Proposed Aquaculture Facility at Guthalungra

Initial Advice Statement

Rev 1

December 2000

SINCLAIR KNIGHT MERZ

Sinclair Knight Merz Pty Limited
ACN 001 024 095
ABN 37 001 024 095
131 Denham Street
PO Box 5426
Townsville QLD
Australia 4810
Telephone: +61 7 4772 5877
Facsimile: +61 7 4721 1353

Contents

Document History and Status

Issue	Rev.	Issued To	Qty	Date	Reviewed	Approved
1	0	Pacific Reef Fisheries	1	24/10/00	TIC	RNB
1	0	Pacific Reef Fisheries	2	17/11/00	TIC	RNB
2	1	Pacific Reef Fisheries	2	1/12/00	TIC	RNB
1	1	Department of State Development	2	5/12/00	TIC	RNB

Printed:	5 December, 2000
Last Saved:	5 December, 2000
File Name:	T:\Ts03331 - Guthalungra\Ts03331.200\REP00_10.09\R05ticguth.Doc
Project Manager:	Troy Collie
Name of Organisation:	Pacific Reef Fisheries (Bowen) Pty Ltd
Name of Project:	Proposed Aquaculture Facility at Guthalungra
Name of Document:	Initial Advice Statement
Document Version:	Rev 1
Project Number:	TSO3331.200

1. Introduction

1.1 Background

In 1999, Pacific Reef Fisheries (Bowen) Pty Ltd ("Pacific Reef Fisheries") purchased 800 ha of land across tow freehold Lots of land adjacent to the Elliot River near the small Queensland coastal town of Guthalungra.

The company's intention is, after the necessary planning and assessment processes, develop the site for prawn aquaculture. The company intends to develop an integrated enterprise using a range of the best features of the industry including leading husbandry practices, emerging wastewater treatment technologies and maximising opportunities for tailwater reuse.

At this stage, the structural elements of this proposal will likely include:

- A hatchery;
- A nursery and a series of growout ponds;
- A seafood processing facility.

Naturally, the total pondage area under production will depend on:

- The physical, ecological and environmental constraints and values of the site (including the terrestrial and aquatic values of the site and adjacent areas and the receiving capacity of marine environments);
- The size of the water treatment and holding areas;
- The level of capitalisation of the farm by the proponent.

Without having finalised these concepts (because full feasibility assessment will occur during the Environmental Impact Assessment (EIA) process), it is believed that the site may support up to 300 hectares of growout ponds producing up to 2 000 tonnes of penaeid prawns per year.

The company has already commissioned a detailed topological survey over approximately 100 ha of land (ie. that most likely to be suitable for the first phase of site development). The company has also conducted a preliminary soil testing program over Lot 370 and part of Lot 8.

The company has a capability and track record in the aquaculture industry in north Queensland. Their existing operation near Alva Beach has been recently expanded with a philosophy of environmentally-responsible development as a key component of their development and operation policy.

Pacific Reef Fisheries (Bowen) Pty Ltd now seeks to proceed with the procurement of all the necessary planning, environmental and operational approvals required for the site as well as detailed design and commission plans.

1.2 The Applicant

Pacific Reef Fisheries (Bowen) is a branch of Pacific Reef Fisheries (Australia), which is a wholly owned subsidiary of Mitris Management Holdings. The total groups assets exceed 100 million dollars with substantial investments in Australian companies, through the Australian stock market, property investment, areas of primary

production, and now, through the Pacific Reef group, Aquaculture, a group founded for the sole purpose of entering into the Australian Fisheries industry.

In 1997 the company acquired its first site in Ayr, Northern Queensland, the site on which it now produces, what are arguably considered Australia's best farm prawns.

Since then it has invested in excess of 10 million on site expansion and operation, now making the site one of the countries largest and most technologically advanced aquaculture sites in Australia.

In 1998 – 1999 turnover commenced at approximately $2.5 million, and in 1999 – 2000 reached $5.6 million, with budgeted sales for the year 2000 – 2001 coming in at $7 million.

Currently the operation employs 74 people, 30 of which are permanent full time staff, and another 40 moving through the site as full time casuals, for a period of six months of every year. It is expected that this number will increase to 105 with further expansion in 2001.

The Pacific Reef Fisheries group having now acquired a second greenfield site south of its Ayr operations, plan to develop another major site at Guthulungra, which will see its production capacity being quadrupled, potentially making the company and the nation's premium Aquaculture business, with a turnover tipped to reach $35 million by 2005 and staff numbers exceeding 320 with 220 being permanent full time and 100 full time casual labourers.

It is the company's intention to continue to pursue its rapid rise in Australia's expanding Aquaculture Industry with vigour over the coming years, and to see the Australian market obtain equal standing as a quality producer on the world market. Making for a bright future for the company aiming to be a world leader.

Mission Statement

Pacific Reef Fisheries divides its operational goals into three areas.

1) **Product Mission**: to produce, process and distribute a product that can stand side by side with the best seafood on the world market.

2) **Social Mission**: to operate our company in a way, which actively recognises the central role that business plays, in the structure of society, by initiating innovative ways to improve the quality of life for its employees and the broader local community which it is situated.

3) **Economic Mission**: to manage our company on a sound financial basis, aimed at sustained profitable growth, which increases value and career opportunities for its Directors, employees and the local community at large.

Summary: to represent our company in a manner that understands the social and moral value of a modern corporate citizen, while maintaining the highest standards of operational professionalism at all times.

1.3 The Proposed Site

As shown in **Figure 1.1**, the proposed site is near the coastal North Queensland town of Guthalungra which lies approximately:

- 40 kilometres north of Bowen,
- 60 kilometres south of Home Hill, and,
- 175 kilometres south of Townsville.

The proposed site is part of the near coastal zone and has previously been used for grazing.

The land is situated at the end of Watts Road and Coventry Road, the latter which comes off the Bruce Highway at Guthalungra. The proposed area for development includes Lot 370 K124643, which abuts the Elliot River and Lot 8 SB294, Parish of Curlewis, County of Salisbury (refer **Figure 1.2**). **Figure 1.3** shows extra details of the location of the proposed development site. Note that Coventry Road extends to the middle of the properties and Watts Road enters Lot 370 K124643.

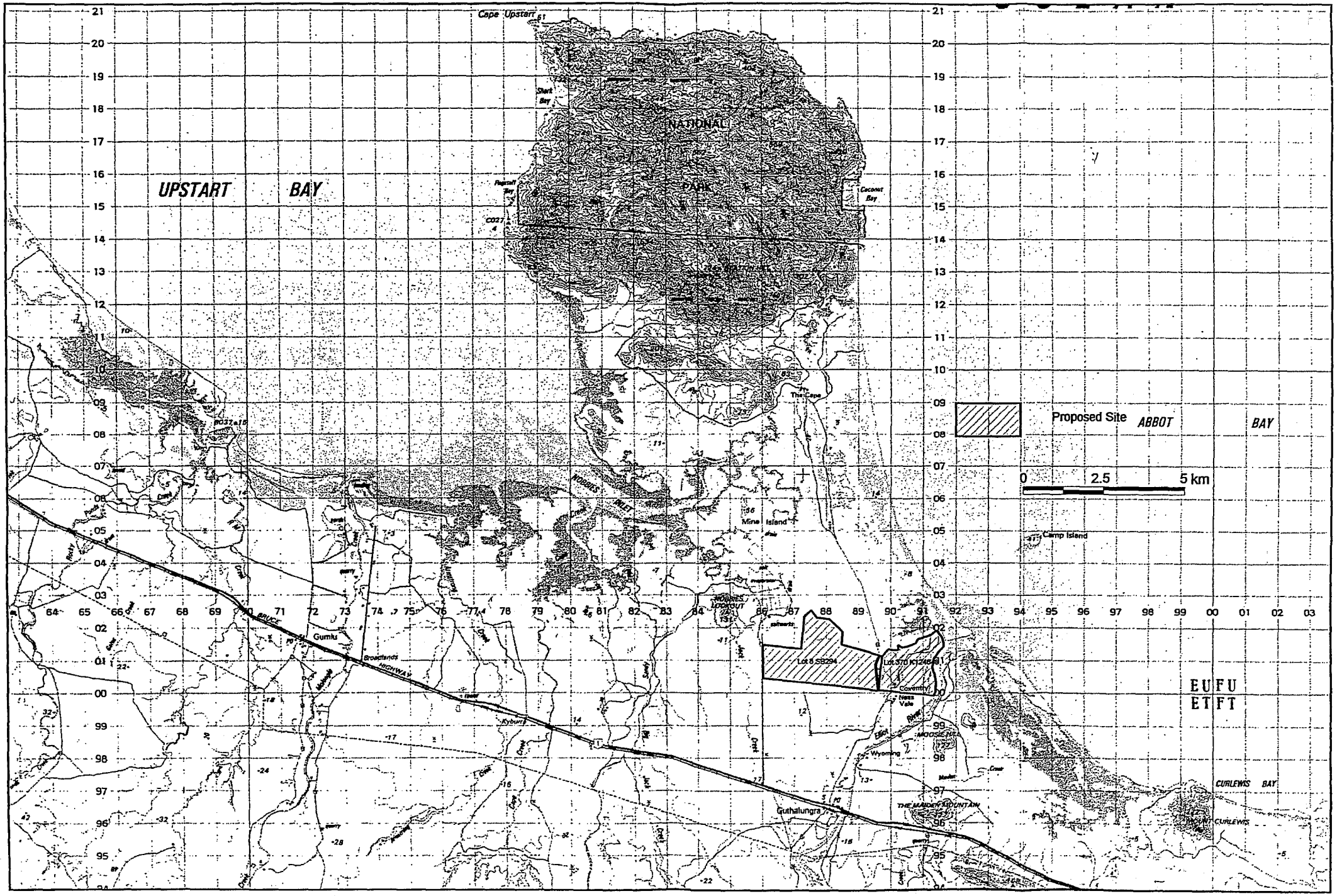
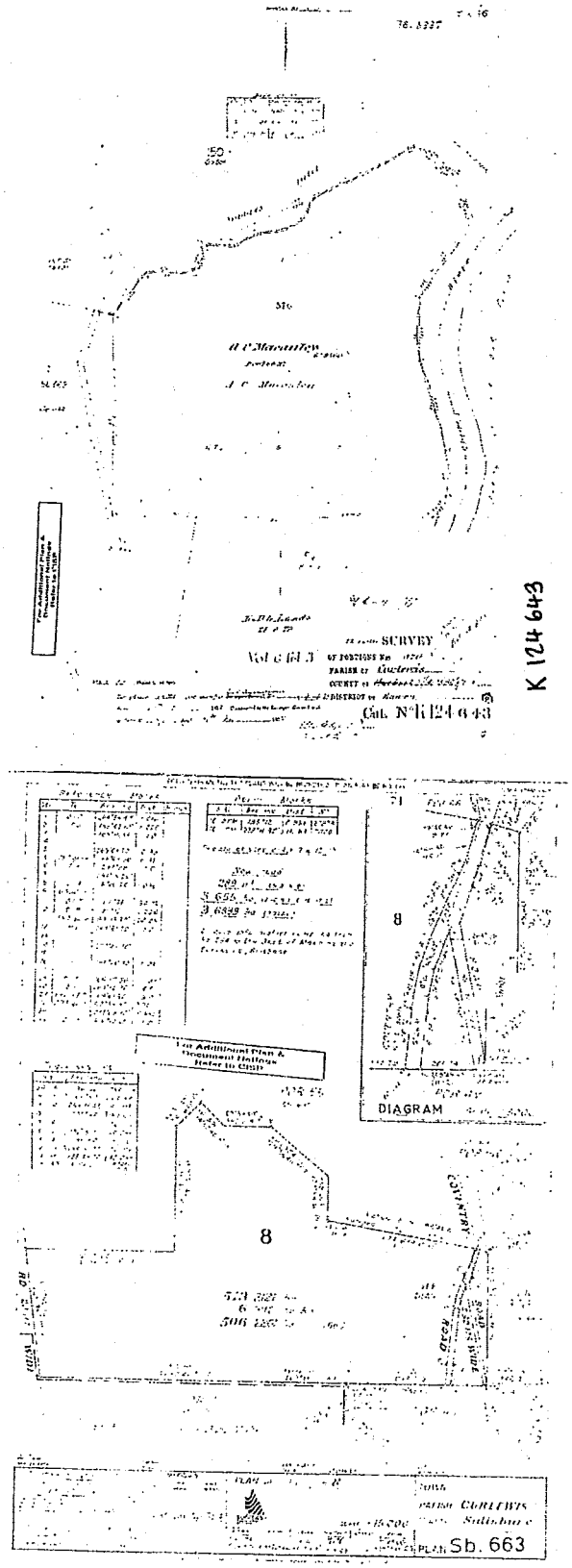


