Environmental Impact Statement (EIS) Report under the *Environmental Protection Act 1994*

Urquhart Point Mineral Sands Project proposed by Oresome Australia Pty Ltd

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April 2013

Contents

1 Introduction

This report provides an evaluation of the environmental impact statement (EIS) process pursuant to Chapter 3 of the *Environmental Protection Act 1994* (EP Act) for the Urquhart Point Mineral Sands Project proposed by Oresome Australia Pty Ltd (Oresome Australia), owned by Metallica Minerals Limited. On 20 August 2010, an application was made by the proponent for an environmental authority in relation to MLA 20669. The environmental impact statement (EIS) decision was made on 1 October 2010 by the former Department of Environment and Resource Management (DERM) in accordance with section 162 of the EP Act.

Chapter 3—Environmental Impact Statements of the EP Act establishes procedures for the Queensland Government, industry and infrastructure providers to carry out environmental impact assessments for major development projects. Under section 57 (EIS assessment report) of the EP Act, the Department of Environment and Heritage Protection (EHP) is required to prepare an assessment report for an EIS process and provide it to the proponent.

In preparing this EIS assessment report consideration has been given to:

- the final terms of reference for the EIS
- the submitted EIS
- all properly made submissions and any other submissions accepted by the chief executive
- the standard criteria
- other matters prescribed under a Regulation.

Matters that must be addressed in this report include:

- the adequacy of the EIS in addressing the final terms of reference
- the adequacy of any environmental management plan for the project
- recommendations about the suitability of the project
- recommendations of any conditions on which any approval required for the project may be given
- any other matter prescribed under a Regulation.

This assessment report summarises key issues associated with the potentially adverse and beneficial environmental, economic and social impacts of the project. It outlines management, monitoring, planning and other measures proposed to avoid or minimise any adverse impacts. Where relevant, the report also highlights issues of particular ongoing concern that were either not resolved in the EIS process or require specific conditions attached to the final environmental authority for the project in order for it to proceed.

Section 2 of this report presents details of the project to provide context for the findings of the report. Section 3 outlines the EIS process that has been followed for the project and the approvals that will be necessary for its commencement. Section 4 addresses the adequacy of the EIS, discusses the main issues with regard to the environmental management of the project, and outlines the environmental protection commitments made in the EIS. Section 5 assesses environmental protection commitments in the environmental management plan (EM Plan) and how well they meet the content requirements content requirements of section 203 of the EP Act. Section 6 discusses the suitability of the project and section 7 makes recommendations for conditions to be included in the draft environmental authority.

The EIS process under the EP Act is completed for the Urquhart Point Mineral Sands Project when this assessment report is given to Oresome Australia.

2 Project details/overview

The main features of the proposed Urquhart Point Mineral Sand Project are described briefly in this chapter. Detailed information on the assessment of these aspects is discussed in section 4.

Oresome Australia plans to develop a new mineral sands mine capable of producing up to 20,000 tonnes per annum (tpa) of heavy mineral concentrate (HMC) for direct export from the Embley River, Weipa. The proposed Urquhart Point Mineral Sands Project (the project) is located approximately 3 kilometres (km) south of Weipa in western Cape York, Queensland, on mining lease application (MLA) 20669 (**Figure 1**). This site has been previously explored and has been identified to have a significant potential for a heavy minerals suite rich in zircon and rutile.

The area is presently owned by the Aurukun Shire Council but is part of an *Aboriginal Land Act 1991* freehold package to the Wik and Wik Way People. Oresome proposes to mine rutile and zircon from sand ridges (strandlines) in continuous pits up to three metres (m) deep. Although the MLA covers approximately 366 hectares (ha), the area of mine disturbance would be approximately 134ha (**Figure 1**).

The initial stage would be a 2-week drilling program to ground-truth historic data. Drilling would be conducted using 3-metre long augers and air core drilling rigs mounted on a 4-wheel-drive vehicle. The proposed mining method would be a form of slot mining to minimise the excavation footprint.

Mining would be undertaken using an excavator, which would load the sand into trucks. The mining face would progress at a typical rate of about 8-10 metres (m) per day. The width of the mining face would typically be about 100m. Mined pits would be decommissioned on an ongoing basis as resources are exhausted. Typically each mining slot would take approximately 2 months to excavate and rehabilitation would take place as soon as practicable after that time, and as the mining face progresses. All sand returned to the pit would be re-contoured, re-establishing drainage lines. Topsoil and vegetation would be replaced as part of the rehabilitation process. The site would be rehabilitated with species native to the local area.

The proposed project would involve treating 700,000 to 800,000 tonnes of sand per annum and the removal by barge of 20,000 tonnes of rutile and zircon per annum over a four to six year period. Annual water requirements for the project would be 280 megalitres and would be mainly sourced from a subartesian bore. The labour force would be small and consist of up to 13 employees including contractors, operators and a traineeship. Personnel would be accommodated in nearby towns and transported to the site by boat or barge.

