# Derby Tidal Power Project

## Tidal Energy Australia

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

**Direction from the Minister for the**
**Environment and Heritage under Section 43**
**of the *Environmental Protection Act 1986***

**Environmental Protection Authority**
**Perth, Western Australia**
**Bulletin 1071**
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# 1. Introduction and background

The Environmental Protection Authority (EPA) has been directed by the Minister for the Environment and Heritage, pursuant to Section 43 of the *Environmental Protection Act 1986* (EP Act), to re-assess proposed variations to the Derby Tidal Power project (DTPP) more fully and report on the EPA's assessment.

The EPA reported on the original DTPP in Bulletin 942 and recommended against the proposal. Appeals received against Bulletin 942 were allowed by the then Minister who subsequently requested conditions and procedures from the EPA on the matters of mangroves, sedimentation, geo-heritage and the transmission system. The EPA subsequently provided a supplementary report (Bulletin 984) including recommended environmental conditions, consistent with the Minister's appeal determinations.

This report provides the EPA's further assessment and recommendations to the Minister on the environmental factors relevant to the proposed variations to the original proposal and the adequacy of the recommended environmental conditions as set out in EPA Bulletin 984.

## 1.1 History

*EPA Bulletin 942*

Tidal Energy Australia's (TEA's) original proposal to construct and operate a tidal power station in Doctor's Creek near Derby and construct new transmission lines to supply the power requirements of Broome, Derby, Fitzroy Crossing and Blendevale was assessed by the EPA in June 1999. The EPA reported on this proposal in Bulletin 942. For this proposal, the EPA determined that the environmental impacts, uncertainties and risks were significant and were of such nature that the proposal should not be implemented. As a consequence the EPA did not develop recommended environmental conditions and procedures at that time.

Appeals received against the recommendations of Bulletin 942 were determined by the then Minister for the Environment, and conditions and procedures were requested from the EPA on the matters of mangroves, sedimentation, geo-heritage and the transmission system.

*EPA Bulletin 984*

Bulletin 984 provided the EPA's recommended environmental conditions to which the proposal should be subject, if it were to be approved for implementation. Some elements of the recommended conditions are an outcome of the Minister's appeal determinations and are therefore final and will not be subject to appeals. The conditions recommended by the EPA in Bulletin 984 is attached in Appendix 2.

Appeals were lodged against the EPA's recommended conditions set out in Bulletin 984 and have yet to be determined by the Minister.

Accordingly, no statement either allowing or disallowing the original proposal to be implemented has been issued.

*This EPA Bulletin*

TEA has written to the Minister advising that it is preparing for a new tender process whereby companies will be invited to tender for the provision of power to Derby, Broome, Fitzroy Crossing and Halls Creek. TEA indicated the proposal that would form the basis of its tender submission to Western Power contains some variations to the original proposal as presented in the Consultative Environmental Review (HGM, 1997). Accordingly, TEA provided the Minister and the EPA with a formal submission which:

- describes the variations to the proposal;
- identifies the environmental implications of the variations to the design; and
- examines the relevance of the draft environmental conditions recommended in Bulletin 984.

TEA's formal submission on the proposed variations entitled 'Notification of Changes to the Derby Tidal Power Project (Assessment 1073) under Section 43 of the *Environmental Protection Act 1986'* accompanies this EPA report.

In response to TEA's submission, the Minister directed the EPA to reassess the proposal more fully and to consider the environmental matters raised by the proposed variations.

An outline of the proposed variations is presented in Section 2 of this Report. Section 3 discusses environmental factors relevant to the proposed variations.

The recommended environmental conditions and commitments, that were set out in EPA Bulletin 984 for the original DTTP are reproduced in Appendix 2.

# 2. The proposed variations

The original DTPP is described in detail in EPA Bulletin 942 and in the proponent's CER document (HGM, 1997). A summary description of the key elements of the original proposal is presented in Table 1. Figure 1 shows the design of the original DTPP.

**Table 1: Summary of key proposal characteristics of the original proposal**

| **Element** | **Quantities/Description** |
|---|---|
| Life of project | Up to 120 years |
| Barrages | Approximately 0.5 and 1.3 kilometres long, comprising 1.0 million cubic metres of earth fill |
| Rock armour | Approximately 60,000 cubic metres |
| Rip-rap | Approximately 70,000 cubic metres |
| Levees | Approximately 26 kilometres |
| Turbine channel | Excavation of approximately 1.0 million cubic metres |
| Dredging • initial low basin dredging<br>• maintenance dredging | • approximately 10 million cubic metres<br>• ongoing |
| Sluice gates x 2 • high basin<br>• low basin | • 60 to 70 metres wide<br>• 100 to 160 metres wide |
| Turbines x 4 to 6 | Total capacity 48 megawatts |
| Transmission lines | Approximately 450 kilometres of 132 kilovolt lines |
| Associated buildings | Office and control room<br>Switchyard<br>Public ablutions block<br>Visitor centre |
| Access road | Approximately 20 kilometre causeway |