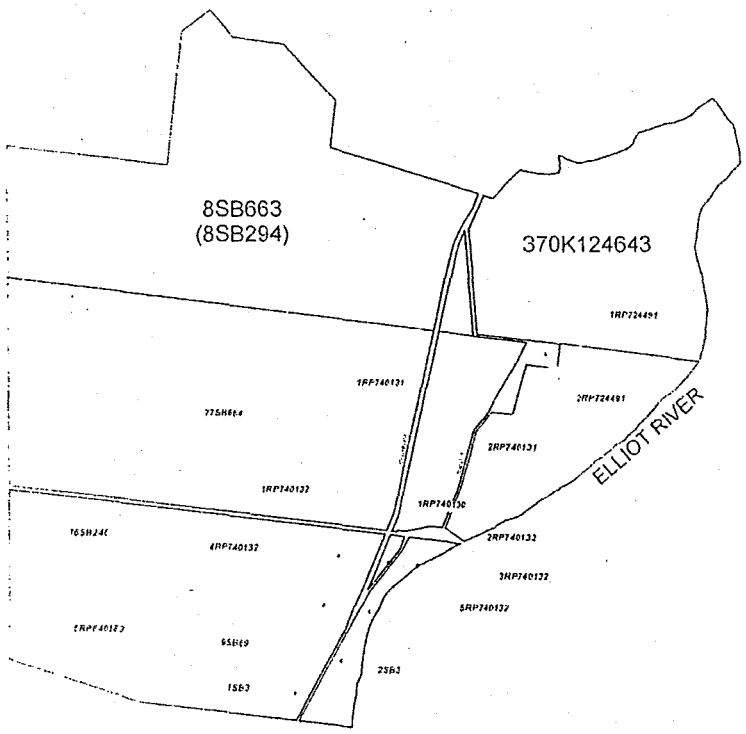
Figure 1.1 Regional Location of Proposed Site

- **Figure 1-2 BLINMAP Lot 370 K124643 and Lot 8 SB294**



Source of BLINMAP: Department of Natural Resources

■ **Figure 1-3 Site location**



Source of BLINMAP: Department of Natural Resources

1.4 Purpose of This Document

Sinclair Knight Merz has been commissioned by Pacific Reef Fisheries to prepare an Initial Advice Statement as the first in a series of documents to describe the intentions of the proponent. This document forms the basis for seeking a formal set of "Terms of Reference" for an Environmental Impact Study (EIS) for the proposed aquaculture development.

The "Terms of Reference" for the proposal should aim to consolidate the considerations under a number of pieces of Federal and State Government legislation. For instance, Pacific Reef Fisheries will seek planning approvals from Bowen Shire

Council to build and operate the prawn farm aquaculture facility at the site. It will also have to satisfy the requirements of several environmental approval (referral and concurrence) agencies to gain the State's sanction over the proposal. Also, the proposal will need to satisfy the *Environmental Protection & Biodiversity Conservation Act*, which is administered at the Federal Government level by Environment Australia. A referral has preceded general release of this document. This is important, both in terms of specifying EIA requirements of the Commonwealth and coordinating joint State and Commonwealth interest in planning and environmental approvals.

The purpose of this document is, therefore, to:

- provide background information on the proposed development,
- describe relevant environmental features for consideration, and
- identify future planning intentions,

It is recommended as a source of reference so that relevant agencies can comment on the proposal and determine a set of "Terms of Reference" to direct the environmental impact assessment process.

1.5 Proposal Overview and Goals

To ensure that this proposal in devised and implemented in an environmentally sustainable manner – with acceptable levels of risk from construction and operational environmental impacts - the company's goal is to meet statutory requirements and generally-accepted standards of "fair play" by adhering to the following principles:

- Minimise disturbance to natural landscapes by recognising and managing significant and resources such as:
  - key physiographic types (such as saltpans, sand dunes, estuaries),
  - vegetation communities (such as mangroves, brigalow, seagrasses), and,
  - high value marine areas and resources (such as Marine Park);
- Maximise opportunities to adopt emerging industry technologies such as:
  - water cycle management efficiencies (including water extraction and farm pond exchange rates, civil design of ponds, optimising water lift and transfer, water storage, evaporative and potential groundwater losses),
  - wastewater treatment and disposal systems (including retention, sedimentation, biological treatment – biofiltration, artificial mangrove systems, aerobic/anaerobic treatment, recycling and recirculation),
  - optimal husbandry and feed systems that result in high return feedstocks, low rates of fertiliser application, stable pond water quality, high FCRs and high crop yields.
- Maximise contributions to social equity and economic development of the region by integrating into the local community by:
  - Promoting awareness of sustainable aquaculture practices;
  - Contributing to local wealth by being an active, valued member of the Bowen and north Queensland business community,
  - Responding to the constructive suggestions of the community and stakeholders through a progressive process of consultation,
  - Providing effective resource management to an accountable standard that meets both statutory and 'duty of care' provisions.

The proponent's intention is to use the Environmental Impact Assessment process as a means of:

- assessing feasibility for development options over the proposed site,
- considering and adopting the most viable and workable alternatives on the site,
- developing risk mitigation strategies,
- promoting the preferred proposal and offering adaptive management to offset residual risks.

The final proposal (devised at the completion of the EIA process) will be planned, designed and proposed for approval in terms of various stages of development including development of:

- a hatchery,
- a nursery and the first set of growout ponds,
- subsequent sets of growout ponds.

2. Description of the Region

2.1 Site Location

The site nominated by Pacific Reef Fisheries lies approximately 40 km north of Bowen and is close to 3 km eastward from the township of Guthalungra. The proposed development site is just north of the lower reaches and mouth of the Elliot River. Pacific Reef Fisheries intends to build a hatchery and aquaculture ponds (with associated infrastructure) on the site for the breeding, growing and processing of prawns.

2.2 Climate

The site, being situated in the dry tropics, has relatively low rainfall in general with coastal areas experiencing a humid, tropical climate. Rainfall is concentrated in the summer months, with a high degree of variability in rainfall amount and intensity. The nearest Bureau of Meteorology registered rainfall station is located at Bowen, some 40km south of the site. It is believed this station is representative of the rainfall patterns at the site.

Bowen has an average annual rainfall of around 906 mm. **Table 2.1** displays average monthly rainfall recorded by the Bureau of Meteorology for Bowen, demonstrating monthly variations. A large proportion of total annual rainfall is of a very high intensity, particularly in the wet season (December - March). The Bowen region generally promotes its attractiveness based on dry, warm conditions which are perfect for culture of marine organisms.

■ **Table 2.1: Average Monthly Rainfall - Bowen (mm)**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Year
246	242	161	64	40	37	24	18	16	23	36	907

Source: Bureau of Meteorology

The area experiences warm to hot summers and mild winters, as typical of North Queensland. Average monthly maximum temperatures range between 24.3 and 31.5°C, with minimum temperatures above 14°C (Refer **Table 2.2**). Temperature variations throughout the year are generally quite gradual.

■ **Table 2.2: Average Monthly Temperatures – Bowen (°C)**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Year
Min	24	23.7	22.9	20.9	17.9	15.4	14.2	15.1	17.3	20.2	22.3	19.5
Max	31.5	31.2	30.6	29.2	26.8	24.7	24.3	25.5	27.3	29.2	30.6	28.3

Source: Bureau of Meteorology

The region, like the majority of North Queensland, is subject to cyclonic activity and the risk of flooding. King tides and storm surges can also pose a problem for lowlying areas along the coastline and adjacent to tidally influenced waterways.

2.3 Site Characteristics

The land, sited adjacent to the Elliot River, is relatively flat with a gradual fall from south-west to northeast. The levels across the blocks range from 2m AHD to 11m AHD. There are isolated areas of lower than 2m AHD where the land adjoins salt pans or tidal creeks. A vegetation survey on the blocks has not yet been undertaken. Vegetation across most of the lots are sparse making the land suitable for cattle grazing. Clayey soils are available on site which are likely to be suitable for pond construction (refer **Figure 2.1**).

The site is just north of the Elliot River close to its mouth that connects to Abbot Bay. This coastal area is highly dynamic. The Lot lies adjacent to extensive salt pans and also appears to contain small claypans on the freehold property. The lots are surrounded by rural grazing areas and National Park (refer **Figure 1.3**). The Elliot River discharges into the Great Barrier Reef Marine Park. This area is zoned as a General Use 'A' area.

2.4 Vegetation Types

2.4.1 Regional Vegetation

Guthalungra lies in the Brigalow Belt Bioregion, a large and complex area covering 36 400 000 ha (Sattler and Williams 1999). The bioregion is characterised by the leguminous tree *Acacia harpophylla* (brigalow) which forms forest and woodland on clay soils. The proposed development site falls within the Bogie River Hills province. This type of vegetation, where it occurs in the region, is dominated by open woodlands of narrow leaved ironbark *Eucalyptus crebra*, red *bloodwood Corymbia erythrophloia*, Dallachy's gum *C. dallachiana*, poplar gum *E. platyphylla*, beefwood *Grevillea striata* and ironbark low woodland. Within the province, there are also scattered patches of vine thicket in sheltered areas particularly within the south and fringing saltmarsh adjacent to the coast.

Vegetation has been described for the adjacent Cape Upstart Lowlands area under the Register of the National Estate (Australian Heritage Commission). The area contains dune systems that support an extensive patch of microphyll vine thicket. The rainforest plant *Pleagyne cunninghami* is at its northernmost limit as this site. The Cape Upstart massif is habitat to the regionally rare gum tree *Eucalyptus shirleyi*.

Cape Upstart Lowlands stretch from the mouth of the Elliot River (north bank), along the shore of Abbot Bay and through the Cape Upstart National Park (**Figure 2.2**). This heritage listed area lies east of Lot 370 of the proposed development site.

The coastal zone of the NE Queensland coast has extensive areas of mangroves. *Ceriops tagal* are dominant in the Burdekin Delta and others species including *Avicennia marina*, *Rhizophora stylosa*, *Bruguiera existata*, *B. gymnorhiza*, *Xylocarpus australasicus*, *Lumnitzera racemosa*, *Exoecaria agallocha*, *Aegialitis corniculatum* and *A. annulata* are present and abundant in north-east Queenland mangal forests.

Coles *et al.* (1992) mapped seagrass beds between Cairns and Bowen. Between Abbot Bay and Cape Edgecumbe the following species were recorded: *Halodule uninervis*, *Halodule pinifolla*, *Halophila decipans*, *H. ovalis*, *H. ovata* and *H. spinulosa*. This survey showed that irregular patches of seagrass bed occurred in nearshore waters in Abbot Bay. Five small beds were located in the nearshore waters within an

approximate radius of 6 km outside the mouth of the Elliot River (Coles *et al.* 1992). Seagrasses have therefore not, to date, been recorded within close vicinity of the development site near the Elliot River.

2.4.2 Vegetation on the Property

A complete description of vegetation on the block has not been undertaken, but a preliminary visual account has been made. The block adjoins extensive salt pans. Part of the Lots contains claypans and salt-affected lands. The remainder of the land includes grassland, sparse open woodlands and, in the southwest corner of the site. a vegetated woodland. The site abuts a tidal, mangrove-lined creek. These are sparsely populated with mangroves (including *Avicennia marina* and *Ceriops tagal*) growing in discrete patches. Occasional Pandanus palms occur on the site. Marine groundcover occurs near the banks of the creeks and tidal estuaries, and around some of the fringes of the saltpans.