The final plan and design of mine infrastructure are still to be completed, however it is expected the mine would consist of:

- open-cut pits
- sand processing facilities
- topsoil storage dumps
- heavy mineral sands stockpile pads
- a water management system
- tailings return facilities
- a barge loading area
- temporary light vehicle access roads
- temporary heavy vehicle haul roads
- electricity generation and reticulation facilities
- an office building, workshops
- fuel and oil storage facilities
- vehicle wash down facilities.

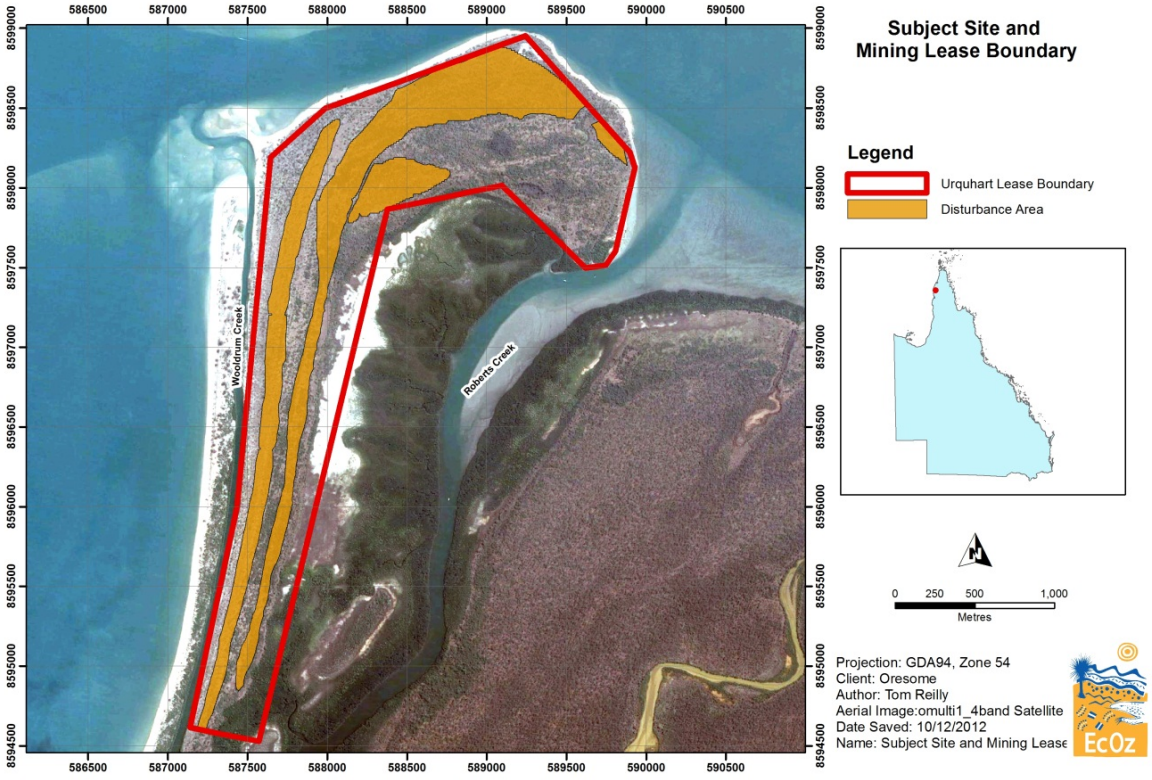

Figure 1 **Project location**
(Figure reproduced from the EIS)

3 The EIS process

3.1 Timeline of the EIS process

On 20 August 2010, an application was made by the proponent, Oresome Australia, for an environmental authority (EA) in relation to MLA 20669. The EIS decision was made on 1 October 2010 by the former Department of Environment and Resource Management (DERM) in accordance with section 162 of the EP Act. The draft terms of reference (TOR) was lodged on 21 December 2010. DERM requested further information on the project and after being supplied with this information, DERM issued a notice of publication of the draft TOR to Oresome Australia on 8 March 2011. DERM placed a public notice (the TOR notice) announcing the start of the comment period for the draft TOR in the Courier Mail on 12 March 2011, on DERM's website on 14 March 2011 and in the Western Cape Bulletin on 16 March 2011. The comment period for the draft TOR was from Monday, 14 March 2011, until close of business on Friday, 29 April 2011. Oresome Australia issued copies of the TOR notice to affected and interested persons.

DERM received 8 comments on the draft TOR within the comment period. Three comments were also received subsequent to the public submission period, which the chief executive accepted. These comments, together with those provided by DERM, were forwarded to Oresome Australia on 16 May 2011. The proponent provided a response to the comments and recommended changes to the draft TOR on 2 June 2011. DERM considered the response and all comments received on the draft TOR, prior to issuing the final TOR on 1 July 2011.