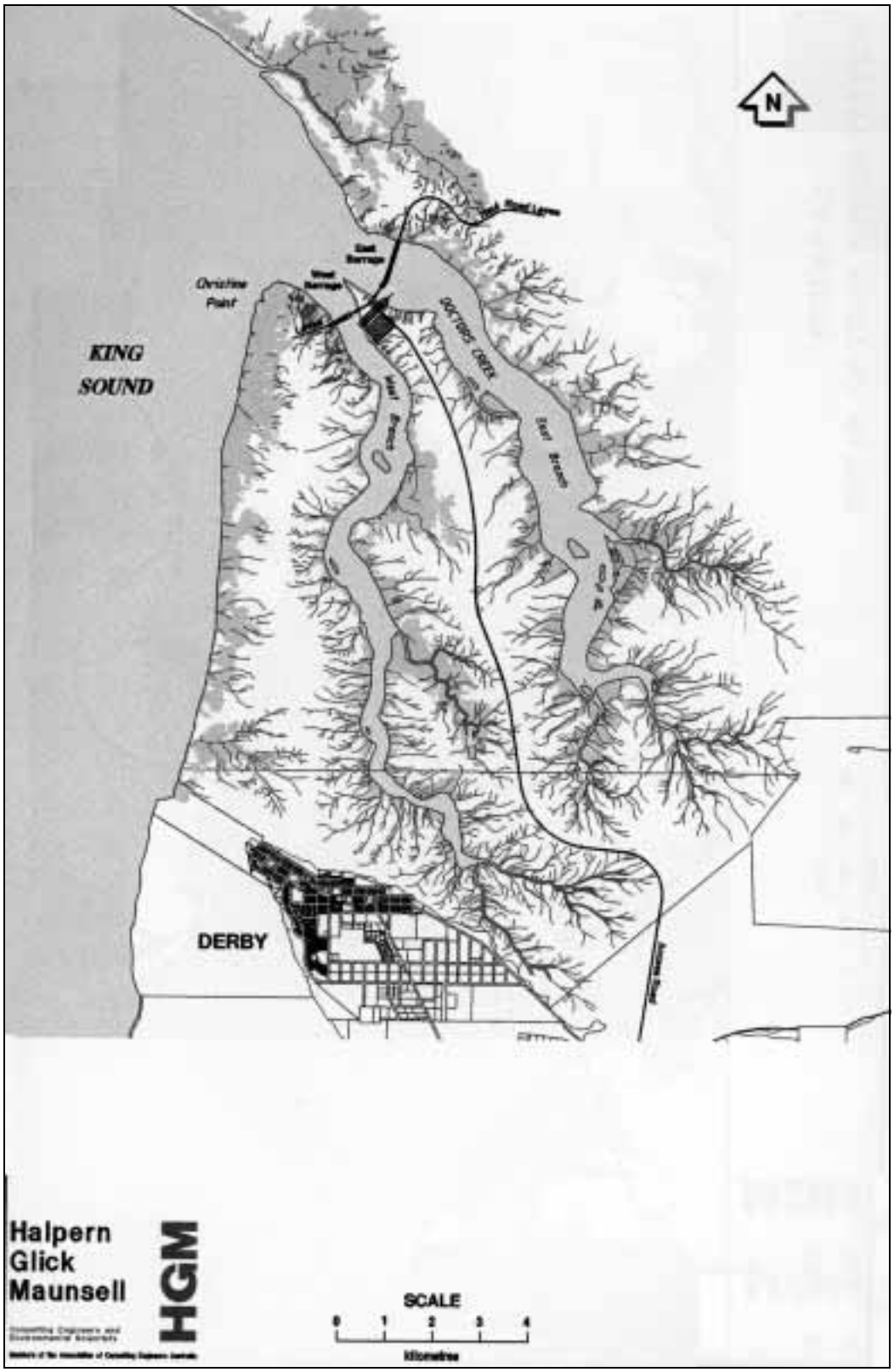


*Figure 1: Original Derby Tidal Power Project design*

TEA has identified key physical elements of the proposed variations to include:

- relocation of the barrages and tidal power station some 3 kilometres (km) further downstream to the mouth of Doctors Creek. The gates and turbines will now be located on one site which has the advantage of bringing the construction into one location;
- modification to the arrangements of the turbines and gates which allows water movement to be selected according to the highest hydraulic head available. The design is such that water always passes through the turbines in the same direction. TEA has indicated that reduced hydraulic head still occurs at neap tides, but less so with the new turbine arrangements;
- deletion of the original cross channel, removing the need to excavate and dispose of 1 million cubic metres of clay, reducing environment disturbance;
- reduction in length of transmission lines from 500 km to 250 km; and
- variation to the profile of the barrages. The low profile embankments has a beach profile reducing the need for large armour rock which would have to be quarried and transported to the site of construction.

Table 2 summarises the key project characteristics of the proposed variations and compares it with the original proposal. Figure 2 shows the design of the varied DTPP. A detailed description of the proposed variation is provided in Section 3 of TEA's submission document which accompanies this report.

**Table 2: Summary of key proposal characteristics of the varied proposal**

| **Element** | **Quantities/Description** |
|---|---|
| Life of project | Up to 120 years |
| Barrages | Approximately 10 kilometres long, comprising 6 million cubic metres of dredged sand from the tidal sandbank |
| Protection of Barrages | Rock armour and rip rap from Point Torment placed over geotextile fabric |
| Levees | Approximately 20 kilometres |
| Dredging • construction<br>• maintenance dredging | • approximately 6 million cubic metres<br>• ongoing |
| Power Production | 40 megawatts |
| Power Station | Located on outer tidal sandbank on a site reclaimed from King Sound and protected by sand embankments<br>Uses head difference between ocean/high and low basins |
| Transmission lines | Approximately 250 kilometres of 132 kilovolt lines |
| Associated buildings | Office and control room<br>Switchyard<br>Public ablutions block<br>Visitor centre |