No	DATE	DESIGN REVIEW	REV'D P MGR	APP'D P DIR	AMENDMENT

SINCLAIR KNIGHT MERZ

Sinclair Knight Merz Pty Ltd
ACN 001 874 095

34-36 Glenferrie Drive
Robina QLD 4226 Australia
Telephone (07) 5593 3111
Facsimile (07) 5593 1181

CLIENT: PACIFIC REEF FISHERIES

PROJECT: GUTHALUNGRA

DRAFTER	DRAFTING CHECK	PROJECT DIRECTOR
A.W.J.	M.B.	
DESIGN REVIEW	PROJECT MANAGER	

TITLE: GUTHALUNGRA
PROPOSED PRAWN FARM

SCALE	DRAWING No	No IN SET	AMDT
1:7000	Figure 2.1		

0 10 20 30 40 50 60 70 80 90 100
FULL SIZE ON ORIGINAL

A3

2.5 Fauna

As stated previously, the site lies in the Brigalow Belt Bioregion. A systematic survey of the fauna has not been done for this bioregion; only accounts for specific localities with the bioregion are available. Information on rare and threatened fauna is available for the Brigalow Belt, as a whole, but not for the specific locality of the development site.

The information for fauna in the Brigalow Belt along the Queensland coastal plain relates to 79 species of animals including:

- eutherian mammals (3),
- marsupials (8),
- birds (29),
- marine turtles (5),
- insects (4),
- lizards (13),
- snakes (4), and,
- the saltwater crocodile.

Four of these species listed are presumed extinct, 10 endangered, 30 vulnerable and 35 rare (Sattler and Williams 1999). There is no evidence at hand to suggest that the property contains such species, but such site-specific determinations will be made if required during the EIA process.

The fauna on the proposed development site have not been documented but information is available for the Cape Upstart Lowlands area (which is east and north of the site) (Australian Heritage Commission). Cape Upstart is a protected area with natural integrity.

Within the Cape Upstart Lowlands is a wetland that is an important drought refuge for local waterfowl and staging point for migratory and nomadic birds. Several of the migratory birds are listed either or both the Japan Australia migratory Birds Agreement (JAMBA)/China Australia Migratory Birds Agreement (CAMBA). These birds include the Sharp-tailed Sandpiper, *Calidris acuminata* and the Whimbrel, *Numenius phaeopu.*, The Cape Upstart massif is near the northern distribution limit of the brush tailed wallaby *Petrogale penicillata.*

The Upstart Bay Dugong Sanctuary 'A' zone is located in Upstart Bay (refer **Figure 2.2**). The dugong is renowned as one of the values for which the Great Barrier Reef was listed as a world heritage area.

2.6 Coastal Geomorphology

Derived from a group of residual hills, the Elliot River extends for 40 km across the gently sloping coastal plain to its mouth. The river drains a short catchment area of only 290 km^2 which borders the Bogie River catchment (the Bogie River is a major south-eastern tributary of the Burdekin River). Typical of dry tropical streams, the freshwater inflows only occur during the wet season usually from January to April (Oliver, 1978). The channel is uniform in width for most of its length at 100m (measured at the Bruce Highway Bridge) until it widens out rapidly 3.5 km from the

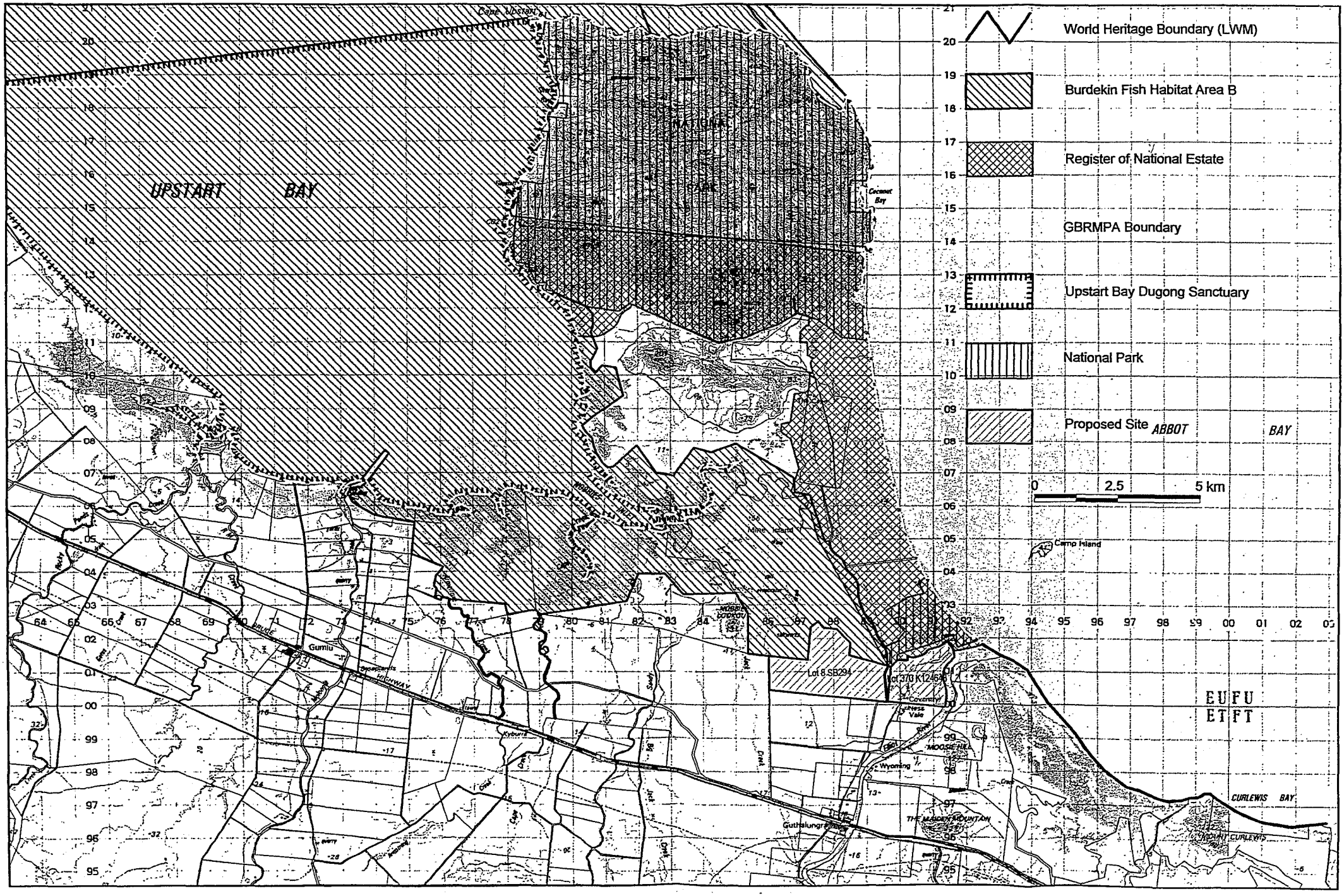


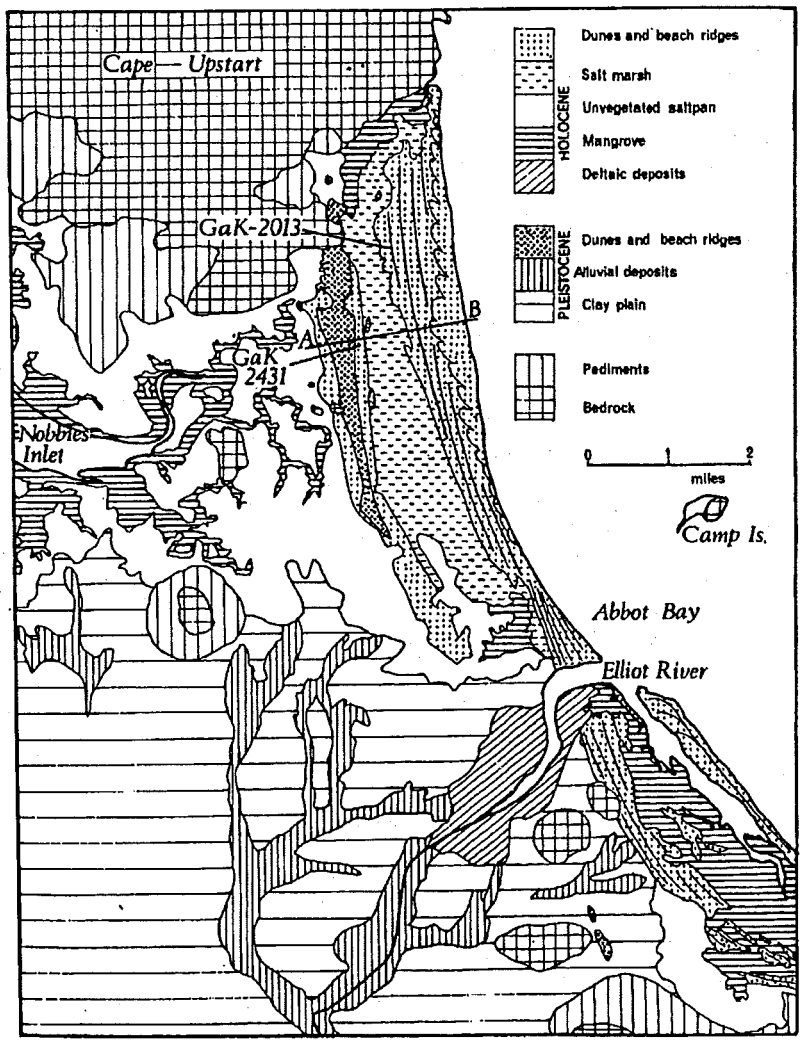
Figure 2.2 Significant Boundaries Adjacent to Proposed Site

mouth to 300m indicating the tidal limit. Ox bow lakes suggest former channel positions and depositions at Coventry and the main river channel.

The river has contributed large volumes of sand to the area north of the mouth (tombolo) (Hopley, 1970) and is believed to be the source of the 4.25 km long sand barrier complex to the south-east, as it is the only stream in the area with the capacity to deliver such large volumes of sand. Hopley (1970) observed that erosion was occurring at the southern end of the tombolo implying a decline in sediment delivery, however, it is not known if this is still occurring. Aerial photo analysis of the barrier complex reveals an extension of the recurves between 1985 and 1998, suggesting some recent accretion.

Elliot River's contribution of sand is valuable to the maintenance of current hydrodynamic conditions in both Abbot and Upstart Bay. In Hopley's (1970) account, he describes how sand deposition from the Elliot River created the tombolo that linked Upstart Island to the mainland over 6 000 years ago (**Figure 2-3**). Continued deposition has lead to the progradation of the shoreline to its current position. This narrow sand ridge or tombolo is the only feature connecting Cape Upstart to the mainland that is not subject to tidal inundation. Therefore, sand transfer patterns around Elliot River are important to prevent the breaching of the tombolo thus preserving the existing case and preventing the separation of Cape Upstart from the mainland. While the effect on sand transport and replenishment from the proposal is negligible, it is nominated here as one of the key natural features and processes of the coastal system, and one of the reasons that the Cape Upstart region is recognised as valuable.

■ **Figure 2-3 The Geomorphology of the Elliot River Floodplain**



Source: Hopley, 1970.

2.7 Socio-Economic Status

2.7.1 Recent Socio-economic Trends

The population of the Bowen shire, which includes Bowen, Collinsville and surrounding areas, is approximately 14 500. There are approximately 6 500 in the labour force with approximately 90% of these employed. A high percentage of these people are employed in the agriculture sector and fishing industry (Gibson Associates, 1998).

Large industries tend to offer fewer permanent jobs with contract work becoming more common. Any further growth in the agricultural industry is unlikely with the current levels of infrastructure, due to the weak market and based on crop yields from rainfall, unpredictability of reliable rains. The meatworks at Merinda has recently closed down causing both an increase in unemployment in the region and a shift in the industry base of the region. These events indicate that, although employment in the area is relatively stable, growth in the region is unlikely unless there is input from new

forms of investment or expansion of infrastructure to support continued development of existing enterprises.

