ASSESSMENT REPORT 36

BLACKMORE RIVER (EAST) AQUACULTURE PROJECT

ENVIRONMENTAL ASSESSMENT REPORT
AND RECOMMENDATIONS

By the Environment and Heritage Division
Department of Lands, Planning and Environment

June 2001

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EXECUTIVE SUMMARY

This report assesses the environmental impacts of the proposal by Phelps/Panniza Holdings (PPH) to build and operate a prawn aquaculture farm at Blackmore River (Middle Arm) in Darwin Harbour. This project has been identified throughout this report as the Blackmore River (East) Aquaculture Project (BREAP).

This Assessment Report reviews the Public Environmental Report (PER). It also relies on information, comments and advice provided by Northern Territory Government agencies, comments from the public and previous studies undertaken in the region.

Environmental Assessment is the process of defining those elements of the environment that may be affected by a development proposal and of determining the significance, risk and consequences of the potential impacts of the proposal.

Major Issues

The principal environmental issues identified by the proponent and this assessment are

Construction Phase

1. water quality;
2. land degradation and erosion;
3. introduced weeds, pests and diseases;
4. biting insects;
5. aesthetic disturbance; and
6. extractive materials.

Operational Phase

1. water quality;
2. surface run-off and erosion;
3. storm surge and cyclones;
4. waste management;
5. mangrove disturbance; and
6. biting insects.

The potential benefits associated with the proposal include

- significant economic growth;
- employment and training; and
- export of a premium product.

Conclusion

It is considered that the environmental issues associated with the project have been adequately identified. Some of the issues have been resolved through this assessment

process, while the remainder will be addressed through the Construction and Operational Environmental Management Plans.

Initially, the PER and recommendations detailed in this Assessment Report will form the basis for the PPH's management and monitoring commitments. The Operational Environmental Management Plan will be a working document for the operation of the facility and will require continual review and updating in the light of operational experience and changed circumstances.

This facility will require licensing under the *Water Act* and the *Fisheries Act* and will be required to comply with any licence conditions as well as regulations set down by those acts.

In addition, expansion from Stage One to the full scale facility will be dependent on demonstration of successful operation and environmental management including waste water discharges, as licensed under the *Water Act* and the *Fisheries Act*.

Provided the environmental commitments and safeguards detailed in the PER are implemented, the recommendations in this Assessment Report are adopted and regular reviews and reporting are undertaken, significant long term environmental impacts are expected to be avoided or minimal.

SUMMARY OF RECOMMENDATIONS

Recommendation 1

Phelps/Panizza Holdings shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards identified in the Blackmore River (East) Aquaculture Project Public Environmental Report (summarised in Table 19 and Section 5 of the PER) and as recommended in this Assessment Report. All safeguards and mitigation measures outlined in the PER are considered to be commitments by Phelps/Panizza Holdings.

Recommendation 2

Prior to the expansion of the facility from Stage One to the full scale development, approval shall be sought from DLPE and shall be based on demonstration of the successful operation and environmental management of Stage One.

Recommendation 3

An Environmental Management Plan that covers the construction phase of Stage One of the BREAP shall be submitted to the DLPE and DPIF for approval, prior to construction commencing.

Recommendation 4

An Environmental Management Plan for the operational phase of Stage One of the BREAP shall be submitted to the DLPE and the DPIF for approval prior to commencement of operations.

Recommendation 5

Prior to construction, a certified civil engineer shall review and amend, where necessary, the plans for all ponds, dams and earthen water-retaining structures to ensure water holding capability and protection of groundwater. Certified plans shall be submitted to DLPE for approval prior to construction.

Recommendation 6

Monthly monitoring for biting midges and mosquitoes shall be carried out in accordance with the recommendations at Appendix K of the PER. This monitoring program shall be included in the construction and operational EMPs.

Recommendation 7

An Erosion and Sediment Control Plan (ESCP) shall be included as a part of the construction EMP.

Recommendation 8

Stabilisation of exterior pond walls and cleared areas shall be to the satisfaction of DLPE.

Recommendation 9

A wash down procedure for all vehicles entering the site and an inspection and wash down procedure for all heavy machinery imported to the site shall be implemented.

Recommendation 10

There shall be provision in the EMP to notify the Controller of Water Resources should over-topping of ponds be anticipated or experienced in the event that input from rainfall exceeds pond capacity.

Recommendation 11

At all stages of the operation, sludge treatment areas and desalination bays shall be sufficiently bunded to prevent loss of nutrients and sediments off-site, or, where this may conflict with mosquito control practices, there shall be an effective filtering buffer in place.

Recommendation 12

A detailed monitoring plan shall be included in the construction and operational EMPs, and shall commence prior to construction with the gathering of baseline data. This plan shall include details of location and frequency of monitoring, parameters and environmental indicators monitored, and trigger levels at which further investigation or implementation of mitigation measures should occur. Additionally the results of all monitoring shall be provided to DLPE on a schedule agreed between PPH and DLPE.

Recommendation 13

Water quality monitoring shall be included in the pre-construction (baseline), construction and operational phases of the development. Monitoring should reflect the conditions imposed on the operation, specifically focusing on environmental indicators and physical parameters that will be determined by DLPE and the Controller of Water Resources under the Water Act.

Recommendation 14

If evidence that the development is causing an unacceptable decline in water quality of the receiving waters of Middle Creek, and if hydrodynamic modelling supports relocation, then the discharge point shall be moved to the main channel of the Blackmore River.

Recommendation 15

The proponent shall prepare a contingency plan for the relocation of the discharge point from the proposed site at Middle Creek to the main channel of the Blackmore River. This plan shall include the design plans for alternative discharge points for both Stage One and Stage Two. The plan shall also include the modelling of discharge regimes at both sites to determine the most appropriate discharge regime.

Recommendation 16

A mangrove monitoring program shall be included in the construction and operational phases of the development and shall include monitoring and analysis of mangrove macro-invertebrates and vegetation species composition and growth at sites agreed between DLPE and the proponent. The mangrove monitoring program shall be developed in consultation with the DLPE and shall be an integral part of the Environmental Management Plans.

Recommendation 17

A waste management plan for general site operations shall be included in the operational EMP.