Oresome Australia submitted the EIS on 12 June 2012. The Department of Environment and Heritage Protection (EHP) then considered whether the EIS addressed the final TOR in an acceptable form. EHP and the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) requested minor changes to be made to the submitted EIS before the EIS could proceed to the public submission period stage. Oresome Australia subsequently incorporated those changes and on 9 July 2012, EHP decided to allow the EIS to proceed under s49(5) of the EP Act. The public notification and submission period was set at the minimum 30 business days starting on Thursday, 26 July 2012, until close of business on Wednesday, 5 September 2012.

EHP announced the start of the submission period for the EIS on its website on Friday 20 July 2012. Oresome Australia advertised the EIS notice in *The Courier Mail* and *The Australian* on Saturday 21 July 2012 and in the Western Bulletin on Wednesday 25 July 2012. The EIS was available for public comment the first business day after the last notice was published in the *Western Bulletin* starting on 26 July and finishing on 5 September 2012. Oresome Australia provided copies of the public notice to all affected and interested persons.

EHP received 21 submissions on the EIS within the submission period:

- 17 submissions from state government departments
- 2 submissions from other interested parties
- 2 submissions from the public.

These submissions, together with a submission from EHP, were forwarded to Oresome Australia on 19 September 2012 allowing the proponent to respond to the submissions within 20 business days.

Between 15 October 2012 and 18 December 2012, the proponent requested three successive extensions of time in order to respond to submissions. EHP agreed to each request.

The proponent provided EHP with a supplementary report to the EIS (hereafter supplementary EIS) on 2 January 2013. Copies of the response to submissions were then distributed to all government submitters, including EHP, where outstanding issues needed to be addressed by the proponent.

As part of the review of the supplementary EIS, EHP received advice on key issues from 10 government departments and interested parties. On 4 February 2013, under section 56A of the EP Act, EHP decided that the submitted EIS could proceed to the assessment report phase. A notice of that decision was given to the proponent on 18 February 2012.

In the preparation of this report consideration has been given to submissions and comments received from members of the advisory body and other interested parties throughout the EIS process. This EIS assessment report will be made available to the public on EHP's website at **www.ehp.qld.gov.au**.

3.2 Approvals

Approvals for this project fall under 2 broad categories:

- On lease—activities that are contained within the mining tenure and are approved under the provisions of the *Minerals Resources Act 1989*.
- Off lease—activities that are not on the mining tenure and are approved under a combination of other legislation, including the *Sustainable Planning Act 2009* (SP Act).

The following section discusses the key approvals sought for the proposed project under the State's legislation.

3.2.1 Mineral Resources Act 1989

Queensland's *Mineral Resources Act 1989* (MR Act) provides the legislative framework for exploration, development and mining tenure in the State. All mineral and coal resources in Queensland are owned by the State. Individuals or companies can apply to explore or extract those resources.

The department that regulates mining activities manages those resources on behalf of the State is the Department of Natural Resources and Mines (DNRM), former Department of Employment, Economic Development and Innovation (DEEDI).

The project area is located within MLA 20669. The assessment and approval of this mining tenement runs concurrently with the assessment of this EIS as per the requirements for approval of the environmental authority (EA for mining activities) by EHP.

3.2.2 Environmental Protection Act 1994

EHP is responsible for the regulation of the environmental management performance of the mining industry in Queensland through the provisions of the *Environmental Protection Act 1994* (EP Act). For a new mining project an applicant must apply concurrently for an EA for mining activities under the EP Act and a mining tenement under the MR Act.

An EA imposes environmental management conditions on mining activities undertaken on an ML. The EA conditions set the environmental performance requirements that the proponent must comply with. Failure to comply with the EA conditions is a breach of the EA and there are various compliance enforcement actions available to the EHP under the EP Act.

Moreover, the EP Act provides the framework for an EIS assessment process for the proposed project. This includes the standard criteria against which the project will be assessed, including the principles of Ecologically Sustainable Development (ESD) as set out in the National Strategy for Ecologically Sustainable Development.

The project requires an Environmental Authority under Chapter 5 of the EP Act. This approval will cover mining and the following activities that are directly associated with, or facilitate or support, the mining activities. These activities would be approved under the EP Act as environmentally relevant activities (ERA), listed under Schedule 2 of the Environmental Protection Regulation 2008, if the project was not a mining project.

The EA would need to cover the following activities that are directly associated with, or facilitate or support, the mining activities and which would (were they not conducted on a mining tenement) otherwise require approval under the EP Act as ERAs:

- ERA 8 chemical storage
- ERA 16 extractive and screening activities
- ERA 50 bulk material handling.

3.2.3 Water Act 2000

The *Water Act 2000* (Water Act) and the Water Regulation 2002 (Water Regulation) are the State's legislative instruments for managing water and other resources, establishing a regulatory framework for providing water and related services and establishing water authorities.

Taking or interfering with the flow of water requires a water licence or permit under Part 6 of the Water Act. A decision about whether to grant a licence or permit must be taken in accordance with the objectives for sustainable water management in the relevant water resource plan.

