.4.3 Public Submissions

Concerns were expressed about the route of the proposed pipeline through Red Book area C66, and along the Australind Bypass road. Concerns were also expressed about clearance of native vegetation, and whether the pipeline route would impact on the function and maintenance of landowner's dams, as well as on telephone and other services to properties.

4.4.4 Proponent's response

The proponent provided the following responses to the concerns expressed in the above public submissions:

> "Western Power has consulted extensively with LIMA with respect to the proposed pipeline route. Western Power proposes to maintain close dialogue with LIMA and CALM through the design and construction process. Western Power recognises the significance of the Leschenault Inlet and adjacent lands and is committed to employing practices that minimise environmental impact."
>
> "The proposed route has been chosen to minimise the extent of vegetation clearing. The pipeline follows existing road reserves (avoiding road side vegetation), cleared farmland, existing services corridors and an existing pipeline."
>
> "The route was chosen to minimise disruption to landowners as much as possible while taking into account known future land requirements...Western Power undertook a detailed public consultation phase in which all landowners, interest groups and government bodies were consulted. Issues such as road upgrades and alignments were discussed with MRWA and where details were known due consideration was given."
>
> "The pipeline route passes close to only one landowner's dam. Western Power will employ construction practices that will ensure the use of the dam is available and maintained throughout the construction and operational phases. Appropriate arrangements will be made with the specific landowner. Western Power does not anticipate the destruction of any dams."

"Western Power's preferred option has been to place the pipeline within existing road reserves and transmission line corridors so as to minimise clearing and disruption to landowners. However, in order to protect stands of significant roadside vegetation it has been necessary to locate the pipeline within private property in some instances. In such cases, the pipeline will generally follow existing fencelines.... Since the pipeline is buried, and there would be only minor disruption during construction, it is preferable to locate the pipeline within private property rather than remove significant stands of existing roadside vegetation."

"A detailed survey will be undertaken prior to commencement of construction. All relevant authorities will be contacted to determine the precise location of buried services. Western Power does not envisage any disruption to telephone or other services."

"With reference to Figure 2.3 of the CER, Western Power has finalised the route to the most northerly route shown in bold. This route follows the existing WAWA pipeline. The optional route is considered to be less desirable as it impacts on a large number of small land holdings that have been established in the Allanson area. In some instances it would run very close to existing houses."

Commitments made by the proponent

6 The proponent will ensure that, where practical, the pipeline will pass through existing cleared service corridors and avoid remnant bushlands, wetlands (including small confined waterbodies) and other environmentally important or sensitive areas, to the satisfaction of the DEP and on the advice of CALM.

19 The proponent will work closely with relevant authorities including local government, MRWA and Westrail to ensure that, as far as possible, future infrastructure upgrades are incorporated into the final route selection.

4.4.5 Evaluation

During the public review period, LIMA and CALM advised that the pipeline route did not present an environmental problem, however, CALM noted that its assessment was based on the commitments made by the proponent, which it believes are implementable. However, CALM also noted that the proponent should engage a competent botanist to check specific areas for rare or priority species. The EPA recommends therefore that the proponent should present details in an EMP of a survey for rare and endangered species of flora, carried out in consultation with CALM.

The DEP has advised the EPA that the proposal should not adversely affect the areas identified in the System Six report or lakes gazetted for protection in the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992.

The EPA has taken DEP's, CALM's and LIMA's advice and notes the commitments made by the proponent concerning route selection. Accordingly, the EPA concludes (Recommendation 1) that the pipeline route selection process effectively identified corridors which would allow a pipeline easement to be chosen that avoids or minimises the potential impacts on environmentally sensitive areas.

4.5 Possible Re-use of Wastewater from the Pipe along the Route

4.5.1 Objective

Given that water is a very valuable resource and that there are water balance issues within the Collie Basin, the Environmental Protection Authority's objective is to ensure that, wherever possible, every effort should be made to assist potential users of this water in accessing it.

4.5.2 Evaluation framework

Technical information

The proponent has indicated that its prime consideration for management of the saline wastewater is to assist the Water Authority in its long term objective of returning the water in the Wellington Dam to potable quality by not discharging water with a salinity greater than 550 g/m^3 total dissolved solids (TDS) into the Wellington Dam catchment. The Water Authority has indicated during discussions that it would prefer to have excess salt removed from the Wellington Dam catchment, while retaining the water resource in that area.

Re-use of the saline wastewater on the power station has been considered by the proponent. The water undergoes approximately 6 cycles (or re-uses) before it needs to be discharged. The largest quantity of waste water is from cooling tower blowdown and cooling tower sidestream filter backwash. This water is moderately saline and needs to be discharged after the concentration of silica reaches an unacceptably high level for further re-use.

The proponent considered desalination and removal of silica by processes including reverse osmosis membrane desalination, clarification/softening and brine concentration, but discarded these options due to problems with disposal onsite or offsite of the resultant highly concentrated brine solution, and the increased environmental risk of transporting highly saline water overland.

The Total Dissolved Solids (TDS) of wastewater discharged from the Collie Power Station (CPS), estimated to be between 3200 to 5000 mg/L, is shown in Table 4.1 below. This wastewater, while unsuitable for further use at the Collie Power Station, may be suitable for several purposes by other users between CPS and the ocean. The proponent has indicated that there is some potential for use of the saline water by future industries in the Kemerton Industrial area. Landowners have also expressed interest in using the saline water. Table 4.2 below indicates that the saline wastewater may be useful as drinking water for livestock.

Comments from key government agencies

Department of Resources Development and Water Authority noted that Muja power station intends to operate a zero discharge water system as the most cost effective method of cooling water disposal, with brine concentrators, whereas the new Collie Power station is proposing a pipeline to the ocean as the most cost effective means of dealing with it. WAWA questioned whether economies of scale involving both power stations discharging saline waters to the coast via a pipeline are worthy of consideration.

4.5.3 Public Submissions

Public submissions raised questions about the adequacy of the investigation by the proponent of alternatives to a pipeline from Collie Power station to the ocean. Concern was expressed that there is a need to conserve water usage, and that mechanisms should be considered to re-use the water. In the light of limited water supplies in the State, it was considered short sighted to discharge this volume of water into the ocean. A closed cycle wastewater system was preferred, with no ocean outfall. Re-use alternatives were suggested including:

- disposal inland east of Collie to salt lakes.
- desalination of waste water
- use of artificial wetlands
- disposal into the Collie River
- Muja power station's zero water discharge system

Table 4.1: Likely composition of saline water discharged into pipeline

Parameter*	Saline water
TDS	3,200 - 5000

* *mg/L*

Table 4.2: Total dissolved solids concentration for drinking water for livestock (mg/L)

Type of livestock	Desirable maximum concentration for healthy growth	Max concentration at which good condition might be expected	Max concentration that may be safe for limited periods
Sheep, dry feed	6000	13000	**
Beef cattle	4000	5000	10000
Dairy Cattle	3000	4000	6000
Horses	4000	6000	7000
Pigs	2000	3000	4000
Poultry	2000	3000	4000

** Level depends on type of feed. Source: Hart (1974)

4.5.4 Proponent's response

The proponent provided the following responses to the concerns expressed in the above public submissions:

Disposal inland east of Collie

> "Disposal of salt or saline slurry to salt lakes east of Collie was addressed in Section 3.3.2 of the CER and not favoured on environmental and economic grounds. The environmental and economic factors for disposal of saline water would similarly not favour this

Desalination of Waste water

> "Processing of the moderately saline water by membrane processes would produce a relatively fresh water stream and a more concentrated saline water stream which would subsequently still require disposal. Such options were addressed in Section 3.4.1 of the CER and not favoured on environmental and economic grounds."
>
> "To further reduce the quantity of water discharged a complex desalination plant, incorporating brine concentrators, would be required. This would produce a small but significant quantity of highly saline waste which would require disposal. The capital and operating costs of such a system would exceed that of the pipeline alone. A combination of both systems cannot be economically justified."
>
> "...the disposal of highly concentrated saline waste (e.g. 220,000 mg/l TDS) would have a number of other significant environmental disbenefits, including the impact on the receiving ocean environment as well as hazards associated with the transportation....The highly saline wastewater would also have limited potential for use by industries located in the Kemerton area."

Use of Artificial Wetlands

"The major drawback with the utilisation of artificial wetlands for the treatment of waste water is that it does not significantly reduce TDS levels...Heavy metals and nutrients are of such a low level of concentration that the use of an artificial wetland on this basis alone cannot be justified."

"Even if the method was to be suitable, the availability of suitable land on site to create artificial wetlands is limited. The site is constrained by the coal margin to the south, the Collie River East Branch to the north and an existing significant wetland to the west of the power block. The WAWA discharge limit of 550mg/l could not be achieved by this system."

"Piping the water out of the Basin to a surrounding region outside of the Wellington Dam catchment would be at least as expensive as the proposed pipeline, and the creation of a saline artificial wetland in already degraded areas of land is considered to be environmentally counter productive."

"Western Power acknowledges that ...artificial wetlands have been used successfully both overseas and also with Western Australia. However, it is not considered to be appropriate for use at Collie Power Station."

Disposal into the Collie River

"The disposal of the saline water into the Collie River was addressed in Section 3.3.4 and Appendix D of the CER. There, it was stated that discharge of the saline water into the Collie River could be environmentally acceptable, and add to the recreational amenity. This option was not preferred primarily because of potential conflicts with a proposal by the Water Authority to extract water from the Collie River near Burekup, and uncertainty regarding impacts upon the ecology of the lower reaches of the Collie River and the Leschenault Inlet. However, these issues may be capable of resolution, and disposal of moderately saline water into the Collie River downstream of Burekup may then be seen to be preferable to ocean disposal.

"While WAWA maintains a water discharge limit of 550 mg/l TDS within the Wellington Dam catchment area, discharge into the upper reaches of the Collie River cannot be considered."

Muja power station's zero water discharge system

"It is Western Power's position that the water management systems at Muja and Collie power stations should be considered and assessed on their own merits."

"There are a number of significant factors to consider:

i) Muja Power Station does not operate a zero discharge water system. It is however, currently undergoing a major review and upgrade to meet the current WAWA discharge limits. Muja is an old technology power station with a high water usage requirement.

ii) Muja Power Station is an existing operating power station with significant infrastructure in place that lends itself to modification. Collie is a greenfields site that has the opportunity to employ best current practices at the outset with a view to the long term environmental impact.

iii) The system proposed for Muja relies on a number of significant on-site waste water storage structures, the installation of desalination equipment and modification to the ash disposal system. Collie Power Station does not have the land that is available to Muja. It is constrained to the south by the coal margin and to the north by the East Branch of the Collie River.

iv) The proximity of the East Branch of the Collie River and identified sensitive wetlands means that more stringent measures need to be employed at Collie

Power Station to comply with WAWA discharge limits and satisfy other environmental constraints.

v) It is not a question of technology but rather one of environmental suitability.

vi) Economic considerations support the use of difference systems at the two stations, both of which will meet WAWA discharge limits."

"The approach adopted by Western Power for Muja and Collie Power Stations is in total compliance with the "Collie Coal Basin Water Resources Management Strategy" issued by the Water Authority as Report No: WG60, July 1988."

4.5.5 Evaluation

The EPA considers that water is a valuable resource and should not be wasted. The EPA understands that the salinity of this wastewater is not so high as to prevent it from being used for some agricultural or industrial purposes. The EPA does not consider that the discharge of moderately saline water to the ocean is an ideal option if it can be re-used for other purposes.

The EPA concludes that there is insufficient knowledge at present to advise on the environmental acceptability or otherwise of the option to discharge into the Collie River downstream of Burekup. Before this option could be considered, the Authority would require additional information.

In order to allow for the potential re-use of the wastewater, the Environmental Protection Authority considers that offtakes be included as part of the pipeline construction at appropriate points.

In addition, the EPA requests the proponent to inform property owners along the pipeline that the water is available subject to it being suitable for a nominated purpose.

4.6 Treatment and disposal of sewage and industrial liquid wastes.

4.6.1 Objective

The Environmental Protection Authority's objectives are:

a) to ensure that sewage water be treated to a standard that it can be used without environmental impact on tree plantations;

b) that no industrial liquid waste collected by road tanker is discharged to the environment; and

c) that the industrial liquid waste is delivered to an appropriate treatment plant that is capable of treating the waste to an acceptable standard.

4.6.2 Evaluation framework

Policy framework

Under the Environmental Protection Act 1986, wastewater treatment plants are licensed as prescribed premises. Sewage treatment plants also require approval by the Health Department of WA. Management of industrial liquid waste must meet requirements of the Department of Environmental Protection.

Technical information

The disposal of liquid waste on site via any mechanism (evaporation ponds or irrigation) has the potential to pollute surface water and groundwater. A key environmental consideration will be the safe disposal of such wastes so that there is no significant impact on the blue-gum

plantation, or surface run-off, groundwater or the ocean, by spillage of process liquor or effluent within operational areas, or as a consequence of effluent disposal within or beyond the site.

The proponent has indicated a preference for sewage treatment by package plant and disposal of effluent by irrigation of blue-gum plantation; and removal to an industrial waste disposal facility for concentrated industrial liquid wastes. No detailed technical information has been given in regard to either sewage disposal or industrial liquid wastes disposal.

Discharge of sewage effluent and concentrated industrial liquid wastes to the ocean is not part of this proposal.

Comments from key government agencies

The Water Authority of Western Australia (WAWA) provided the following comments in its submission relating to the CER's discussion of liquid waste disposal issues:

> "The effluent disposal system via a eucalyptus plantation will need to be designed on suitable nutrient application rates based on plantation uptake and local environmental factors (e.g. soils, meteorological conditions)."

4.6.3 Public Submissions

Concern was expressed that contaminants from sewage wastewater used to irrigate an on-site plantation do not reach the Collie river.

4.6.4 Proponent's response

The proponent provided the following responses to the concerns expressed in the above public submissions:

> "Sewage will undergo appropriate treatment to satisfy both WAWA and public health authorities. Appropriate treatment incorporating on-site algal lagoons will be undertaken. The treated sewage will be small in quantity and taken up by on-site blue gums or used for general site watering. It is not expected that any would reach the Collie River. The effluent disposal system will be designed taking due account of both plant uptake and local environmental factors. A quantity of the treated effluent will also be used for on site garden reticulation."

Commitments made by the proponent

5 The proponent will ensure that sewage will undergo appropriate treatment to satisfy both WAWA and public health authorities. The treated sewage will be recycled within the power station as appropriate or use for on-site reticulation of vegetation.

4.6.5 Evaluation

The practice of using treated sewage effluent for agro-forestry is becoming more common. The EPA considers that as long as export of nutrients offsite through the water table from the forest plantation is minimised, and there is no threat to public health, that the practice should be encouraged.

During the public review period WAWA and CALM, who have experience in this area, have indicated that this aspect of the project can be managed in an environmentally acceptable manner. The Health Department of WA under its own Act, and the DEP through Licence Conditions can regulate this practice to insure against the potential for public health and environmental impacts respectively. Accordingly, the EPA considers the proponent's proposal to dispose of treated sewage effluent to agro-forestry as being environmentally acceptable. The EPA recommends that the proponent investigates the nutrient absorptive capacity of the land proposed for agro-forestry, to the requirements of the EPA.

With respect to industrial liquid waste disposal, the EPA considers that either onsite treatment of the waste to a standard acceptable to municipal sewage treatment failities, or disposal of such wastes at any government approved liquid waste treatment facility (such as the Forrestdale facility) are environmentally acceptable.

4.7 Abstraction of groundwater from Collie Basin

4.7.1 Objective

The Environmental Protection Authority's objective is to protect the Collie Basin water resource from adverse impacts associated with the proposed wastewater management methods.

4.7.2 Evaluation framework

Policy framework

In 1982, Cabinet endorsed a report that acknowledged coal mining to be the primary land use in the Collie Coal Basin, provided that "full account must be taken of the need for mining to be compatible with other land uses". In 1988 a water resources management strategy for the coal basin was prepared by the Water Authority.

The State Government recognises that declining water tables in the Collie Basin due to mining and power generation activities are an issue requiring careful attention. An advisory body chaired by the Department of Resources Development is being set up to advise Cabinet on strategic issues of water extraction, use, disposal and quality within the area defined geologically as the Collie Basin.

Technical information

The water resources of the Collie Basin are used in several ways - industrial supply to power station, environmental supply to rivers, forest and wetlands, agricultural supply and domestic water supply. Mine drainage and dewatering, and cooling water at power stations are the largest demand on the resource of the Basin.

Coal mining cannot be undertaken without dewatering, which locally reduces the level of the water table. Some of this dewater is used for cooling by Western Power at the Muja Power Station and the remainder is discharged to river systems. Western Power also takes groundwater from wellfields to provide an alternative source of cooling water.

Due to the complex hydrogeology of the area, the effects of dewatering have been variable from place to place.

Estimates of re-charge of the Collie Basin by rainfall and surface water vary significantly, and estimates of power station use and mine dewatering over the next 30 years are subject to many variables. The following table (from Water Authority of WA, May 1995) summarises the water balance in the Collie Basin:

Table 4.3: Collie Basin Water Balance -Water Volume (million kL/yr).

Annual Recharge	20 to 30,	probably low 20's
Total Annual Abstraction for 1984 to 1994	23 to 32,	usually 28 to 30
Muja Annual use for 1984 to 1994	16 to 22,	average 20
New Power Station	5 10	for 300 MWatt for 600 MWatt
Total Annual discharge to environment (1984 to 1994)	6 to 10,	average 9.

Recently, the communities in the Collie Basin have been concerned over shortages of water from bores, and the drying up of creeks and streams in the area.