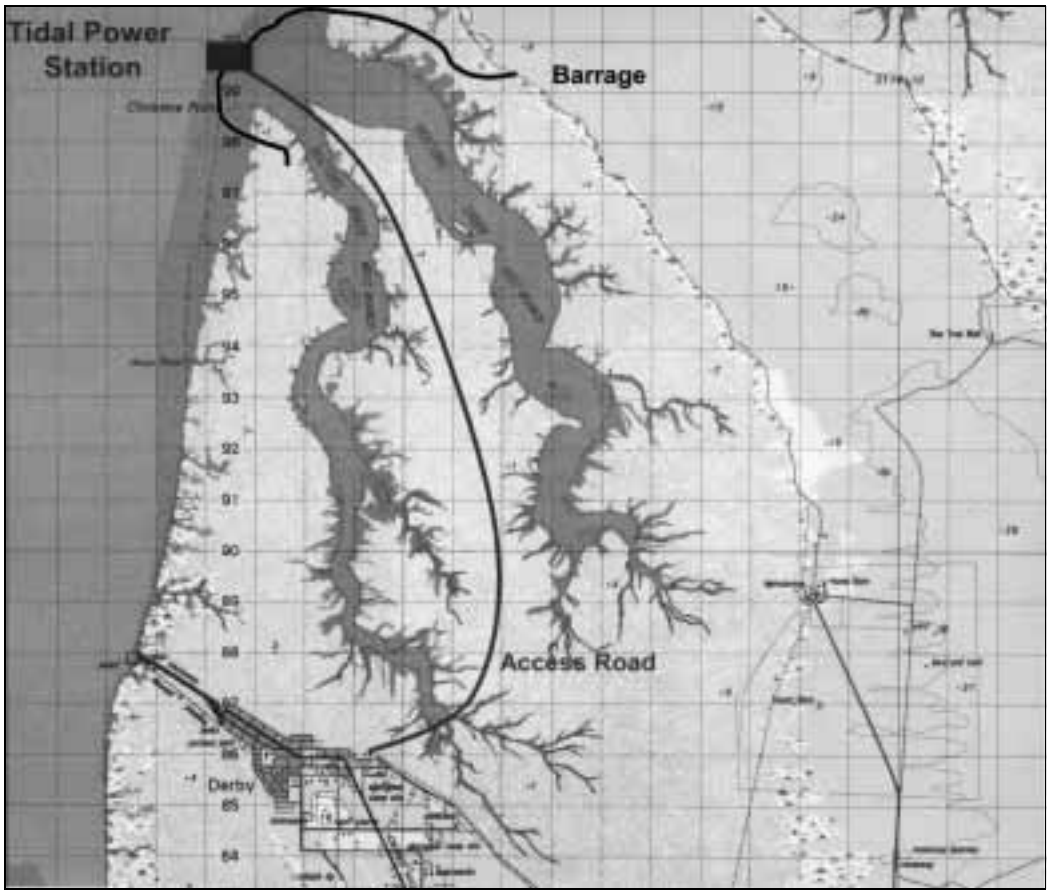


***Figure 2: Varied Derby Tidal Power Project design***

# 3. Relevant environmental factors

It is the EPA's opinion that following are environmental factors which could be affected by the proposed variations and require evaluation in the report:

- **Mangroves** – impact on mangrove communities, abundance, structure and function; and
- **Sedimentation** – impacts from and around the basins.

The EPA considers that the assessment of the proposed variations against the above factors needs to have regard for the following:

- the environmental consequences of the proposed variations;
- whether new technical information has become available that would cause the EPA to reconsider its previous assessment and conclusions; and
- the EPA's recommended environmental conditions presented in EPA Bulletin 984, and their adequacy to the proposed modifications.

## 3.1 Mangroves

*Environmental consequences of the proposed variations*

The impacts of the DTTP on mangroves have increased from a predicted loss of 1473 hectares (ha) in the original proposal, to 1498 ha for the varied proposal (an increase of 25 ha). An additional 25 ha of mangroves will be impacted by the revised DTPP due to the seaward extension of the barrages and levees and the consequent enclosure of additional areas of mangroves within the high and low basins.

TEA has reiterated its prediction from the original proposal that there is likely to be a possible net increase in the area available for mangrove colonisation in the medium to long term, of 862 ha. The proponent's view is that the revised configuration of the barrages to low 'beach' profile embankments is likely to provide additional areas for mangrove colonisation to occur. TEA has predicted that mangrove colonisation is likely to occur on both sides of the embankments.

Taking into account the additional loss of mangroves and the additional areas that will be available for potential mangrove re-colonisation, TEA has put forward the proposition that the effect of the proposed variations is to bring the possible net increase in the area available for potential mangroves colonisation to 890 ha.

*EPA's conclusion*

No new information has been submitted by TEA to provide greater certainty on the issue of impacts on and management of mangroves. The uncertainty was critical to the EPA's consideration of mangrove impacts in the previous assessment. The EPA was of the opinion that based on the information available, it is highly probable that the EPA's objective cannot be met.

Due to the larger loss of mangroves associated with the proposed variations and the continued uncertainty associated with the proponent's predictions on mangrove regeneration responses, it is appropriate for the EPA to reiterate its conclusion from Bulletin 942 that the EPA's objective for mangroves cannot be met.

*Adequacy of recommended conditions set out in Bulletin 984*

The scope and content of the draft mangrove condition (recommended condition 7) reflects the considerable uncertainty that needs to be addressed by the proponent. This recommended mangrove condition requiring further detailed information on mangrove impacts and management, prior to ground disturbing activities commencing, is applicable to the varied proposal should it be approved for implementation.

The EPA's recommended condition with respect to mangroves, as set out in Bulletin 984, was based on the outcome of the Minister's determination of appeals against Bulletin 942. Some parts of the condition result from the Minister's determination of previous appeals, and these portions are final and without appeal.

## 3.2 Sedimentation

*Environmental consequences of the proposed variations*

TEA has predicted the proposed variations to the DTPP will have favourable implications on the issue of sedimentation. A combination of factors including:

- the variation to the alignment of the barrages bringing them more in line with the general south to north drift across the mouth of Doctors Creek;
- proposed management of water flow between the basins and the King Sound; and
- the advice of Dr Jorg Imberger (Centre for Water Research University of Western Australia) to suggest that the new design of the DTPP will greatly improve resistance to siltation and probably decrease the need for maintenance dredging,

have led TEA to conclude that the sedimentation is less likely to be an issue at the creek mouth and within the basins. TEA has acknowledged the impacts of the issue of sedimentation need to be carefully modelled and monitored as required by the draft recommended conditions.

*EPA's conclusion*

The EPA did not provide its final advice on the factor of sedimentation in Bulletin 942 as it was of the opinion that further information would be required on the potential impacts to finalise its advice. The EPA previously highlighted its concern regarding the potential effects if the proponent's predicted 'worst case' scenario was realised. This concern related to the effects of 'extreme events' such as cyclones on the movement of sediment, the potential need to dispose of large volumes of accumulated sediment and possibility of premature decommissioning of the proposal.

While the EPA notes the advice of Dr Imberger, no further investigations have been undertaken by the proponent to address the uncertainties associated with sedimentation and therefore the EPA is still unable to finalise its advice.

*Adequacy of recommended conditions set out in Bulletin 984*

The intent of the sedimentation condition recommended by the EPA in Bulletin 984 (recommended condition 12) was to require the proponent to address the substantial uncertainties that confronted the EPA during its assessment of the original proposal. As no additional sedimentation investigations have been undertaken by TEA to eliminate the uncertainties associated with the issue of sedimentation or address the information requirements which flowed on from the Minister's appeal determinations, the EPA considers the recommended sedimentation condition to be applicable to the varied proposal.

The outcome of the Minister's determination on appeals against EPA Bulletin 942 was to require further detailed modelling work be undertaken through the conditions of environmental approval to assess the long-term implications of sedimentation. This portion of the recommended condition on sedimentation is therefore final and without appeal.

# 4. Conclusions

The EPA has considered the proposed variations to the DTPP and the information provided by TEA on the environmental implications of the variations.

The information suggests that although the scale of the proposal covers a greater area and the location of some key construction and operational aspects of the DTPP have varied, the fundamentals of the DTPP which utilises the twin arms of Doctors Creek as basins for power generation, have not changed. From the information provided by TEA, the proposed variations have not raised any new environmental issues and/or factors in addition to those previously identified by the EPA in Bulletin 942.