For the purposes of the Water Act, artesian water is water that occurs in an aquifer that would naturally flow to the surface if tapped by a bore. A water license is required to take or interfere with artesian water anywhere in Queensland. Under the Water Act, subartesian water is water that occurs naturally in an aquifer, which if tapped by a bore, would not flow naturally to the surface. An authorisation to take subartesian water is required in:

- a subartesian area declared under Schedule 11 of the Water Regulation
- a groundwater management area established under a water resource plan.

The project's development footprint falls within a declared subartesian area listed on Schedule 11 of the Water Regulation, namely Great Artesian Basin subartesian area on plan CAS2054.

The supply of water for on-site processing would be sourced from subartesian bores within the MLA and hence a water licence is required to extract subartesian water. This water would supply process water for the mine operations (potable water will be supplemented by rainwater harvesting).

3.2.4 Coastal Protection and Management Act 1995

The objective of the *Coastal Protection and Management Act 1995* (Coastal Act) is to provide a comprehensive framework for the coordinated management of Queensland's coastal resources and values.

The principal statutory instrument under the Coastal Act is the newly adopted Queensland Coastal Plan (Coastal Plan) which prescribes how the Queensland coastal zone 3 is to be managed. The Coastal Plan commenced on 3 February 2012 and replaces the State Coastal Management Plan (2001) and regional coastal management plans.

The Coastal Plan provides a framework to achieve the following objectives of the Coastal Act:

- Provide for the protection, conservation, rehabilitation and management of the coastal zone, including its resources and biological diversity.
- Have regard to the goal, core objectives and guiding principles of the National Strategy for Ecologically Sustainable Development in the use of the coastal zone.
- Ensure decisions about land use and development safeguard life and property from the threat of coastal hazards.
- Encourage the enhancement of knowledge of coastal resources and the effect of human activities on the coastal zone.

EHP is responsible for the administration of the Coastal Act and subordinate policies for development assessment in parts of the coastal zone. The project area lies within the Aurukun, Pormpuraaw and Kowanyama Shires Local Government Area Erosion Prone Area (Plan No. APK 1A). The erosion prone area is defined in this plan as 40m landward of highest astronomical tide (HAT) or the plan position of the level of HAT plus 0.8 m, whichever gives the greater erosion prone area width.

The Erosion Prone Area Plan No. APK 1A was used in the EIS to identify erosion prone areas. It also will apply for any development assessments outside the MLA (e.g. barge landing) and in combination with the SCL Act.

3.2.5 Sustainable Planning Act 2009

The *Sustainable Planning Act 2009* (SP Act) is the principal legislation for sustainable regulation of development in Queensland. The SP Act provides the framework for which development is assessed known as the Integrated Development Assessment System (IDAS). The SP Act does not apply to mining activities carried out under a relevant mining tenement issued under the MR Act.

However, SPA will apply to any regulated activities associated with a mine that are carried out off tenement and to any plumbing, building or drainage work that is carried out on a mining tenement; for example operational works (tidal works) applications. The following applications will apply under the SP Act:

- Operational work approval (above the high water mark for the access track).
- Operational work (tidal works) development permit for the chain ramp.
- Operational work (tidal works development permit) for the transhipment anchorage areas.

3.2.6 Other approvals

The North Queensland Bulk Ports Corporation requires that transhipment and anchorage in the main shipping channel, all movements across the landing and any use on Strategic Port would be subject to Port Development Approvals and commercial arrangements with the North Queensland Bulk Ports Corporation.

3.3 Consultation program

3.3.1 Public consultation

In addition to the statutory requirements for advertising the TOR and EIS notices and the mailing of the notices to interested and affected parties, the proponent undertook community consultation with members of the public and regional councils during the public submission period of the EIS. The proponent also circulated information about the project to the community through meetings, phone calls, letters, and emails. In particular, the proponent has facilitated a regular and ongoing consultation process with the Traditional Owners, the Wik and Wik Way People, in order to develop the Urquhart Point Mineral Sands Project as a model for business development in remote Aboriginal lands.

A key component of the project would include the continuation of the current Stakeholder Engagement Program with Traditional Owners, mine employees and their families, focus group interviews with affected communities, Rio Tinto Alcan, relevant government departments and local business owners directly affected by the project.

3.3.2 Advisory bodies

The administering authority invited the following organisations to assist in the assessment of the TOR and the EIS by participating as members of the advisory body for the project. Due to the change in the structure of government, ('machinery of government'), on 3 April 2012 the names of several Queensland departments changed (refer to Attachment A). Consistent attendance by relevant advisory bodies was maintained through the changes.