Recommendation 18

PPH shall examine the operations of the facility to see if it exceeds National Pollutant Inventory (NPI) thresholds. If this is the case, PPH shall report the NPI emissions as part of the national program.

1 INTRODUCTION AND BACKGROUND

This report assesses the potential environmental impacts of a proposal by Phelps/Panizza Holdings to build and operate a prawn aquaculture farm on the Blackmore River, Middle Arm. This facility is to be known as the Blackmore River (East) Aquaculture Project (BREAP).

This Assessment Report relies on information, comments and advice provided by Northern Territory Government agencies, Non-Government Organisations and the public, and previous studies undertaken in the region.

1.1 Environmental Assessment Process

Environmental impact assessment is based on adequately defining those elements of the environment that may be affected by a proposed development, and on evaluating the significance, risks and consequences of the potential impacts of the proposal at a local and regional level.

The Public Environmental Report (PER), submitted by the proponent, provides a description of the existing environment in the area and the proposed operations, and evaluates the environmental impacts and proposed measures to minimise the expected impacts.

This Assessment Report describes the adequacy of the PER in achieving the above objectives and evaluates the undertakings and environmental safeguards proposed by the proponent to mitigate the potential impacts. Further safeguards may be recommended as appropriate.

The safeguards may be implemented at various levels within the planning framework of a project. These include, but are not limited to

1. site selection;
2. design and layout of facilities;
3. management of construction activities;
4. processes used in operations and facilities (i.e. inputs and outputs); and
5. management of operations, processes and facilities.

The contents of this Assessment Report form the basis of advice to the Northern Territory Minister for Lands, Planning and Environment on the environmental issues associated with the project.

1.2 Environmental Assessment History

An application for land at Blackmore River was lodged with the Department of Lands, Planning and Environment (DLPE) on 23 January 1996, proposing the development of a prawn aquaculture farm on Section 1840(a), Hundred of Ayers. After a lapse of time, this site was reconsidered by the proponent in May 2000, and referred to DLPE, which considered that the environmental issues associated with the

proposal warranted assessment under the *Environmental Assessment Act 1982* at the level of a PER. The Minister for Lands, Planning and Environment accepted the DLPE's recommendation and on 25 October 2000 determined that a PER would be required for the proposal.

Draft guidelines for the preparation of a PER were advertised for public comment and circulated to NT Government advisory bodies for comment for a two week period from 11 November 2000. Final guidelines were prepared taking into account the comments received from government agencies and the community. One public comment was received. The Minister issued the final guidelines and a direction to the proponent to prepare the PER on 19 December 2000.

The PER was submitted on 6 April 2001 and placed on public review for 4 weeks from 7 April 2001 to 8 May 2001. It was also circulated to government advisory bodies for review and comment. Nine public comments were received. All submissions have been summarised at Appendix A.

2 THE PROPOSAL

Phelps/Panizza Holdings (PPH) proposes to build and operate prawn aquaculture farm at a site adjacent to Finn Road and the Blackmore River on Middle Arm in the Northern Territory.

PPH seeks to produce a high quality product in sufficient quantity to establish a brand of preference in target markets. In doing so, it is expected that a skilled, local workforce will be formed.

The proposal incorporates recent, advanced technology for the minimisation of environmental impacts, including wastewater treatment ponds and recirculating systems. These technologies should minimise impact by reducing the amount of waste nutrients that will enter the marine environment.

The objectives of the facility are

- preservation of the surrounding natural environment;
- formation of an effective workforce, offering job satisfaction and real long term career prospects for employees;
- operational and cost efficiencies achieved by well researched design, professional management and application of modern technology; and
- the presentation for sale of a consistently high quality product in sufficient quantity to establish a brand of preference in target markets.

It is proposed to develop the facility in two stages, with Stage Two commencing 3-5 years after Stage One.

Stage One of the facility incorporates

- 22 production ponds covering an area of 27 ha;
- a saltwater pump jetty into the Blackmore River;
- a saltwater supply channel;
- a 20 ha exchange water treatment pond;
- a 20 ha freshwater dam;
- associated supply channels; and
- access roads and buildings.

The full scale facility (Stage Two) incorporates;

- 93 production ponds covering an area of 115 ha;
- a freshwater dam with a holding capacity of approximately 5500 ML and covering an area of 186 ha;
- four exchange water treatment ponds, covering an area of 80 ha;
- a packaging and processing factory, hatchery, office and dwellings; and
- supporting saltwater channels, pasture, roads, fencing, pipe-work, power generators, diesel storage tanks and associated infrastructure.

3 ENVIRONMENTAL ASSESSMENT

3.1 Introduction

The information provided in the PER has been assessed and then used, along with submissions from advisory bodies and the public, to determine the adequacy of the information provided by the proponent and the accuracy and acceptability of predicted impacts and safeguards. Comments and recommendations have been prepared in the form of this Environmental Assessment Report.

It is acknowledged that during implementation, flexibility is necessary and desirable to allow for minor and non-substantial changes to the proposal outlined in the PER and examined as part of this assessment. It is considered that subsequent statutory approvals for this project could make provisions for such changes, where it can be shown that the changes are not likely to have a significant effect on the environment. It is important for interpretation purposes that the recommendations (in bold) are not considered in isolation, as the supporting text also identifies concerns, suggestions and undertakings associated with the project.

Safeguards and mitigation commitments undertaken by the proponent in the PER are summarised in Table 19 and Section 5 of the PER.

Subject to decisions that permit the project to proceed, the primary recommendation of this assessment is:

Recommendation 1

Phelps/Panizza Holdings shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards identified in the Blackmore River (East) Aquaculture Project Public Environmental Report (summarised in Table 19 and Section 5 of the PER) and as recommended in this Assessment Report. All safeguards and mitigation measures outlined in the PER are considered to be commitments by Phelps/Panizza Holdings.

A second key recommendation is:

Recommendation 2

Prior to the expansion of the facility from Stage One to the full scale development, approval shall be sought from DLPE and shall be based on demonstration of the successful operation and environmental management of Stage One.

3.2 Issues

3.2.1 Major Environmental Issues

The principal environmental issues identified by the proponent and this assessment are:

Construction Phase

1. water quality;
2. land degradation and erosion;
3. introduced weeds, pests and diseases;
4. biting insects;
5. aesthetic disturbance; and
6. extractive materials.