2.7.2 Strategic Planning – Bowen Shire Council / Bowen Collinsville Enterprise Aquaculture Policy

Aquacultural development has been recognised as a likely significant contributor to employment opportunities and investment within Bowen Shire. It is understood that the Bowen Shire Council supports development of sustainable aquaculture ventures within its region, on the basis that land within the Shire has been identified as being suitable for aquaculture (Pacific Aquaculture Consultants, 1999).

The aquaculture industry is considered to offer employment opportunities derived from medium level investment. It is recognised as valuable to the local community, providing for those who are no longer working within other industries, but have experience and skills derived from primary industries (such as cattle and fishing industries). It is also seen as opportune for development of skills for the youth living in the region.

2.8 Cultural Significance

The Australian Heritage Commission has determined that the Cape Upstart Lowlands area have indigenous and archaeological values of National Estate significance. These were identified at the time of listing of the general region, based on the occupation of the region by indigenous people over many generations. A cultural heritage / archaeological assessment and consultation program will be undertaken to determine sites of cultural significance on the proposed development sites.

3. Proposed Aquaculture Development Plan

3.1 Proposed Hatchery Design

An integral part of the proposed aquaculture enterprise is to design and construct a facility to propagate and rear young to the post-larvae (PL) stage for placement into the growout facility. The proponents also intends to use this facility as a source of animals to stock its growout operation near Alva Beach via Ayr.

The hatchery will be developed as an independent aquaculture facility. It will require a separate intake pipe for water supply and will be managed separately from the growout ponds.

An integral part of the hatchery facility will be the implementation of biosecurity measures to maintain the integrity of the larvae production process. High quality water treatment, water reuse and disease prevention/control measures will be implemented as part of this facility, use "best practise" techniques and technology.

Pacific Reef Fisheries will work collaboratively with agencies such as Department of Primary Industries (Fisheries), and organisations such as the Australian Institute of Marine Sciences and CSIRO to determine the optimum combination of species culture, husbandry requirements and water treatment technologies appropriate for the site.

The "footprint" of the hatchery infrastructure and required water intake and release volumes will be very small in comparison to the proposed growout facility for prawn growout.

3.2 Proposed Farm Design

The farm production system will generally be based on a design relying on a "broad scale" production system and, as such, will include the following key elements and infrastructure:

- Numerous growout ponds (100m x100m) supported by the nursery facility (used to maximise the success rates of post-larvae)
- At least one seawater storage dam
- Wastewater retention, sedimentation and treatment areas (by biofouling, biofiltration basins and/or constructed mangrove wetlands)
- Processing and storage facilities
- Supplementary freshwater storage dam(s)

Other ancillary elements of the project will include:

- pumped water supply offtake and associated pipeline works
- water supply channels
- drainage channels
- access roads
- internal power supply infrastructure
- stormwater drainage works
- office and administration buildings
- domestic residences for farm managers.

Figure 3.1 gives a general indication of the current conceptual layout of the development. A maximum of 400 one-hectare ponds can occupy the site. The nature and configuration of works will be developed and refined during the course of the EIS, as site constraints and environmental issues become better known.

3.2.1 Water Management

The water management regime to be employed on the farm will be dependent on a range of factors such as:

- type of crop grown (penaeid prawns, other endemic marine species)
- animal husbandry techniques adopted
- quality of water intake
- opportunity for water recirculation (as determined by topography, evaporation, seawater storage, on-farm quarantine procedures, wastewater treatment success)
- constraints on water quality and volumes that can be released from the site.

The location of the site, and the likely significance of local aquatic environmental values, suggest that stringent controls will be placed on tailwater releases (ie. pollutant loads). In recognition of this requirement, and the operational benefits that can be achieved through efficient water management, it is proposed that a minimum exchange and water reuse system will be developed for the farm. The detail of the systems to be employed will be developed early in the EIS process, however, it is likely to include "best practice" features such as:

- sedimentation areas and artificial marine plant systems
- polyculture systems for managing and optimising exchange water quality and seafood production
- reuse of exchange water on-farm
- additional treatment of water to be discharged from the farm
- the benefits of various penaeid species with different biological and husbandry requirements
- release strategies to minimise disturbances in receiving water systems.

Pacific Reef Fisheries will work collaboratively with agencies such as Department of Primary Industries (Fisheries), and organisations such as the Australian Institute of Marine Sciences and CSIRO to determine the optimum combination of species culture, husbandry requirements and water treatment technologies appropriate for the site.

3.2.2 Pond Seepage Control and Potential Groundwater Effects

It is common practice in Australia for growout ponds and storage basins to be earthen based, sometimes with clay lining to improve water holding capacity and reduce seepage losses.

There will be potential for seepage of water from farm growout ponds, storage dams and exchange water treatment areas to infiltrate local groundwater systems. In coastal areas, this effect is often made more complex as aquifers may be shallow, transient or seasonal. As part of the EIS process, an investigation of the local soils, hydrology and hydrogeological characteristics will be undertaken to assess the potential risk associated with seepage. Typically, however, in estuarine or near coastal areas, the risk is typically low particularly if there are no conflicting landuses in close alignment with the proposed 'maritime' use of the site. Appropriate control measures can be

implemented should there be a need, in accordance with the risks identified by the hydrogeological investigations.

3.3 Stock Management

The most common type of animal grown will likely be from the genus *Penaeus*. These species will include:

- *Penaeus monodon* , the Black Tiger prawn,
- *Penaeus esculentis,* the Brown Tiger prawn, and
- *Penaeus merguiensis,* the Banana prawn.

Pre-feasibility assessment will also be made into the commercial success and operational determinants for adoption of *Penaeus japonicus,* the Kuruma prawn, as a culture species.

Other species which may be reared on the farm are, *Scylla serrata,* mud crab, *Lates calcarifer,* Barramundi, as well as other species such as mangrove jack, oysters, *Artemia* sp., barramundi cod, coral trout, grouper, and mullet. Some of these species may be used selectively to enhance wastewater treatment (oysters, mullet) ie. for the purpose of nutrient removal, and not subject to commercial sale.

Details on stock management, including stocking densities, types and amounts of feed and fertiliser, and use of any other chemical, will be developed during the EIS process.

3.4 Disease Management

A disease management plan will be developed during the EIS process when species types and numbers are determined. This management plan will include:

- treatment procedures such as:
  - addition of powdered tea-seed for predator infestation,
  - use of chlorine for disease outbreaks,
  - and quarantine procedures for site isolation; and
- notification and testing procedures.

3.5 Proposed Nursery Facility

The company also intends to operate a dedicated nursery facility. The aim of the nursery operation is to maximise 'return' from a finite natural resource (ie. wild harvest females and their offspring) by increasing the strike or success rate of juvenile prawns. At a time when the industry generally competes for a finite pool of PLs and when the industry relies on broodstock females being brought ashore from the wild harvest fishery, it is important to:

- Close the life cycle on desirable fish species (to eliminate dependency on wild harvest fisheries resources); and
- To maximise the success rates of PLs converted to harvest prawns.

The proponents intend to address these issues by operating

- broodstock ponds
- hatchery facilities
- nursery facilities consisting of raceways and maturation ponds.

The company also intends to continue its alliance with research and applied science organisations to promote the development of lifecycle closure technologies.

The farm will aim to have the capacity to supply its own entire prawn stocking requirements through the operation of a commercial brood stock production, hatchery and maturation facility.

Brood stock will be grown from animals produced on the farm (and elsewhere), and spawned in the farm hatchery. The nursery facilities will be used to grow the stock from post larval stage through to approximately six weeks maturity. After six weeks the prawns will be transferred to the growout ponds where they remain in the same pond for up to 10 weeks before they are harvested.

An integral part of the nursery facility will be the implementation of biosecurity measures to maintain the integrity of the breeding process. High quality water treatment, water reuse and disease prevention/control measures will be implemented as part of this facility, use "best practise" techniques and technology.

3.6 Seafood Processing Facility

The Seafood Processing Facility is where the prawns and other produce will be prepared for transportation. Produce will be washed and graded on arrival to the facility. It is then separated for cooked or green processing.

The facility will produce discharge water from the cooking and washing of prawns, cleaning of the facility and brine. The discharge water will be released into sedimentation basins and treated and monitored in accordance with other wastewaters.

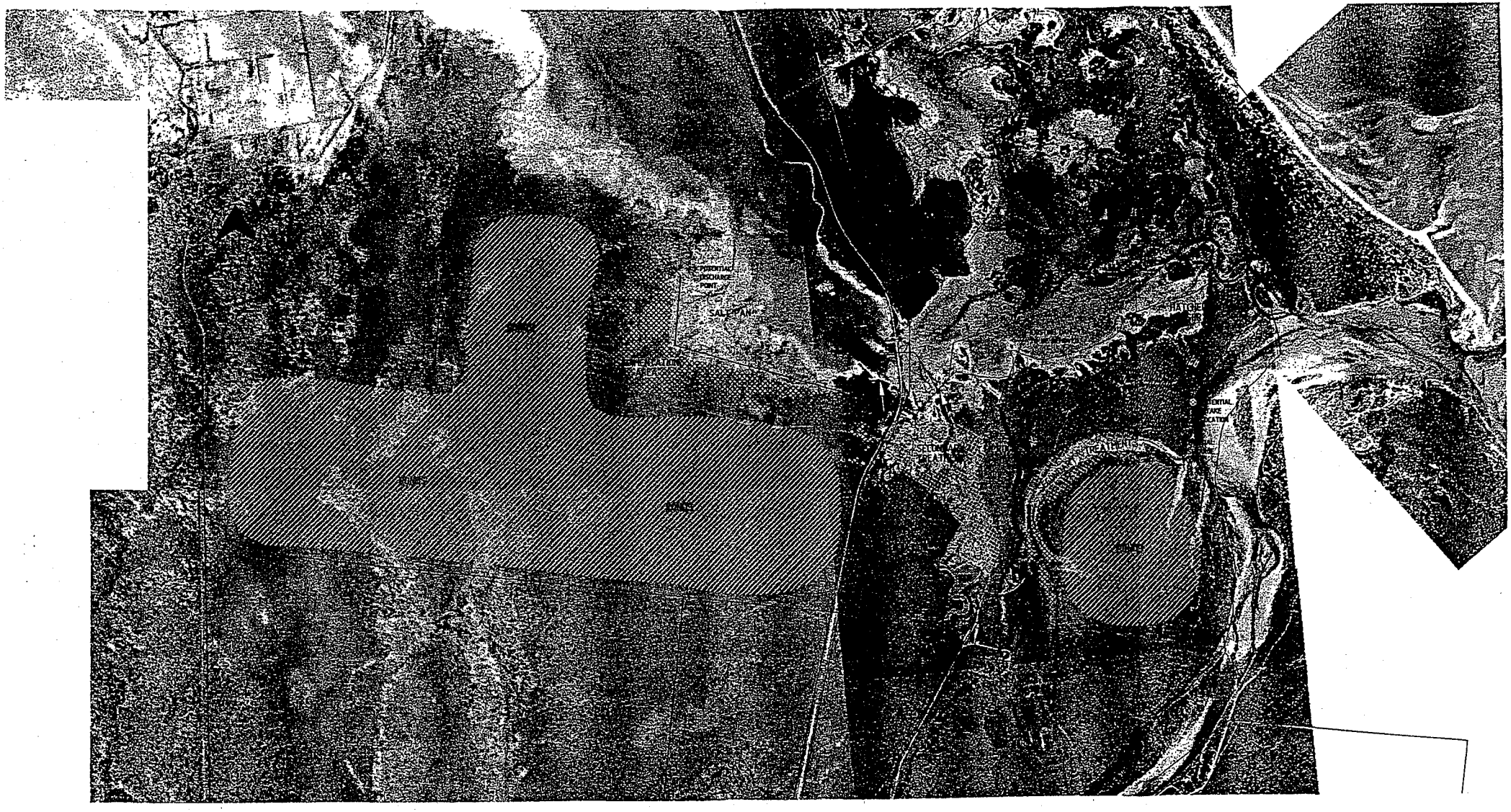
Any solid waste produced will be either incinerated or minced and frozen before being fed to adult prawns.