- Department of Community Safety
- Department of State Development, Infrastructure and Planning
- Department of Transport and Main Roads, including Maritime Safety
- Department of Energy and Water Supply
- Department of National Parks, Recreation, Sport and Racing
- Department of Agriculture, Fisheries and Forestry
- Department of Natural Resources and Mines

- Department of Science, Information Technology, Innovation and the Arts
- Department of Housing and Public Works
- Department of Aboriginal and Torres Strait Islander and Multicultural Affairs
- Department of Tourism, Major Events, Small Business and the Commonwealth Games
- Office of the Coordinator General
- Queensland Health
- Queensland Police Service
- Skills Queensland
- Former Queensland Treasury; now Queensland Treasury and Trade
- Former Department of Communities; now Department of Communities, Child Safety and Disability Services
- Former Department of Education and Training; now Department of Education, Training and Employment
- Former Department of Local Government and Planning; now Department of Local Government, Community Recovery and Resilience
- Former Department of Employment, Economic Development and Innovation
- North Queensland Bulk Ports Corporation Limited
- Weipa Town Authority
- Aurukun Shire Council
- Cook Shire Council
- HWL Ebsworth Lawyers representing the Wik and Wik Way People and the Ngan Aak-Kunch Aboriginal Corporation RNTBC (NAKAC)
- Balkanu Cape York Development Corporation
- Napranum Aboriginal Shire Council
- Cape York Land Council
- Construction, Forestry, Mining & Energy Union, Mining & Energy Division, Qld District Branch
- Australian Conservation Council.

A field trip to inspect the project site was held on 4 December and 5 December 2012 attended by representatives of the proponent, Traditional Owners and EHP.

3.3.3 Public notification

In accordance with the statutory requirements, public notifications of the of the draft TOR and EIS and public comment periods were made through notices in *The Courier Mail*, *The Australian* (EIS only), the *Western Bulletin* and on DERM/EHP's websites.

The draft TOR and EIS were placed on public display at the following locations during their respective public comment and submission periods:

- DERM's website: www.derm.qld.gov.au (draft TOR only)
- EHP's website: www.ehp.qld.gov.au (EIS only)
- DERM/EHP Referral Centre, 400 George Street, Brisbane
- DERM/EHP Cairns Office, William McCormack Place, 5B Sheridan Street, Cairns
- SEWPaC Central Library, John Gorton Building, King Edward Terrace, Parkes, ACT
- Weipa Town Council Library Service, Hibberd Drive, Weipa
- Oresome Australia's office and webpage.

3.4 Matters considered in the EIS assessment report

Section 58 of the EP Act requires that an EIS assessment report consider the following matters:

- the final TOR for the EIS
- the submitted EIS
- the submitted supplementary EIS or any amendments to the EIS
- additional information submitted
- the amended EM Plan
- all properly made submissions and any other submissions accepted by the chief executive
- the standard criteria
- another matter prescribed under a regulation.

These matters are addressed in the following subsections.

3.4.1 The final TOR

The final TOR document, issued on 1 July 2011, was considered when preparing this EIS assessment report. While the TOR were written to include all the major issues associated with the project that were required to be addressed in the EIS, they were not exhaustive, nor were they to be interpreted as excluding all other matters from consideration.

Where matters outside of those listed in the final TOR were addressed in the EIS, those matters have been considered when preparing this EIS assessment report.

3.4.2 The submitted EIS

The submitted EIS was considered when preparing this report. The submitted EIS comprises of:

- The EIS that was made available for public submissions on 26 July 2012 until 5 September 2012—referred to as the EIS in this report.
- The response to submissions and the amendments to the EIS—referred to as the supplementary EIS—received by EHP on 2 January 2013. The supplementary EIS included amendments to the EMP.

3.4.3 Properly made submissions

EHP accepted 21 submissions on the EIS, within the submission period, from:

- Department of Tourism, Major Events, Small Business and the Commonwealth Games (DTESB)
- Dr S Gould
- Department of Natural Resources and Mines (DNRM; 3 submissions)
- Department of Local Government (DLG)
- Department of Aboriginal and Torres Strait Islander and Multicultural Affairs (DATSIMA)
- Queensland Health (QH; 2 submissions)
- Social Impact Assessment Unit of the Department of State Development, Infrastructure and Planning (SIAU)
- Department of Agriculture, Fisheries and Forestry (DAFF; 2 submissions)
- Skills Queensland (Skills Qld)
- Department of State Development, Infrastructure and Planning (DSDIP)
- Department of Energy and Water Supply (DEWS)
- Department of Housing and Public Works (DHPW)
- Queensland Treasury and Trade (QTT)
- Dr M Morrison, Flinders University
- Rio Tinto Alcan

- Department of Education, Training and Employment (DETE)
- Department of Community Safety (DCS)
- Department of Science, Information Technology, Innovation and the Arts (DSITIA)
- North Queensland Bulk Ports Corporation (NQBP)
- Department of Transport and Main Roads (DTMR).
- The department also received and accepted submissions outside the submission period from:
- Queensland Police Service (QPS).

EHP also made its own submission on the EIS.

All government agencies that made submissions about issues arising from the EIS were given the opportunity to review and provide comments on the supplementary EIS. This included comments on conditions that should apply to the project and on the adequacy or otherwise of the supplementary EIS in addressing concerns raised in submissions.