Operational Phase

1. water quality;
2. surface run-off and erosion;
3. storm surge and cyclones;
4. waste management;
5. mangrove disturbance; and
6. biting insects.

3.2.2 General Issues

The proponent has addressed the issues detailed in the PER Guidelines of 19 December 2000; however, the PER lacks detail in some areas resulting in uncertainty as to the impacts of the proposal, their mitigation and management. Where this uncertainty occurs, recommendations have been made to resolve this.

3.2.2.1 Environmental Management Plans

An integral part of the environmental management of the BREAP will be the preparation and implementation of comprehensive Environmental Management Plans (EMPs) and their effective integration into other management plans relating to construction and operation of the development.

The EMPs will need to be developed for both aspects of the project, the construction and the operation. Each of these plans will require approval by DLPE and the Department of Primary Industry and Fisheries (DPIF) prior to the commencement of construction and operation.

The EMPs will also need to identify the construction and operational management structure and a specific contact officer and contact details, where these have not been identified within the PER.

Recommendation 3

An Environmental Management Plan that covers the construction phase of Stage One of the BREAP shall be submitted to the DLPE and DPIF for approval, prior to construction commencing.

Recommendation 4

An Environmental Management Plan for the operational phase of Stage One of the BREAP shall be submitted to the DLPE and the DPIF for approval prior to commencement of operations.

The EMPs should incorporate, but no be limited to, aspects such as Waste Management, Monitoring and Environmental Management. The plans should be routinely reviewed by PPH, and any major amendments should be submitted to the DLPE and the DPIF for approval. Additional EMPs will be required for the expansion to Stage Two, taking into account experience from the construction and operation of Stage One.

Both EMPs should incorporate the matters raised in this Assessment Report relevant to construction and operations.

3.2.2.2 Site Constraints

The BREAP site is adjacent to the future urban centre of Weddell. The proposed zoning immediately around the farm is for small lot rural subdivision. Expected impacts from urbanisation include altered run-off patterns, increased surface water, and the possibility of water-borne contaminants carried through the catchment after the "first flushes" of the wet season. The development of Weddell will involve development of roads and facilities to service the growing population, and this growth will increase the pressures on the Blackmore River.

Over time, it is expected that the existing quality and quantity of water resources will be modified by other users in the catchment. The quality of run-off water, particularly the “first flush” from the rains at the start of the wet season, may comprise a risk to operations at the BREAP, and the proponent will be responsible for diverting this run-off if it has the potential to impact the facility.

Water is not expected to be in short supply, however, and the development of a nearby urban centre will supply town water and electricity to the region, which will be a benefit to the proponent.

Groundwater is not considered to be in short supply in the region, and at present there are very few users of this resource. The development of Weddell will have an

unknown impact on the aquifer, but with a town water supply also becoming available a shortage is not anticipated.

The proponent will be required to obtain a permit from Natural Resources Division of DLPE to construct a bore.

These issues have been raised with the proponent, who is aware of the limitations of the site with respect to future development in the catchment.

3.2.2.3 Site Design

Given the large scale of the proposed project, aspects associated with water management and public focus on such facilities, and the potential for the site to be exposed to adverse weather such as cyclones, storm surge and torrential rain, a high standard of site design and construction is imperative.

Comprehensive and appropriate pond design and construction are particularly important to ensure that the operation of the facility does not impact groundwater supplies in the region. The preferred lining of all water-holding structures is clay, bentonite or polyurethane. The availability of suitable material on-site for lining the ponds has not yet been determined and will require comprehensive assessment by the proponent prior to construction. As there is a wide range of local expertise within DLPE, the proponent is advised to liaise with the Department to obtain relevant advice.

Recommendation 5

Prior to construction, a certified civil engineer shall review and amend, where necessary, the plans for all ponds, dams and earthen water-retaining structures to ensure water holding capability and protection of groundwater. Certified plans shall be submitted to DLPE for approval prior to construction.

3.2.2.4 Monitoring

The PER provides a brief outline of a monitoring program that covers the following aspects:

Construction Phase

- water quality;
- mangrove health; and
- mosquito and biting insects.

Operational Phase

- input surface water quality;
- water quality;
- mangrove health; and

- mosquito and biting insects.

Each of these aspects has been addressed only superficially without details on the location of monitoring sites and how monitoring is to be undertaken. Throughout this report, specific goals for monitoring will be recommended.

3.2.2.5 Noise

The proposed aquaculture facility is sufficiently far away from existing residential areas that off-site construction and operation noise will not be an issue in the three to five year duration of Stage One. Stage Two of the facility includes plans to connect to the electricity grid, doing away with diesel generators that will supply the power needs of Stage One. This will help in reducing noise which could become a nuisance to the future rural residential development of Weddell.

On site exposure to noise, however, will be significant for workers and contractors particularly during construction, but also in the immediate vicinity of the generators during the operation of Stage One. PPH should liaise with the Work Health Authority (WHA) to ensure that appropriate Occupational Health and Safety practices are implemented.

3.2.2.6 Biting Insects

The PER included comprehensive goals for the management of biting insects on site. Design features have been incorporated into conceptual plans of water holding structures to prevent the creation of nuisance biting insect breeding sites. Because of the proximity of the BREAP site to known breeding habitats of biting midges and mosquitoes, the biting insect problems will not be eradicated by these management methods. Biting midges and mosquitoes will continue to be a health problem at the site throughout construction and operation.

PPH has indicated that in line with recommendations of the Medical Entomology Branch (Territory Health Services), they will implement measures to control or eliminate potential breeding sites and undertake regular inspections to ensure potential habitat areas are kept in check.

PPH should continue to liaise with the Medical Entomology Branch of THS throughout the construction and operation of the site on issues of Biting Insects.

Workers at the facility should be informed of the potential pest problem and encouraged to use personal protection measures when biting insect numbers are high. Reference should be made to the THS publications *Personal Protection for Mosquitoes & Biting Midges in the NT* and *Construction in Tidal Areas*.

Results from the biting insect survey at the BREAP site are at Appendix K of the PER. The recommendations of this survey are not reflected in the main body of the PER. The recommendations for the construction of the site to minimise biting insect pest problems shall be implemented.