Comments from key government agencies

The Water Authority stated that the Collie Power station, where practical, should use mine dewatering waters as their primary source of water supply in lieu of a dedicated wellfield to minimise unnecessary groundwater drawdowns within the Collie Basin. The Water Authority acknowledged the potential benefits of reduced saline impact on the Wellington reservoir, but questioned the loss of 2.5 ML/yr of brackish waters from the Collie Basin, which is suffering from a declining water table.

Department of Resources Development commented that the future expansions of the power station (to 600 MW, and beyond), may require additional groundwater resources, which are becoming increasingly committed. DRD recommended that Western Power undertakes further consultation with the Water Authority in order to produce a definitive statement on the use of borefields and mine dewatering water for the Collie and Muja power stations.

4.7.3 Public Submissions

The water extracted for use at Muja power station from the coal mines and borefields is considered as a "valuable water resource which needs careful management to ensure a harmonious water balance exists". Concerns were expressed that the wastewater pipeline would be removing water from the Collie Basin out to sea; while rivers, forest and vegetation in the area are showing evidence of lack of water. The water table in some areas in the Collie Basin has decreased, with resultant impacts on supplies of water, and recreational and cultural amenities.

4.7.4 Proponent's response

The proponent provided the following responses to the concerns expressed in the above public submissions:

> "It is Western Power's intention to use mine dewatering as its principle source of water for the power station. Any excess water not required by Western Power will be subject to disposal approval from WAWA."
>
> "The proposed Cardiff East borefield is intended to be used as an emergency or stand-by measure. It is expected to contribute less than 1% of the total water annually abstracted from the Collie Basin."
>
> "Collie Basin recharge comes primarily from rainfall, and a smaller amount from streams flowing in the wetter months (6% estimated). Thus the use of coal mine dewatering water which would otherwise be discharged to the river system is expected to have a minor effect on the total recharge."

"The 2.5 million kL/annum of saline water discharged should be viewed in the context of the net water discharged from mine dewatering operations. In the years before the first 300MW unit becomes operational some 4-11 million kL/annum will be discharged from mine dewatering. The first 300MW unit will result in approximately 1.2 million kL/annum of saline water being discharged down the pipeline. The quantity of water is considered to have an insignificant impact on the Collie Basin water table."

4.7.5 Evaluation

Water Balance

The EPA has recently been made aware by WAWA of new information about groundwater abstraction issues since the 1990 approval for the proposed Collie Power Station. Community and government concerns have been raised about the sustainability of Collie Basin water resources, and impacts on the environment. Water Authority of WA information indicates that recharge of the Collie Basin will not keep up with demand once the Collie Power Station first stage is operating. This imbalance would be worsened once the second stage is built.

The EPA understands that the Department of Resources Development is presently coordinating an advisory group (the Collie Water Advisory Group) with a whole of government approach and that this is a suitable mechanism for dealing with the issues of water balance (Recommendation 3).

Whilst this issue is not a direct subject of this assessment, the EPA considers that a resolution to the issue of water balance in the Collie Basin should be determined prior to the commissioning of the first stage of the proposed Collie Power Station.

Water Salinity

The EPA is aware of the increased salinity of many of the waterways in the southern portion of Western Australia. The EPA considers that every effort should be made to manage such waterways so that the issue of salinity is addressed. The EPA recognises WAWA's concern regarding salinity in the Collie Basin, and the potential increase in salinity in the Wellington Dam. The EPA agrees with WAWA's position that retention of fresh water in the Collie Basin with an accompanying reduction of salt is environmentally desirable.

The EPA recognises however that these problems have been developing over many years and that there is no immediate solution.

During the public review period several submitters noted that Muja Power Station's method of disposal for its saline wastewater differs to that for this proposal. (See section 4.5 above and letter from EPA to DEP in Appendix 6). The EPA does not believe that issues relating to Muja Power Station are matters which can be dealt with in this proposal. The EPA believes that this issue should be addressed in a different forum, such as the advisory group mentioned above.

Notwithstanding that, the EPA concurs with WAWA in that storage of salt (albeit in flyash ponds) is a poor long term option and should be discouraged. The EPA considers that every effort should be made to allow the proposed pipeline to be used by other saline waste generators so as to minimise the effects of salt build-up in the Collie Basin.

5. Conclusions & Recommendations

The Environmental Protection Authority concludes that the proposal by Western Power to:

Manage and dispose of wastewaters from the proposed Collie Power Station in three ways:-

- saline wastewaters to ocean via pipeline,
- industrial liquid wastewaters to a licensed off site treatment facility, and

- treated sewage via irrigation to an on-site blue gum plantation
- is environmentally acceptable, subject to the proponent's commitments and EPA recommendations.

In reaching this conclusion, the Environmental Protection Authority identified the main environmental factors requiring consideration to be:

- effects of effluents on the marine environment;
- impacts associated with pipeline ruptures;
- impacts from construction of 68 km pipeline;
- pipeline route selection to avoid areas of environmental significance;
- possible re-use of wastewater from pipe along route; and
- treatment and disposal of sewage and industrial liquid wastes;

The Environmental Protection Authority believes that these issues are adequately addressed by the commitments made by the proponent, the proponent's responses to issues raised in public submissions, and the Environmental Protection Authority's recommendations in this report.

In examining the wastewater treatment and disposal proposal, the EPA concluded that the abstraction of power station water from the Collie Basin may have significant environmental impacts.

Recommendation 1

The Environmental Protection Authority recommends that the proposal as described in the Consultative Environmental Review be approved to proceed subject to:

a) **the proponent's commitments to environmental management through an Environmental Management Programme to be prepared for the Collie Power Station (required in Assessment No. 132), to the requirements of the Minister for the Environment;**

b) **the adoption by the proponent of the Environmental Protection Authority's Recommendation 2.**

Recommendation 2

The Environmental Protection Authority recommends that as part of the Environmental Management Programme, the proponent submit and subsequently implement plans detailing the following, to the requirements of the DEP:

(i) **Pipeline**

- **monitoring and audit of quality of saline water from the power station into the pipeline;**
- **monitoring of integrity of the pipeline;**
- **management of dust, fire risk, soil erosion and spread of dieback through construction, operation, maintenance and de-commissioning of the project to acceptable levels.**
- **survey of areas for rare and endangered flora, in consultation with CALM;**

- **construction at Leschenault Inlet in summer to protect wetland area, but avoiding peak bird use times;**
- **revegetation and rehabilitation to land affected by construction of pipeline;**
- **rectification measures should monitoring indicate that adverse impacts have occurred.**

(ii) <u>Ocean Discharge</u>

- **baseline monitoring of environmental conditions at and around the ocean outfall;**
- **monitoring at and around the ocean outfall to verify that mixing, interaction with adjacent outfall plumes and transport of effluent discharge is as predicted;**
- **rectification measures should monitoring indicate that effluent discharge mixing, interaction with adjacent outfall plumes and transport at the ocean outfall are not as predicted.**

(iii) <u>Onsite</u>

- **monitoring and audit programme for on-site ponds;**
- **investigation of the nutrient absorptive capacity of the land proposed for agro-forestry.**

Reports of the results of monitoring programmes should be submitted annually to the DEP for audit, and will be made publicly available.

Recommendation 3

The EPA recommends that the Collie Water Advisory Group consult widely and provide advice from time to time to the EPA on the impact of groundwater extraction in the Collie Basin and its management implications.

6. Recommended environmental conditions

Based on the assessment of this proposal and recommendations in this report, the Environmental Protection Authority considers that the following Recommended Environmental Conditions are appropriate.

1 Proponent Commitments

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

1-1 In implementing the proposal, the proponent shall fulfil the commitments made in the Consultative Environmental Review and in response to issues raised following public submissions; provided that the commitments are not inconsistent with the conditions or procedures contained in this statement.

A schedule of environmental management commitments (May 1995) which will be audited by the Department of Environmental Protection is included in Appendix 5 of this report.

2 Implementation

Changes to the proposal 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 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.

3 Proponent

These conditions legally apply to the nominated proponent.

3-1 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.

4 Environmental Management Programme

4-1 The proponent shall protect the land environment from the impacts resulting from the construction and operation of a pipeline from the Collie Power station to the ocean.

4-2 The proponent shall protect the marine environment from the impacts resulting from the discharge of saline wastewater to the ocean.

4-3 To achieve the objectives of conditions 4-1 and 4-2, prior to commissioning and in consultation with the Department of Environment and other appropriate government authorities, the proponent shall prepare an Environmental Management Programme which addresses but is not limited to the following:

Pipeline

1 management of dust, fire risk in vegetated areas, soil erosion and spread of dieback;

2 survey of areas for rare and endangered flora, in consultation with CALM;

3 construction at Leschenault Inlet in summer to protect wetland area, but avoiding peak bird use times;

4 revegetation and rehabilitation to land affected by construction of pipeline;

5 pipeline input water quality monitoring;

6 pipeline integrity monitoring;

7 rectification measures should monitoring indicate adverse impacts;

Onsite

8 monitoring of ponds (including pond integrity and leakage);

9 rectification measures should monitoring indicate adverse impacts;

10 the nutrient absorptive capacity of the land proposed for agro-forestry;

Ocean Discharge

11 background and ongoing monitoring of ocean outfall;

12 rectification measures should monitoring indicate that ocean outfall effects are not as predicted.

4-4 The proponent shall implement the Environmental Management Programme required by condition 4-3, to achieve the objectives of conditions 4-1 and 4-2, to the requirements of the Department of Environmental Protection.

4-5 In the event that monitoring shows unacceptable environmental impacts, the proponent shall prepare and subsequently implement plans to mitigate these impacts.

5 Decommissioning

5-1 The proponent shall carry out the satisfactory decommissioning of the project, removal of installations and rehabilitation of the site and its environs.

5-2 At least six months prior to decommissioning, the proponent shall prepare a decommissioning and rehabilitation plan to achieve the objectives of condition 5-1.

5-3 The proponent shall implement the plan required by condition 5-2.

6 Time Limit on Approval

The environmental approval for the proposal is limited.

6-1 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.)

7 Compliance Auditing

To help determine environmental performance, periodic reports on progress in implementation of the proposal are required.

7-1 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.

Note

1 The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the Environmental Protection Act.

7. References

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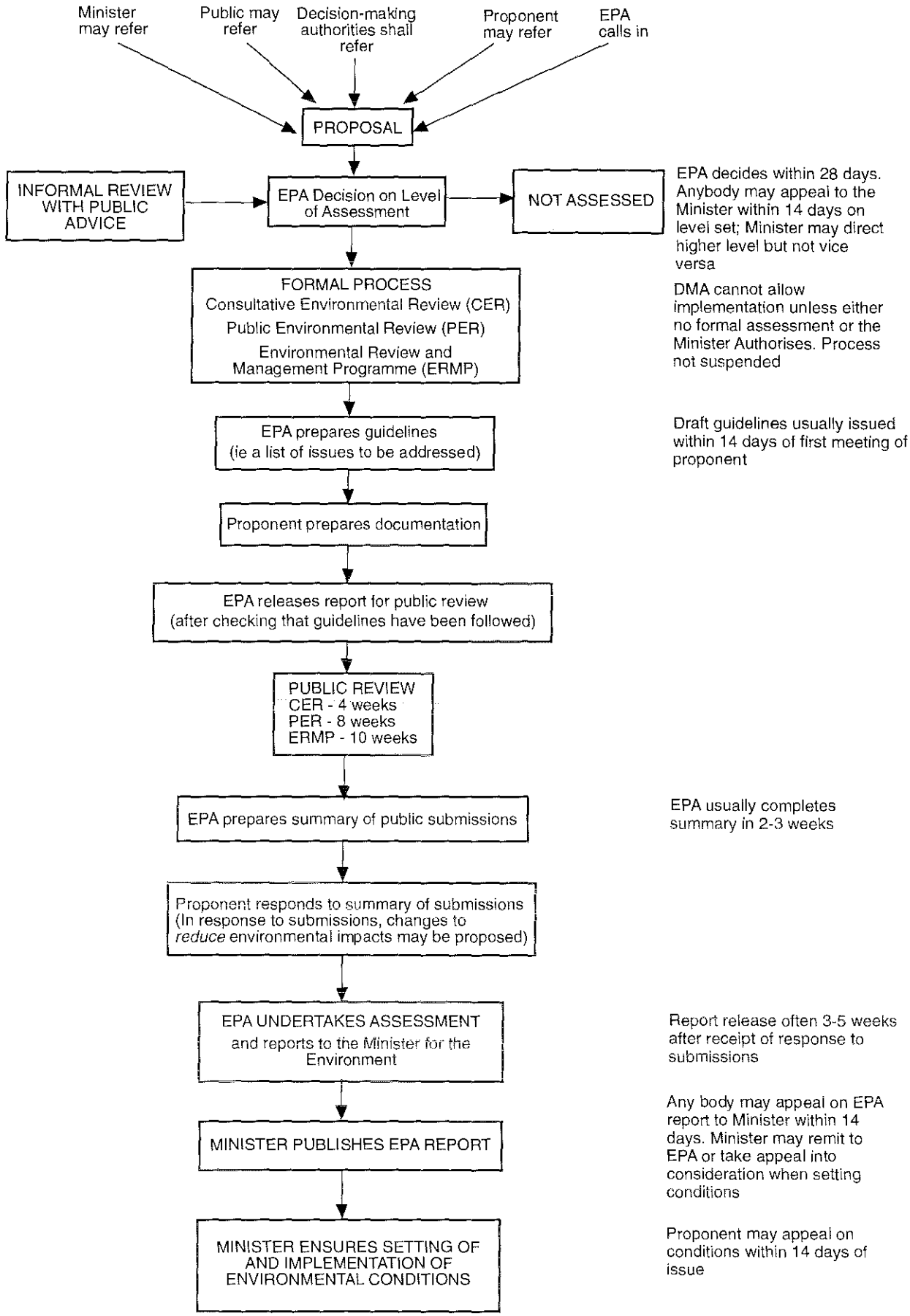

Minister may refer
Public may refer
Decision-making authorities shall refer
Proponent may refer
EPA calls in
PROPOSAL
INFORMAL REVIEW WITH PUBLIC ADVICE
EPA Decision on Level of Assessment
NOT ASSESSED
EPA decides within 28 days. Anybody may appeal to the Minister within 14 days on level set; Minister may direct higher level but not vice versa
FORMAL PROCESS
Consultative Environmental Review (CER)
Public Environmental Review (PER)
Environmental Review and Management Programme (ERMP)
DMA cannot allow implementation unless either no formal assessment or the Minister Authorises. Process not suspended
EPA prepares guidelines (ie a list of issues to be addressed)
Draft guidelines usually issued within 14 days of first meeting of proponent
Proponent prepares documentation
EPA releases report for public review (after checking that guidelines have been followed)
PUBLIC REVIEW
CER - 4 weeks
PER - 8 weeks
ERMP - 10 weeks
EPA prepares summary of public submissions
EPA usually completes summary in 2-3 weeks
Proponent responds to summary of submissions (In response to submissions, changes to *reduce* environmental impacts may be proposed)
EPA UNDERTAKES ASSESSMENT and reports to the Minister for the Environment
Report release often 3-5 weeks after receipt of response to submissions
MINISTER PUBLISHES EPA REPORT
Any body may appeal on EPA report to Minister within 14 days. Minister may remit to EPA or take appeal into consideration when setting conditions
MINISTER ENSURES SETTING OF AND IMPLEMENTATION OF ENVIRONMENTAL CONDITIONS
Proponent may appeal on conditions within 14 days of issue

Appendix 2

Summary of submissions and proponent's response to questions

COLLIE POWER STATION

WASTE WATER MANAGEMENT AND DISPOSAL SYSTEM

RESPONSE TO QUESTIONS FROM SUBMISSIONS TO

CONSULTATIVE ENVIRONMENTAL REVIEW

1 HEAVY METALS

a) Please clarify the expected sources of heavy metals, and the extent to which heavy metals will be removed prior to discharge of waste water to ocean.

The main source of the metals in the saline water discharged to the ocean is the natural content present in the groundwater abstracted from bores and mine dewatering used to supply the power station.

Prior to discharge, the saline water would be treated with lime and by filtration, as described in Section 2.3.1 of the CER. The final concentration of metals quoted in Table 2.5 of the CER is based upon removal of lead to a level of 0.01 g/m^3 which is achievable based upon the literature cited. Conservatively, the levels of the other metals are not assumed to be decreased by the lime treatment, but in reality, some removal would be expected. The levels of heavy metals would likely be lower than those listed in Table 2.5.

b) Does Western Power intend to extend Commitment 1 to include coverage of metals and toxic substances, plus any matter producing undesirable aesthetic impacts?

Commitment 1 covers the quality of saline water discharged down the pipeline in terms of all "objectionable" components. The defining criterion is that this water will ultimately discharge into the ocean environment at the outfall. Thus the water constituents after dilution would need to meet the EPA guidelines for marine and estuarine water quality (see section 6.2.3). Materials classified as "toxic", ie from other operations on site would be disposed of by commercial disposal contractors.

2 PIPELINE CONSTRUCTION

a) Please indicate what measures would be taken to ensure that:

i) environmental damage during construction of pipeline is minimised;

ii) disruption of farm irrigation and other farm activities by pipeline, during and after construction, is minimised;

iii) disturbance to firebreaks is minimised and access ways reinstated to their original state;

iv) vegetation clearing is minimised.

i) Section 6.1.2 of the CER details the measures to be taken to minimise environmental damage. Western Power will ensure that, where practical, the pipeline would pass through existing cleared service corridors and avoid remnant bushlands, wetlands and other environmentally sensitive areas. Western Power will consult extensively with both the EPA and CALM through the planning, design and construction phases.