3.4.4 The standard criteria

Section 58 of the EP Act requires that, among other matters, the standard criteria listed in Schedule 3 of the EP Act must be considered when preparing the EIS assessment report.

The standard criteria under the EP Act are:

- the principles of ecologically sustainable development as set out in the National Strategy for Ecologically Sustainable Development
- any applicable environmental protection policy
- any applicable Commonwealth, state or local government plans, standards, agreements or requirements
- any applicable environmental impact study, assessment or report
- the character, resilience and values of the receiving environment
- all submissions made by the applicant and submitters
- the best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows:
  - i an environmental authority
  - ii a transitional environmental program
  - iii an environmental protection order
  - iv a disposal permit
  - v a development approval
- the financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) as they would relate to the type of activity or industry carried out, or proposed to be carried out, under the instrument
- the public interest
- any applicable site management plan
- any relevant integrated environmental management system or proposed integrated environmental management system
- any other matter prescribed under a regulation.
- The department has considered the standard criteria in assessing the project and preparing this report.

3.4.5 Prescribed matters

Section 58 of the EP Act requires that the following prescribed matters, under the Environmental Protection Regulation 2008, are considered when making an environmental management decision for this project:

- section 51, matters to be considered for environmental management decisions
- section 52, conditions to be considered for environmental management decisions
- section 53, matters to be considered for decisions imposing monitoring conditions
- section 55, release of water or waste to land
- section 56, release of water, other than stormwater, to surface water
- section 57, release of stormwater
- section 60, activity involving storing or moving bulk material
- section 62, activity involving acid-producing rock
- section 64, activity involving indirect release of contaminants to groundwater.

3.4.6 Notifiable activities

Activities that have been determined as having the potential to cause land contamination, otherwise known as 'notifiable activities', are listed in Schedule 3 of the EP Act. Under section 371 of the EP Act, landowners have a duty to notify EHP where notifiable activities are being or have been carried out on a site. Where it is confirmed that a notifiable activity is being or has been conducted in the site, the property is listed on Queensland Environment Management Register, established under the EP Act.

The EIS identified and listed the following relevant notifiable activities under schedule 3 of the EP Act that would apply to the project:

- Drum reconditioning or recycling—a number of old oil drums have been detected within the existing spoil area.
- Petroleum product or oil storage—storing petroleum products or oil in an above ground tank with a storage capacity of more than 25,000 litres (L).
- Waste storage, treatment or disposal - temporary storage of regulated waste (hydrocarbons, tyres, batteries).
- Asbestos disposal - it is possible that some of the derelict beach huts have been constructed from asbestos.

3.5 Environment Protection and Biodiversity Conservation Act 1999

On 19 May 2011, SEWPaC determined the Urquhart Point Mineral Sands Project to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The controlling provisions were sections 18 and 18A (listed threatened species and communities), sections 20 and 20A (listed migratory species) and sections 23 and 24A (Commonwealth marine areas) (EPBC 2010/5707).

The environmental assessment of this project was not assessed under the bilateral agreement between the Commonwealth and the State of Queensland under section 45 of the EPBC Act because the project (action) is taken in one jurisdiction outside Queensland (i.e. Commonwealth marine areas). Hence, the EIS submitted for the proposed Urquhart Point Mineral Sands Project by Oresome Australia, addressed matters requiring consideration under both the EPBC Act and the EP Act and was assessed by both the Commonwealth and Queensland governments, under separate but parallel processes. As many matters of environmental significance (i.e. same flora and fauna species) under the EPBC Act and under the EP Act overlap considerably, MNES matters have been stated, where relevant, in this assessment.

4 Adequacy of the EIS in addressing the final TOR

This section of the EIS assessment report details how the EIS addressed the TOR, the specific comments provided during the public consultation process on the EIS and the departmental comments arising from the supplementary EIS responses. **Table 1** lists the main subject headings of the TOR, notes whether the submitted EIS adequately addressed the matters described in the final TOR, highlights any remaining issues and outlines commitments made by the proponent.

Table 1 Summary of the adequacy of the submitted EIS in addressing the final TOR

Matters included in the final TOR	Significant issues	Adequacy of submitted EIS and supplementary EIS Outstanding issues Proponent's commitments and management plans
Introduction	Overview of the project, its objectives and scope. Outline of the necessary approvals and their assessment processes.	Adequate.
Project need and alternatives	Project justification and discussion of alternatives.	Adequate.
Description of the project	Location of the project in the regional and local contexts. Description of the construction phase of the project. Description of the operational phase of the project. Product handling. Energy and fuel. Telecommunications. Infrastructure requirements. Waste management. Rehabilitation and decommissioning.	Adequate. Adequate. Adequate. Adequate. Adequate. Adequate. Adequate. Adequate. Discussed under Transport. Discussed under Waste. Discussed under Rehabilitation.
Climate	Climatic conditions at the site. Extreme weather events.	Adequate. **Proponent's commitments:** • Emergency management plan. • Fire response/fighting capabilities. • Shutdown and evacuation procedures.