Recommendation 6

Monthly monitoring for biting midges and mosquitoes shall be carried out in accordance with the recommendations at Appendix K of the PER. This monitoring program shall be included in the construction and operational EMPs.

3.2.3 Construction Issues

The site is currently undeveloped woodland, occupying an area of approximately 796 hectares. Preparatory works will involve the clearing of approximately 490 hectares of native vegetation for the full scale development, which includes around 200 hectares for Stage One alone. Other preparation includes earthworks, pond formation, and construction of necessary infrastructure

PPH intends to begin construction of Stage One immediately all approvals have been obtained. It is envisaged that construction works will commence late in the dry season of 2001.

3.2.3.1 Surface Run-off and Erosion

Farm layout minimises necessary vegetation clearing and maximises the maintenance of vegetation corridors; however, the large scale clearing of vegetation from areas of low hills and drainage depressions has the potential to escalate land degradation.

Earth works associated with land clearing and pond development have the potential to impact both surface and groundwater resources. Surface water resources can be contaminated through surface run-off. Groundwater will potentially be impacted by a change in the level of the water table associated with the loss of vegetation. Additionally, off-site discharge of surface drainage can cause undesirable sedimentation problems in low lying areas and waterways.

It is suggested that where possible, major earthworks should be conducted in the dry season. If the construction timetable extends into the wet season, attempts should be made prior to the onset of the wet season, to rehabilitate the disturbed areas or to apply other treatments to minimise the transport of sediment into low lying areas and waterways.

Recommendation 7

An Erosion and Sediment Control Plan (ESCP) shall be included as a part of the construction EMP.

The ESCP guidelines are included at Appendix B.

A lack of stabilisation of cleared areas and pond wall slopes has the potential to cause sedimentation in mangrove areas which may result in mangrove die back and increased turbidity and sedimentation in the waters of the Blackmore River.

Recommendation 8

Stabilisation of exterior pond walls and cleared areas shall be to the satisfaction of DLPE.

The PER commits to implementing appropriate dust control measures should dust levels prove to be an issue. Periodic watering of construction roads and earth materials is seen as a more effective method than attempting to predict conditions when dust is likely, or acting after high levels of dust are observed.

3.2.3.2 Introduced weeds, pests and diseases

With increased traffic movement on and off the BREAP site the potential for weeds to be spread around the Darwin area through traffic movements is significant.

Introduced weeds are of particular concern during the construction phase where heavy earthmoving equipment may be sourced from around the Territory and interstate.

It is essential that prior to operation on site, machinery is washed down and inspected to ensure no weeds are present.

Recommendation 9

A wash down procedure for all vehicles entering the site and an inspection and wash down procedure for all heavy machinery imported to the site shall be implemented.

The importation of post larvae from interstate hatcheries carries with it the risk of importing an exotic pest or disease. Quarantine procedures outlined in the PER have been examined by the DPIF and are considered to be adequate to minimise this risk. The issue of exotic pests/diseases will not be further investigated in this report, but DPIF may seek further information as a requirement of their licensing procedures.

The DPIF and the Parks and Wildlife Commission of the Northern Territory (PWCNT) should be consulted on the best approach to prevent the importation or proliferation of weeds, pests and diseases.

3.2.3.3 Traffic

During construction, traffic entering and exiting the site from Middle Arm Road will temporarily increase. Movement of large vehicles and loads is expected throughout the construction phase.

As the BREAP site is located away from major arterial access to the Darwin River and Cox Peninsula regions, traffic movements should not be adversely affected. There are currently no residential areas that will be affected by the proposal.

3.2.3.4 Extractive Materials

It is important that extractive resources be utilised without creating significant disturbance and with regard to safely considerations. Legislative requirements that are directly applicable to this development are that:

- extractive materials are mined to a depth no greater than two metres below surface level; and
- borrow pits, where constructed, are to be progressively rehabilitated and made stable.

In the event that there is insufficient fill material available on site, it is a requirement that any extractive material supplied to the project is sourced from an operation that has been previously approved and authorised by the Department of Mines and Energy.

3.2.3.5 Acid Sulfate Soils

The proposed development does not include any plans to disturb actual or potential acid sulfate soils. If plans are altered in any way, particularly if construction of a discharge channel to the Blackmore River is required, an Acid Sulfate Soils Management Plan must be prepared.

3.2.3.6 Aesthetic Disturbance

The site is adjacent to Middle Arm Boat Ramp, and the property is bound by the access road to the boat ramp for several kilometres. Additionally, the region is targeted for future urban development. The PER commits to dense vegetation buffers. This is endorsed by the DLPE as a means of reducing impacts of noise and dust and maintaining the visual amenity of adjacent areas.

3.2.4 Operational Issues

Operation practices for the husbandry of prawns will include water uptake, pond maintenance, stocking, feeding, harvest and processing of the product, treatment of wastewater, and finally the discharge or recirculation of the treated water. Water quality and run-off will therefore be areas of potential environmental impact. The waste outputs from the facility will also have the potential to impact the environment.

Wastes from the facility, particularly increased nutrients and suspended sediments in the discharge water, will be produced and will require treatment. The treatment for these wastes will be by passage through a passive treatment system, with the potential to result in a net reduction in nutrient and suspended sediments. The waste product from this system is a nutrient rich soil, which will be desalinised on site, and used on site as an organic fertiliser and topsoil for a pasture area.

3.2.4.1 Surface Run-off

The Darwin region is exposed to intense rainfall throughout the wet season. These events frequently produce flash floods and large quantities of run-off that are not generally experienced in other parts of Australia. The proposed site is also located adjacent to Darwin Harbour and sensitive mangrove communities. Given this and the nature of the development, water management will be a critical aspect of the environmental management of the BREAP.

The proposal includes ponds for the treatment of nutrient rich waters. The treatment ponds will collect all site run-off as well as receiving water discharging from the production ponds. All ponds have been designed to hold an additional 500 mm of water, over and above normal operating levels. Overflow structures will be set up so that if any production pond were to fill more than 300 mm above normal operations, water would commence to overflow to the treatment ponds. These are designed to contain a maximum 24 hour rainfall event of 300 mm. The treatment ponds will be similarly equipped so that input to ponds from a 300 mm rainfall event should be contained.