Among specific commitments made by Western Power are:

- Construction would occur during summer to reduce the risk of soil erosion and spread of dieback.
- Strict fire precautions will be implemented during the construction of the pipeline.
- Dust suppression measures will be employed to minimise dust nuisance.
- Vehicle movements will be confined to predefined access routes.

ii) The pipeline route has been selected to run close to property boundaries and to avoid irrigation channels. Where the pipeline crosses existing irrigation channels this will be done by means of an above ground steel bridging pipe. Irrigation channels will not be disrupted.

Where necessary, Western Power will provide alternative access for stock movement to ensure disruption to farming activities is minimised. Western Power will liaise with individual land owners as required.

iii) Western Power is committed to restoring areas disturbed by construction activities progressively and as soon as possible after the completion of a portion of the construction. Disturbed areas will re revegetated with appropriate species. Particular attention will be paid to the rehabilitation on coastal sands, near wetlands and in areas that may be susceptible to erosion.

iv) The proposed route has been chosen to minimise the extent of vegetation clearing. The pipeline follows existing road reserves (avoiding road side vegetation), cleared farmland, existing services corridors and an existing pipeline.

2b) Please indicate what measures would be taken to avoid erosion problems due to poor pipeline laying on properties where the route goes over steep elevated land?

Construction will occur during the summer months to reduce the risk of soil erosion. This will also maximise the opportunity for rehabilitation of disturbed areas.

Both the contractor and Western Power will employ stringent quality assurance and inspection procedures to ensure that the highest standards are maintained through all stages of the project.

Western Power will consult with landowners and the appropriate government bodies (CALM, Department of Agriculture, EPA) to ensure that appropriate construction and rehabilitation measures are put into place.

3 PIPELINE MAINTENANCE

a) What measures will Western Power undertake to maintain the integrity of the pipeline and prevent, identify and repair damage over the life of the project?

By its very nature a buried pipeline is a highly reliable engineered structure. Western Power proposes to incorporate a number of design and construction features to minimise the likelihood of damage to the pipeline. These range from the use of distinctive above ground and below ground markers to the installation of safety devices and automatic shut down valves. These features are detailed in Section 6.2.2 of the CER.

Routine maintenance inspections will be undertaken on a regular basis to ensure that valves and metering facilities are functioning properly.. Western Power are proposing to construct an on-site storage facility to contain the saline water in the event that a shut down of the pipeline is necessary for maintenance or repairs. The saline water storage facility will provide a six day storage capacity. This will cater for any foreseeable outage.

b) What monitoring procedures will be used to check the integrity of the pipeline and what will be the monitoring frequency?

Western Power proposes to implement a regular monitoring programme to detect any impacts on the environment, in the vicinity of the power station, along the pipeline route and at the ocean outfall. Section 7 of the CER details Western Power's commitment to monitoring.

c) **Does Western Power intend to modify Commitment 13 according to WAWA advice that "patrol of the pipeline should initially occur on a quarterly basis. After six months if no problems are detected (including testing in situ of safety devices for successful operation under a range of pressures conditions) then biannual or annual patrol would be acceptable"?**

Western Power has not formally received this advice to date. However, Commitment 13 specifies that the maintenance procedures (including inspection times) will be undertaken to WAWA's satisfaction. Western Power will comply with WAWA's requirement in this regard.

4 LEAKS AND PIPELINE RUPTURE

a) **What measures will be taken to prevent long-term effects on wetlands if undiluted waste water containing heavy metals and nutrients were to leak into the wetland environment?**

Western Power recognises that in the unlikely event of a rupture of the pipeline the most significant effect would be on any wetlands in the vicinity of the rupture. Consequently Western Power has undertaken a review of wetlands in proximity of the pipeline and the impact upon them in the event of a major rupture. The effect of heavy metals and nutrients in the saline water would be negligible because of their low concentrations. Section 6.2.2 of the CER which incorporates Commitment 15 details the expected impacts and appropriate remedial strategies.

b) **Does Western Power intend to make a commitment to make good any adverse impacts resulting from leakage or breach of the pipeline where utilised water sources are disrupted or threatened?**

Western Power has made the commitment (Commitment 15) to repair any damage to the surrounding environment in the event of a pipeline rupture or leak. This includes utilised water sources.

5 WATER SUPPLY

a) **Is the estimated TDS concentration of around 400 g/m3 for water from the Chicken Creek mine correct, or is a value of 500-700 g/m3 more accurate? If the latter is correct, how would this affect the quality of the water discharged to the ocean ?**

According to Western Power records, the average TDS of all water analyses available from the Chicken Creek mine is 432mg/L with a range of 144mg/L to 580mg/L. It should be remembered however, that Chicken Creek water has been used in the CER as it is representative of the worst quality water likely to

be supplied to the power station. Chicken Creek water per se is not likely to be available when the power station becomes operational.

The TDS of the saline water to be discharged depends both on the TDS of the raw water and on the number of concentrations that the cooling water undergoes in the colling towers. The number of concentrations however, depends on other chemical characteristics of the raw water - primarily the silica content, which needs to be controlled in the cooling water system.

A silica content of say 15mg/L in the raw water would dictate about 6 cycles of concentration, and if the TDS was 400mg/L, the discharge quality would be approximately 2,400mg/L TDS. If the raw water had a higher TDS, eg 600mg/L, but still the same silica content, the TDS of the saline discharge would be proportionally higher, ie 3,600mg/L. If the silica content increased in proportion with the TDS of the raw water, the saline discharge would remain essentially unchanged, as the number of cycles of concentration would decrease.

b) **What arrangements are there to treat mine dewaterings at the point of abstraction to maintain quality of water supply (which may affect discharge water quality), given that Griffin coal mining company does not currently treat its mine dewatering water at point of extraction prior to delivery to Muja power station, and that Griffin does not intend to change this practice, stating that "in the event that Griffin does develop its Ewington deposit, any mine dewatering water delivered to the Collie Power Station would remain untreated at source".**

In order to protect pipework and fittings, pre-treatment of mine dewatering at or near the source is essential. The question of responsibility for treatment at the source is a commercial matter to be negotiated by Western Power and the coal mining companies. Western Power does not envisage any difficulties in this regard. The treatment of water at or near the source will be undertaken directly by Western Power, if necessary.

c) **Can Western Power give a definitive statement on projected water consumption by Collie and Muja power stations, versus availability from mine dewatering and borefields at Cardiff East and Shotts borefield ?**

A probable projected water abstraction regime is shown in the following table. This identifies all known and anticipated water sources.

Probable Abstraction Regime (1994-2003) - Summer Peak (Ml/d)

POTENTIAL WATER SOURCES	DEC 1994	DEC 1995	DEC 1996	DEC 1997	DEC 1998-2003
MINE DEWATERING					
Existing Sources					
Chicken Creek o/c	12.0	12.0	0	0	0
Muja o/c	11.6	11.6	11.6	11.6	11.6
*Western WO5H	8	7	6	0	0
*Western WO5	3	3	3	0	0
Proposed Sources					
Premier o/c	-	7.0	7.0	7.0	7.0
Others	-	22	22	20	16
GROUNDWATER SOURCES					
Existing Borefields					
Shotts	9.4	9.4	9.4	9.4	9.4
Cardiff-South	9.9	9.9	9.9	9.9	9.9
Existing Mine Sumps					
ACIRL Bores	1.8	1.8	1.8	1.8	1.8
Western 2 Bores	14.6	14.6	14.6	14.6	14.6
Proposed Mine Sumps					
Western 6 Bores	10.0	10.0	10.0	10.0	10.0
Proposed Borefield					
Cardiff East	-	-	-	-	up to 20.0
STATION DEMAND :MPS	57.0	58.0	50.0	51.0	51.0
:CPS	-	-	-	-	16.5

d) **What effects will abstraction of groundwater for the power station have on recharge of the Collie basin ?**

Water for Collie Power Station will primarily come from dewatering of new mines proposed to be developed. The development of these mines have been covered by separate environmental approvals.

The proposed Cardiff East borefield is intended to be used as an emergency or stand-by measure. It is expected to contribute less than 1% of the total water annually abstracted from the Collie Basin.

Collie Basin recharge comes primarily from rainfall, and a smaller amount from streams - flowing in the wetter months (6% estimated). Thus the use of coal mine dewatering water which would otherwise be discharged to the river system is expected to have a minor effect on the total recharge.

c) **Is the estimated 25-30 ML/day of mine dewatering water from Ewington II coal mine (as indicated in the July 1994 Notice of Intent for Griffin Coal Mining Company Ewington II Open-Cut Mine) available for power station use, or will the water be directed into the Stockton dam or the east branch of the Collie River?**

It is Western Power's intention to use mine dewatering as its principle source of water for the power station. Any excess water not required by Western Power will be subject to disposal approval from WAWA. Western Power is not able to authorise the redirection of water to either the Stockton Dam or the Collie River East branch. This will need to be determined by WAWA.

6 SEWAGE EFFLUENT

a) **What safeguards are there to ensure that contaminants from sewage waste water used to irrigate an on-site plantation do not reach the Collie river?**

Sewage will undergo appropriate treatment to satisfy both WAWA and public health authorities. Appropriate treatment incorporating on-site algal lagoons will be undertaken. The treated sewage will be small in quantity and taken up by on-site blue gums or used for general site watering. It is not expected that any would reach the Collie River.

b) **Can Western Power advise of the projected station workforce or alternatively the projected employee amenities wastewater output?**

The construction workforce will vary through the life of the project and it is expected to peak at approximately 450.

During the operating phase a workforce of 130 is estimated.

c) **Does Western Power intend to design the effluent disposal system via a eucalyptus plantation (Clause 2.4) on suitable nutrient application rates based on plantation uptake and local environmental factors eg soils, meteorological conditions?**

The effluent disposal system will be designed taking due account of both plant uptake and local environmental factors. A quantity of the treated effluent will also be used for on site garden reticulation.

d) **Can Western Power provide details of the proposed site and method of management of the plantation?**

There are currently approximately 774 hectares of blue gums on the Coolangatta farm property. The management of the blue gum plantation is the responsibility of CALM under a commercial arrangement with Western Power.

7 ALTERNATIVES TO OCEAN DISPOSAL

a) Disposal Inland East of Collie

Has an alternative disposal inland east of Collie been considered? What would be the options and costs for disposal in this direction, rather than to ocean ?

Disposal of salt or saline slurry to salt lakes east of Collie was addressed in Section 3.3.2 of the CER and not favoured on environmental and economic grounds. The environmental and economic factors for disposal of saline water would similarly not favour this option.

b) Separation of High TDS and Low TDS Waste water at the Source

Has the proponent considered source (ie at the power station) separation of high TDS waste water from lower TDS waste water. What will be the overall improvement in water quality if this is done? Are there any other potential uses of this quality water in the region (other than discharge to the ocean)?

The largest quantity of waste water is from cooling tower blowdown and cooling tower sidestream filter backwash. This water is moderately saline and needs to be discharged after the concentration of silica reaches an unacceptably high level. The water streams within the power station water management systems are separated so that maximum re-use/recycling occurs. The water undergoes approximately 6 cycles (or re-uses) before it needs to be discharged. The high TDS and low TDS waters are in fact separated. The low TDS waters are re-used until their level of concentration makes them unsuitable for use by the power station.

c) Partial Desalination of Waste water

Has the proponent considered the use of partial desalination of wastewaters using membrane based systems (eg Reverse Osmosis)? Partial desalination of waste water would involve treatment of waste water to reduce TDS levels from 3000-5000 mg/L to 1000-1500 mg/L. This quality water is suitable for many potential end uses including irrigation, re-use within the plant; groundwater recharge and discharge into riverine systems.

Processing of the moderately saline water by membrane processes would produce a relatively fresh water stream and a more concentrated saline water stream which would subsequently still require disposal. Such options were addressed in Section 3.4.1 of the CER and not favoured on environmental and economic grounds.

d) Use of Artificial Wetlands

The proponent is asked to comment on the following alternative method of waste water disposal utilising artificial wetlands for the treatment of waste water.

The moderately saline water from the cooling towers, filter backwash, boiler water treatment plant wastes and excess rainfall runoff from sludge storage areas are proposed to be discharged to the ocean.

This water should not be seen as a waste but a valuable resource to be utilised for other purposes.

Although the water is slightly brackish and contains low concentrations of some metals, the use of an alternative waste water treatment method such as an artificial wetland can "polish" this water so that it may be used for other purposes.

Artificial wetlands have been used to treat far worse quality water than that proposed to be discharged by the Collie Power Station. Artificial wetlands have been used throughout the world to treat:

- **acid coal mine drainage (over 400 wetlands constructed) and coal ash pond drainage;**
- **tin wastes at Wheal Jane mine in the United Kingdom. These wastes contain high concentrations of cadmium, iron, zinc, manganese, arsenic, copper, aluminium and lead;**
- **lead/zinc mine wastewaters; and**
- **treatment of municipal wastewaters.**

There are large ares of cleared or degraded land available which may be suitable for the construction of wetlands in the Collie area or surrounding region (eg Shire of West Arthur).

The area chosen for the wetlands would depend on the final end use of the treated water. Although wetlands are capable of significantly reducing heavy metal, suspended solids and nutrients concentrations they may not significantly reduce the TDS levels. However overall water quality may be such that the treated water may be suitable for discharge into an already salt affected riverine system (such as Collie River East, or the Blackwood system) or irrigation of salt tolerant pastures or plantation timber in already salt affected areas.

It may also be beneficial to separate high strength TDS wastes (eg boiler water treatment plant wastes) from lower TDS water, at the source (ie at the power station). This would decrease the level of TDS entering the wetlands and improve final water quality exiting the wetlands. High strength TDS wastes at the source can be discharged into evaporation ponds.

The use of an artificial wetland may also reduce costs associated with lime dosing (to precipitate heavy metals) and disposal of sludges, as metals are taken up in biomass.

The proponent should liaise with the Bunbury Agriculture Department - Department of Catchment Hydrology to identify areas that may be available to take waste water from the power station and support a disposal option such as this.

The major drawback with the utilisation of artificial wetlands for the treatment of waste water is that it does not significantly reduce TDS levels. This is acknowledged by the author of the question. Heavy metals and nutrients are of such a low level of concentration that the use of an artificial wetland on this basis alone cannot be justified.

Even if the method was to be suitable, the availability of suitable land on site to create artificial wetlands is limited. The site is constrained by the coal margin to the south, the Collie River East Branch to the north and an existing significant wetland to the west of the power block.

The WAWA discharge limit of 550mg/l could not be achieved by this system.

Piping the water out of the Basin to a surrounding region outside of the Wellington Dam catchment would be at least as expensive as the proposed pipeline, and the creation of a saline artificial wetland in already degraded areas of land is considered to be environmentally counter productive.

Western Power acknowledges that the use of artificial wetlands have been used successfully both overseas and also with Western Australia. However, it is not considered to be appropriate for use at Collie Power Station.

e) **Why is Western Power proposing a pipeline to the ocean as the most cost effective means of dealing with saline waste water from the new power station, when the Muja power station operates a zero water discharge system (with brine concentrators) as the most cost effective method of cooling water disposal ? Muja has a rated capacity of 1040MW - nearly twice the capacity of the proposed new power station after Stage 2 is developed.**

Western Power considered a variety of treatment and disposal options as detailed in the CER. It is Western Power's position that the water management systems at Muja and Collie power stations should be considered and assessed on their own merits.

There are a number of significant factors to consider:

i) Muja Power Station does not operate a zero discharge water system. It is however, currently undergoing a major review and upgrade to meet the current WAWA discharge limits. Muja is an old technology power station with a high water usage requirement

ii) Muja Power Station is an existing operating power station with significant infrastructure in place that lends itself to modification. Collie is a greenfields site that has the opportunity to employ best current practices at the outset with a view to the long term environmental impact.

iii) The system proposed for Muja relies on a number of significant on-site waste water storage structures, the installation of desalination equipment and modification to the ash disposal system. Collie Power Station does not have the land that is available to Muja. It is constrained to the south by the coal margin and to the north by the East Branch of the Collie River.

iv) The proximity of the East Branch of the Collie River and identified sensitive wetlands means that more stringent measures need to be employed at Collie Power Station to comply with WAWA discharge limits and satisfy other environmental constraints.

v) It is not a question of technology but rather one of environmental suitability.

vi) Economic considerations support the use of difference systems at the two stations, both of which will meet WAWA discharge limits.

The approach adopted by Western Power for Muja and Collie Power Stations is in total compliance with the "Collie Coal Basin Water Resources Management Strategy" issued by the Water Authority as Report No: WG60, July 1988.

f) Could the waste water be disposed of into the Collie River ? If so, how would the recreational value of Collie river be affected ?

The disposal of the saline water into the Collie River was addressed in Section 3.3.4 and Appendix D of the CER. There, it was stated that discharge of the saline water into the Collie River could be environmentally acceptable, and add to the recreational amenity. This option was not preferred primarily because of potential conflicts with a proposal by the Water Authority to extract water from the Collie River near Burekup, and uncertainty regarding impacts upon the ecology of the lower reaches of the Collie River and the Leschenault Inlet. However, these issues may be capable of resolution, and disposal of moderately saline water into the Collie River downstream of Burekup may then be seen to be preferable to ocean disposal.

While WAWA maintains a water discharge limit of 550 mg/l TDS within the Wellington Dam catchment area, discharge into the upper reaches of the Collie River cannot be considered.

g) **Can Western Power provide relative costs and assumptions underlying cost calculations for alternatives considered ?**

Cost was only one of a number of factors considered in the assessment of the various alternatives.