Product will be tested regularly for diseases in accordance with the Food Standards Code and Food Act 1981. The testing will include chemical standards, physical quality, microbial standards, contaminant residues and specific packaging and labelling requirements.

3.7 Stormwater Management

There are a number of man-made and natural water features located on the property, including is a freshwater dam in existence on Lot 370. When this dam overflows it runs through to the salt pan to the east. One of the proposed concepts is to divert the overflow from the dam into the existing freshwater creek that runs through the centre of the property. This creek currently flows through to an existing dam wall on the property boundary. It has been suggested that this dam be removed so that water can flow onto the salt pan.

On the western part of Lot 8, there is a series of dry shallow gullies which, during the wet season, flow through to the saltpan. These gullies will be diverted around the proposed growout ponds and continue on the original flow path, delivering the same volume of water from up to downstream and doing so with similar hydraulic characteristics.



PACIFIC REEF FISHERIES

GUTHALUNGRA PRAWN FARM
PROPOSED DEVELOPMENT

SINCLAIR KNIGHT MERZ | FIGURE 3.1

Job No. TS03331.100 Date: 15.11.2000

4. Existing Site Conditions

4.1 Typical Soil Characteristics

The soil conditions at the proposed development site were investigated in order to determine the site's suitability for prawn aquaculture. In order to describe the environmental baseline conditions, soil samples were taken to determine:

- average metal and element content
- sulfur (and potential acid sulfate soil) content with depth
- engineering properties.

4.1.1 Preliminary Investigation Methodology

A wide cross section of representative soil samples were collected from across the site. Thirteen (13) pits were excavated and samples were collected from various depths down to 2 m. The location of the test pits is given in **Figure 4.1**. While a large number of samples were tested complete soil maps of the land were not made as this was beyond the scope of the brief. It is possible that some 'patches' of soil not suitable for aquaculture exist on the property but were not detected in this preliminary survey. Each test site was excavated to at least 2 metres (**Figure 4.1**), unless this was not possible (eg. intersecting the water table), with photorecords and notes of soil being removed made at

- 0.2-0.5m
- 0.5-1.5m
- below 1.5m (approximately)

These samples were bottled, labelled, chilled and delivered to Australian Laboratory Services (ALS) for analysis of potential acid sulphate soils, metals and elements. Element and metal content levels were compared to the Australian and New Zealand Environmental and Conservation Council (ANZECC) Guidelines for the Assessment and Management of Contaminated Sites.

Sediment samples were also tested for ASS in accordance with guidelines prepared by the Queensland Acid Sulfate Soils Investigation Team (QASSIT) (Ahern et al 1998). Samples were sent to Australian Laboratory Services for analysis of Total Potential Acidity (TPA) and Peroxide Oxidisable Sulfur (S_{pos}%) using the POCAS (Peroxide Oxidation Combined Acidity & Sulfate) method. This method is recommended by Ahern et al (1998).

Thirteen (13) samples have been collected as a preliminary description during the pre-feasibility assessment and tested for properties of the soil; specifically,

- USCS-manual classification of soil type,
- shrinkage,
- dispersivity, and
- plasticity index.

The results of these analyses will guide feasibility and early decision-making about the suitability of the soils for pond construction and drainage works.

4.2 Soil Characteristics

Analytical results of engineering properties indicate a series of silty clay materials from across the proposed site that are suitable for lining of the ponds and outer layers of the embankment. The balance of material tested can generally be used for bulk earthworks and the core of embankments.

None of the soil samples had any odour or discolouration normally associated with AASS or PASS. Samples from each pit were sent to the laboratory for detailed testing and examination to test for the exact content of sulfidic material.

4.2.1 Soil Chemistry

4.2.1.1 Potential Acid Sulphate Soils

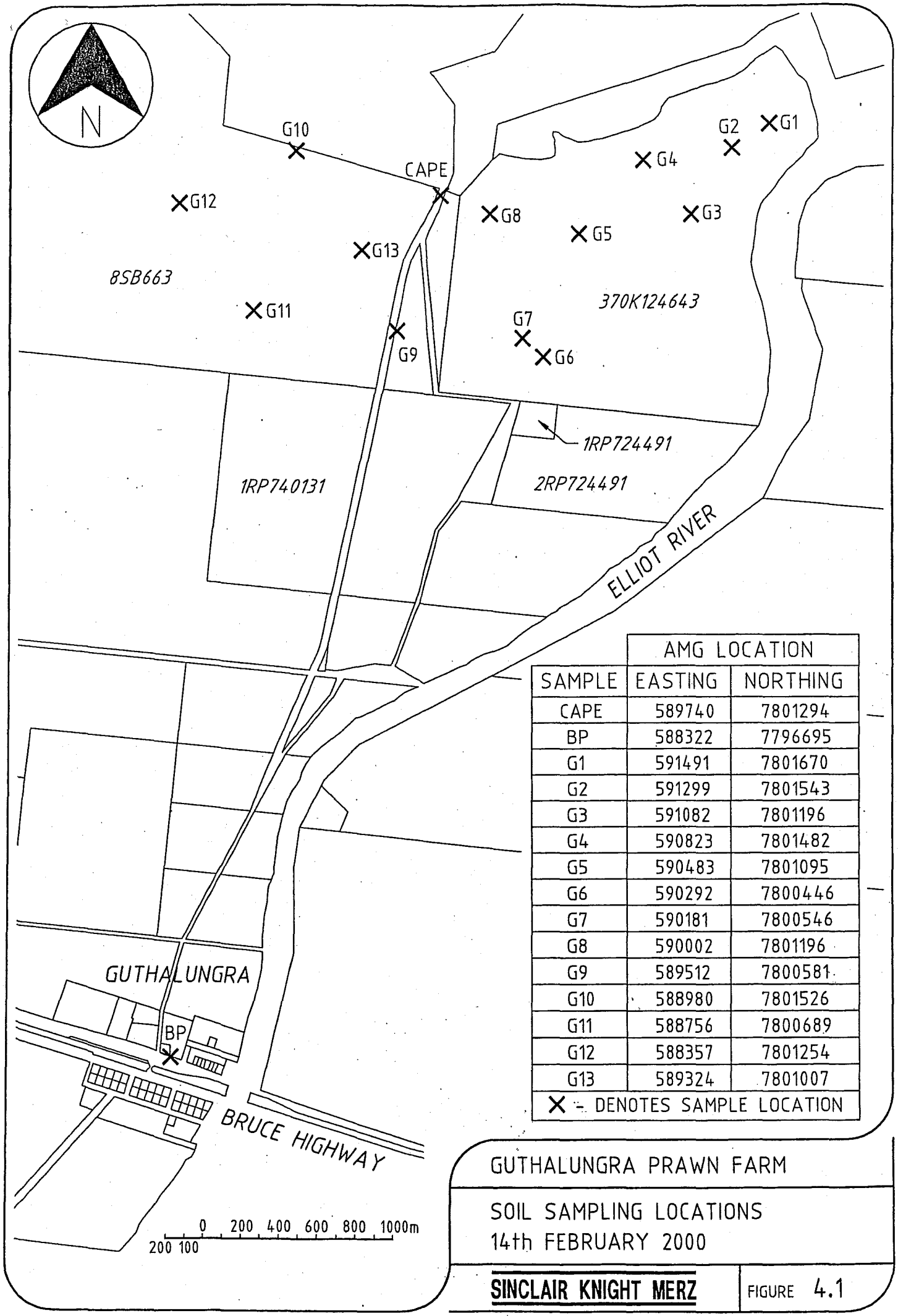
Significant quantities of sulfuric acid can be produced if sediments containing iron sulphides are exposed to air. These soils are commonly called acid sulfate soils (**ASS**). Actual acid sulfate soils (**AASS**) are soils containing highly acidic soil horizons of pH of 4 or less. Potential acid sulfate soils (**PASS**) are soils containing sulfidic material that has not been exposed to air or oxidised. The field pH of these soils in their undisturbed state can be pH4 or more, and may be neutral or slightly alkaline. However, they pose an environmental risk when disturbed, as they will become very acidic when exposed to air and they oxidise.

Acidification results from oxidation of sulfidic soils in the atmosphere. If soils remain buried in anaerobic conditions, then acidification cannot occur. Such conditions may also be present in compacted clays or below the water table. Excavation of anaerobic soils or lowering the water table is the most common cause of acid sulfate problems. Clay soils typically have a higher buffering capacity and lower rate of oxygen movement. Sandy soils lack these properties and are highly sensitive to even small levels of sulfide or other acid forming agents. Therefore, aerobic sandy soils may also be highly sensitive to acidity generation.

Soils on Lots 8SB663 and 370K124643 (with the exception of two) were free from potential acid sulfate soils. In two samples, PASS levels exceeded the 'Action Criteria' (specified by QASSIT guidelines). Elevated PASS levels were encountered at depth (>1.5m) in an area close to the Elliot River (Sites G1, G2.See **Figure 4.1**). It is likely that all soils in this area and at this depth (less than 2 metres AHD) are generally sulfidic of recent or ancient geological origin and that appropriate treatment and/or disposal of PASS would be required if deep excavations (ponds or channels) were made in the vicinity.

4.2.1.2 Soil Contaminants

All soils tested have to date contained metal and element concentrations within the range of 'background' or 'natural' levels and well below any "investigation threshold" or level of concern. However, in four test samples, manganese exceeded the investigation levels set by ANZECC (1992), yet they were well within the background range typical of Australian soils. These manganese levels were likely a result of local, site-specific geology, likely in chemical complex and not expected to be harmful to crustaceans.



SAMPLE	AMG LOCATION EASTING	NORTHING
CAPE	589740	7801294
BP	588322	7796695
G1	591491	7801670
G2	591299	7801543
G3	591082	7801196
G4	590823	7801482
G5	590483	7801095
G6	590292	7800446
G7	590181	7800546
G8	590002	7801196
G9	589512	7800581
G10	588980	7801526
G11	588756	7800689
G12	588357	7801254
G13	589324	7801007

× = DENOTES SAMPLE LOCATION

GUTHALUNGRA PRAWN FARM

SOIL SAMPLING LOCATIONS
14th FEBRUARY 2000

SINCLAIR KNIGHT MERZ

FIGURE 4.1

Job No. TS03331 Date: 28.11.2000

4.2.1.3 Soil Engineering Properties

The following is a summary of the engineering property analyses undertaken on 11 samples of soil taken from across the Guthalungra site.

- Moisture Content: The majority of samples had a high moisture content, ranging from 6% to greater than 20% (essentially saturated). In some locations, the water table was found within 1.5 m of the surface, most probably a result of recent heavy rainfall and proximity to the Elliot River and other drainage features (salt pans). The salinity of the water table was not assessed.
- Plasticity and Linear Shrinkage: Testing for these parameters indicated the workability of the clays and their potential to crack during wetting/drying cycles. Two samples (G2A and G9C) showed higher potential than the others, however, cracking of placed clay layers during construction is not likely to be an issue and alternative clay sources are available, if required, for these areas.
- Emerson Class: This index refers to the dispersivity of the soils and the potential for piping failure and erosive action from rainfall. Most of the soil samples exhibited low risk to these mechanisms, so these problems can be avoided to provide sound construction techniques for embankment surfaces (compaction, revegetation, etc.).
- Particle Size Distribution: Those samples with a higher coarse fraction (sands and clayey sands) were sieved to provide information of their particle size distribution (above 75 microns). The results indicate that all the samples are well graded with a fines fraction ranging between 5% and 50%, suggesting they are suitable cohesive construction materials.

4.3 Future Soil Assessments

During the EIS process, soils will be investigated according to Queensland Acid Sulfate Soils Investigation Team (QASSIT) guidelines and the ANZECC Guidelines for the Assessment and Management of Contaminated Sites and Queensland EPA Contaminated Sites Guidelines. For instance, PASS samples will be sampled at 0.5m intervals to a depth of two metres or one metre below depth of proposed soil disturbance.