Matters included in the final TOR	Significant issues	Adequacy of submitted EIS and supplementary EIS Outstanding issues Proponent's commitments and management plans
Land	Land tenure. Land use and suitability. Topography and geomorphology. Mineral resources. Soils. Acid sulfate soils. Contaminated land. Land use. Existing infrastructure. Sensitive environmental values.	Most issues adequately addressed. **Outstanding issues:** • Acid sulfate soils (ASS) investigation. • ASS reporting and management. • Updated contour information on all relevant figures. **Proponent's commitments:** • Restoring original landform contours (where possible) and re-creating self-sustaining, stable vegetation communities. • Removal of rubbish and derelict beach huts. • Remediation and rehabilitation of existing dredge spoil site. • Implementation of revegetation land disturbance rehabilitation goals and strategies (as part of the revegetation strategy). • Monitoring.
Transport	Shipping operations. Barge landing. Water taxi. Tracks (roads). Anchorage.	Adequate. **Outstanding issue:** • Clarification on the use of a tug boat to pull the barge of the shoreline. **Proponent's commitments:** • A shipping impact management plan. • A turtle management plan which includes speed restrictions. • As part of the EMP—managing transportation issues related to unplanned impacts on the environment. • Weed spread management.
Waste	Description of environmental values and potential impacts and mitigation measures regarding: • construction waste • sand rejects • waste streams • ship sourced pollution.	Adequate. **Proponent's commitments:** • Waste management plan. • Waste management hierarchy. • Waste monitoring and auditing. • Marine suppliers to operate in accordance with legislative and policy obligations.

Matters included in the final TOR	Significant issues	Adequacy of submitted EIS and supplementary EIS Outstanding issues Proponent's commitments and management plans
Water	Description of environmental values and potential impacts and mitigation measures regarding: • surface watercourses and overland flow • stormwater • groundwater • hydrogeology • aquifers • water supply and storage.	Most issues adequately addressed. **Outstanding issues:** • Groundwater and surface water investigation and reporting. **Proponent's commitments:** • Ongoing ground and surface water monitoring program. • Pit water balances. • Extraction of sand would not occur at a depth below 3m without further groundwater investigation. • Drainage and water quality treatment. • Sediment and erosion control and effective drainage.
Air quality	Description of environmental values and potential impacts and mitigation measures regarding: • dust • greenhouse gases • other air emissions.	Adequate. **Proponent's commitments:** • Dust control and suppression. • Dust monitoring of individuals. • Radioactivity level monitoring, training and appropriate PPE.
Noise and vibration	Description of environmental values and potential impacts and mitigation measures regarding: • noise at sensitive receptors • noise impacts on wildlife • vibration due to blasting.	Adequate. **Proponent's commitments:** • Noise control measures.
Cultural heritage	Description of environmental values and potential impacts and mitigation measures regarding: • Indigenous cultural heritage • non-indigenous cultural heritage.	Adequate. **Proponent's commitments:** • Cultural heritage management plan. • Operator positions and traineeship offered to Traditional Owners and surrounding Indigenous communities.

Matters included in the final TOR	Significant issues	Adequacy of submitted EIS and supplementary EIS Outstanding issues Proponent's commitments and management plans
Social values	Description of environmental values and potential impacts and mitigation measures regarding: • impacts on local community, housing and services • contribution to local economy.	Adequate. **Proponent's commitments:** • Employment opportunities to local Indigenous communities and Traditional Owners. • Regular communications with Traditional Owners. • Stakeholder engagement program. • Conversion of the proposed site offices to an outstation and ranger station subsequent hand-over to Traditional Owners when mining ceases.
Health and safety	Description of environmental values and potential impacts and mitigation measures regarding: • health risks • air emissions, noise and vibration • drinking water supply • hazardous substances and safety • wildlife hazards and heat • radioactive material exposure.	Adequate. **Proponent's commitments:** • Providing a healthy and safe work environment. • Conducting audits. • Radioactivity level monitoring, training and appropriate personal protective equipment.
Economy	Assessment from national, state, regional and local perspectives of the direct and indirect economic benefits and impacts of the project.	Adequate. **Proponent's commitments:** • Maximising benefits to local and regional economies. • Engagement with its workforce. • Targeted training to residents of the shire.
Hazard and risk	Description of environmental values and potential impacts and mitigation measures regarding: • unplanned discharges to air, water or land • transportation, storage and use of hazardous substances • emergency response • risk analysis.	Adequate. **Proponent's commitments:** • Emergency management plan. • Hazard and incident reporting. • Site-based register . • Monitoring, review and audits.