Cost information was obtained from a number of sources, including published data, information provided by contractors and consultants, and Western Power records and experience.

In its economic assessment both capital cost and long term on-going operating and maintenance costs were taken into account. A scheme with low initial capital cost may prove to be less economically attractive because of high operating and maintenance costs.

Western Power's standard corporate economic parameters were used in the assessment.

h) **The CER discusses various options for disposal of saline wastewaters from the project power station operating at an output of up to 600MW. The selected option is to discharge ~6,700kL/d of saline wastewaters to the ocean north of Bunbury via a pipeline. While acknowledging the potential accompanying benefits of reduced saline impact on the Wellington reservoir, the Water Authority questions the loss of ~2.5ML/an of brackish waters from the Collie Basin which is suffering from a declining water table. In Clauses 3.3 and 3.4 of the CER various alternatives involving silica reduction and brine/fresh water partitioning are described as having a high and relatively high capital and operating cost.**

Will Western Power provide a cost benefit analysis in response to this and other queries over alternatives to ocean disposal considered, to permit reasonable judgements to be made on the assertion by SECWA that these options be discarded?

The 2.5MkL/annum of saline water discharged should be viewed in the content of the net water discharged from mine dewatering operations. In the years before the first 300MW unit becomes operational some 4-11 MkL/annum will be discharged from mine dewatering. The first 300MW unit will result in approximately 1.2MkL/annum of saline water being discharged down the pipeline. The quantity of water is considered to have an insignificant impact on the Collie Basin water table.

To further reduce the quantity of water discharged a complex desalination plant, incorporating brine concentrators, would be required. This would produce a small but significant quantity of highly saline waste which would require disposal. The capital and operating costs of such a system would exceed that of the pipeline alone. A combination of both systems cannot be economically justified.

Further the disposal of highly concentrated saline waste would have a number of other significant environmental disbenifits, including the impact on the receiving ocean environment as well as hazards associated with the transportation. These factors are discussed in Sections 3.3 and 3.4 of the CER.

The highly saline wastewater would also have limited potential for use by industries located in the Kemerton area.

i) **Can Western Power further explain Clause 3.3.2, where it may be unclear why salt lake sites some 120km away from the power station are being considered for saline disposal when the ocean is only about 60km away by road?**

Disposal of highly saline waste into salt lakes east of Collie was considered for completeness of addressing all likely options. The principle was that the nature of the saline waste could be assimilated into a naturally saline environment. The closest lake, suitable in principle, was found to be 120km away.

8 PIPELINE ROUTE

a) **To what extent has the route been selected so that the pipeline is outside proposed boundaries of future land requirements, such as road upgrades and alignments ?**

The route was chosen to minimise disruption to landowners as much as possible while taking into account known future land requirements. Section 2.3.2 of the CER provides details of the proposed route.

Western Power undertook a detailed public consultation phase in which all landowners, interest groups and government bodies were consulted. Issues such as road upgrades and alignments were discussed with MRWA and where details were known due consideration was given.

Western Power has maintained on-going discussion with MRWA. Western Power recognises that there may need to be adjustments to the current preferred alignment to suit long term development issues.

b) **Does the pipeline route pass close to or through any landowner's dams, thereby possibly impairing its function and affecting access to maintenance of the dam by excavation and re-lining equipment ? If so, does Western Power propose to compensate land owners for destruction of dams ?**

The pipeline route passes close to only one landowner's dam. Western Power will employ construction practices that will ensure the use of the dam is available and maintained throughout the construction and operational phases. Appropriate arrangements will be made with the specific landowner. Western Power does not anticipate the destruction of any dams.

c) **Will the pipeline route impair access and function to telephone and other service lines ?**

A detailed survey will be undertaken prior to commencement of construction. All relevant authorities will be contacted to determine the precise location of buried services. Western Power does not envisage any disruption to telephone or other services.

d) **Installation of the pipe to the south of Buffalo Rd may disturb significant fringing vegetation and require approval by the Leschenault Inlet Management Authority under the Waterways Conservation Act 1976 and Regulations 1981. Does Western Power have any reason not to align the pipe with the existing SCM pipeline on north side of Buffalo Road?**

Western Power has consulted extensively with LIMA with respect to the proposed pipeline route. Western Power proposes to maintain close dialogue with LIMA and CALM through the design and construction process. Western Power recognises the significance of the Leschenault Inlet and adjacent lands and is committed to employing practices that minimise environmental impact.

The route south of Buffalo Road was chosen because it presented a simpler construction option. This will generally mean less disruption to the environment.

If the line was to run north of Buffalo Road the pipeline would need to stand some 7 metres off the existing SCM pipeline to permit construction and to ensure appropriate easements were maintained. This would result in a much greater encroachment onto fringing vegetation to the north of Buffalo Road.

9 USE OF ROAD RESERVE FOR PIPELINE

a) To what extent has the road reserve been used for pipeline infrastructure to prevent clearing of roadside vegetation and disrupt private landowners?

Western Power's preferred option has been to place the pipeline within existing road reserves and transmission line corridors so as to minimise clearing and disruption to landowners. However, in order to protect stands of significant roadside vegetation it has been necessary to locate the pipeline within private property in some instances. In such cases, the pipeline will generally follow existing fencelines.

Property owners along the route have been consulted. All known property owners were individually contacted and supplied with a copy of the CER. The preliminary centreline survey has commenced to more accurately define the pipeline centreline. The survey has shown that some sections will require modification in order to minimise damage to existing vegetation.

Since the pipeline is buried, and there would be only minor disruption during construction, it is preferable to locate the pipeline within private property rather than remove significant stands of existing roadside vegetation.

b) Does the pipeline route take into account roads under Main Roads of WA control for likely future control and upgrade/widening?

Western Power has consulted extensively with MRWA in an endeavour to establish requirements to satisfy long term upgrading/widening. At this stage limited information has been made available from MRWA. We understand that MRWA are currently reviewing their development options.

Western Power will work closely with MRWA to ensure that as far as possible proposed future road upgrades are incorporated in the final route selection.

c) Does the pipeline route use the road reserve set aside for the proposed Australind bypass freeway ?

Western Power has been directed by MRWA to remain outside the road reserve along the Australind bypass freeway. While it is Western Power's preferred option to be in the road reserve, where possible, we understand that under current MRWA policy this is not permitted. Western Power would be happy to review this in the event of a change of policy.

Details of the route are given in Section 2.3.2 of the CER.

10 OCEAN DISPOSAL

a) How does Western Power respond to comment that ocean disposal may be seen as a convenient dumping ground for industrial waste water?

The disposal of saline water to the ocean meets the stringent requirements set by the EPA for marine environments. This can be demonstrated by reference to Table 6.1 of the CER. The water being disposed is essentially salt water that has been concentrated by the evaporation process within the cooling water circuit. It is not an industrial waste as it is not a derivative of a manufacturing process.

b) What guarantees can Western Power provide that the outfall will be maintained and monitored to protect the ocean environment?

Sections 6.2.3 and 7.3 of the CER detail the commitments and procedures that Western Power would follow to monitor and maintain the integrity of the ocean outfall, which include periodic inspection and maintenance and a back pressure gauge near the onshore break tank in order to detect any potential rupture of the outfall pipe or diffuser. Additionally there is commitment to annual monitoring of the ocean environment in the vicinity of the outfall.

c) Can Western Power state that there will be no adverse impacts from ocean disposal on the aquatic ecosystem?

Table 6.1 of the CER compares the saline water after 100 fold dilution with the water quality guidelines for marine environment set by the EPA.
The table demonstrates that the chemical composition (including heavy metal) falls within the limits specified by the EPA for the protection of aquatic ecosystems and human consumption of fish and other aquatic organisms.

Notwithstanding this, Western Power is committed to on-going regular monitoring (Commitment 18) and implementation of remedial measures (Commitment 17) should monitoring indicate unacceptable, adverse impacts.

11 REHABILITATION / VISUAL IMPACTS

Does Western Power intend to rehabilitate land and manage visual impacts on CALM managed estate to CALM satisfaction?

Western Power has identified those areas of the pipeline route which impact on land managed by CALM. Western Power has consulted with CALM to identify their requirements with respect to minimising environmental impact.

There are three basic areas to be considered:

i Areas within State Forest through which an existing transmission line corridor passes. No further clearing is envisaged in these areas. The pipeline will be confined to the existing transmission line corridor.

ii Areas of state forest adjacent to Lots 3640 and 1790 in State Forest No 25. Western Power has met representatives of CALM on site to determine the most acceptable route. As a result modifications to the proposed route were made to incorporate existing tracks to minimise the extent of clearing. This has resulted in additional deviations which have had significant cost impact.

iii The CALM reserve at the end of Buffalo Road is known to be environmentally sensitive. A preliminary survey revealed that the originally proposed route required modification to minimise environmental impact. As a consequence it is proposed to parallel the existing SCM pipeline from the end of Buffalo Road, also paralleling the existing access road. Western Power propose to parallel the SCM pipeline through the existing modified dune environment.

Western Power are committed to rehabilitation to the satisfaction of CALM and EPA to restore any damage to the environment's current condition.

12 BREAK TANKS

a) Where are break tanks to be installed? - On whose properties?

The precise location of break tanks cannot be determined until the detailed design phase.

b) What are the specifications (size etc) and visual impact of the tanks?

As described in Section 2.3.3 of the CER the break tanks are expected to be in the order of 3m high and 3.7m in diameter. They will be located on high ground, painted dark green and shielded from direct view to minimise visual impact.

13 IMPACTS ON RECREATIONAL USERS OF OCEAN/BEACH

What risks are there to recreational users of the ocean and beach (swimming, diving, surfing, fishing), including possible health impacts?

There would be no risks to recreational users of the ocean and beach since the outfall would be buried and discharged 710m offshore in 10m of water. The outfall would not discharge any material remotely capable of affecting human health since it would only contain moderately saline water and would not contain any human sewage.

14 FLORA

Does Western Power intend to check areas for significant flora? (IE by a competent botanist in consultation with CALM.)

The route has been selected to minimise environmental impact. The route is confined to existing road reserves, transmission line corridors, cleared farm land, fire breaks or existing access roads. A detailed flora survey is not considered necessary but areas that are identified as particularly sensitive by the DEP will be closely examined if required.

15 OWNERSHIP OF LAND

Does Mr H Shier or Western Power own the portion of Lot 794 to north of Williams Rd and east of Collie River?

The particular land in question is not affected by the proposed pipeline route.

Portion of Location 794 south and west of the Collie River and north of the Collie-Williams Road is owned by G F H Shier, C/T 1182-427.

Western Power owns the portion of Location 794 south of the Collie-Williams Road and south of the Collie River. The land north of the Collie-Williams Road and east of the Collie River is part of Locations 765 and 766 both owned by Western Power.

16 SEEPAGE FROM PONDS ONSITE

a) How does Western Power intend to monitor seepage rates ex containment structures at the power station?

The water containment structures on site are of two types:

(i) The raw water pond, and the run off collection ponds, which would contain relatively low TDS water and should not require seepage monitoring as the quality of water would be similar, if not better than the quality of underlying groundwater.

(ii) The saline water disposal pond, which may contain higher TDS water, but for short periods of time. This pond is strategically located upstream of the raw water pond which would intercept any leakage or rupture.

This is explained in Section 6.2.1 of the CER. Specific leakage monitoring of this pond does not appear to be warranted.

However, general groundwater quality will be monitored by suitably placed observation bores (see section 7.1). Western Power is committed (Commitment 18) to prepare and implement a monitoring programme to the satisfaction of the EPA and WAWA.

b) **In Clauses 2.2.3 and 6.2.1 the proponent advises of using clay-lining with a permeability of 1 x 10^{-8} m/s which is an order of magnitude less than that recommended by WAWA for non-hazardous waste containment. No predictions of anticipated seepage losses are made, other than the quantity of seepage "would be small".**

Can Western Power please advise why a lower permeability cannot be achieved if clay is the chosen lining medium?

Clause 2.2.3 was intended to give a range of liners ranging from 10^{-8} permeability clay to the use of a synthetic HDPE liner. Western Power is committed (Commitment 3) to construct and line on-site storage ponds to limit seepage to the satisfaction of the EPA on the advise of the Water Authority.

Western Power acknowledges that a permeability of 10^{-9} can be achieved with clay lining. Western Power will target a minimum permeability of 10^{-9} for all clay lined water storage ponds.

17 PIPELINE DESIGN

Does Western Power intend to conduct a detailed engineering design for the projected pipeline including factor of safety determination for water hammer caused by valve closures? Will any scour points on the pipeline or release points from pressure control devices be located away from sensitive water resources such as freshwater wetlands, irrigation channels and streams used for irrigation supplies?

The pipeline is considered to be a significant and integral part of the power station. As such it will be subject to intensive engineering design. Western Power proposes to engage an experienced consulting engineering firm with appropriate QA procedures to ensure that the highest engineering design standards are employed.

The design will take due account of all design conditions and loads, including water hammer.

The precise location of valves, break tanks etc cannot be determined at this stage. It is Western Power's intention to locate scour valves away from sensitive water resources.

18 ECONOMIES OF SCALE

Can Western Power comment on the practicality of saline waters from Muja Power Station being transported to the coast via the pipeline? If the pipeline is the most economical, environmentally sound solution why has Western Power opted for brine concentration and on-site disposal at Muja? Are there reasons why economies of scale involving both power stations discharging saline waters to the coast via a pipeline are not worthy of consideration in the CER?

Refer to the answer for question 7(e).

Appendix 3

List of submitters

1. Westrail South Western District
2. Mr/Ms CR & MA Tonkin
3. Mr W (WJ) Carmody
4. Shire of Collie
5. Conservation Council of WA
6. The Griffin Coal Mining Company Pty Ltd
7. Department of Resources Development
8. Ms M Tonkes
9. Mr T Lynch
10. Leschenault Inlet Management Authority
11. Mr R J Scott
12. Department of Conservation and Land Management
13. Shire of Harvey
14. Main Roads WA
15. Water Authority of Western Australia

Appendix 4

Proponent's Project Description

2 PROJECT DESCRIPTION

The proposed Collie Power Station would require water for a variety of purposes, and would generate wastewater from a number of processes during its operation. This section describes the individual elements of the proposed water management system and their interrelationship in the overall water management strategy for the 600 MW Collie Power Station.

2.1 WATER SUPPLY

As described in SECWA's ERMP (SECWA 1990) and SECWA's power station water resources management proposal (SECWA 1994), the water required for the operation of the power station would be drawn from the following sources:

- rainfall runoff from the power station hardstand areas
- mine dewatering operations
- groundwater from a dedicated borefield.

Surface water resources in the Collie region are already heavily committed for agricultural and domestic purposes, and many are generally too saline to be used by the power station. Water from Wellington Dam and the Collie River East Branch, for example, is generally high in total dissolved solids (TDS). In addition, the flow of the Collie River East Branch is considered too highly variable to be suitable as a reliable water supply. These sources would only be considered if no suitable alternative was available.

Large quantities of water are potentially available from mine dewatering from collieries likely to supply the power station. However, some of this water is also required for the operation of Muja Power Station, and until the collieries' future mining plans are further advanced, the quantity of mine dewatering water available for use by the Collie Power Station is uncertain.

Because of the uncertain availability of supplies of mine dewatering water, a dedicated borefield would also be developed at Cardiff East to supply groundwater to the power station from deep aquifer bores. Water supplies would also be supplemented by rainfall runoff from hardstand areas within the power station site. The above-mentioned sources of water would ensure that sufficient water supplies were available for the ongoing operation of the power station. However, a limited quantity of water from the Harris River Dam would be utilized during the construction stage.

Indications to date are that mine dewatering water would be suitable for use by the power station after treatment. However, because of the uncertainty regarding the source of mine dewatering water, the quality of water to be used by the power station is as yet undetermined. For the purposes of this CER, the water management strategy has been based on the likely worst quality water. The water quality has implications for the quantity of water required by the power station, since the water would be reused a number of times until its quality was such that it could not be used further and it would require disposal. Generally, the number of times the water can be reused depends on its levels of TDS and silica, scaling occurring in pipework if the silica exceeds a certain concentration.

The quality of water from the various sources likely to be used by the proposed Collie Power Station is summarized in Table 2.1. The water from Chicken Creek is considered to be representative of the worst quality likely to be supplied to the Collie Power Station. If better quality water were used, a lesser quantity would be required since greater reuse would be possible within the power station before silica levels became excessive.

Table 2.1 **Quality of various waters likely to be used by the Collie Power Station**

Water source	Silica (g/m^3)	Total dissolved solids (g/m^3)
Chicken Creek mine dewatering	12	393
Cardiff East borefield	15	350
Premier mine dewatering	13	310
Ewington mine dewatering	5	320

Whatever the source, mine dewatering water and borewater would be treated at the point of abstraction by aeration and lime dosing to pH 7 in order to precipitate iron and other metals, to remove hydrogen sulfide and to reduce carbon dioxide. Solids would be allowed to deposit in a settling basin before the treated water was pumped to the power station. At the power station, the water would be treated by dissolved air flotation to remove suspended solids before it was stored in the water supply reservoir.

2.2 POWER STATION WATER MANAGEMENT SYSTEM

The power station would require water for the following:

- cooling tower make-up
- boiler water make-up
- ash transport
- fire-fighting
- washdown
- potable purposes.

A schematic water flow diagram for the 600 MW power station operating under average conditions is shown in Figure 2.1.