Additionally, the proponent has demonstrated that in the same 24 hour period, utilising normal discharge procedures as indicated in the PER, it will be possible to release the equivalent of 212 mm rainfall per day in Stage One, and 281 mm per day in Stage Two without having to depart from normal discharge hours.

Recommendation 10

There shall be provision in the EMP to notify the Controller of Water Resources should over-topping of ponds be anticipated or experienced in the event that input from rainfall exceeds pond capacity.

Other management techniques that will be employed by the proponent to reduce the effects of unusually large rainfall events include the following:

- water exchange will be reduced during the wet season, with rainfall being relied on for exchange water (rain water will also keep salinities down in production ponds, minimising the need to exchange);
- production ponds will be run with lower water levels, especially where stock is small, as the lower biomass requires less water volume. This will increase the freeboard of the ponds; and
- the treatment ponds will be operated at lower levels in the wet season, increasing capacity for extreme rainfall events.

Velocities of stormwater run-off will be high at times and have the potential to scour at discharge points. To avoid significant scouring, energy dissipation in the form of blocks or rip rap should be considered at stormwater and waste water discharge locations.

Desalination bays have the potential to add sediment loads to storm water run-off if they are not correctly bunded. Additionally, water washing through the sludge treatment areas will be laden with high levels of nutrients and salts.

Recommendation 11

At all stages of the operation, sludge treatment areas and desalination bays shall be sufficiently bunded to prevent loss of nutrients and sediments off-site, or, where this may conflict with mosquito control practices, there shall be an effective filtering buffer in place.

3.2.4.2 Storm Surge and Cyclones

Storm surge, cyclones and other climatic events have the potential to cause extensive damage to developments in the coastal zone. Section 4.5.3 of the PER provides details of storm surge that are known for the area. Given that the lowest construction on the farm (the saltwater settling channel), at 6.5m AHD, will be 100 mm above the 1 in 1000 year peak combined sea level, this is considered to be adequate to minimise risk from flooding.

3.2.4.3 Water Quality

Darwin Harbour has many commercial and recreational beneficial uses. Many of these uses are applicable to the Blackmore River. These beneficial uses have become a focal point for public attention in recent times. The main focus on the BREAP will be its potential to impact Darwin Harbour from discharges into the harbour.

Environmental monitoring is vital in determining the environmental impact of a project. The information gained over time will be invaluable in assessing the long-term impact of the proposal on the surrounding environment as well as indicating trends and indicating if or when remedial work should be implemented to avoid or minimise environmental pollution. The monitoring program should begin prior to the commencement of construction to gather baseline data on the existing conditions.

Recommendation 12

A detailed monitoring plan shall be included in the construction and operational EMPs, and shall commence prior to construction with the gathering of baseline data. This plan shall include details of location and frequency of monitoring, parameters and environmental indicators monitored, and trigger levels at which further investigation or implementation of mitigation measures should occur. Additionally the results of all monitoring shall be provided to DLPE on a schedule agreed between PPH and DLPE.

Expected water quality targets from the waste water treatment systems as discussed in the PER indicate that the facility would deliver a net *reduction* in nutrient levels at its peak of efficiency. The facility is, however, expected to release some nutrients to the Blackmore River system at times when peak efficiency can not be achieved. The

behaviour and fate of increased nutrient loads on the Blackmore River system are currently poorly understood. Modelling by DLPE suggests that flushing in the Blackmore River system, including Middle Creek, may be sluggish. Middle Creek is the proposed location for the discharge of the treated waste water. Because of restricted tidal influence and poor flushing, it is important that the fate of any discharged effluent from the facility is determined and recorded. Additionally, the facility will need to comply with conditions of a Waste Discharge Licence issued under the *Water Act*.

Recommendation 13

Water quality monitoring shall be included in the pre-construction (baseline), construction and operational phases of the development. Monitoring should reflect the conditions imposed on the operation, specifically focusing on environmental indicators and physical parameters that will be determined by DLPE and the Controller of Water Resources under the Water Act.

The results of the monitoring program proposed in the PER will benefit both DLPE resource management and DPIF aquaculture planning. The proposed monitoring program will also indicate to the operators of the facility whether their aim of a low impact facility is being achieved. Indications from research carried out by CSIRO at existing prawn farms are that the operators should be able to achieve their aim.

As there is currently a lack of physical and chemical data on the Blackmore River system to support both the hydrodynamic modelling and the assertions of the proponent that the facility will have a minimal impact on the system, precautions should be applied to the operation and expansion of this development. Data gathered through the recommended monitoring programs will be an important input into current and future hydrodynamic models to increase knowledge of the flushing regimes of the Blackmore River system, including Middle Creek.

Monitoring of the receiving waters during operations will indicate whether the discharges are leading to eutrophication and/or other unacceptable water quality of the receiving waters. The proponent will consider the following measures if there is evidence of unacceptable impacts to water quality:

- relocation of discharge point;
- change of practices to improve the quality of the discharge water;
- change the timing of the discharges; and
- change the tidal range when discharge is permitted.

As flushing regimes of the Blackmore River system become better understood, hydrodynamic modelling may indicate the potential for significantly improved dilution and dispersion of treated waste water in the main channel of Blackmore River as opposed to the location in Middle Creek. In this situation, relocation of the discharge point to the main channel may be required if the project is causing an unacceptable decline in water quality of Middle Creek.

The expansion of the facility from 27 ha to 115 ha of ponds from Stage One to Stage Two will greatly increase the eutrophication potential at the proposed discharge point.

The gathering of physical and chemical data throughout Stage One will assist DLPE in determining the likely impacts of the full scale facility and whether these impacts would be acceptable. These concerns have been addressed in recommendation two.

Recommendation 14

If evidence that the development is causing an unacceptable decline in water quality of the receiving waters of Middle Creek, and, if hydrodynamic modelling supports relocation, then the discharge point shall be moved to the main channel of the Blackmore River.

Recommendation 15

The proponent shall prepare a contingency plan for the relocation of the discharge point from the proposed site at Middle Creek to the main channel of the Blackmore River. This plan shall include the design plans for alternative discharge points for both Stage One and Stage Two. The plan shall also include the modelling of discharge regimes at both sites to determine the most appropriate discharge regime.

3.2.4.4 Mangroves

Impacts to mangroves are expected to be minimal but will include changes relating to altered drainage patterns, lack of direct freshwater input from run-off, changed hydrodynamics relating to quantity and composition of waste water, and alteration of vegetation immediately to the landward margin of the mangroves.