The EPA notes that TEA has not undertaken any additional investigations to address the uncertainties that confronted the EPA in the original assessment or the information requirements which flowed on from the Minister's appeal determinations.

Therefore, the EPA submits that the period since the DTPP was originally assessed has not given rise to any new technical information that would cause the EPA to revisit the factors of Mangroves and Sedimentation which were important in the assessment of the original proposal and cause it to reconsider its previous recommendation as to the environmental acceptability of the project.

The EPA, following the consideration of the Minister's determination of appeals against the recommendations in Bulletin 942, developed a set of environmental conditions in Bulletin 984 (July 2000) which it recommended be imposed if the DTPP is approved for implementation.

Having considered the scope and intent of the environmental conditions recommended in Bulletin 984, the EPA concludes that the conditions which require additional work to be undertaken by the proponent prior to ground-disturbing activities occurring are applicable to the varied proposal.

In addition to the above, the EPA considers that Schedule 1 of the draft environmental conditions in Bulletin 984 should be updated to incorporate the variations to the DTPP.

# 5. Recommendations

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

1. That the Minister notes that this report is limited to the assessment of proposed variations to the original proposal.
2. The EPA recommends that the Minister consider the report on the relevant environmental factors associated with the proposed variations to the DTPP set out in Section 3.
3. That the Minister notes that the period since the DTPP was originally assessed has not given rise to any new information (as a result of detailed investigations) from the proponent that would reduce or eliminate the considerable uncertainty associated with the factors of mangroves and sedimentation.
4. The EPA recommends that in the event the DTPP is approved for implementation, the Minister impose the recommended environmental conditions set out in Bulletin 984. However, the Schedule 1 of the recommended conditions should be updated to incorporate the variations to the proposal.

# Appendix 1

**References**

Environmental Protection Authority (June 1999). *Bulletin 942: Derby Tidal Power Project,* Proponent: Derby Hydro Power Pty Ltd.

Environmental Protection Authority (June 2000). *Bulletin 984: Derby Tidal Power Project,* Proponent: Derby Hydro Power Pty Ltd.

Halpern Glick Maunsell (1997) Derby Tidal Power Project Doctors Creek, Kimberley: Consultative Environmental Review, for Derby Hydro Power Pty Ltd, December 1997.

Tidal Energy Australia (2002). *Notification of Changes to the Derby Tidal Power Project (Assessment 1073) under Section 43 of the* Environmental Protection Act 1986. *Unpublished report.*

# Appendix 2

**Recommended Environmental Conditions as set out in Bulletin 984**

Statement No.

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

TIDAL POWER STATION AND ASSOCIATED TRANSMISSION LINES
DOCTOR'S CREEK, DERBY

**Proposal:** The proposal involves the construction of barrages across the mouth of East and West Doctor's Creeks with sluice gates installed in the barrages to control the flow of water into and out of the creeks. West Doctor's Creek will be the "high basin" and East Doctor's Creek the "low basin".

A turbine channel will be constructed between the two creeks. The flow of water from the high basin to the low basin through the channel will drive the turbines.

Approximately 26 kilometres of levee banks will be constructed to increase the water-holding capacity, and 450 kilometres of power lines will distribute the power to major centres in the West Kimberley.

**Proponent:** Tidal Energy Australia Pty Ltd

**Proponent Address:** 34 Colin Street, West Perth WA 6005

**Assessment Number:** 1073

**Reports of the Environmental Protection Authority:** Bulletins 942 and 984

The proposal to which the above reports of the Environmental Protection Authority relate may be implemented subject to the following environmental procedures and conditions:

**Procedures**

## 1 Implementation

1-1 Subject to these conditions and procedures, the proponent shall implement the proposal as documented in schedule 1 of this statement.

1-2 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.

1-3 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

## 2 Proponent Commitments

2-1 The proponent shall implement the consolidated environmental management commitments documented in schedule 2 of this statement.

2-2 The proponent shall implement subsequent environmental management commitments which the proponent makes as part of the fulfilment of conditions and procedures in this statement.

## 3 Proponent

3-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the Environmental Protection Act 1986 is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person in respect of the proposal.

3-2 Any request for the exercise of that power of the Minister referred to in condition 3-1 shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.

3-3 The proponent shall notify the Department of Environmental Protection of any change of proponent contact name and address within 30 days of such change.

## 4 Commencement

4-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposal has been substantially commenced.

4-2 Where the proposal has not been substantially commenced within five years of the date of this statement, the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment will determine any question as to whether the proposal has been substantially commenced.

4-3 The proponent shall make application to the Minister for the Environment for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement at least six months prior to the expiration of the five year period referred to in conditions 4-1 and 4-2.

4-4 Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years for the substantial commencement of the proposal.

## 5 Compliance Auditing

5-1 The proponent shall submit periodic Compliance Reports, in accordance with an audit program prepared in consultation between the proponent and the Department of Environmental Protection.

5-2 Unless otherwise specified, the Chief Executive Officer of the Department of Environmental Protection is responsible for assessing compliance with the conditions, procedures and commitments contained in this statement and for issuing formal, written advice that the requirements have been met.

5-3 Where compliance with any condition, procedure or commitment is in dispute, the matter will be determined by the Minister for the Environment.

# Conditions

## 6 Environmental Management System

6-1 In order to manage the environmental impacts of the project, and to fulfil the requirements of the conditions and procedures in this statement, prior to any ground-disturbing activity, the proponent shall demonstrate to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection that there is in place an environmental management system which includes the following elements:

1 An environmental policy and corporate commitment to it;

2 Mechanisms and processes to ensure:

(1) planning to meet environmental requirements;

(2) implementation and operation of actions to meet environmental requirements;

(3) measurement and evaluation of environmental performance; and

3 Review and improvement of environmental outcomes.

6-2 The proponent shall implement the environmental management system referred to in condition 6-1.

## 7 Mangroves

7-1 Prior to ground-disturbing activity, the proponent shall prepare a Mangrove Management Plan to achieve the following objectives:

- identification of the environmental values of the current mangrove community of East and West Doctor's Creeks, including regional and local biodiversity values;
- quantification of the extent of impacts from the implementation of the proposal on the current mangrove community of East and West Doctor's Creeks;
- quantification of the greenhouse gas offset as a result of the implementation of the proposal;
- demonstration, on a scientific basis, that the environmental values of the impacted area of mangroves can be replaced on a sustainable basis; and
- following demonstration that environmental values can be sustainably replaced, implementation of an agreed course of action to maintain the environmental values of the mangrove community.