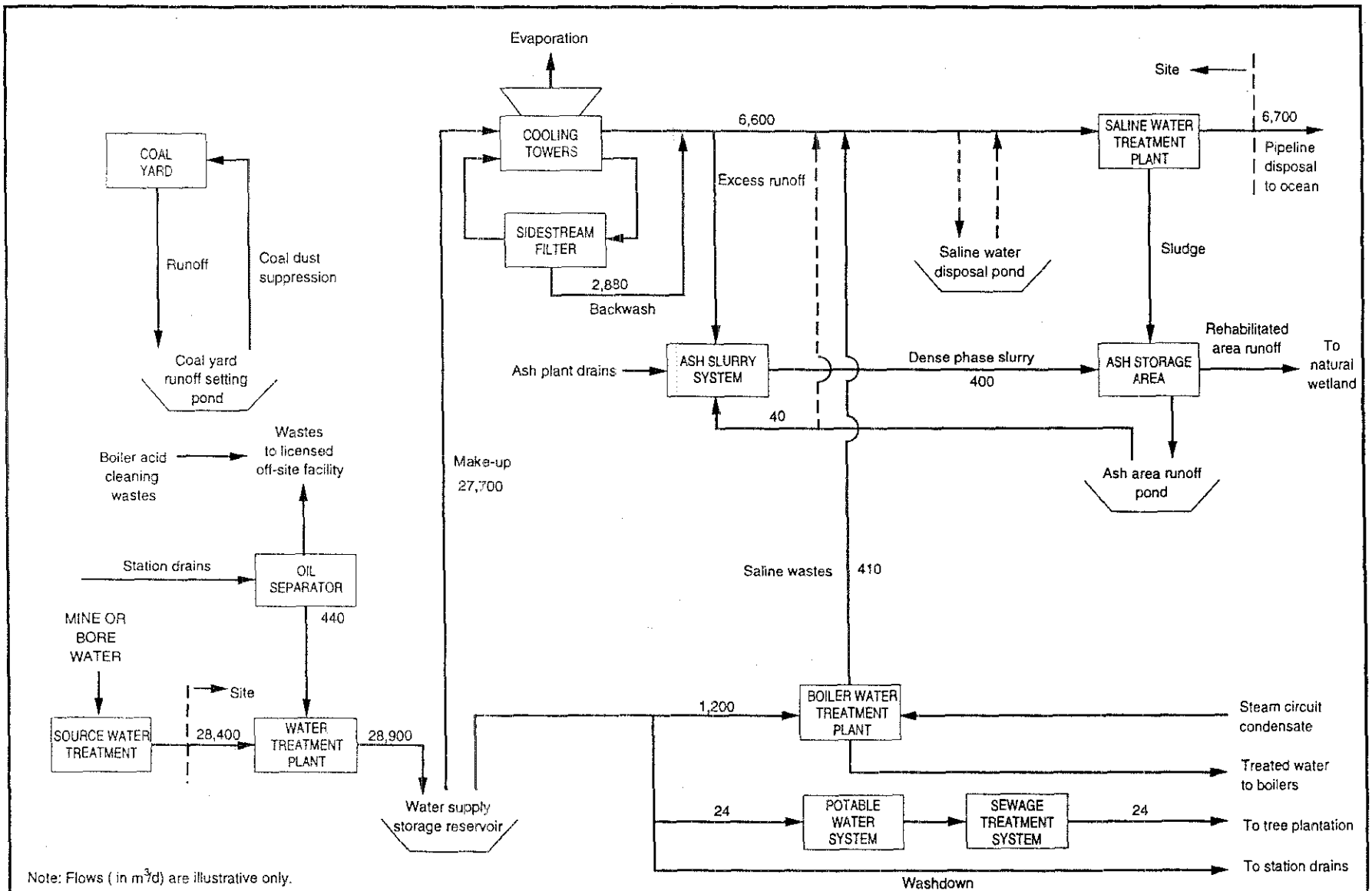


Figure 2.1

600 MW COLLIE POWER STATION AVERAGE WATER FLOW DIAGRAM

2.2.1 WATER REQUIREMENTS AND TREATMENT

The various uses of the water required by a 600 MW power station are shown in Table 2.2, indicating that a maximum of about 30,000 m^3/d would be required during summer peak periods. On average, about 28,000 m^3/d would be required and the total annual water requirements would be about 10,700,000 m^3.

Table 2.2 **Maximum water uses during summer for a 600 MW station**

Use	Volume (m^3/d)
Cooling water make-up	28,500
Boiler water make-up	1,200
Potable water	24
Service and fire water	200
Total	**29,920**

Water would be transformed to high-pressure steam in the power station boilers. After generating power in the turbo-generators, the steam would be condensed in a recirculating cooling water system utilizing mechanical draft cooling towers. The cooling towers would be the largest users of water in the power station, as make-up water would be required to replace that lost by evaporation during the cooling process. Make-up water would also be required to replace the amount lost from the boilers, including that lost during blowdown.

Water used in the cooling water circuit to cool steam would be treated with alkaline chemicals to control pH and acidity. Sodium hypochlorite or other disinfectant chemicals as well as dispersants would be added to control biofouling of the cooling towers. Water to be used as boiler make-up would be filtered using a microfilter, and demineralized through a combination of reverse osmosis and ion exchange units. Water to be used for potable purposes would be minimally chlorinated or treated by ultraviolet light after microfiltration prior to its discharge into the water supply system.

Waters of similar quality generated or collected on site would be treated together to avoid degradation of high-quality water. Boiler blowdown is relatively pure water and would be recycled for further use. Rainfall runoff from plant hardstand areas would be collected and directed to the station drains settling pond and would be treated using an oil separator before reuse by the station. Areas of the plant where high levels of oil, grease or chemical contamination could be expected would be bunded and drained to a separate area for collection and disposal. Coal yard rainfall runoff would be collected and used for dust suppression purposes. Any excess would be reused in other areas of the power station.

2.2.2 GENERATION OF WASTEWATER

Wastewater would be generated from a variety of sources within the Collie Power Station (see Figure 2.1). The major types and destinations of wastewater that would be generated are shown in Table 2.3.

The largest quantities of wastewater would be cooling tower blowdown and cooling tower sidestream filter backwash. Moderately saline water from both these sources would be discharged to prevent the excessive build-up of dissolved solids in the cooling towers, particularly silica, resulting from evaporation in the towers. This water would cause scaling of equipment if it were concentrated further by the evaporative cooling process.

Table 2.3 **Destination of wastewater generated by the 600 MW Collie Power Station**

Type of wastewater	Destination
Cooling tower blowdown	Saline water pipeline
Cooling tower sidestream filter backwash	Saline water pipeline
Boiler water treatment plant saline wastes	Saline water pipeline
Water treatment plant wastes	Recovered for reuse
Saline water treatment plant wastes	Ash storage area
Active ash storage area rainfall runoff	Ash storage area
Treated sewage wastewater	Tree plantation on site
Boiler acid cleaning wastes	Licensed off-site facility
Oily sludges	Licensed off-site facility

Boiler water treatment plant saline wastes would result from the removal of the dissolved salts in the water supply to produce demineralized water for the boilers.

It is proposed to dispose of ash from the burning of coal at the power station as a slurry containing about 30% water. The slurry would be produced by mixing a small amount of saline water derived from cooling tower blowdown or boiler water treatment plant saline wastes with the ash. The ash would be dosed with lime and pumped to a storage area on the power station site, where it would be discharged into clay-lined compartments of about 2–3 ha in size. The slurry would flow out onto the storage area in 20–30 mm thick layers to form an advancing beach, coming to rest at a very shallow angle. Because of the high solids content of the ash slurry, there would be very little free water in the slurry; during dry periods, nearly all the water in the slurry would evaporate.

The design of the ash storage area incorporates collection and reuse of leachate, supernatant and rainfall runoff from active ash storage areas to transport the ash. The average net rainfall runoff from active ash storage areas between April and October is expected to be 70 m^3/d. The ash storage area would be designed so that it would be capable of handling infrequent heavy storms. Only during extremely heavy rainfall would it be necessary to dispose of any ash storage area rainfall runoff along with saline water discharges. In such a situation, the runoff would be likely to have a low salinity, and would not contain any heavy metals.

Wastewater from the dissolved air flotation process used to treat the incoming water supply would be allowed to settle and the clarified water would be reused within the power station. Solid or slurry wastes arising from the on-site treatment of water or wastewater streams, such as cooling tower sidestream filter backwash, settled water treatment plant solid waste and saline water treatment plant wastes, would be disposed of with the ash in the ash storage area.

Boiler acid cleaning would generate highly saline wastewater during power station commissioning and then very infrequently, if ever.

The disposal of the various wastewater streams from the power station is further described in Sections 2.3 and 2.4.

2.2.3 ON-SITE WATER STORAGE PONDS

The approximate capacities of the various water and wastewater storage and disposal ponds are shown in Table 2.4, while the locations of the major ponds are shown in the site layout in Figure 2.2.

Table 2.4 **Pond capacities**

Pond	Capacity (m^3)
Water supply storage reservoir	160,000
Saline water disposal pond	20,000
Coal storage area runoff collection pond	1,000
Ash storage area runoff collection pond	1,000
Station drains settling pond	1,000

The water supply storage reservoir and coal storage area runoff collection pond would contain water with low TDS levels and would be free of most contaminants except suspended solids. The ash storage area runoff collection pond and the station drains settling pond would contain water with relatively low TDS levels, but may contain other contaminants including oil. The saline water disposal pond may hold water with a TDS level between 2,500 g/m^3 and 5,000 g/m^3 (from cooling tower blowdown), and up to 20,000 g/m^3 (from boiler water treatment plant saline wastes), for short periods.

The ponds would be lined either with clay with a permeability of 1×10^{-8} m/s or with high density polyethylene (HDPE) to minimize the leakage of water to the surrounding environment. Ponds lined with clay would contain a small volume of water at all times to prevent the clay liner drying out and cracking.

When the power station is decommissioned, the ponds would be drained and allowed to dry by solar evaporation. The pond contents would be removed and placed in the ash storage area. The ponds would then be restored to their former use, namely part of the original wetland system on the site.

The solids which accumulate in the settling basins near the mine dewatering and borewater on-site treatment plants would require periodic removal. Since this solid material would consist predominantly of iron oxides, it is expected that it would be suitable for disposal in an uncontrolled landfill.

2.3 DISPOSAL OF SALINE WATER

2.3.1 QUANTITY AND QUALITY OF SALINE WATER

On average, the 600 MW station would generate approximately 6,700 m^3/d of moderately saline water which would require disposal. This would consist primarily of cooling tower blowdown, cooling tower sidestream filter backwash, boiler water treatment plant saline wastes and excess rainfall runoff from the ash storage area.

It is proposed to dispose of this moderately saline water by discharge to the ocean via a pipeline. Before its discharge from the power station, the saline water would be dosed to pH 8 with lime to precipitate heavy metals. It would then be filtered to remove the precipitate and other suspended solids. The heavy metals precipitated and removed by this process would be disposed of in the ash storage area. Skimmers and below-surface suction pipes would be incorporated into the cooling tower basin and wastewater collection basins to prevent the discharge of floating material, including oil, in the extremely unlikely event that such material should ever enter the saline water disposal system.

If a failure of the saline water disposal system should occur, the proponent would direct the water to the saline water disposal pond until the fault was rectified to the satisfaction of the EPA (Commitment 2).

This saline water disposal pond would have sufficient capacity to hold at least three days' production of saline water, which would allow the fault to be repaired without disruption to the operation of the power station. Subsequently, the collected saline water would be pumped to the ocean, resulting in a slight increase in the nominal discharge rate.

Because the saline water would predominantly comprise cooling tower blowdown and boiler water treatment plant saline wastes, the water discharged into the ocean would have a composition similar to, though more concentrated than, that of the water supply to the station.

The levels of some heavy metals in the saline water would be lower than those in the water supply because of treatment of the supply water before use in the power station, by precipitation in the cooling water circuit and by treatment of the saline water before disposal (Sorg et al. 1978; Boling et al. 1992).

The likely chemical composition of the saline water is shown in Table 2.5. These data show that the saline water would have a design TDS level of 3,200 g/m^3 and have a density of 1,002 kg/m^3 compared to the density of seawater of 1,024 kg/m^3; however, the TDS could be as high as 5,000 g/m^3 if a water supply with a lower silica level than that listed in Table 2.5 was used. The main constituent of the saline water would be sodium chloride. The saline water would also contain low levels of heavy metals, but radioactivity and biocide levels would be negligible. The saline water, although no longer suitable for cooling purposes in the power station, could be used by other industrial users, particularly for 'once through' cooling or other purposes where the concentration of silica is not a limiting factor.

The proponent would ensure that the water discharged into the ocean would be clear, moderately saline, at ambient temperature and free of any objectionable or unsightly material, to the satisfaction of the EPA (Commitment 1).

Table 2.5 **Likely composition of water supply and saline water discharged into the ocean**

Parameter*	Water supply	Saline water
pH	5.2	8.0
Sodium	100	815
Potassium	4	29
Calcium	8	231
Magnesium	14	91
Iron	4	0.3
Manganese	5	0.1
Chloride	210	1,732
Sulfate	18	244
Bicarbonate	7	39
Silica	12	78
TDS	393	3,200
Suspended solids	10	0.2
Phosphate (as phosphorus)	0.03	0.2
Nitrate (as nitrogen)	0.16	1.4
Cadmium	0.001	0.01
Chromium	0.001	0.01
Cobalt	0.001	0.01
Copper	0.02	0.15
Lead	0.06	0.01
Mercury	0.0002	0.002
Nickel	0.008	0.05
Zinc	0.02	0.15
Hydrocarbons (total)	0	0.11
Carbon dioxide	30	1
Dissolved oxygen	0	8

* *g/m^3, except in relation to pH.*

2.3.2 PIPELINE ROUTE

It is proposed to pump the saline water from the power station through a pipeline for approximately 68 km to an ocean outfall location at the northern end of the Leschenault Peninsula. The proposed route is shown in Figure 2.3 and Appendix C, while a profile of the route is shown in Figure 2.4. Details of the properties along the route are shown in Table 2.6.

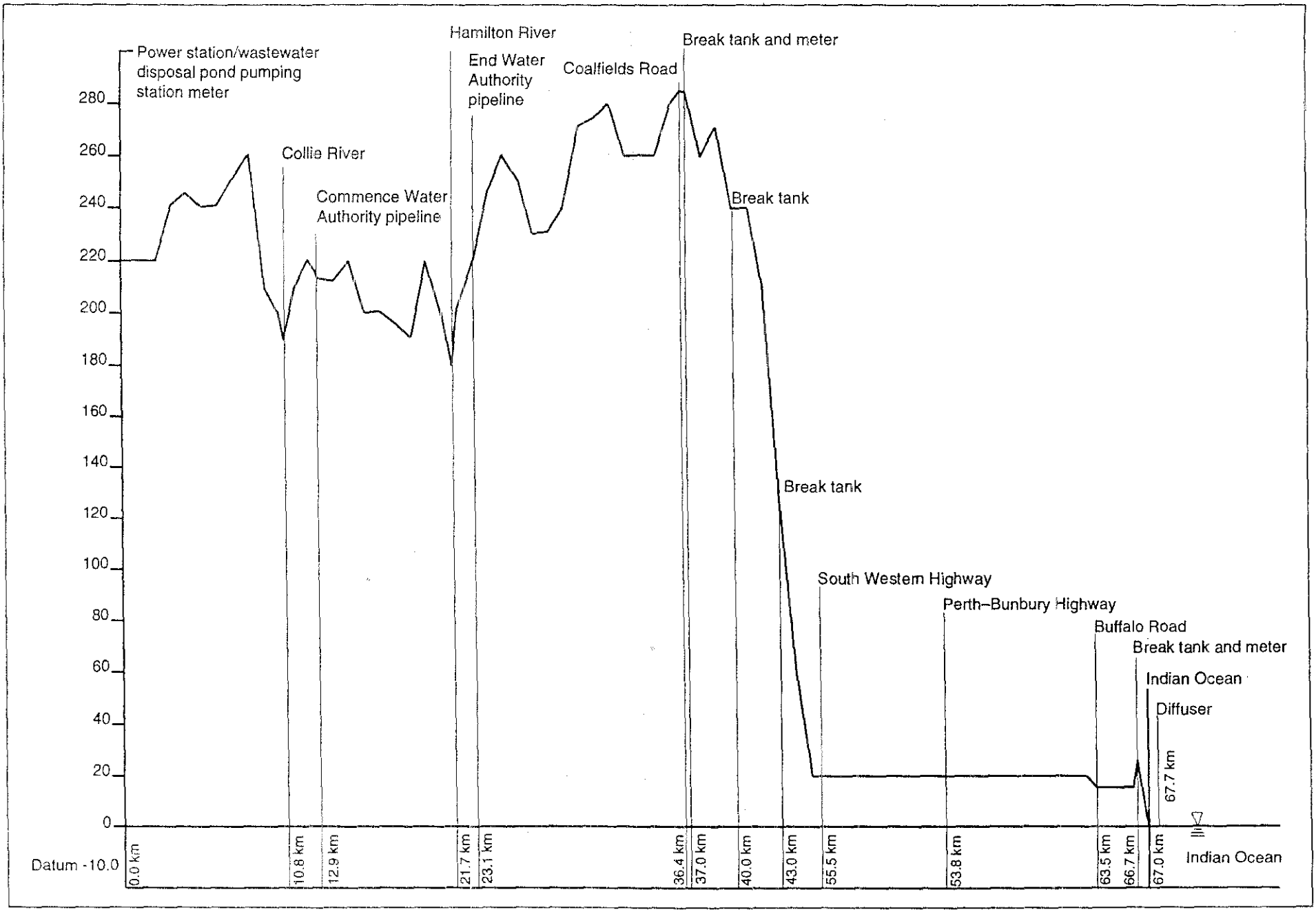


Figure 2.4

PROFILE OF PROPOSED PIPELINE ROUTE

Table 2.6 **Proposed pipeline route property details**

Sector (km)	Alignment	Easement	Adjoining property
0.0–4.0	–	Private property	SECWA buffer zone
4.0–6.5	66 kV line	Transmission line	Farmland
6.5–8.5	66 kV line	Transmission line	State Forest No. 15
8.5–12.9	66 kV line	Transmission line	Farmland
12.9–23.1	Water Authority pipeline	Pipeline	Town site, farmland
23.1–36.4	66 kV line	Transmission line	Private, State Forest No. 25
36.4–45.5	Coalfields Road	Private property	Farmland and tree plantation
45.5–46.0	South Western Highway	Road reserve	Farmland
46.0–47.5	Raymond Road	Road reserve	Farmland
47.5–49.3	Alma Road	Road reserve	Farmland
49.3–53.8	Victoria Road	Road reserve	Farmland
53.8–63.3	Perth–Bunbury Highway	Private property	Farmland
63.3–65.5	Buffalo Road	Private property and road reserve	Farmland/public open space
65.5–67.7	SCM Chemicals' wastewater pipeline	None	Public open space

From the power station, the pipeline would pass through State Forest and farmland north of Collie, through the outskirts of the townships of Collie and Allanson, and then to the edge of the Darling Scarp. From there, the pipeline would proceed to the township of Burekup and cross the coastal plain to the north of the Leschenault Peninsula mainly through farming properties. The pipeline would almost entirely follow existing mostly cleared service corridors such as transmission line corridors, access tracks, property boundaries and road reserves.