Full geotechnical assessment of soils across the whole site will also be undertaken to assess the suitability of soils for construction purposes. That is, the availability to win clayey material from on site will determine the location, number and type of ponds that may be constructed. Importation to the site of clay that will help ponds floors and walls to seal effectively, although not desirable, may be necessary should the reserves not be available on the property.

The history of usage of the site includes prolonged use for cattle grazing. It is possible that dipping and drenching facilities existed on the site. A Site Investigation, conducted in accordance with Environmental Protection Agency contaminated site guidelines, will also need to be undertaken to identify the likely location and type of any activity or use that may have generated contaminated material.

4.4 Water Quality and Accessibility

The quality of nearshore waters along the north Queensland coastline is generally excellent. The best set of site-specific data is described with the following characteristics, as follows (source: QDEH & QDNR, 1999).

Water Quality Characteristic	Range or Level
Turbidity	75% data less than 10 ntu; max < 150 ntu
Nitrates	75% data at detection limits; max approx. 0.2 mg/L
Total Phosphorus	75% data less than 0.05 mg/L; max approx. 0.2 mg/L
Chlorophyll-a	50% data less than 10 ug/L; max approx 40 ug/L
Dissolved Oxygen	50% data greater than 80% saturation; range 0-150% saturation

The above data (no.obs.=31-32) were derived from monitoring at a site in the estuary located at an average middle thread distance of 5.5 kilometres from the mouth (DNR Station No.1370802).

Where water quality was poor, these conditions are likely to be associated with large catchment runoff events. This accentuates the need for water intake (pump capacity) and storage capacity on the proposed site to buffer supply of quality water to hatchery and growout ponds especially during seasonal freshwater flows through the mouth of the estuary.

The proximity of the proposed site to the ocean means that tidal intrusion will provide high quality oceanic waters to the point of intake.

4.5 Noise Assessment

A noise assessment has not been undertaken in the area. This type of assessment will occur during the EIS process based on predictions of noise dispersion and attenuation during the construction (eg. plant and equipment) and operations (eg. aerators, refrigeration, transport movements) phases.

The site is located well distant from neighbouring properties and residences. Absence of large numbers of noise sensitive receptors means that the issue of noise intrusion and noise abatement is likely to be minor, but nonetheless worthy of investigation and appraisal. The closest area of human habitation is a non-approved series of beach huts across the mouth of the Elliot River. Occupancy at this site is transient and not approved by Bowen Shire Council.

4.6 Local Traffic and Transportation

The proposed farm is located approximately 3km form the town of Guthalungra and east from the Bruce Highway. Coventry Road is the main road leading basically between the two properties (along the cadastral boundary) and ultimately to the National Park. Watts Road derives from Coventry Road and leads to Lot 370. It is intended that these roads will remain and there will be a need to develop internal access and service roads. The roads do not traverse an easement, nor a road reserve.

The future of the access road, across the private properties, to the southern portion of the Cape Upstart National Park is under consideration. It may not be appropriate to permit general public access across the property given that the site will need to become a controlled access zone dictated by quarantine measures and controls.

An assessment of the impacts of increased traffic flow:

- leading from the National Highway turnoff onto Coventry Road (eg. farm workers, transportation and haulage), and

- along the current roadway (Coventry and Watts Rds),

will assessed during the EIA process.

4.7 Natural Habitat and Resource Management & Protection Areas

A major pre-determining factor in the suitability of any form of development on the coastal zone is its location or alignment with protection and management areas.

An important element to be considered in the suitability of the site is its adjacency with Fish Habitat Area (FHA) (Area B). The FHA is immediately adjacent to the proposal area and property of interest (ie. FHA to the north of Lot 8 on SB663).

Any disturbance to FHA may require sanction by permit from DPI Fisheries. Fish Habitat Areas (Area B) are gazetted to protect important fish habitat. Their purpose is to provide management buffers, to maintain biodiversity of fisheries resources and minimise the impacts from non-fisheries disturbances (refer **Figure 2.2**). This area of Upstart Bay also includes a Dugong Protection Area, administered by GBRMPA.

Consideration may also given to the location of the land of interest because it is directly adjacent to a portion of Cape Upstart National Park (ie. behind the lowland dunes on the north bank of the mouth of the Elliot River). Naturally, consideration during the EIA process needs to be given to management of visual effects encountered within the boundaries of the National Park (buffers, screens etc).

There are also areas registered through the Australian Heritage Commission under the Register of the National Estate that are located near the site of this proposal. These areas are Upstart Bay-Bowling Green Bay, Cape Upstart National Park, the Great Barrier Reef and Cape Upstart Lowlands (refer **Figure 2.2**).

The site is located on the Elliot River, some 0.5 to 1 kilometres inland from the mouth. At the mouth of the Elliot, where it enters Abbot Bay, Great Barrier Reef Marine Park General Use 'A' zone commences. The waters of Upstart Bay, to the north of the site and on the western side of Cape Upstart, are also in the Marine Park (General Use 'B'). There is also an area zoned under the Marine National Park 'A' zone on the Upstart Bay side of Cape Upstart. At the mouth of the Elliot the World Heritage Area also commences (**Figure 2.2**).

The distribution of various terrestrial (State national park, Register of National Estate listing, fish habitat area) and marine (dugong protection area, commonwealth marine park, fish habitat area) have been summarised in **Figure 2.2**. It suggests that one configuration for the proposal is for intake seawater and release of acceptable quality tailwater (with maximal dispersion characteristics) via the mouth of the Elliot River. Because of the relative importance of natural resource protection values, priority will be given to minimising the risk of off-site impact in the vicinity of Upstart Bay and waterways draining to the west of Cape Upstart (ie. to the north of the site).

5. Legislative Requirements and Drivers

Prior to construction and operation, it is understood that various environmental approvals will need to be granted for the activity from local, State and Commonwealth departments and authorities such as:

- Planning approval for major projects can be granted after application under section 29 of *State Development & Public Works Organisation Act*, administered by Department of State Development. Delegations can be sought by Queensland government departments as lead agencies to act for the Coordinator-General.
- Department of Primary Industries *Fisheries Act* and *Regulations* aquaculture licence, permits and approvals including any disturbance to marine plants;
- Environmental Protection Agency environmental authority *under Environmental Protection Act*;
- *Harbours Act* (repealed) approvals for intake and release structures on tidal lands,
- *Water Resources Act* authority for modifications to bed or banks of watercourses, and Department of Natural Resources planning policies associated with Potential Acid Sulfate Soils (QASSIT).
- State Planning policies including GQAL and draft Coastal Management Plans,
- Bowen Shire Council town planning scheme and "Material Change of Use". Under Integrated Planning Act.
- Consideration by Great Barrier Reef Marine Park Authority *under GBRMP Aquaculture Regulation 2000* and issuance of a Marine Park permit for any structure located or dedicated to making a wastewater release inside a Marine Park.
- Environment Australia approval for "controlled actions" likely being development and operation of a large-scale aquaculture operation in accordance with the *Environmental Protection & Biodiversity Protection Act 1999;*

Following is a description of the likely effect of these various legislative and statutory instruments on the proposal.

5.1 Integrated Planning Act (IPA)

Any "Material Change of Use" may trigger an IDAS application. The use of the Lot 370 and Lot 8 will need to be approved by Bowen Shire Council as they are currently have approval for rural grazing.

IPA defines *impact assessment* as-

"the assessment of-
a) the environmental effects of proposed development; and
b) the ways of dealing with the effects."

Being an impact assessable development, a development permit is required for *material change of use.* Under s.1.3.5 of IPA, a material change of use means:

a) the start of a new use of the land or building; or
b) the re-establishment on the building or land of a use that has been abandoned; or
c) the material change in the intensity or scale of the use of the building or land.

5.2 Great Barrier Reef Marine Park Authority (GBRMPA)

Aquaculture Regulations under the *Great Barrier Reef Marine Park Act* came in to effect as of 23 February 2000. The regulations apply to all aquaculture farms that are larger than 1 hectare of operational area and were not in operation as of October 1 1999.

This farm development will need approval under this piece of Commonwealth legislation. An aquaculture permit will need to be issued from GBRMPA for the proposed aquaculture farm before any discharge of waste into the Marine Park can be lawfully made.

Of major interest in determining the suitability of a release into coastal waters is the quality of the release waters, the strategy for mixing and advecting release waters to an ambient level as quickly as possible, and disease management practices. Such factors, as well as numerous others, will determine the sustainability of aquaculture for the proposed site and sanction to allow the discharge.

5.3 Environmental Protection Act

The Act and Regulation provides a framework for regulating activities that have the potential to release contaminants to the environment. These are prescribed as Environmentally Relevant Activities (ERAs) under Schedule 1 of the *Environmental Protection Regulation 1998*. An environmental authority will need to be issued for the farm operations including aquaculture (hatchery and growout facilities) and seafood processing. There may also be ancillary activities to the primary activity such as motor vehicle workshop" (for farm equipment maintenance purposes) and storage of petroleum products.

5.4 Beach Protection Act

The Beach Protection Authority is a statutory authority that manages, among other things, Erosion Prone Areas, declared over areas where special development controls are required. If a development occurs in an Erosion Prone Area, then approval of any clearing of vegetation or earthworks on freehold land can be granted under section (47)(2) of the *Beach Protection Act*. Any disturbance of earth on Unoccupied Crown Land will require a submission, consultation and approval with the Beach Protection Authority. It is likely that if a seawater intake pipeline and pump station is constructed, approval under *Beach Protection Act* will be required.

Should the plan to intake waters from the delta proceed, a written submission to the Beach Protection Authority will be made to obtain advice on whether the subject land falls within an Erosion Prone Area and to seek formal approval.

5.5 Fisheries Act

The objective of the *Fisheries Act* is to maintain sustainable fish resources in Queensland waters. Values and links between fish and their habitats are recognised and protected through measures such as declaration of Fish Habitat Areas and the protection of marine plants. A Fish Habitat Area has been declared in Upstart Bay. Declared Fish Habitat Areas can exist up to the high water level, including within estuaries. The legislation also allows for the granting of approvals for works in

declared fish habitat areas. This approval is contingent upon potential impacts being minimised, the works are for fisheries purposes and community benefit and mitigation is undertaken to counter loss of fisheries habitat values.

Six categories of Permit applications reflect works or related activity that may be considered for approval in a declared Fish Habitat Area under section 38 of the *Fisheries Regulation 1994*:

- Category 1 - maintain an existing facility (s38(2)(a) of the Regulation applies)
- Category 2 - restore an area or natural process in it (s38(2)(b) of the Regulation applies)
- Category 3 - management, use or enjoyment of an area (s38(2)(c) of the Regulation applies)
- Category 4 - community infrastructure (s38(2)(d) of the Regulation applies)
- Category 5 - education/research (s38(2)(e) of the Regulation applies)
- Category 6 - public health and safety (s38(2)(a) of the Regulation applies)

"Marine plants are defined as any plant on tidal land, or plant material that usually grows on, or adjacent to, tidal land, whether it is living, dead, standing or fallen. Whilst the *Fisheries Act* does not specifically identify plant species that are encompassed by this definition, mangroves, seagrass, algae, saltwater couch, saltpan succulents, Melaleuca in adjacent swamps etc comprise typical marine plant communities. Tidal land in this definition includes all land up to an including the level of Highest Astronomical Tide." (DPI 1997 Fisheries Habitat Information Booklet).

Under section 123 of the Act, all marine plants are protected regardless of land tenure. Any proposed removal or destruction of marine plant species or any impact on the integrity of a fisheries resource will require the proposal to be forwarded to the Department of Primary Industries (Fisheries) for consideration. This will apply for any marine plant on the freehold property, as well as any marine plant disturbed on other land.

5.6 Harbours Act

The *Harbours Act* is now repealed with sections transitional *under Coastal Protection & Management Act.* Applications and approvals are administered by the Environmental Protection Agency. The Act provides for management of issues such as the safe navigation of coastal waters and development approvals for works below high water mark. Section 86 requires that approval must be granted for works on tidal lands or waters such as infrastructure such as an intake pipe sited in Queensland waters.