A change in species composition may be observed where the facility inhibits the direct influx of fresh water into the mangroves. Altered morphology of vegetation may be observed from the changed hydrodynamics relating to an increased volume of water and from increased nutrient composition in the discharge water.

The PER was deficient in discussion of mangrove fauna, in particular the rich and diverse invertebrate fauna which are well documented as being highly sensitive to changes in habitat, and therefore excellent indicators of disturbance.

Recommendation 16

A mangrove monitoring program shall be included in the construction and operational phases of the development and shall include monitoring and analysis of mangrove macro-invertebrates and vegetation species composition and growth at sites agreed between DLPE and the proponent. The mangrove monitoring program shall be developed in consultation with the DLPE and shall be an integral part of the Environmental Management Plans.

3.2.4.5 Waste Management

Waste disposal will be required for both liquid and solid outputs from the BREAP. Liquid outputs from pond operations will be dealt with through the on-site treatment ponds, as discussed above. Solid wastes from operations, dwellings and associated functions will be sent to landfill disposal at the Darwin City Council's Shoal Bay Landfill. Disposal of diseased or unprocessable stock will be undertaken on-site, in consultation with the DPIF. Any offensive, corrosive, or restricted substances will be required to be disposed of in consultation with the Senior Environmental Health Officer of Territory Health Services, or with DLPE. Approvals may be required. These approvals will be based on meeting the disposal criteria for each respective facility.

The Darwin City Council (DCC) operates the solid waste disposal facility at Shoal Bay. Any solid wastes PPH intends to dispose of at this facility will be required to meet certain acceptance criteria which relate to volumes and contaminants. If solid wastes fail to meet these requirements the waste will not be accepted at the site, and PPH will have to find alternative disposal sites interstate, or re-treat the waste until it meets the criteria.

PPH should also consult with the DLPE regarding appropriate waste disposal and general on-site waste management.

Recommendation 17

A waste management plan for general site operations shall be included in the operational EMP.

Septic system effluent disposal will be in accordance with THS requirements. PPH should be aware that the current requirements are detailed in the Territory Health Services' *Code of Practice for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent.*

3.2.4.6 National Pollutant Inventory

The National Pollutant Inventory (NPI) is an internet database designed to provide the community, industry and government with information on the types and amounts of certain substances being emitted to the air, land and water.

Since 1998, larger Australian facilities are required to estimate and report annually their emissions to the NPI. Estimation of emissions from smaller industry, households and everyday activities have been made by State and Territory environment authorities and listed on the data base.

The main objectives of the NPI are to:

- provide information to industry and government to assist in environmental planning and management;
- satisfy community demand for accessible information on emissions to the environment; and
- promote waste minimisation, cleaner production, and energy and resource savings.

Recommendation 18

PPH shall examine the operations of the facility to see if it exceeds National Pollutant Inventory (NPI) thresholds. If this is the case, PPH shall report the NPI emissions as part of the national program.

3.2.4.7 Traffic

Increased traffic movements to and from the BREAP site will be a constant pressure on the roads of the district, and at present, access is not assured to the site during the wet season. Additionally, the current access, Middle Arm Road, is not a gazetted road, and in the longer term, access to the BREAP site will be on other planned roads. The proponent is aware of these issues and has undertaken to maintain access to the site (by grading) if necessary. All road works will be done after consultation with Litchfield Shire Council.

3.2.4.8 Decommissioning and Rehabilitation

Because at present the nature of the future surrounding land uses is unknown, development of decommissioning and rehabilitation goals, at this stage, is not appropriate. It has been agreed by the proponent, however, that decommissioning and rehabilitation of the site will be the responsibility of the proponent, and all actions must be approved by the DLPE at the time of decommissioning. All actions must be appropriate to the surrounding land uses at the time of decommissioning and rehabilitation.

4 CONCLUSION

It is considered that the environmental issues associated with the project have been adequately identified. Some of the issues have been resolved through this assessment process, while the remainder will be addressed through the Construction and Operational Environmental Management Plans.

Initially, the PER and recommendations detailed in this Assessment Report will form the basis for the PPH's management and monitoring commitments. The Operational Environmental Management Plan will be a working document for the operation of the facility and will require continual review and updating in the light of operational experience and changed circumstances.

This facility will require licensing under the *Water Act* and the *Fisheries Act* and will be required to comply with any licence conditions as well as regulations set down by those acts.

In addition, expansion from Stage One to the full scale facility will be dependent on demonstration of successful operation and environmental management including waste water discharges, as licensed under the *Water Act* and the *Fisheries Act*.

Provided the environmental commitments and safeguards detailed in the PER are implemented, the recommendations in this Assessment Report are adopted and regular reviews and reporting are undertaken, significant long term environmental impacts are expected to be avoided or minimal.

5 REFERENCES

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APPENDIX A

SUMMARY OF PUBLIC AND GOVERNMENT AGENCY COMMENTS ON THE PER.

Author	Comments
Parks and Wildlife Commission	▪ Proposal represents significant foreclosure of conservation options for protection of Darwin Harbour and it's immediate catchment. ▪ Plausible that the region does not contain any unique or highly restricted environments. ▪ Response to guidelines request for information on rehabilitation following decommissioning is inadequate and provides no reassurance of revegetation or rehabilitation. ▪ Sections related to management of water, waste and disease control appear adequate.
Lands, Planning & Environment	▪ Sound Archaeological report. ▪ There are sites of significance within 5km of the proposed development, however the proposal will not impact these sites. ▪ A staged approval process is recommended. ▪ Monitoring regimes should be endorsed by DLPE. ▪ An Erosion and Sediment Control Plan should be developed prior to development. ▪ More detailed information regarding sludge removal methods and/or treatment should be provided. ▪ Methods should be put in place to prevent sedimentation of mangroves. ▪ The mangrove monitoring program should be developed in consultation with DLPE. ▪ More information is required on expected water quality – composition and nutrient loadings. ▪ The future development of Weddell may impact on the proposal. ▪ Insufficient information on pond design. ▪ Concerned with the lack of recognition of the potential constraints the proposal may impose on planned future development in the locality. ▪ Unknown impact of urban residential and small lot rural residential on the freshwater storage area. ▪ Middle Arm Road is not a gazetted road, and in the long term the proposal will be dependent on other planned roads. ▪ Sections in the PER relating to surface water and ground water hydrology ignore potential future changes. ▪ Future development may need to be assessed with regard to potential environmental impact on the prawn farm. This may constrain future development.