In the initial section, from the power station to the 10.8 km mark, the proposed route would pass through farmland, private natural bushland and State Forest, utilizing SECWA's existing cleared 66 kV transmission line corridor (Figure 2.5). The pipeline would cross the Collie River near the existing 66 kV alignment (Figure 2.6), and continue along the south side of Hull Road, crossing to the north side to avoid disturbing numerous trees on the southern side. At the 12.9 km mark, the pipeline would intersect with the existing but largely redundant Water Authority of Western Australia's (Water Authority's) Wellington to Collie water pipeline. The saline water would flow through this pipeline from the Hull and Mornington Road intersection near Collie to Coalfields Road near Wellington Dam at the 23.1 km mark (Figure 2.7).

In the next section, from 23.1 km to 36.4 km, the saline water pipeline would again largely follow the existing cleared 66 kV transmission line corridor, passing through farmland and State Forest, and crossing the Coalfields Road twice (Figure 2.8). At several locations in private property between the 27.6 km and 28.3 km marks, the pipeline would deviate from the transmission line corridor in order to avoid areas of granite and wet ground. The pipeline would follow cleared property boundaries and a partially cleared track, and would pass through about 25 m of uncleared State Forest. Some clearing of State Forest would be required.

From the 36.4 km mark to the township of Burekup on the South Western Highway at the 45.5 km mark, the pipeline would pass inside the property boundary alongside Coalfields Road.

There are several options for the pipeline route from the west of Burekup to Marriott Road, Kemerton (46 km to 63 km). This section of the Swan Coastal Plain has been predominantly cleared and is under cultivation, with many irrigation channels, drains, roads and transmission lines crossing the area.

The proposed route would follow Raymond, Alma and Victoria Roads, and the Perth–Bunbury Highway. Most of the route between Burekup and the Perth–Bunbury Highway would follow cleared road reserves or private property. However, some clearing would be required east of the junction of Victoria Road with the Australind Bypass (Figure 2.9), as this section of the route does not follow an existing road. The pipeline would then follow the eastern side of the Perth–Bunbury Highway (Figure 2.10). As the Highway may be upgraded to a freeway in the future, Main Roads Western Australia have advised that no services would be permitted inside the road reserve. Consequently, the pipeline would be constructed within adjacent private farming properties. Land along the Australind Bypass south of Clifton Road is predominantly cleared pasture, while the land north of Clifton Road is predominantly uncleared grazing land. The pipeline would cross the Brunswick River supported from the road bridge.

Between Victoria Road and Stanley Road, the pipeline would be parallel and adjacent to the Water Authority's Kemerton Industrial Park water supply pipeline which has recently received environmental approval (EPA 1994). The two pipelines could share the same easement and possibly even the same trench.

The final alignment of the pipeline route in the area between the South Western Highway and Marriott Road would avoid remnant bushlands, wetlands and other environmentally important or sensitive areas where possible and would depend on specific negotiations with land owners and service authorities.

Between Kemerton and the ocean, the proposed pipeline route would be parallel and adjacent to SCM Chemicals Ltd's (SCM Chemicals') existing pipeline for much of the route. The pipeline would be in cleared private property along the eastern side of the Perth–Bunbury Highway, and partly in cleared private property and partly in the road reserve along the southern side of Buffalo Road. The pipeline would utilize an existing cleared access track and partly revegetated pipeline route through the dunes (Figure 2.11) at the northern end of the Leschenault Peninsula, and terminate adjacent to SCM Chemicals' existing outfall (Figure 2.12).

2.3.3 CONSTRUCTION OF THE PIPELINE

The saline water pipeline would be made from either unplasticized polyvinyl chloride (UPVC), HDPE, ductile iron or cement-lined steel and would be 300–375 mm in diameter. For major river crossings (e.g. the Collie River), the pipeline would be enclosed in a steel pipe and either supported on trestles, suspended across the river or