This Plan shall be prepared to the requirements of the Environmental Protection Authority on advice of the Department of Conservation and Land Management and Fisheries Western Australia, and shall include:

1 clear objectives for mangrove rehabilitation work, ie. rehabilitation work for mangrove density, diversity or biomass or a combination of density, diversity or biomass;

2 information on the present soil condition and the predicted soil condition and 'ripeness' for mangrove colonisation of newly available areas after construction of the barrages, including soil properties such as moisture, texture, chemistry and compaction;

3 demonstration of a good understanding of flowering and fruiting times of target species to optimise the chances of re-establishment;

4 methodology and results of a scientifically based approach which demonstrates whether the environmental values of the impacted mangrove community can be sustainably replaced;

5 strategies for the protection of juvenile plants from effects that reduce viability, eg. contamination, siltation, wind and tidal erosion, excessive temperature, excessive evaporation and insolation;

6 strategies for mangrove community rehabilitation, including research, monitoring and management as detailed in commitment 3 in the Consultative Environmental Review document; and

7 a contingency plan to be implemented if the objectives for mangrove rehabilitation work or the strategies detailed above in requirements 5 and 6 are not being met. The contingency plan shall detail the timing of its implementation.

7-2 The proponent shall implement the Mangrove Management Plan required by condition 7-1.

7-3 The proponent shall make the Mangrove Management Plan required by condition 7-1 publicly available, to the requirements of the Environmental Protection Authority.

## 8 Geomorphological Processes

8-1 Prior to ground-disturbing activity, the proponent shall prepare a Geo-heritage Monitoring Program to document the following:

- changes to the inundation patterns occurring in East and West Doctor's Creeks;
- the long-term changes to the erosional processes occurring in the creeks;
- changes to the tidal flat to hinterland groundwater relationship; and
- identification of a site or a number of sites in King Sound that may possess similar geo-heritage values so that a similar type-site can be used to continue geologic / ecologic research in tidal flats in high-tidal, semi-arid deltaic areas.

This Program shall be prepared to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection and the Department of Conservation and Land Management.

8-2 The proponent shall implement the Geo-heritage Monitoring Program required by condition 8-1.

8-3 The proponent shall make the Geo-heritage Monitoring Program required by condition 8-1 publicly available, to the requirements of the Environmental Protection Authority.

## 9 Proposed Nature Reserve

9-1 Prior to ground-disturbing activity, the proponent shall prepare a Nature Reserve Management Plan to achieve the following objectives:

- identification of the environmental values of the proposed Nature Reserve;
- detection of any changes to the agreed environmental values of the proposed Nature Reserve;
- demonstration that the environmental values of the proposed Nature Reserve can be replaced; and
- implementation of an agreed course of action to replace the environmental values if they are shown to be impacted.

This Plan shall be prepared to the requirements of the Environmental Protection Authority on advice of the Department of Conservation and Land Management and shall include:

1 the process of how the environmental values were identified;

2 details of the monitoring program that will detect changes to the environmental values;

3 criteria that define unacceptable changes to the environmental values;

4 a contingency plan to be implemented if the criteria are not met, which will include identification of an area of land with similar environmental values, in consultation with the Department of Conservation and Land Management, acquisition of this area of land and offering this area of land to the Department of Conservation and Land Management for inclusion in the Conservation Estate.

9-2 The proponent shall implement the Nature Reserve Management Plan required by condition 9-1.

9-3 The proponent shall make the Nature Reserve Management Plan required by condition 9-1 publicly available, to the requirements of the Environmental Protection Authority.

**10 Groundwater**

10-1 Prior to ground-disturbing activity, the proponent shall prepare a Groundwater Management Plan to achieve the following objectives:

- identification of the area and beneficial uses of the groundwater potentially affected by the proposal;
- ensure that the beneficial uses of the groundwater are not adversely impacted by the operation of the proposal;
- prevention of the contamination of the groundwater in excess of appropriate guideline levels recognised by the Environmental Protection Authority, such as those in the National Health & Medical Research Council / Agricultural & Resource Management Council of Australia & New Zealand “Australian Drinking Water Guidelines (1996)”.

This Plan shall be prepared to the requirements of the Environmental Protection Authority on advice of the Water and Rivers Commission, the Water Corporation, the Shire of Derby-West Kimberley and the Department of Environmental Protection, and shall include:

1 detailed modelling of the aquifers beneath the Derby peninsula;

2 a monitoring program to detect changes in the freshwater / saltwater interface;

3 criteria that specify maximum levels of contamination (by saltwater), dependent on the groundwater use for that area;

4 a contingency plan to be implemented if criteria are not met. This may include a staged action plan requiring additional monitoring if one or more criteria are not met and identification of alternative supplies and/or provision of alternative supplies.

10-2 The proponent shall implement the Groundwater Management Plan required by condition 10-1.

10-3 The proponent shall make the Groundwater Management Plan required by condition 10-1 publicly available, to the requirements of the Environmental Protection Authority.

## 11 Water Quality

11-1 Prior to ground-disturbing activity, the proponent shall prepare a Water Quality Management Plan to achieve the following objectives:

- identification of the environmental quality objectives of the waters of Doctor's Creek; and
- maintenance of agreed environmental quality criteria for the waters of Doctor's Creek.

This Plan shall be prepared to the requirements of the Environmental Protection Authority on advice of the Water and Rivers Commission, Fisheries WA, the Department of Conservation and Land Management and the Department of Environmental Protection, and shall include:

1 the rationale for environmental quality objectives and criteria;

2 a monitoring program to detect changes in criteria, including monitoring for the generation of acid sulfate soils;

3 detailed water circulation studies for both arms of Doctor's Creek to determine areas of potential water quality concern;

4 a contingency plan if agreed criteria are breached, including a component on the management of acid sulfate soils. The plan may include management of sluice gates to flush creeks.

11-2 The proponent shall implement the Water Quality Management Plan required by condition 11-1.

11-3 The proponent shall make the Water Quality Management Plan required by condition 11-1 publicly available, to the requirements of the Environmental Protection Authority.

## 12 Sedimentation

12-1 Prior to ground-disturbing activity, the proponent shall prepare a Sediment Management Plan to achieve the following objectives:

- minimises adverse effects on natural sedimentary patterns;
- ensure that sedimentation does not significantly impact on navigation channels or water movement in King Sound; and
- ensure that sedimentation does not detrimentally affect water quality in Doctor's Creek.