Author	Comments
Department of Primary Industry and Fisheries	▪ There is no mention of non-commercial fisheries species in the PER. ▪ Water and mangrove monitoring programs were not stated in the PER. ▪ No detail provided on how waste water could be contained if the farm was found to have a pest problem. This is required. ▪ It is important that environmental goals for the discharge be established as soon as possible so that the proponent and Government agencies can demonstrate the minimal impact and sustainability of the project. ▪ The potential discharge of imported microalgae should be checked with the proponent. This action is covered by a fisheries import permit. ▪ Little understanding on the impact of compounding water. ▪ Where are the sludge desalinisation bays for stage one? ▪ Clearly potential exists for disease transfer between adjacent facilities. A number of measures should be implemented to minimise the risk of disease transfer between adjacent facilities, these include: - Stocking with SPF animals; - Strict quarantine of farm and hatchery facilities; - On-going health testing and monitoring; - Settlement and bio-remediation of effluent before discharge; - Chemical and/or physical disinfection of effluent waters; and - Recirculation of water after bioremediation. ▪ As this farm is separated from others by approximately 7km, DPIF considers that construction and future operation is an acceptable risk. ▪ Fisheries will consider the issue of the cost of decommissioning when determining license conditions**.**
Department of Arts and Museums	▪ The development will only impact a relatively small amount of habitat of mentioned vertebrates. ▪ Prior to earthworks, a program to trap and remove monitor lizards (*Varanus primordius*) could be considered. ▪ Provisions for rehabilitation must be included.
Department of Transport and Works	No Issues
Police, Fire & Emergency Services	No Issues
Department of Mines and Energy	▪ It is important that extractive resources be utilised without creating significant disturbance and with regard to safety considerations: ▪ It is a requirement that extractive materials are mined to a depth no greater than 2 metres below surface level. ▪ Borrow pits, where constructed, are to be progressively rehabilitated and made stable. ▪ In the event that there is insufficient material available on site, it is a requirement that any extractive material supplied to the project is sourced from an operation that has been previously approved and authorised by the Department of Mines and Energy.

Author	Comments
Territory Health Services	▪ The provision of an adequate potable water supply is required for all habitable dwellings. ▪ The water supply for the proposed aquaculture operation must comply with current national standards for bacteriological, physical and chemical parameters. ▪ Sewage treatment and effluent disposal must be approved by Territory Health. ▪ The seafood processing plant plans must be submitted to a building certifier, and be assessed with respect to: - AQIS requirements; - DPIF requirements; - Territory Health Service requirements; - Fire Service requirements; - PAWA requirements (with respect to grease traps); and - Department of Industries and Business (with respect to Noxious Trade license). ▪ If a laboratory is to be constructed it must conform to relevant standards ▪ All waste must be disposed or in accordance with a schedule determined in consultation with the Senior Environmental Health Officer (THS). ▪ This facility must be designed, constructed and operated so as not to cause noise, odour or dust nuisance to neighbouring properties.
Power & Water Authority	▪ Discussions must be held with PAWA regarding access to the transmission tower following flooding of the proposed fresh water dam. ▪ A connection to the electricity grid will require negotiations with an electricity supplier for connection and supply. ▪ Limited bore test data suggests that potable water supply will be a limiting factor in the development of the proposal. No reticulated water supply is currently available, but is proposed with the development of Weddell. ▪ DLPE should consider the impacts of the attached documents: ▪ Interim design criteria – PAWA waste stabilisation ponds; and ▪ Guidelines for buffer zones, PAWA NT. ▪ A suitable monitoring program should be implemented for waste water discharges to ascertain operational impact on the Blackmore River. ▪ DLPE should consider the cumulative impact of this proposal and the sewage treatment facility on the Blackmore River. ▪ The proponent should be made aware that any proposal to connect a non domestic sewage discharge, such as from the processing factory, to a future PAWA sewerage system, would be subject to meeting the requirements of PAWA's Trade Waste Code and trade waste acceptance criteria.

Author	Comments
Larrakia Nation	▪ Must be consistent with *Darwin Harbour Strategic Plan*. ▪ Area to be cleared acts as a "natural filter" for the river. ▪ Concerned about the source of food source (concerned about disease). ▪ There may be archaeological sites in area – would like to be consulted and given opportunity to "clear" the area. ▪ Native title process may be a chance for discussions for mutual benefit (for example employment and training).
Environment Centre	▪ Pressure on wild fisheries for prawn food. ▪ Government approvals process – Development consent prior to Environmental process. ▪ Site selection process – just concerned with keeping recreational fishers happy. ▪ Lack of information on impacts to marine species other than barramundi. ▪ Clearing of mangroves is unacceptable. ▪ Clearing of 420 ha of woodland represents a significant loss of habitat for the area. ▪ Costs of allowing up to 27kg of Nitrogen to be released – may lead to eutrophication. ▪ NT lacks experience in aquaculture and should "lay the groundwork" prior to rushing into a big development. ▪ Staged approach does not alleviate concerns if no further assessment is required prior to expansion to stage two. ▪ Recommends that Minister considers PER in context of stage 1, and requires further assessment and review prior to expansion to stage 2. ▪ Recommends that the proponent be required to lodge a bond equivalent to cost of rehabilitation of the project. ▪ Proposes 100m vegetation buffer shorewards of the mangroves. ▪ Proposes annexing areas occupied by *Grevillea longicuspis* form the development area. ▪ Proposes constructing nets over ponds to exclude birds. ▪ Proposes establishment of a record of faunal deaths at the site available for public review.
AFANT	▪ Pleased to see proposed farm is located on higher ground. ▪ Question the absence of desalinisation bays in stage 1. ▪ Question the option of a bond for decommissioning. ▪ Question the possibility of diseased stock contaminating waterways. ▪ Public should have access to results of monitoring. ▪ Perceived lack of baseline information.
Seafood Council	▪ Clarify that this proposal intends to draw an amount of water in five days, equivalent to what one existing farm draws in 12 months. ▪ Feels there is no study to show that the Blackmore River can sustain this. ▪ Feels that the precautionary principle should be adopted. ▪ Wants Government's written assurance that this proposal will not adversely affect the existing industry.