5.7 Water Resources Act

If any construction of development is likely to occur in a watercourse (including a lake, waterbody or a stream or creek), a permit will need to issued from the Department of Natural Resources under the *Water Resources Act.*

5.8 Lands Act

Any future development such as installation of a pipeline to service a seawater offtake would probably require burying such a pipeline to maintain the current use of the land

(for grazing). An application will be made to the Department of Natural Resources (Lands Division), to seek consent and granting of a permit to occupy for the pump housing and pipeline infrastructure on Crown land, if the option to use an intake is required.

5.9 Queensland Cultural Records (Landscape Qld and Queensland Records) Act

Any item, record or relic encountered will be managed in accordance with legislative requirements. It is not anticipated that such material will be disturbed during approved construction works on the land parcel. Should they need to be, they will be managed and reported to EPA, Townsville.

5.10 Commonwealth World Heritage Properties Act

The Marine Park in the waters adjacent to Lot 135 NPW463 and Lot 26 SB441 is located within the Central Section of the Marine Park. The Central Section Zoning Plan defines this area as General use 'A'.

The World Heritage Properties Act also gives powers to the Commonwealth to regulate activities which affect world heritage values in the world heritage area. Section (66)(2) gives the Commonwealth powers to intervene in land-based activities under circumstances where there may be risk to the adjacent world heritage values.

It appears that no other specific approval will be required for the planned development under this legislation, although any risk to world heritage values should be considered.

5.11 Environmental Protection & Biodiversity Conservation Act (EPBC Act)

The Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) established a new Commonwealth process for assessment of proposed actions that are likely to have significant impacts on matters of national environmental significance of on Commonwealth Land.

An 'action' under the EPBC Act includes a project, development, undertaking, activity or series of activities. An action needs approval if it is taken:

- anywhere in Australia and has, will have, or is likely to have a significant impact on a matter of national environmental significance,
- on Commonwealth land and has, will have, or is likely to have a significant impact on the environment,
- outside Commonwealth land and has, will have, or is likely to have a significant impact on the environment on Commonwealth land, or
- by the Commonwealth and has, will have, or is likely to have a significant impact on the environment.

Matters of environmental significance identified in the Act as triggers for Commonwealth assessment and approval are:

- World Heritage Properties,
- Ramsar Wetlands of international importance,
- Nationally threatened species and communities,
- Migratory species protected under international agreements,

- Nuclear actions, including uranium mining, and
- The Commonwealth marine environment.

As the proposed farm will make a release into a coastal river system that enters the Commonwealth Marine Park, and is nearby a National Park with representative high value species and communities, it is believed that the integrated aquaculture facility proposal is likely to be a "controlled action" under the EPBC Act. A referral will need to be made to Environment Australia so it can determine if this proposed development will trigger Commonwealth assessment, and this is being done prior to lodgement of this Initial Advice Statement to other referral and concurrence agencies.

5.12 Coordination of State and Commonwealth Planning Approval Processes

It is desirous to run a single, coordinated process to seek assessment and approvals under both State and Commonwealth legislation. Presently, the State and the Commonwealth are deciding how their respective legislation can be integrated, with the aim being that specific State planning and operational instruments and approvals can be 'accredited' by the Commonwealth. Until that 'accreditation' is granted, separate State and Commonwealth applications and assessment processes will be required. However, the proponent is interested to amalgamate the requirements of the State and Commonwealth to eliminate potential for duplication during the EIA phase.

It is the intention of the proponent to seek a 'case-by-case' accreditation by the Commonwealth for a State assessment process run under section 29 of *State Development & Public Works Organisation Act.*

6. Conclusions

- The proposed works, nominated for construction and operation on Lot 370 K124643 and Lot 8 SB294 (Parish of Curlewis, County of Salisbury, Shire of Bowen) is for the purpose of aquaculture. Currently the area is zoned for rural grazing of cattle. Proximity to essential communication and transport infrastructure and services networks of Bowen, the Burdekin and Townsville makes the venture commercially viable.

- The ultimate development of the farm is intended to include a hatchery, nursery and growout pond facilities for predominantly penaeid species. Water will most likely be drawn from the Elliot river. The development footprint will include growout ponds (up to 300 one-hectare earthen above ground ponds), a hatchery, a nursery, dedicated water cycle management and treatment areas, service (workshop) buildings, a seafood processing facility (including refrigerated storage shed) and water supply and drainage infrastructure (including pumps and pipes).

- Approvals will be sought from a variety of agencies beginning with a referral to Environment *Australia (Environmental Protection & Biodiversity Conservation Act*) and notification to the Queensland Department of State Development (for an assessment process under *State Development & Public Works Organisation Act*).

- The proposal will be planned, designed and proposed for approval in terms of various stages of development including development of:

  - a hatchery

  - a nursery and the first set of growout ponds

  - subsequent sets of growout ponds.

- The Environmental Impact Assessment (EIA) process will detail, as part of the iterations undertaken to identify the "best" proposal, a series of alternatives to contrast the final preferred proposed model. In this way, a case for the preferred proposal will be substantiated.

- Based on a preliminary round of information, the existing condition of the natural environment is that:

  - conditions are dry and warm and suited to single crop per year culture of penaeids in broad-scale, proven production systems,
  - marine and estuarine water quality and accessibility is likely to be excellent, thus generally promoting the development and sustainability of this type of industry,
  - soils on the site are:
    - free from contamination,
    - suitable for engineering purposes (pond constructability and maintenance, geotechnical stability and seepage control), and,
    - free from potential acid sulfate content (except near the banks of the Elliot River with little need for disturbance).

- the large majority of 'desirable' native vegetation (due to previous historical grazing uses of the coastal plain) is likely to be outside any development footprint of proposed broad-scale growout ponds

Because of the very nature of these features in both the coastal zone and the Bowen region – ie. they are attractive not only for aquaculture – the resource demands a high level of management and relevant mitigation measures that either reduce or eliminate risks of adverse environmental impacts on the natural and common coastal resources.

- High value natural aspects of the environment adjacent to the site are apparent at the outset. The proposal will proceed - subject to initial feedback from regulatory agencies – to assess the feasibility of designing an aquaculture facility that not only fits into the constraints of the landscape, but satisfies the qualities sought for the sustainable future of the enterprise, the Bowen region, and the State of Queensland.

- Furthermore, the applicant intends to incorporate a set of practices forming an integrated series of water management and treatment technologies including:
  - sedimentation areas and artificial marine plant systems for water treatment,
  - polyculture systems for managing water quality and optimising seafood production,
  - seawater storage reservoirs for managing on-farm water cycles,
  - reuse and recirculation of exchange water on-farm,
  - optimising use of various penaeid species to achieve a balanced operating condition,
  - release of treated pond water under optimal receiving environment conditions.

  Feasibility assessments will be conducted to determine the most appropriate set of strategies and procedures to deliver the desired outcome.

- The applicant seeks to provide an equitable balance of features that not only promotes the financial and environmental success of the venture, but achieves this within the broader social, economic, cultural and ecological framework.

- The venture also aims to satisfy an array of standards and requirements of contemporary government policy and legislation in various arenas. In this regard, the proponent also seeks the support of local, State and Commonwealth government to expedite a streamline administrative and assessment process that allows for coordinated direction and assessment of this EIA process. We submit that this level of guidance and service can be provided without compromising the requirements or ultimate decision-making ability of the respective agencies and governments.

7. Draft Terms of Reference

7.1 Introduction

The following suggested Terms of Reference have been proposed to enable assessment of a proposed aquaculture farm near Guthalungra approximately 30km North of Bowen. They are contemporary for north Queensland aquaculture ventures and similar to other ToRs recently approved for other EIA processes.

The proponent has agreed to approach the project mindful of the EIS and public review process:

- To provide a source of information from which interested individuals and groups may gain an understanding of the proposal, the need for the proposal, the alternatives, the environment which it would affect, the impacts that may occur and the measures to be taken to minimise these impacts;
- To provide a forum for public consultation and informed comment on the proposal; and
- To provide a framework by which decision-makers can consider the environmental aspects of the proposal in parallel with economic, technical and other factors.

The report will be made available for public review. If the proponent requires any information to remain confidential, this will be clearly indicated.

7.2 Suggested Content of the EIS

The EIS is to address specifically the items set out below:

7.2.1 Executive Summary

7.2.2 Background and Need for the Proposed Development

The need for the proposed development should be discussed, including compliance with local planning strategies and policies, population and growth projections and other forecasts. A description of the Developer, its mandate, and the strategy and objective behind the proposal should be included. This section should also include the legislative basis or government policy on which the project is based, and a summary of the relevant legislation which may affect this proposal.

7.2.3 Alternatives Considered

Any alternatives considered in developing the proposed development should be described in detail including the 'do nothing' option.

The discussion of alternatives should address the likely impact of the preferred alternative on the environment. Alternatives considered should be tabulated in criteria which form the basis of decision making. The criteria are to include environmental criteria and costs.

More specifically, the discussion of alternatives should describe any prudent and feasible alternatives to the proposed design and construction methods investigated during the planning process. Include consideration of alternative excavation methods that may be employed, and proposals for creek diversion and management of water flows and water quality. Discussion should include the reason for the choice of the preferred option and the likely situation if the project does not proceed. Alternatives should focus on two broad categories:

a) alternative design options; and
b) alternative operation proposals for control of impacts (where these are available).

Evaluation criteria should include relative level of environmental harm and risk of environmental harm (air, noise, waste, social, biological, and cultural heritage sustainability and life-of-project considerations). Alternatives should be discussed in sufficient detail to enable an understanding of any environmental tradeoffs inherent in choosing the preferred options.

Tracking of changes adopted during the EIA process will be made to show how improvements and alternatives have been incorporated into the proposal.

7.2.4 Description of the Existing Environment

A description of the existing environment is required, including explicit reference to World Heritage values in the vicinity of the development site.

In summary, details shall include the following:

Physical Environment

- Location and general site characteristics:
  - historical and current usage of site and adjacent land, coast and waters;
  - historic heritage values;
  - existing facilities on or adjacent to the site;
  - town planning provisions;
  - present land tenure of each parcel of land associated with the development including the areas below high water mark; and
  - World Heritage and National Estate status and other environmentally significant areas of site and surrounding regions.

- Climate
  - precipitation and temperature;
  - wind velocity, direction, and seasonal variation;
  - evaporation data;
  - atmospheric stability; and
  - incidence of extreme events (eg. Cyclones, floods, storm, storm surges, etc.)

- Soils and Geology
  - topography;
  - geology;
  - erosion potential;
  - contaminants;
  - acid-sulphate soils;

- soil stability; and
- identify flood prone land and seasonally in undated areas.

- Hydrology and hydrogeology
  - surface water and groundwater quality and quantity;
  - representative profiles across the site demonstrating the locations and cross-sections of any existing creek channels;
  - impacts of flood events upon the site;
  - details on any impacts works may have on recreational fishers;
  - details on any permanent adverse impacts;
  - details on any impacts on river system from release of effluent;
  - baseline information to seek approval under current legislation; and
  - details on changes in river hydrology and tidal regimes and associated impacts on bank stability and riparian and marine plant communities.

- Marine Environment
  - water quality;
  - season, including identification of pollution and pollutant sources;
  - hydrodynamics of the adjacent area, including currents and waves under normal, cyclonic and storm surge conditions; and
  - the ecological functioning of the estuary including tidal flushing characteristics and areas reliant on high productivity tidal flows.

- Visual Amenity
  - existing visual amenity of the site and its views, including views from World Heritage areas and National/State Parks, and surrounding townships.

- Noise
  - background noise levels and sources and noise sensitive receptors;
  - define areas likely to be affected by the development;
  - describe how the management of the proposed activities will address the requirements of *the Environmental Protection (Noise) Policy 1997.*

- Air Quality
  - existing air quality, including dust, smoke and colours;
  - sources of any dust nuisance, including that associated with haulage roads, should be detailed.

- Traffic and Access
  - traffic and transport;
  - methods of transporting materials;
  - size of loads;
  - access for Bruce Highway and frequency and number of truck movements;
  - any need for closure of unapproved roads in relation to maintenance of farm quarantine status.