This Plan shall be prepared to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection, and shall include:

1 identification of the portion on King Sound where sedimentary patterns are likely to be influenced by the proposal;

2 detailed modelling work to assess the short- and long-term implications of sedimentation, potential high erosion areas (to assist in management of mangrove colonisation), changes in water circulation patterns (sediment distributions), effects of storm events, and to estimate sediment disposal loads over the life of the project;

3 description of sedimentation management strategies to avoid adverse environmental impacts resulting from the proposal;

4 a contingency plan if sedimentation is found to be causing an adverse environmental impact, for example, through smothering of mangroves down-current of Doctor's Creek.

12-2 The proponent shall implement the Sediment Management Plan required by condition 12-1.

12-3 The proponent shall make the Sediment Management Plan required by condition 12-1 publicly available, to the requirements of the Environmental Protection Authority.

## 13 Transmission Line

13-1 Prior to finalisation of detailed design, the proponent shall prepare a Route Transmission Plan to demonstrate how the following objectives will be achieved:

- avoid, minimise and mitigate the visual impact from the transmission lines;
- prevent disturbance to significant vegetation communities; and
- minimise or avoid impacts on areas of cultural significance.

This Plan shall be prepared to the requirements of the Environmental Protection Authority on advice of the Department of Aboriginal Affairs, the Tourism Commission, the Department of Conservation and Land Management, the Shire of Derby-West Kimberley, relevant affected Aboriginal groups, and the Department of Environmental Protection, and shall include:

1 examination of alternate routes, including vegetation and environmental values of the landscape;

2 a detailed map of the preferred route alignment;

3 a detailed description of infrastructure;

4 clear evidence that current best practice design principles and siting guidelines have been used to minimise visual impacts from major tourist routes in finalisation of route alignment; and

5 description of the construction methods to be employed.

13-2 The proponent shall implement the Route Transmission Plan required by condition 13-1.

13-3 The proponent shall make the Route Transmission Plan required by condition 13-1 publicly available, to the requirements of the Environmental Protection Authority.

## 14 Fauna Management Plan

14-1 Prior to ground-disturbing activity, the proponent shall prepare a Fauna Management Plan to achieve the following objectives:

- identification of the current avifauna, marine fauna and vertebrate fauna which inhabit the Doctor's Creek area on a permanent and seasonal basis;
- identification of the significant habitat areas (eg. receding tidal water off the mudflats may be used by a species of wader bird protected under a migratory bird agreement);

- detection of changes in community structure;
- identification of significant species and minimises impacts on the abundance of these species; and
- demonstration that effects on significant species and habitat areas can be managed.

This Plan shall be prepared to the requirements of the Environmental Protection Authority on advice of the Department of Conservation and Land Management, Environment Australia, Fisheries Western Australia and the Department of Environmental Protection, and shall include:

1 detailed marine fauna and fish usage study;

2 detailed avifauna survey including identification of significant species and seasonal variations of visitation over the long-term;

3 detailed terrestrial vertebrate monitoring program to identify the occurrence of any endangered species; and

4 an on-going monitoring program to detect changes in community structure and composition, including seasonal populations, over time;

14-2 The proponent shall implement the Fauna Management Plan required by condition 14-1.

14-3 The proponent shall make the Fauna Management Plan required by condition 14-1 publicly available, to the requirements of the Environmental Protection Authority.

## 15 Dust Management Plan

15-1 Prior to ground-disturbing activity, the proponent shall prepare a Dust Management Plan to achieve the following objective:

- ensure that dust levels resulting from the construction and operation of the proposal do not adversely impact the welfare and amenity or cause health problems by meeting statutory requirements and acceptable standards.

This Plan shall be prepared to the requirements of the Environmental Protection Authority on advice of the Shire of Derby-West Kimberley and the Department of Environmental Protection, and shall include:

1 identification of acceptable standards;

2 identification of background levels and monitoring methods to identify project-related dust generation;

3 a contingency plan to be implemented if dust levels exceed acceptable standards.

15-2 The proponent shall implement the Dust Management Plan required by condition 15-1.

15-3 The proponent shall make the Dust Management Plan required by condition 15-1 publicly available, to the requirements of the Environmental Protection Authority.

## 16 Auxiliary Power Supplies

16-1 Prior to ground-disturbing activity, the proponent shall prepare an Auxiliary Power Supply Plan to achieve the following objectives:

- design and operate proposed power plants based on best practice environmental principles; and
- demonstrate measures to minimise adverse environmental impacts (eg. noise, emissions).

This Plan shall be prepared to the requirements of the Environmental Protection Authority on advice of the Shire of Derby-West Kimberley and the Department of Environmental Protection, and shall include:

1 identification of appropriate sites;

2 demonstration of compliance with appropriate standards and regulations (eg. noise regulations, National Environmental Protection Measures);

3 description of links to transmission lines; and

4 documentation of greenhouse gas emissions.

16-2 The proponent shall implement the Auxiliary Power Supply Plan required by condition 16-1.

16-3 The proponent shall make the Auxiliary Power Supply Plan required by condition 16-1 publicly available, to the requirements of the Environmental Protection Authority.

## 17 Decommissioning

17-1 Within five years following commissioning, the proponent shall develop a Decommissioning Management Plan to the requirements of the Environmental Protection Authority on advice of the Department of Land Administration, the Department of Conservation and Land Management, the Shire of Derby-West Kimberley and the Department of Environmental Protection.

The objectives of this Plan are:

- to return the area, as far as is practicable, to its pre-disturbance state, or to a state agreed to by the Environmental Protection Authority; and

- to minimise the environmental impacts caused by decommissioning and removal of infrastructure.

This Plan shall address:

1 the removal of infrastructure;

2 rehabilitation of disturbed areas;

3 preparation of a post-project Environmental Management Plan that identifies on-going monitoring and management for at least 10 years following the decommissioning of the project and removal of infrastructure;

4 changes in community structure that have been detailed in the Fauna Management Plan over the life of the project; and

5 decommissioning completion criteria.

17-2 The proponent shall implement the Decommissioning Management Plan required by condition 17-1.

17-3 The proponent shall make the Decommissioning Management Plan required by condition 17-1 publicly available, to the requirements of the Environmental Protection Authority.