Author	Comments
Julie Potter	▪ Concerned that the discharge methods adopted will not drain directly and rapidly into the creek leaving pooling of nutrient rich water (no discharge channel). ▪ Questions what is known of the tidal flushing regime of the discharge creek. ▪ Concerned that little is known of the hydrodynamics of the Blackmore. ▪ Concerned about the cumulative impacts in the system. ▪ Concerned about the overflow of nutrient rich water from ponds and waste treatment areas during high rainfall events. ▪ PER contained no detailed explanation of stormwater channels mentioned in the text. ▪ Concerned about the impact of the development of Weddell on water quality for the farm. ▪ What are the consequences of a sewerage system planned for the Blackmore River on the proposal? ▪ Complete catchment anaylsis should be undertaken, particularly with respect to flooding. ▪ Questions the implications of ground water pollution. ▪ Perceived that no background water quality parameters were given. ▪ Rehabilitation should include active revegetation.
NT Prawn Farmers Association	▪ Concerned at quantity of water to be used from Blackmore River. ▪ Risk that the proposal will be “perceived” by public and government as causing detriment, limiting expansion possibilities of existing farmers. ▪ Risk of detrimental effect if proposal goes ahead as planned. ▪ May have the effect of monopolising a resource.
Denise Goodfellow	▪ The total number of bird species observed is a very poor reflection and survey should be repeated.
Australian Barramundi Culture	▪ Concerned about a single stage approval – would prefer 2 stage approval after operation at stage 1 has been assessed. ▪ Feels that there is a significant probability that the venture will fail as most new aquaculture ventures have. The exceptions seem to be small, locally owned ventures that have grown with experience. ▪ Concerned that the water requirements will use up the water allocation for aquaculture in the upper middle arm region limiting the potential of existing and emerging operators. ▪ Concerned that risk of disease increases as intensity and proximity of farms increases – this has led to downfall of the industry in much of Asia. ▪ Feels that the likelihood of significant pollution and adverse public reaction will be higher with large scale development by a newcomer to the industry. ▪ Worried about the limiting of future development of existing operators and that negative public reaction will increase regulatory stringency.

Author	Comments
Greg Chapman and Diana Rickard	▪ Feels that the report was not in the price range of the average member of the public. ▪ Feels that timing the release of the PER with the Litchfield Land Use Objectives and the Development Consent application resulted in inadequate public consultation. ▪ There is no evidence of a reliable water supply for dust control measures. ▪ Further information is required on whether salinity will interfere with the potable ground water supply in stage 2. ▪ Feels that dust generation will be a major problem. ▪ Feels that the proposed modifications to Finn Road are inadequate, with respect to the culverts. Feels a bridge would be more appropriate. ▪ Investigations should be carried out into the suitability of the earthen walls to carry water. ▪ "Environmental aspects" of the dam and ponds has been inadequately considered in the PER. ▪ Object to the likely eutrophication of the Blackmore River. ▪ Feel that the freshwater dam will impact Berry Springs, Southport, Tumbling Waters, Blackmore River and Darwin River and surrounding areas. ▪ Feel that ground water will be non-existent in the late dry season. ▪ Power generation from the proposed 8 diesel generators will cause unacceptable noise pollution and goes against the Greenhouse Renewable Energy policy. ▪ Destruction of mangroves is unacceptable and no channels should be allowed through the mangroves. The development should be at least 100 metres away from mangroves. ▪ Only no-release ponds should be allowed. ▪ The ponds should be round as these are more economically viable and less risk than square ones. ▪ No development should be carried out until proper mapping of significant Aboriginal sites has occurred.

APPENDIX B

EROSION AND SEDIMENT CONTROL PLAN GUIDELINES

Erosion & Sediment Control Plan Content

An Erosion and Sediment Control Plan (ESCP) is a plan that shows how to minimise soil erosion on and sediment transport from any type of construction site. These plans should communicate with all involved in undertaking any works on a site/land development, how erosion and sedimentation can be controlled on and offsite. The Natural Resources Division requires that an ESCP be submitted for **all on ground works** which involve the clearing of land and subsequent exposure of soil to rainfall and runoff. The erosion and sediment control measures as outlined in the plan must be put in before any disturbance of the site occurs.

Site Layout

- Timing of construction
- Locality plan identifying the development site and external catchment area
- Plan scale, north arrow and benchmarks
- Plans showing the existing topography and final site contours with cut and fill locations identified.
- The staging of works, including the staging of site clearing and topsoil stripping.
- Locations of all site access points, parking areas, site facilities and on-site roadways/tracks
- Location of site storage and stockpile areas (sand, gravel, topsoil & building materials)
- Property boundaries
- Contour levels
- Erosion risk mapping – ID of low, medium, high and extreme erosion risk areas
- Recognised topographic site limitations to include aspects such as:
    - excessive slope gradients
    - relevant design flood inundation lines
    - rock outcrops
    - existing soil erosion or streambank erosion
    - significant water bodies; and
    - drainage problem areas.
- Location of erosion control/drainage structures

Vegetation Layout

- General location, nature and condition of existing vegetation
- Location plan of protected trees and bushland, non-disturbance areas and buffer zones – includes buffers to vegetation and watercourses
- Natural vegetation to be retained – buffers – avoid area being used as a dumping ground

- Revegetation landscape plan and critical areas of stabilising vegetation
- Limits of clearing

Soil Properties

- Location and limitations of major soil types
- Identification of all known dispersive soils – including subsoils
- Drainage depressions – problem soils – geotechnical report (eg. Land unit 6a, 6b)

Drainage and Land Management

- Plans for both temporary and permanent drainage, including design frequency/capacities, identification of all proposed overland flow paths or watercourses from the site
- Location, type and timing (instigation and decommissioning) of all drainage, erosion and sediment control measures
- Maintenance access ramps to major sediment control structures
- Proposed grades and batter slopes
- Location of disposal sites for trapped sediment
- Return period proposed for earthworks
- Gross pollutant trap identification and installation
- Program for maintenance of erosion and sediment controls