Socio-Economic Environment and Cultural Heritage

A description of the existing socio-economic environment of the area should include:

- the existing community profile;
- describe existing and adjacent site users;

- existing community facilities and infrastructure including roads, power, telecommunications; water supply, stormwater and sewerage capacity;
- adequacy of existing services to the local communities;
- local and regional infrastructure that may be affected by the construction and/or operation of the proposed development;
- existing recreation opportunities and facilities;
- transport arrangements, including current road traffic and traffic projections; current and projected water-based transport;
- employment;
- existing tenure and use of site and surrounding land;
- traditional custodians/habitants of the area and effects of the proposed development on Native Title
- sites of natural significance;
- sites of cultural significance;
- commercial significance of the sites including both marine and terrestrial elements such as fisheries, tourism etc; and
- World Heritage values existing in the adjacent part of the Great Barrier Reef World Heritage area.

Biological Environment

- Marine Environment (highlight rare or threatened animals or plants)
  - map location of seagrasses and mangroves and effect development might have on them;
  - effect development will have on aquatic fauna and benthic infauna; and
  - importance of site and adjacent marine and estuarine areas for fisheries or aquaculture (including Aboriginal utilisation or significance).

- Terrestrial Ecology
  - Potential impacts on birds especially migratory species under JAMBA/CAMBA;
  - presence and extent of feral animals and exotic flora;
  - describe presence and distribution of State and Commonwealth listed rare and threatened species and natural communities;
  - use of area and environs by migratory species;
  - movement corridors and barriers to movement;
  - insect vectors and pests; and
  - significance of flora or fauna species to horticultural community.

7.2.5 Description of the Proposal

State the objectives of the proposal and the need for the development. State any benefits including economic benefits. Provide general background information and a detailed description of the proposal outlining the following.

Design Details

The description of the design shall include:

- Nature, scale and siting of all proposed buildings and infrastructure, including details of ability to withstand extreme events and showing relationships to design rainfall runoff, return periods, storm surge etc.;

- Location of offtake and discharge areas and estimated volumes of water offtake from river;
- Details on the management of water quality;
- Details on the drainage proposed for the farm;
- Information on location of refuelling facilities, volume and spill control procedures;
- Details of any proposed maintenance facilities, potential contaminants arising from these activities, and mitigation measures;
- Details on treatment of wastewater derived from hatchery, nursery, growout ponds and any seafood processing facility.
- Town planning controls including detailed building design standards relating the preservation of vistas, building spacing, building height and roof detailing; and
- Relationship to adjacent areas.

Discussion on each of the above issues should address the site itself as well as the adjacent areas (land and water) and the relationship/compatibility between the site and those adjacent areas.

Construction Aspects

Information required on the construction phase of the development includes:

- Plans on the timing and staging of construction proposed;
- Construction workforce, including proposals to accommodate the workforces and provide other services;
- The anticipated workforce, including management structures and chain of command;
- Hours of work activities;
- Supply of raw materials including transportation, handling and storage;
- Supply of any hazardous materials including transportation, handling and storage;
- Proposed capital dredging, volumes, proposed techniques and spoil disposal sites;
- Quantities, source and nature of all fill required for the project;
- Treatment of cleared vegetation;
- Plan showing location of natural/artificial drainage lines during the construction phase/plan showing the extent of earthworks proposed at all stages of construction;

- Plan showing sediment and erosion control mechanisms for the site during construction;
- Describe any machinery and equipment to be used for excavation, stockpiling, and dredging;
- Quality and source of water required in construction;
- Anticipated environmental emissions, including liquid, solid and gaseous, and noise emanation from construction activities and proposed management to ensure compliance with relevant state regulations; and
- Vehicle parking and access/ egress routes during construction.

Operational Aspects

Information required on the operation phase of the development includes:

- The nature of the uses and activities proposed:
- Details of any relevant requirements for approvals such as those administered by EPA, DNR, DPI or GBRMPA and Environment Australia and Bowne Shire Council;
- Effects on water quality including impacts on surrounding environment;
- Economic viability;
- Future maintenance dredging requirements, methods and disposal sites;
- Emergency contingency procedures, including fuel spill prevention, recovery and management; and
- Access for vehicles and pedestrians.

Site Services

Specify services and infrastructure to be altered and the supply of all necessary service requirements, including:

- Sewerage;
- Water supply;
- Solid waste;
- Stormwater drainage;
- Transportation requirements; and
- Energy supply.

Economic Feasibility

- Costs of development of the project, including the provision or upgrading of services and infrastructure and the provision of any development incentives;
- Ongoing maintenance and operational costs;
- The capacity of the proponent to satisfactorily develop the project; and

- Range of facilities and programs intended to be offered, and the costs of establishing and maintaining them.

7.2.6 Assessment of Environmental Impacts

The EIS should discuss direct and indirect potential impacts on environmental and World Heritage values, and within the context of potential impacts to wetlands and birds, biodiversity values, from the construction and operational phases. It should include the likelihood of each impact, its expected nature, magnitude, duration and geographic extent. Consideration should also be given to cumulative impacts, in local and regional contexts.

Discussion on the effects on heritage values should include the following:

- Impacts on habitat used by migratory birds (CAMBA, JAMBA) including any change to ambient noise environment;
- Impacts on wetlands
- Impacts on any species/habitats listed under the Commonwealth's Endangered Species Protection Act 1992;
- Impact on National Estate values; and
- Impact on the Great Barrier Reef World Heritage Area.

Construction Impacts

- General
  - water quality, soil erosion, extent and effects of earth moving, disposal of wastes site restoration, landscaping, etc.
  - effect of new infrastructure works associated with the proposed development, such as roads, powerlines, pipelines, sewer and solid waste disposal facilities and sites;
  - potential impacts of dredging on the marine environment;
  - visual and aesthetic impact of the construction works;
  - location of the nearest noise sensitive areas to the development and the impact of excessive noise during the construction phase on these areas;
  - changes to coastal processes or coastal management at the site or on the adjacent coastline;
  - impact on fisheries and ecological functioning of the area including bird life and any rare, threatened or otherwise noteworthy species, both short term and long term;
  - extent of marine habitat clearing and effects of such on the area's fisheries;
  - effect on cultural heritage values; detail any relevant negotiations with traditional custodians; and on World Heritage values;
  - likely demand of construction staff for local accommodation and other services;
  - impacts on existing or adjacent users and uses; and
  - facilities and adequacy of existing facilities and services to meet such demands.

- Coastal Processes
  - effect of any works to accommodate a sea level rise will have on the coastal management or coastal processes in the vicinity of the proposed development;
  - impact of the development of the hydraulics of the area;

- expected siltation rates within dredged areas, including the nature of the siltation material, maintenance dredging requirements and the method of disposal of such spoil.

- Construction Materials
  - extraction of materials for fill, roads, etc, including quantities required, possible extraction sites, transport of material, methods of extraction, site restoration and rehabilitation; and
  - impact on the local road network in terms of traffic volumes and pavement loadings of truck volumes generated by the transport of fill and other building materials during the construction phase of the development.

Operational Phase

- General
  - air and noise pollution;
  - long term impacts on existing fisheries and on the natural marine environment;
  - impacts of pesticide, herbicide or fertiliser used on the site on the native biota, both terrestrial and aquatic;
  - impacts on site drainage and soil erosion;
  - effects on water quality due to pollution from run off, leaching, sewage or maintenance dredging; and
  - describe likely effects on the proposal of a worst-case storm surge.

- Town Planning Controls
  - local approval required;
  - relationship of built form controls on site with those off site;
  - protection of corridors; and
  - visual amenity and relationship to urban visual amenity.

- Cultural Heritage
  - impacts on sites of cultural significance; and
  - likely impacts to cultural heritage places and develop appropriate management strategies to mitigate the impact.

- Social Impacts
  - demand and impact of such on existing and proposed community facilities and infrastructure;
  - socioeconomic impacts on local aboriginal communities;
  - impacts on local government counter disaster plans, including storm tide hazard management;
  - information on the extent to which local and Australian services and goods will be utilised and of the opportunities which may arise as a result of proceeding with the proposal;
  - effects of works occurring during irregular working hours;
  - public health issues; and
  - impacts on existing and nearby users and the World Heritage.

- Land Use Amenity
  - potential impact on the amenity of adjacent areas used for recreation, industry education, aesthetics, or scientific or residential purposes, in

particular quality of life and such impacts as odour, dust, noise, and smoke should be discussed; and
- compatibility with surrounding land uses and any Planning Scheme zones should be described.

7.2.7 Environmental Management

An Environmental management program incorporating and Environment Management Plan (EM Plan), Monitoring and reporting procedures are required for the development. Where practicable the costs of monitoring programs should be estimated and responsibility for monitoring programs specified. References should be made to relevant legislation and standards.

An Environmental Management Plan is required to address the following:
- Maintenance schedules throughout operations including:
  - stripping and disposal of vegetation,
  - control of stock piling and location for sands, gravels, overburden and topsoil; and
  - general maintenance of earthworks and surfaces including repair of bank erosion or failure,
- Erosion and sediment management strategies. Detail and evaluate both interim and final control measures for erosion protection with respect to creeks, banks, buffers and overall operations,
- Pollution control and waste management methods,
- Management and administration plans outlining strategies and procedures in the event of an emergency.

Monitoring and mitigation programs should:
- Ensure safeguards are being effectively applied;
- identify any unpredicted impacts requiring remedial measures;
- measure any differences between predicted and actual impacts; and
- measure the frequency of implementation of programs to be taken to correct detrimental effects identified by monitoring.

Specify responsible persons/bodies for each of the programs to be undertaken.

The reporting program should detail:
- steps to be taken to correct detrimental effects identified by monitoring;
- procedures for reporting on monitoring programs; and
- proposed recipients of reports.

The content of an EM Plan will significantly influence the acceptance of the EIS and can also be used to support applications for environmental approvals. The intention is that the EIS provides the supporting information for decisions on environmental related approvals and that an EM Plan contains the strategies for management of environmental impacts.

7.2.8 Conclusions

As a result of the findings of the EIS, present a balanced overview of the proposal's net impact and provide recommendations on the proposal. This should include the identification of any alterations to the proposal considered to further mitigate environmental impacts.

7.3 Consultation

In preparing the EIS, the applicant/consultant should consult affected and interest groups. The EIS should detail any public comment sought and any consultation conducted with any affected groups (eg. Community, Environmental, Government, Industry) in developing the proposal and preparing the EIS.

Early consultation is beneficial in helping to ensure that a development will cause a minimum of undesirable effects and in reducing delays in the latter stages of planning and design. In relation to this EIS, the following bodies are referral agencies and should be contacted during the preparation of the EIS:

- The Bowen Shire Council,
- The Environmental Protection Agency,
- Department of Primary Industries,
- Department of Natural Resources,
- Department of Main Roads / Queensland Transport,
- Great Barrier Reef Marine Park Authority, and
- Environment Australia.

8. References

Anon (2000) Proposed prawn farm site at Guthalungra. Investigation of soil condition at proposed Guthalungra sites. Sinclair Knight Merz.

Coles, R.G., Lee Long, W.J., Helmke, S.A., Bennett, R.E., Miller, K.J. and Derbyshire, K.J. (1992) Seagrass beds and juvenile prawn and fish nursery grounds Cairns to Bowen. Department of Primary Industries Brisbane.

Department of Environment & Heritage and Department of Natural Resources (1999). Testing the Waters – the State of Queensland's Water Quality. DEH/DNR, Brisbane.

Gibson Associates. (1998). Economic Development Strategy for Bowen Shire. Working Document.

Hopley, D. (1970) 'Coastal Geomorphology in the Townsville Region.' Unpublished Ph.D. Thesis. Department of Geography, James Cook University of North Queensland.

Oliver, J. (1978). 'The climatic environment of the Townsville area.' In: D. Hopley. *Geographical Studies of the Townsville Area.* Department of Geography, James Cook University of North Queensland.

Sattler, P. and Williams, R. (1999) The conservation status of Queensland's bioregional ecosystems. Environmental Protection Agency.