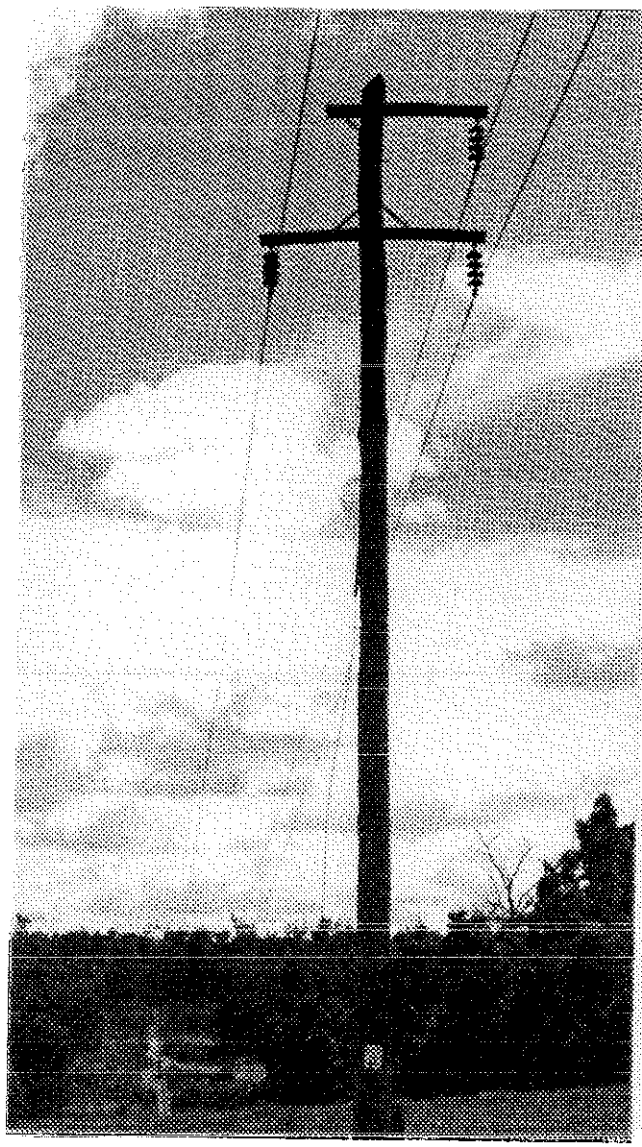


Figure 2.5

7 KM MARK—
COLLIE–WILLIAMS ROAD CROSSING

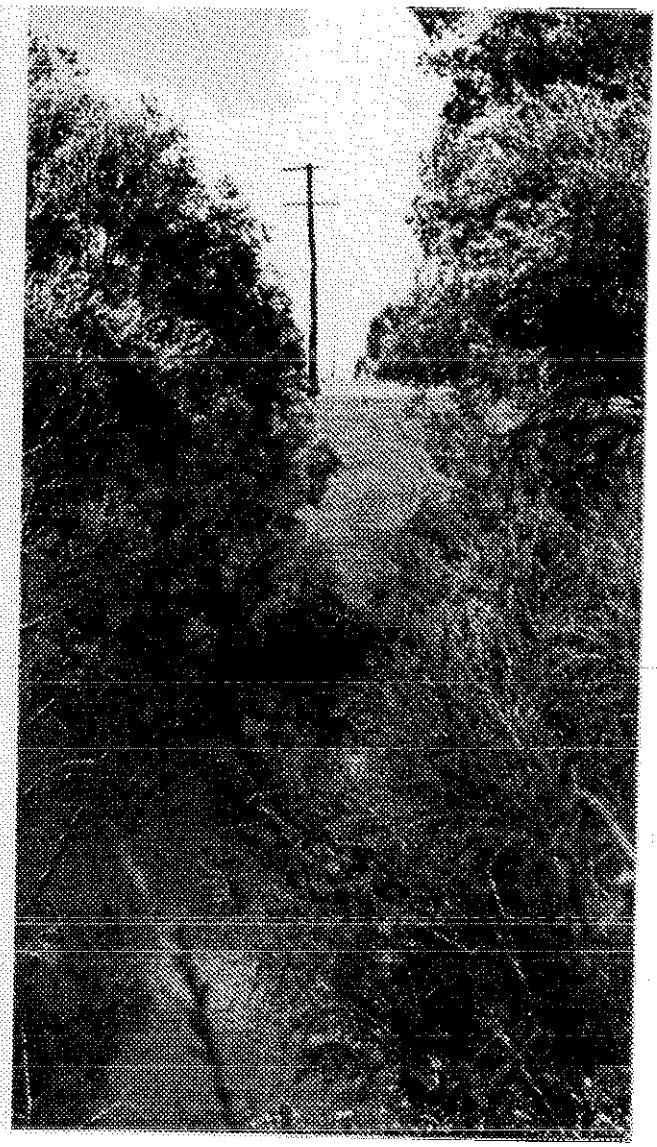


Figure 2.6

10.8 KM MARK—
COLLIE RIVER CROSSING

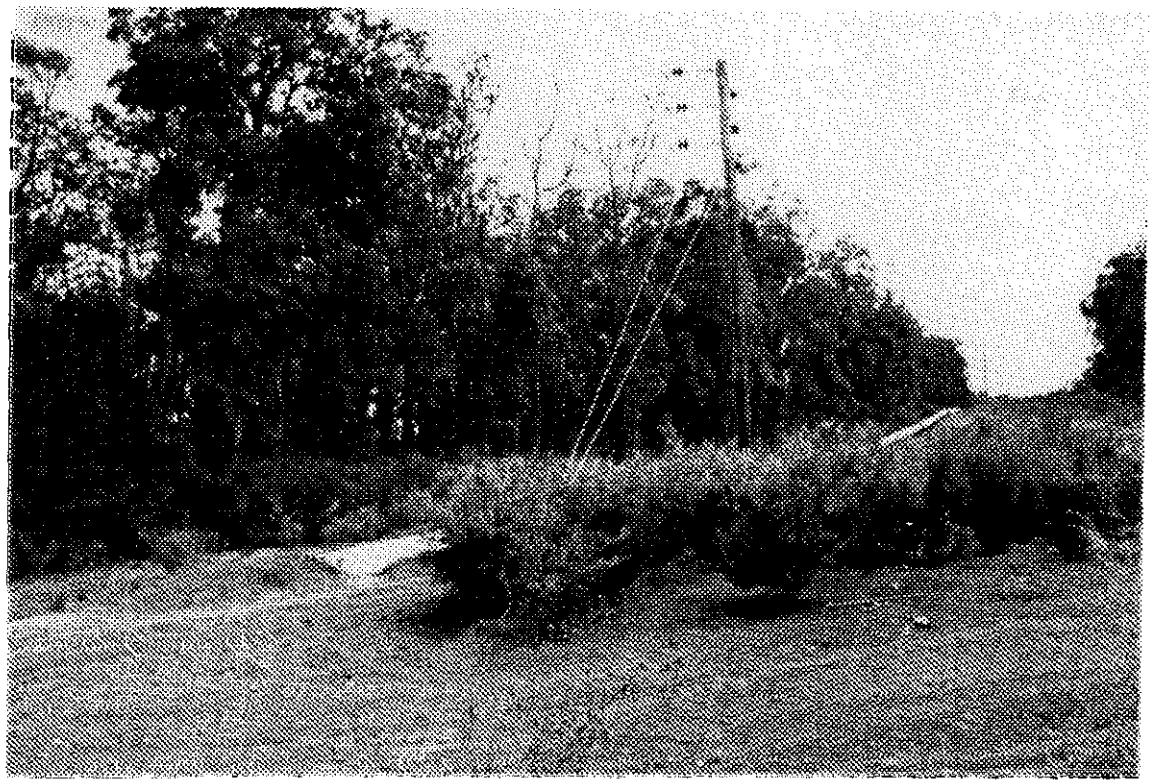


Figure 2.7

23.1 KM MARK—WELLINGTON TO COLLIE PIPELINE

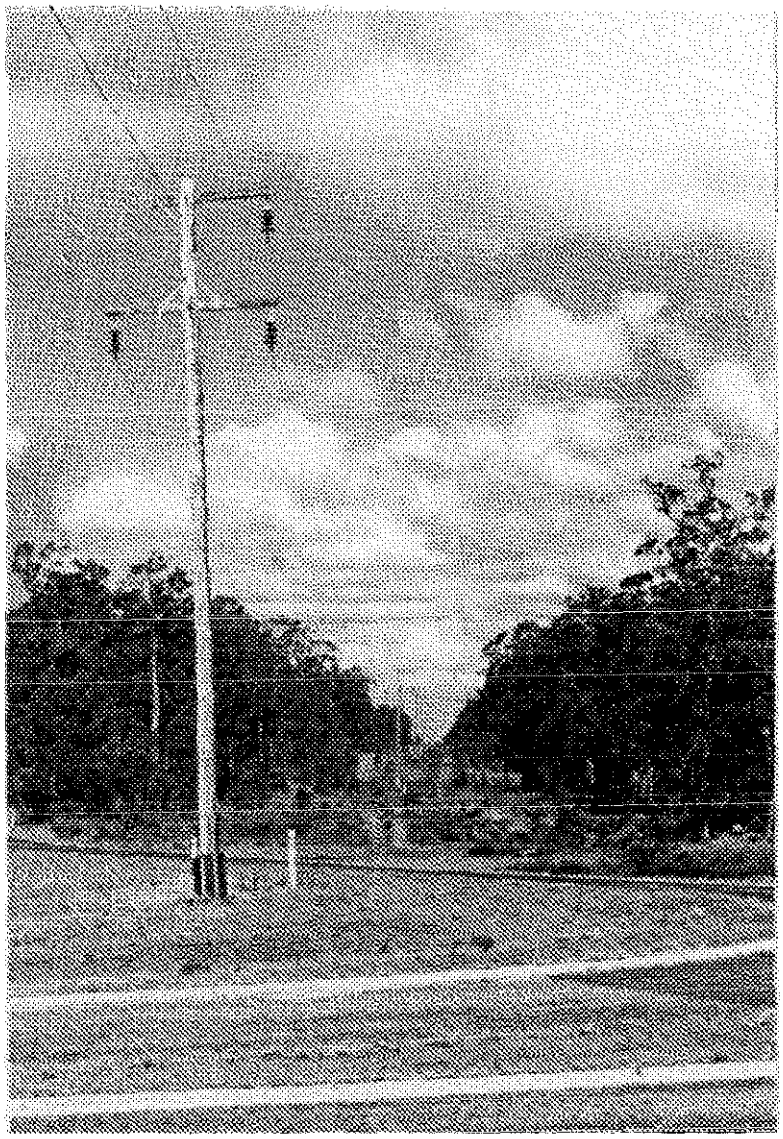


Figure 2.8

25 KM MARK—COALFIELDS ROAD CROSSING

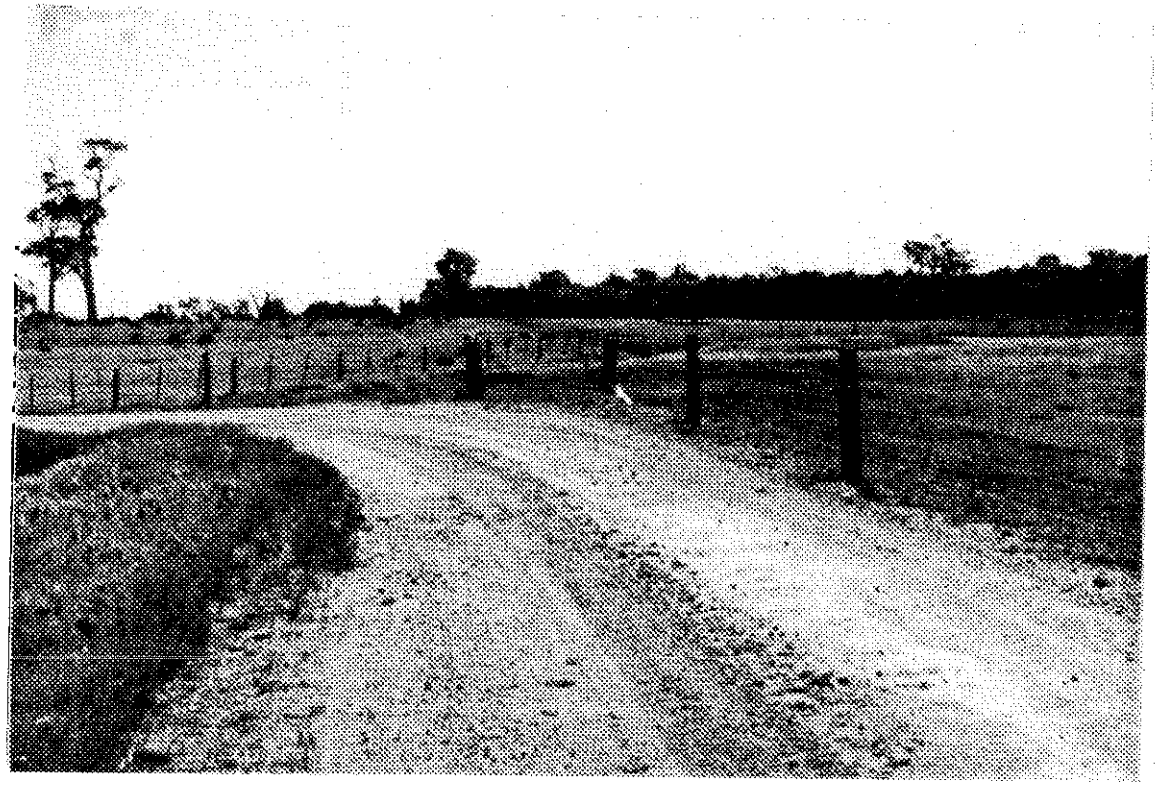


Figure 2.9

51.5 KM MARK—BALACLAVA AND VICTORIA ROADS INTERSECTION

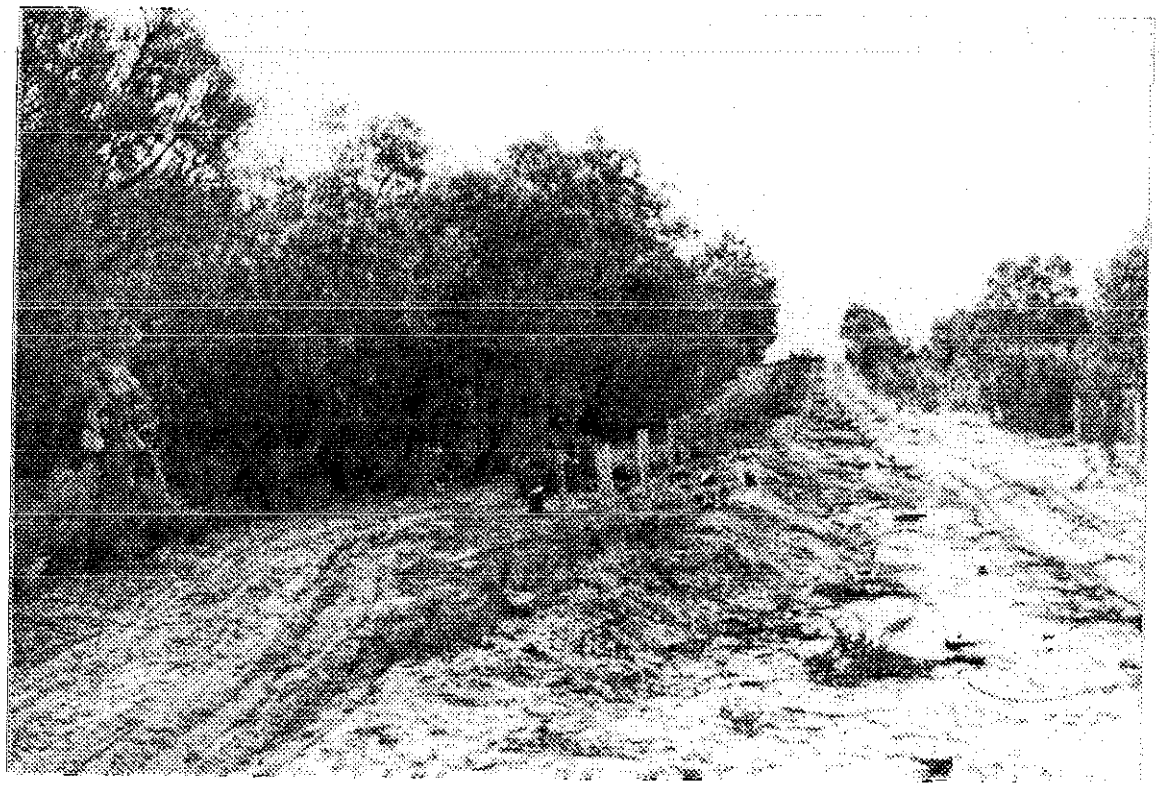


Figure 2.10

55 KM MARK—PERTH–BUNBURY HIGHWAY

Figure 2.11
66 KM MARK—SCM CHEMICALS' PIPELINE

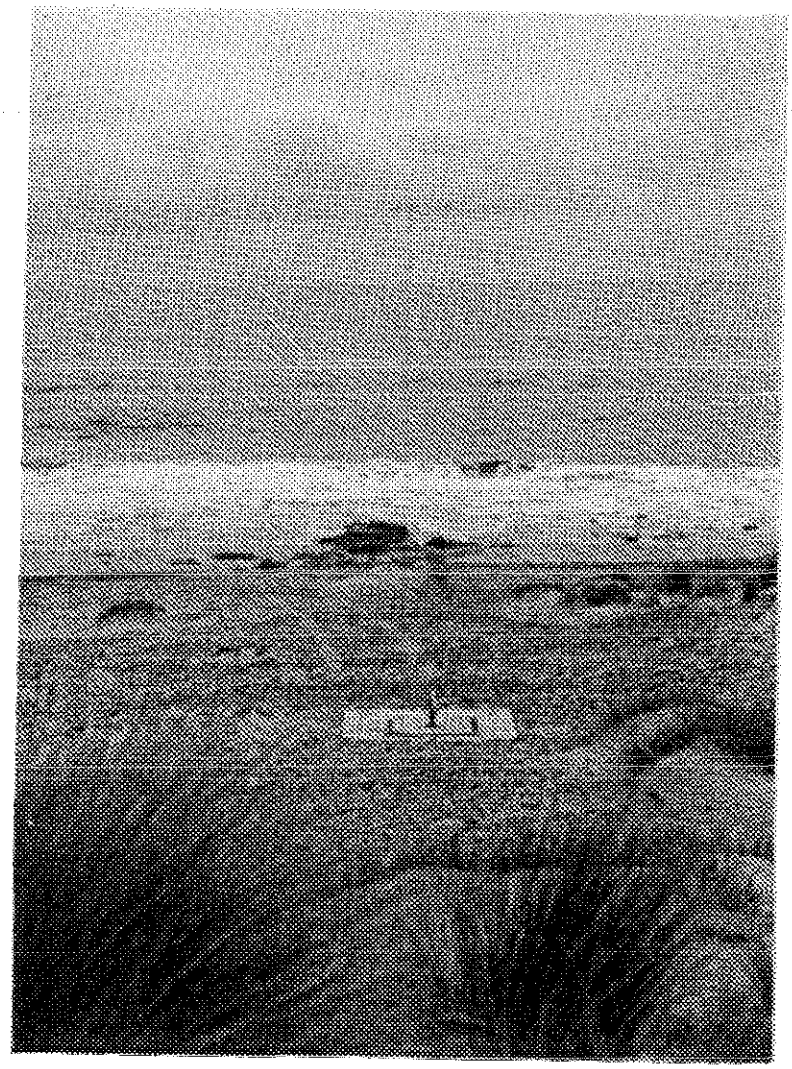


Figure 2.12
66.7 KM MARK—SCM CHEMICALS' OCEAN OUTFALL

attached to existing road bridges. At road or stream crossings the pipeline would be constructed from ductile iron or cement-lined steel. Where the pipeline was constructed of ductile iron or cement-lined steel and ran in proximity to a transmission line, it would be earthed to prevent induced current problems.

The pipeline would generally be buried below ground with a minimum soil cover of 600 mm. Under roads and where required for agricultural or other purposes, it would be buried deeper. Thrust boring techniques would be used to install the pipeline under major roads and railways to avoid disruption to traffic. Where the pipeline was required to cross irrigation channels, the pipeline would be enclosed in a steel pipe and bridge the channel so as not to affect the integrity of the side walls.

Surface ground conditions do not indicate the presence of rock along most of the proposed route. However, laterite and coffee rock exist along certain sections of the route on the western edge of the Darling Scarp, and blasting would be required if the rock could not be ripped out with a bulldozer.

Construction in typical cleared SECWA transmission line corridors and other cleared corridors is shown in Figure 2.13. The maximum width of area that would be disturbed is approximately 11 m (which includes an access track), but only a 5 m easement would be required for long-term access. Negotiations would be held with land owners to obtain this easement.

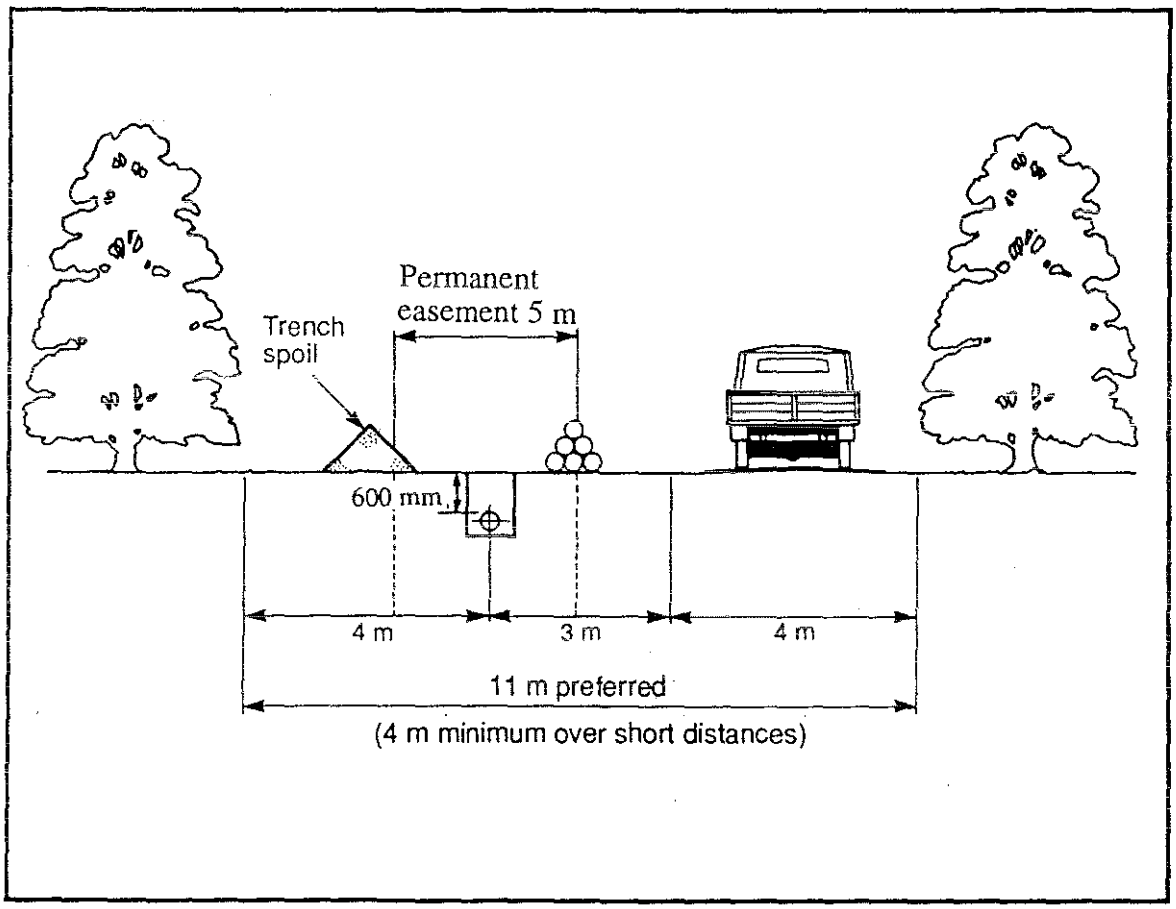


Figure 2.13

TYPICAL CONSTRUCTION CORRIDOR

It is currently planned that there would be one pumping station at the power station site; however, this would depend on final engineering design. Depending on the pipeline material chosen, pressure break tanks would probably be installed at (approximately) the 37 km, 40 km, 43 km and 67 km marks (as shown in Figure 2.4) to relieve pressure build-up. It is proposed that these tanks be above-ground steel structures, some 3 m high and 3–7 m in diameter. They would be located on high ground, but would be painted dark green and shielded from direct view to minimize visual intrusion. Automatic pressure relief valves would also be installed along the pipeline to prevent it from becoming overpressurized.

The pipeline would be under automatic control and three flowmeters would be installed, one at the power station, one at the top of the Darling Scarp and one at the ocean outfall, to continuously monitor the flow. A telemetry or land wire system would be installed to notify the control centre and raise an alarm immediately a significant difference in flow between any of the meters, was detected. The pumps would shut down automatically.

Solar panels would be used as power sources for the telemetry system if there was not an existing secure power source nearby.

Methods to reduce the volume of water lost in the unlikely event of a pipeline rupture are being investigated. The favoured option is to install check valves, which would isolate sections of the pipe, limit the volume of water released and facilitate repair procedures. In addition, manual isolating valves would be installed at regular intervals, discharge tanks would be installed at high points, and scour valves would be installed at low points in the pipeline profile. Fresh water would be used to scour the pipeline if required, and the resulting water would be discharged into the natural drainage system.

The route would be well marked with appropriate signs at strategic locations. It is also proposed to place readily visible tape above the pipeline in the trench, and to place above-ground markers at each change of direction of the pipeline and at regular intermediate intervals. These precautions should minimize the chances of accidental damage to the pipeline.

Access to the pipeline would be maintained to facilitate inspections and to minimize delays in reaching the pipeline if repairs were required.

2.3.4 OCEAN OUTFALL

The ocean outfall would be sited in an area that:

- has a barren ocean floor
- is of low fisheries significance
- has maximum dispersion/dilution characteristics.

It is proposed to locate the ocean outfall off the Leschenault Peninsula near an existing outfall operated by SCM Chemicals. It would begin within 100 m of SCM Chemicals' outfall and would discharge approximately 710 m offshore, 500 m away from, and 190 m to the north of, the SCM Chemicals discharge point.

The proposed ocean outfall would be similar in construction to that of SCM Chemicals, and would consist of a 250 mm (approximate) diameter welded HDPE pipe buried in a trench, secured by concrete anchor blocks. It would have 750 mm of sand cover and scour protection through the beach and surf zone to enable the pipeline to withstand near-shore wave action. A multiport diffuser would be located at a depth of approximately 10 m. Diffuser design studies indicate that, with such a diffuser, a dilution of at least 100 times would be achieved within 6 m of the outfall. A back pressure gauge would be installed near the onshore break tank in order to detect any potential rupture of the outfall pipe or diffuser.

Construction of the ocean outfall would proceed in a similar manner to that adopted for the construction of the SCM Chemicals outfall. The cutting of a trench in the rock platforms in the

nearshore zone would be undertaken using a combination of dozers and underwater excavators and/or excavators mounted on barges. Some blasting of rock may also be required.

The outfall pipeline would be welded together on the beach and prepared for floating into position. Immediately prior to launching the pipe a trench in the nearshore sand beds would be excavated so that the pipeline would be buried below the sea bed wherever possible.

The outfall pipeline would then be launched and towed into position before being sunk and stabilized with concrete weights. Construction would be completed by installation of the diffuser and removal of construction material from the beach.

2.4 DISPOSAL OF OTHER WASTEWATER

Sewage would be treated in a package sewage treatment plant. Treated sewage wastewater, because of its high nutrient content, would be used to irrigate an on-site eucalyptus plantation.

Clean rainfall runoff from the general site area and the rehabilitated ash storage areas would be directed to silt traps where, after settling to reduce turbidity and suspended solids, the rainfall runoff would be discharged into the local natural stream system.

Oily sludges generated by leaks and spills or by treatment of rainfall runoff from plant hardstand areas would be collected and transported in road tankers for disposal at a licensed treatment plant.

The cleaning of boilers at the end of construction, and infrequently thereafter, the cleaning of membranes used in the desalination of water for use as boiler make-up, and the use of solutions for the preservation of these membranes, would result in the production of concentrated wastes containing a variety of chemicals such as hydrochloric, citric, or phosphoric acids, ammonium salts and inhibitors. These wastes would be collected in road tankers, as they were produced, for disposal at a licensed treatment plant.

Appendix 5

Proponent's consolidated list of environmental management commitments

Consolidated List of Environmental Management Commitments

for the
Collie Power Station Wastewater Management and Disposal System.

This section presents a summary of the commitments made by Western Power Corporation.

WATER MANAGEMENT SYSTEM

1	The proponent will ensure that the water discharged into the ocean will be clear, moderately saline, at ambient temperature and free of any objectionable or unsightly material, to the satisfaction of the DEP.
2	If a failure of the saline water disposal system should occur, the proponent will direct the saline water to the saline water disposal pond until the fault is rectified, to the satisfaction of the DEP.
3	The proponent will construct and line on-site storage ponds to limit seepage into local groundwater systems, to the satisfaction of the DEP and on the advice of the Water Authority.
4	If any of the on-site storage ponds is found to leak and cause an environmental impact (as defined by the DEP), the proponent will implement procedures to identify the reasons for the leakage and prevent a recurrence, to the satisfaction of the DEP and on the advice the Water Authority.
5	The proponent will ensure that sewage will undergo appropriate treatment to satisfy both WAWA and public health authorities. The treated sewage will be recycled within the power station as appropriate or use for on-site reticulation of vegetation.