## 18 Performance Review

18-1 Each six years following the commencement of construction, the proponent shall submit a Performance Review report to the Department of Environmental Protection:

- to document the outcomes, beneficial or otherwise;
- to review the success of goals, objectives and targets; and
- to evaluate the environmental performance over the six years;

relevant to the following:

1 environmental objectives reported on in Environmental Protection Authority Bulletin 942;

2 proponent's consolidated environmental management commitments documented in schedule 2 of this statement and those arising from the fulfilment of conditions and procedures in this statement;

3 environmental management system environmental performance targets;

4 environmental management programs and plans; and/or

5 environmental performance indicators;

to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

Note: The Environmental Protection Authority may recommend changes and actions to the Minister for the Environment following consideration of the Performance Review report.

# Schedule 1

**The Proposal (1073)**

Construction of a 48 megawatt double basin tidal power station in the two arms of Doctor's Creek near Derby, as shown in Figure 1. The power station is designed to supply the requirements of Derby, Broome, Fitzroy Crossing, and some Kimberley industrial developments, such as the Pillara mine east of Fitzroy Crossing.

The proposal involves the construction of barrages across the mouth of East and West Doctor's Creeks with sluice gates installed in the barrages to control the flow of water into and out of the creeks. West Doctor's Creek will be the "high basin" and East Doctor's Creek will be the "low basin". A channel will be constructed between the two creeks in which the turbines will be placed. The flow of water from the high basin to the low basin via the turbine channel will drive the turbines. Approximately 26 kilometres of levee banks will be constructed around West Doctor's Creek to increase the water containment, and East Doctor's Creek will be dredged to increase its water storage capacity. A diagrammatic representation of the main components of the proposal is shown in Figure 2.

This proposal also includes the installation of approximately 450 kilometres of high tension power lines to Derby, Broome and Fitzroy Crossing.

**Key Characteristics Table**

| **Element** | **5.1.1.1 Quantities/Description** |
|---|---|
| Life of project | Up to 120 years |
| Barrages | Approximately 0.5 and 1.3 kilometres long, comprising 1.0 million cubic metres of earth fill |
| Rock armour | Approximately 60,000 cubic metres |
| Rip-rap | Approximately 70,000 cubic metres |
| Levees | Approximately 26 kilometres |
| Turbine channel | Excavation of approximately 1.0 million cubic metres |
| Dredging • initial low basin dredging<br>• maintenance dredging | • approximately 10 million cubic metres<br>• ongoing |
| Sluice gates x 2 • high basin<br>• low basin | • 60 to 70 metres wide<br>• 100 to 160 metres wide |
| Turbines x 4 to 6 | Total capacity 48 megawatts |
| Transmission lines | Approximately 450 kilometres of 132 kilovolt lines |
| Associated buildings | Office and control room<br>Switchyard<br>Public ablutions block<br>Visitor centre |
| Access road | Approximately 20 kilometre causeway |