SALINE WATER PIPELINE

6	The proponent will ensure that, where practical, the pipeline will pass through existing cleared service corridors and avoid remnant bushlands, wetlands (including small confined waterbodies) and other environmentally important or sensitive areas, to the satisfaction of the DEP and on the advice of CALM.
7	The proponent will implement policies to eliminate the possible spread of dieback and weeds during construction from infected areas to disease-free and weed-free areas, to the satisfaction of CALM.
8	The proponent will implement strict fire precautions during pipeline construction to the satisfaction of CALM.
9	The proponent will ensure that disruption to access and stock movement during construction is of minimal practical duration.
10	The proponent will utilize dust suppression measures, such as water sprays from tankers, to minimize dust generation during pipeline construction, to the satisfaction of the DEP.

11 The proponent will minimize the impact of blasting by limiting blasting to daylight hours and calm conditions, and by using the minimum charge required, to the satisfaction of the Department of Minerals and Energy.

12 The proponent will develop site-specific mitigation or management plans by negotiating with individual land owners before commencing construction of the pipeline.

13 The proponent will install safety devices to reduce the potential for and impact of pipeline rupture. These devices will be installed to the satisfaction of the DEP and on the advice of the Water Authority.

14 The proponent will conduct periodic inspections of the pipeline and its components and undertake periodic maintenance to ensure system integrity, to the satisfaction of the Water Authority.

15 The proponent will institute measures so that an alarm will be raised and the pumps shut down automatically if a significant leak in the pipeline was detected. These measures will be to the satisfaction of the DEP and on the advice of the Water Authority.

16 The proponent will repair any damage to the surrounding environment in the event of a pipeline rupture or leak, to the satisfaction of the DEP.

17 The proponent will restore areas disturbed by construction activities progressively and as soon as possible after the completion of a portion of the construction. Disturbed areas will be re-vegetated with appropriate species. Particular attention will be paid to the rehabilitation of coastal sands, near wetlands and areas that may be susceptible to erosion.

18 The proponent will arrange for the rehabilitation of land on CALM managed estates to a condition that existed prior to construction. The rehabilitation shall be to the satisfaction of CALM.

19 The proponent will work closely with relevant authorities including local government, MRWA and Westrail to ensure that, as far as possible, future infrastructure upgrades are incorporated into the final route selection.

OCEAN OUTFALL

20 The proponent will site the ocean outfall off the Leschenault Peninsula in an area of low conservation value to minimize the effects of the discharge on the surrounding environment, to the satisfaction of the DEP.

21 Should monitoring of the ocean near the outfall detect an adverse environmental impact as a result of the saline water discharge (as defined by the DEP), the proponent will review the operation of the saline water management system and implement changes, to the satisfaction of the DEP.

Appendix 6

Copy of letters from relevant government agencies

WATERWAYS COMMISSION

LIMA

LESCHENAULT INLET MANAGEMENT AUTHORITY

PROTECTING OUR WATERWAYS

Our Ref: ETW 95/2
Your Ref:
Enquiries: Eric Wright

(9)

Chairman
Environmental Protection Authority
Westralia Square
141 St Georges Terrace
Perth WA 6000

DEPARTMENT OF ENVIRONMENTAL PROTECTION
10 FEB 1995
143/1 Initials 6M 6

Attention: Mr G Mueller

Dear Sir

COLLIE POWER STATION
WASTE WATER MANAGEMENT AND DISPOSAL SYSTEM

The CER was considered by the Authority at the February 6 meeting, and members resolved that they had no objection to the pipeline proposal or to the discharge of waste water to the ocean off Buffalo Beach.

The only area of concern may be with the construction of the pipeline alongside Buffalo Road at the north end of the Leschenault Estuary. There is significant fringing vegetation to the south of Buffalo Road, and any proposal to disturb this shore rush will need to be approved by this Authority under the Waterways Conservation Act 1976 and Regulations 1981. The preferred option would be for the pipeline to be aligned with the existing pipeline (SCM Chemicals) on the north side of Buffalo Road.

Should you require clarification of the above points or any further information please contact Mr Eric Wright or Ms Cathie Derrington at the LIMA office on telephone 097211666.

Yours faithfully

Sir Donald Eckersley OBE
CHAIRMAN
6 February, 1995

83435 I-FO

Inner Harbour Road, P.O. Box 261, Bunbury, Western Australia, 6230, Telephone: (097) 21 1875, Fax: (097) 21 8290

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

HEAD OFFICE
HACKETT DRIVE CRAWLEY
WESTERN AUSTRALIA
Phone (09) 442 0300
Facsimile (09) 386 1578

STATE OPERATIONS HEADQUARTERS
50 HAYMAN ROAD COMO
WESTERN AUSTRALIA
Phone (09) 334 0333
Facsimile (09) 334 0466
Teletype (09) 334 0546

Please address all correspondence to Executive Director, P.O. Box 104, COMO W.A. 6152

Your Ref:
Our Ref: 034878f3102
Enquiries: N Caporn.
Phone:

Chairman
Environmental Protection Authority
141 St Georges Terrace
PERTH WA 6000

ATTENTION: Mr G Mueller

CER : Collie Power Station.
Waste Water Management and Disposal System.

I refer to the SECWA memo of 30 December 1994 requesting submissions on this proposal.

CALM has reviewed the CER document prepared by SECWA and considers the committments contained in the document are generally adequate, however the following areas need attention:

- Significant Flora.-.SECWA will need to engage a competant botanist to check specific areas for rare or priority species. The areas will need to be determined in consultation with CALM.
- Rehabilitation to manage visual impacts on CALM managed estate will need to be to CALM safisfaction.

for Syd Shea
EXECUTIVE DIRECTOR

83230

YOUR REF
OUR REF A25772
ENQUIRIES P N Ryan
DIRECT TEL 420 2431
420 3176 fax

Water
AUTHORITY

Water Authority of
Western Australia
629 Newcastle Street
Leederville 6007
Western Australia
PO Box 100
Leederville WA 6902
Tel (09) 420 2420
Fax (09) 420 3200

The Director
Evaluations
Dept of Environmental Protection
141 St Georges Terrace
PERTH WA 6000

27 FEB 1995
143/94 amd 6

Att: Mr G Mueller

CONSULTATIVE ENVIRONMENTAL REVIEW
SECWA (WESTERN POWER) - COLLIE POWER STATION WASTEWATER MANAGEMENT & DISPOSAL SYSTEM, DECEMBER 1994

I apologise for the delay in providing comments on the above document, which was referred to the Water Authority by SECWA in late December 1994. The CER has now been reviewed and the following comments are offered.

1. The CER discusses various options for disposal of saline wastewaters from the projected power station operating at an output of up to 600 MW. The selected option is to discharge ≈6,700 kL/d of saline wastewaters to the ocean north of Bunbury via a pipeline. While acknowledging the potential accompanying benefits of reduced saline impact on the Wellington reservoir, the Water Authority questions the loss of ≈2.5 ML/an of brackish waters from the Collie Basin which is suffering from a declining water table. In Clauses 3.3 and 3.4 of the CER various alternatives involving silica reduction and brine/fresh water partitioning are described as having a high and relatively high capital and operating cost. A cost benefit analysis should be included to permit reasonable judgements to be made on the assertion by SECWA that these options be discarded.

2. In Clause 3.3.2, it is unclear why salt lake sites some 120 km away from the power station are being considered for saline disposal when the ocean is only about 60 km away by road.

3. No comment has been made on the practicality of saline waters from Muja power station being transported to the coast via the pipeline. If the pipeline is the most economical, environmentally sound solution why has Western Power opted for brine concentration and on-site disposal at Muja. Surely economies of scale involving both power stations discharging saline waters to the coast via a pipeline are worthy of consideration in the CER.

83820 (WE)

4. We wish to clarify WAWA's views on the use of the Wellington to Collie Pipeline route as follows:

   - we have no objection to use of a parallel pipeline route provided no damage to WAWA infrastructure occurs, or if it does occur, damage is made good at Western Power's expense; and

   - if the actual WAWA pipeline is to be utilised for disposal, WAWA will make it available on the understanding that the pipeline or its equivalent may need to be returned to WAWA's control (in equal or better condition to the present) within the next 25 years on the basis of the Wellington reservoir being utilised for potable water supply. In the interim a small scale pipeline to supply Allanson and the proposed Potter's Gorge development would need to be negotiated between Western Power and WAWA.

5. Western Power will need to conduct a detailed engineering design for the projected pipeline including factor of safety determination for water hammer caused by valve closures. Any scour points on the pipeline or release points from pressure control devices should be located away from sensitive water resources such as freshwater wetlands, irrigation channels and streams used for irrigation supplies.

6. Western Power should make a commitment to make good any adverse impacts resulting from leakage or breach of the pipeline where utilised water sources are disrupted or threatened.

7. In Clauses 2.2.3 and 6.2.1 the proponent advises of using clay-lining with a permeability of 1×10^{-8} m/s which is an order of magnitude less than that recommended by WAWA for non-hazardous waste containment. No predictions of anticipated seepage losses are made, other than the quantity of seepage "would be small". The proponent should be requested to advise why a lower permeability cannot be achieved if clay is the chosen lining medium.

8. We confirm our previous advice that the Power Station (where practical) should use mine dewatering waters as their primary source of water supply in lieu of a dedicated wellfield to minimise unnecessary groundwater drawdowns within the Collie Basin.

9. The proponent has not advised of the projected station workforce or alternatively the projected employee amenities wastewater output. The effluent disposal system via a eucalyptus plantation (Clause 2.4) will need to be designed on suitable nutrient application rates based on plantation uptake and local environmental factors eg soils, meteorological conditions. Comments on these matters and the projected site/management of the plantation should be included in a response from the proponent.

10. How does Western Power intend to monitor seepage rates ex containment structures at the power station?

11. Patrol of the pipeline should initially occur on a quarterly basis. After six months if no problems are detected (including testing in situ of safety devices for successful operation under a range of pressure conditions) then biannual or annual patrol would be acceptable.

12. Commitment C1 should be extended to include coverage of metals and toxic substances, plus any matter producing undesirable aesthetic impacts.

Provided Western Power is able to satisfy the issues described above, WAWA will raise no objection to the Ministerial approval being granted for the wastewater management and disposal system projected for the power station.

Yours faithfully

K J TAYLOR
MANAGER, GROUNDWATER & ENVIRONMENT

22 February 1995 KB

Copy: Regional WR Manager, South West
WAWA, Bunbury

EPA's COPY

WESTERN AUSTRALIA

MINISTER FOR THE ENVIRONMENT

24 FEB 1995

Manager - Major Projects
Western Power
363-365 Wellington Street
PERTH WA 6000

Your Ref: 5C/A17/2 CCC
Our Ref: 180/83
Enquiries: G Mueller

Attention : Mr K G Allen

Dear Sir

COLLIE POWER STATION (132)

Thank you for the letter of 20 December 1994 and information with respect to clearing condition 9 of the Statement published on 12 June 1991.

The Environmental Protection Authority has now considered the Wetland Survey, the advice from Department of Conservation and Land Management regarding forest clearing and the revised Site Layout plans and recommends that the requirements of Environmental Condition 9 have been satisfactorily met, provided that further commitments are implemented.

Accordingly I advise the following, using the codes applied in the Audit Table for this project:

> The proponent for this project has met the requirements of Environmental Condition M9.1:1, M9.2, M9.3. Condition M9.1:2 has been conditionally met provided that the value of the wetlands onsite is enhanced as per the commitments made in the letter dated 24 November 1994 from SECWA to the Department of Environmental Protection, and subsequently. Those commitments are principally:
>
> a) fencing the western wetland (for protection from stock and power station activity intrusion).
>
> b) monitoring the wetlands for water levels, salinity, regeneration of native plant species, and bird surveys.
>
> c) planting seedlings of naturally occurring tree species to rehabilitate the wetlands.
>
> d) creating an alternative pond habitat of the Raw Water pond (which is proposed to cover the eastern wetland.)

12th FLOOR, DUMAS HOUSE, 2 HAVELOCK STREET, WEST PERTH, 6005 TELEPHONE (09) 321 2222 FAX (09) 322 5149

e) developing a landscaping design which contains plans to revegetate the wetlands as well as drier upland areas of the site where practicable.

The above commitments should be implemented prior to commissioning of the plant, and maintained as required through the operating stages of the project.

Please note that the above information refers to environmental issues in the Statement. This does not remove the necessity to obtain approvals which may be required by other agencies.

Yours faithfully

Signed

Hon Peter Foss,MLC

Peter Foss MLC
MINISTER FOR THE
ENVIRONMENT, WATER
RESOURCES, THE ARTS AND
FAIR TRADING

ff_____

NOTE TO FILE

FILE #143/94

TO: Mr G Mueller

FROM: A H Van der Wiele

DATE: Thu, 13 Apr 1995

SUBJECT: Proposed outfall site - Western Power off Buffalo Rd, Kemerton

CC:

Greg

As discussed, I had occasion to accompany Kinhill employees Tracey Bell and Kim Grey on an SCM Kemerton Ocean outfall sampling exercise on April 12, 1995. The SCM outfall is approximately 300m off shore.

Following on from the sampling, I took the opportunity of undertaking a manta board inspection of the proposed site of the Western Power proposed outfall site for the new Collie Power Station. The site is approximately 750 m offshore.

The tow distance was approximately 500m.

Water depth is approximately 10 - 11 m at the site. The bottom consists of what would seem to be a thin veneer of coarse and fine sands (patchy distribution) over calcrete. The bottom is relatively featureless, with only the occasional outcrop of limestone at maximum 30 cm above the sediments. Vegetation cover consists of 30 - 40 % cover of *Posodonia sinuosa*. Quality varies, with some areas being heavily covered with epiphytes. Other meadows are quite dense and in good condition. An assortment of brown and red algae cover limestone outcrops.

I believe the area observed follows quite closely the description provided by Kinhill in their CER.

Need any more?

Henk

FACSIMILE TRANSMISSION

Water AUTHORITY

GROUNDWATER & ENVIRONMENT BRANCH

Water Authority of Western Australia
629 Newcastle St. Leederville WA 6007
Postal Address PO Box 100 Leederville WA 6007
Facsimile (09) 420 3176

TO: Name [redacted]

Company DOE

Facsimile No. 3221598 Page 1 of 2 pages

FROM: Name Rob. HAMMOND, Program Manager, Groundwater Quantity

Section Management and Protection, Groundwater and Environment Branch

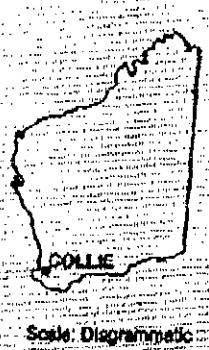
Telephone No. 4202939 Date

Please telephone (09) 420 2901 if there are any problems with this transmission.

Greg,

Copy of axe head requested.

Rob



Scale: Diagrammatic

Collie Basin Water Balance

WATER VOLUME

million kl / yr

Annual Recharge	20 to 30, probably low 20's
Total Annual Abstraction for 1984 to 1994	23 to 32, usually 28 to 30
Muja Annual use for 1984 to 1994	16 to 22, average 20
New Power Station	5 for 300 Mwatt, 10 for 600 Mwatt
Total Annual discharge to Environment (1984 to 1994)	6 to 10, average 9

Appendix 7

Water quality guidelines and likely composition of saline water after 100-fold dilution

Table 7.1 Marine and estuarine water quality guidelines and likely composition of Collie Power Station saline water after 100-fold dilution

Parameter*	Saline water after hundred-fold dilution	Water quality guideline**	Seawater *** typical
pH	8.0	8.0–8.4	8.2
Sodium	10,400	NC	10,500
Potassium	376	NC	380
Calcium	398	NC	400
Magnesium	1,387	NC	1,400
Iron	0.01	NC	0.01
Manganese	0.003	NC	0.002
Chloride	18,830	NC	19,000
Sulphate	2,428	NC	2,450
Bicarbonate	139	NC	140
Silica	6.8	NC	6
TDS	34,187	32,800–36,200	34,500
Suspended solids	10	<10% change	10
Phosphate (as phosphorus)	0.01	0.001–0.01	0.01†
Nitrate (as nitrogen)	0.03	0.04–0.26	0.02†
Cadmium	0.0002	0.0002†††	0.0001
Chromium	0.0004	0.002†††	0.00005
Cobalt	0.0005	NC	0.0004
Copper	0.004	0.004†††	0.003
Lead	0.0001	0.001†††	0.00003
Mercury	0.00006	0.0001	0.00005††
Nickel	0.0025	0.015	0.002
Zinc	0.01	0.02	0.01
Hydrocarbons (total)	0.001	0.01	0
Dissolved oxygen	7	>6	7

* g/m^3, *except in relation to pH.*

** *Source: EPA 1993b, Table 2.2 (except as noted).*

*** *Source: Fairbridge 1972.*

† *Source: South West Development Authority 1992.*

†† *Source: Riley and Chester 1971.*

††† *Source: EPA 1993b, Table 2.7.*

NC *No criteria set.*

MONITORING

22 As part of the environmental management programme to be prepared for the Collie Power Station, the proponent will submit and subsequently implement a monitoring programme to the satisfaction of the DEP. The monitoring programme will address the following aspects of the water management system:

1 leakage of on-site ponds
2 quality of saline water discharge
3 integrity of the pipeline
4 verification of dispersion at the outfall
5 quality of the ocean-receiving environment.

Reports of the results of the monitoring programme will be submitted regularly to the DEP and will be made publicly available, to the satisfaction of the DEP.