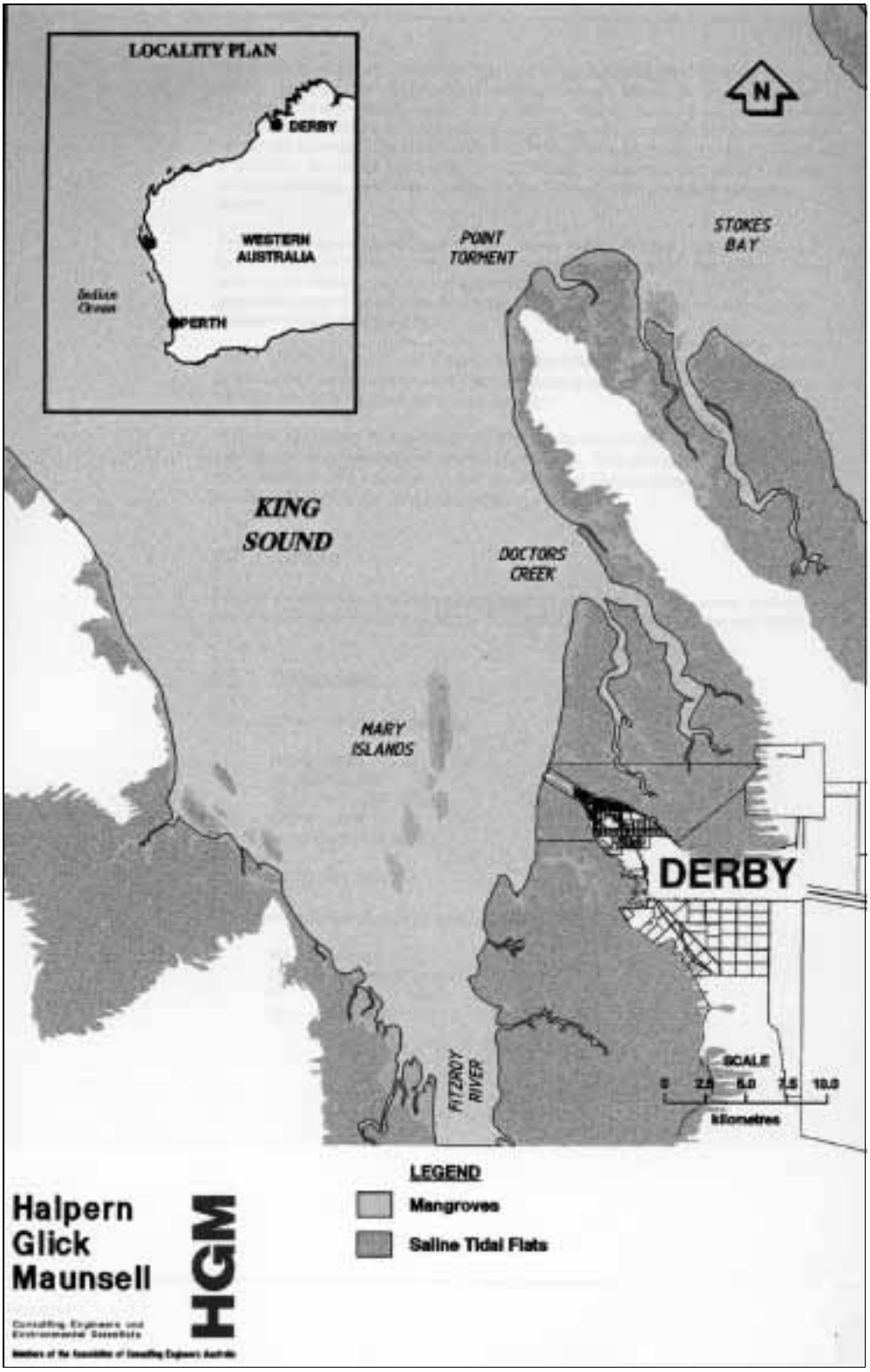


***Figure 1: Locality map, East & West Doctors Creeks, Derby.***

**Schedule 2**

# Proponent's Consolidated Environmental Management Commitments

March 2000

## TIDAL POWER STATION AND ASSOCIATED TRANSMISSION LINES DOCTOR'S CREEK, DERBY

TIDAL ENERGY AUSTRALIA PTY LTD

## Proponent Commitments

| No. | Commitment | Objective (why) | Action (how / where) | Timing (when) | Whose advice | Measurement / compliance criteria |
|---|---|---|---|---|---|---|
| 1 | The Proponent will prepare and implement an Environmental Management System (EMS) for the project. | To manage the relevant environmental factors and to fulfill the requirements of the Conditions and procedures in the Ministerial Statement. | The EMS will include:<br>• an environmental policy and corporate commitment to the EMS;<br>• planning to meet environmental requirements;<br>• specification and implementation of actions to meet environmental requirements;<br>• measurement and evaluation of environmental performance;<br>• review and improvement of environmental outcomes; and<br>• the EMP's identified under Commitments 2 and 3 will form part of the EMS and conform to EMS requirements. | An EMS for the construction phase components will be completed prior to construction commencing.<br>An EMS for the operations phase components will be substantially completed prior to operations commencing. | DEP or any accredited assurance service. | Evidence of 1st party audits annually and 2nd and 3rd party audits after three years or certification to ISO14001 or equivalent where the scope covers the EPA's environmental factors. |
| 2 | The Proponent will prepare and implement a construction phase Environmental Management Plan. | To manage the impacts of the construction phase of the project. | The EMP will contain plans, guidelines and procedures to manage environmental issues associated with the construction of the power station, transmission lines and associated infrastructure, including:<br>• vegetation clearing and management;<br>• surface water quality;<br>• groundwater quality;<br>• flora;<br>• fauna;<br>• Aboriginal heritage;<br>• noise;<br>• dust;<br>• vehicle movements;<br>• dredge spoil disposal;<br>• sewage disposal;<br>• waste and hazardous materials;<br>• development and rehabilitation of borrow pits;<br>• ongoing liaison with appropriate authorities;<br>• monitoring; and<br>• contingency planning. | Prior to the start of construction. | DEP, Western Power, MRD, WRC. (depending on the project component). | An approved Construction Phase Environmental Management Plan prepared and implemented. Review of final transmission line design by relevant authorities. Results provided in annual and triennial reports. |
| 3 | The Proponent will prepare, implement and regularly revise an operations phase Environmental Management Plan. | To manage the impacts of the operations phase of the project. | The EMP will contain plans, guidelines and procedures to manage environmental issues associated with the operation of the power station, transmission lines and associated infrastructure, including:<br>• surface water quality;<br>• groundwater quality;<br>• flora including weed control;<br>• fauna, including fish exclusion from the turbines;<br>• Aboriginal heritage;<br>• coastal processes and sedimentation;<br>• dredge spoil disposal;<br>• waste and hazardous materials;<br>• ongoing maintenance;<br>• ongoing liaison with authorities;<br>• monitoring;<br>• contingency planning;<br>• rehabilitation; and<br>• decommissioning; | Prior to the start of operations. | DEP, Western Power, MRD, WRC. (depending on the project component) | An approved Operations Phase Environmental Management Plan prepared, implemented and regularly revised. Results provided in annual and triennial reports. |
| 4 | The Proponent | To document | The programme will include, but not be | Programme | CALM, WRC | Programme of |

| No. | Commitment | Objective (why) | Action (how / where) | Timing (when) | Whose advice | Measurement / compliance criteria |
|---|---|---|---|---|---|---|
| | will prepare and implement a Programme of Research, Monitoring and Management to initiate research into mangrove biology and re-establishment, and to quantify and document ecosystem changes following construction of the barrages. | and manage ecosystem changes associated with the project. | limited to, the following:<br>• research and implement a programme to re-establish mangroves including the evaluation of such options as the recontouring of creek banks and creek bed to increase the intertidal area available for recolonisation, and dredging of channels in the low basin to increase water penetration into the creek. This work will be directed towards an objective of increasing primary production in the medium to long term;<br>• research into mangrove biology including interactions between soil salinity, elevation, aspect, ground stability and soil type on mangrove distribution, productivity and ecological value; and<br>• a monitoring programme, centred on Doctors Creek, to quantify changes in:<br>- water quality including temperature, salinity, dissolved oxygen, turbidity and chlorophyll *a*;<br>- sediment characteristics including oxygen demand, particle size and organic carbon;<br>- phytoplankton and zooplankton density and species diversity;<br>- infauna density and species diversity;<br>- density and species diversity of benthic flora and fauna;<br>- mangrove distribution, density and species diversity;<br>- fish use; and<br>- bird use. | developed prior to start of construction. Relevant sections implemented prior to start of operations. Programme ongoing. | and DEP. | Research, Monitoring and Management prepared and implemented. Results provided in annual and triennial reports. |
| 5 | The Proponent will prepare and implement a Groundwater Monitoring Programme. | To confirm the extent of seawater intrusion and to protect town water supplies. | To document any seawater intrusion as a result of the project in areas potentially affected by seawater intrusion. If a project induced adverse effect is identified, the Proponent will investigate and implement remedial action. | Programme developed prior to start of construction. Relevant sections implemented prior to start of operations. Programme ongoing. | WRC. | Groundwater Monitoring Programme prepared and implemented. No project induced, adverse effect on town water supplies. Results provided in annual and triennial reports. |
| 6 | The Proponent will maintain regular consultation with traditional land owners. | To ensure that any concerns of traditional landowners in relation to the project are identified and addressed. | Regular meetings. | As required. | | Results provided in annual and triennial reports. |
| 7 | The Proponent will ensure that the access road is appropriately constructed and signposted. | To ensure that the access road meets state and local government requirements. | Review of final road design by relevant authorities. | Prior to construction of the access road. | Shire of Derby / West Kimberley, MRD. | Sign off by the Shire and MRD. |
| 8 | The Proponent will document the proposed | To promote effective management of | To be conducted in consultation with traditional owners. | Prepared to a timetable agreed with the Shire of | Shire of Derby / West Kimberley. | Preparation of relevant documentation. |

| No. | Commitment | Objective (why) | Action (how / where) | Timing (when) | Whose advice | Measurement / compliance criteria |
|---|---|---|---|---|---|---|
| | vesting of, and management objectives for, multiple use of the project area. | the project area. | | Derby / West Kimberley. | | |