Matters included in the final TOR	Significant issues	Adequacy of submitted EIS and supplementary EIS Outstanding issues Proponent's commitments and management plans
Coastal Environment	Description of environmental values and potential impacts and mitigation measures regarding: • coastal environment • coastal processes • marine sediments • coastal water quality • coastal ecology.	Most issues adequately addressed. **Outstanding issues:** • Clarification on mining schedule to avoid dune erosion during wet seasons. • Clarification on erosion prone areas within the project area. • Clarification on disturbance to mangrove forests. **Proponent's commitments:** • Ecological monitoring plan. • Vegetative buffer zones. • Mining schedule that avoids extractive operations in sensitive areas during turtle breeding. • Daylight operations. • Marine turtle management plan. • Restriction of access by personnel on beaches outside barge and vessel landing areas. • Indigenous ranger program. • Erosion and sediment control program.

Matters included in the final TOR	Significant issues	Adequacy of submitted EIS and supplementary EIS Outstanding issues Proponent's commitments and management plans
Ecology	Description of environmental values and potential impacts and mitigation measures regarding: • terrestrial ecology • groundwater dependent ecosystems • marine and migratory species • pest and weed management.	Most issues adequately addressed. **Outstanding issues:** • Impacts on groundwater dependent ecosystems and listed threatened terrestrial and marine species warrants further monitoring. • Clarification on disturbance to mangrove forests. **Proponent's commitments:** • A turtle management plan, including marine turtle lighting plan. • An ecological monitoring program. • Feral species, pest and weed control. • Ongoing Indigenous ranger program. • Vegetated buffer zones. • Exclusion zones around breeding and nesting areas. • Mining of the northern pits only outside turtle breeding season. • Further migratory bird and freshwater macroinvertebrate surveys. • Removal of rubbish, illegal fishing huts. • Remediation and rehabilitation of existing dredge spoil site. • Implementation of disturbance buffers. • Erosion and sediment control program. • Engagement of a spotter catcher prior clearing.

Matters included in the final TOR	Significant issues	Adequacy of submitted EIS and supplementary EIS Outstanding issues Proponent's commitments and management plans
Rehabilitation	Description of options, strategic approaches and methods for progressive and final rehabilitation of the environment disturbed by the project. Development of a rehabilitation strategy that would minimise the amount of land disturbed at any one time, and minimise the residual loss of land with ecological or productive value.	**Outstanding issues:** • Rehabilitation management plan and associated matters. • Successful rehabilitation of existing ecosystems. • Potential impacts of saline water on rehabilitation success. • Rehabilitation of the dredge spoil. **Proponent's commitments:** • Progressively rehabilitate mined areas. • A Rehabilitation management plan. • An ecological monitoring program, including monitoring rehabilitation success. • Remediation and rehabilitation of existing dredge spoil site. • Revegetate with native plant species. • Relocate any valuable habitat features found on-site (e.g. large fallen logs, log piles, rock piles) into adjoining undisturbed habitat and/or rehabilitation area. • Feral species, pest and weed control. • Ongoing Indigenous ranger program overseeing the progress of rehabilitation.
Offsets	Offsets proposed under State legislation.	Biodiversity offset strategy proposed by the proponent is pending on Commonwealth's offset requirements, and management plans. **Proponent's commitments:** • 250ha offset area south of the project site. • Ongoing Indigenous ranger program. • Turtle management plan, including ghost net removal and recovery, feral pig control and turtle nest protection, environmental monitoring programs, control of visitor access, weed control.

Matters included in the final TOR	Significant issues	Adequacy of submitted EIS and supplementary EIS Outstanding issues Proponent's commitments and management plans
Matters of National Environmental Significance (under the EPBC Act)	Not assessed. Commonwealth and State EIS are assessed separately. However, where matters of State and Commonwealth overlap, they have been described briefly.	Communications with SEWPaC continue regarding a suitable offset strategy under both Acts.

The following sections assess the adequacy of the submitted EIS in addressing the requirements of the final TOR. Each subsection includes discussion of relevant issues raised in submissions and how these were dealt with in the supplementary EIS. The discussion also includes any outstanding issues, as well as any environmental protection commitments made by the proponent.

4.1 Introduction

Chapter 1 of the EIS and supplementary EIS provided an overview of the project, its objectives and scope. It adequately identified the regulatory approvals for the project and outlined the assessment and approval processes.

4.2 Project need and alternatives

Chapter 2 of the EIS and supplementary EIS describe the need for the project and briefly outlined the social, economic and environmental benefits and costs and discussed project alternatives. The EIS considered the principles of ecologically sustainable development (ESD) where these were incorporated within the project. The positive and negative impacts, mitigation and management measures and environmental protection commitments of the project were addressed in later sections of the EIS.

The EIS incorporated environmental criteria into the overall mine design. These are based on the findings of studies undertaken as in the EIS in order to characterise the relevant environmental values. While the location of the mineral sand resource would be fixed, the location of pits, the mining schedule, mining processing, associated infrastructure and shipping has been iterative. Modifications to the original design were adopted as appropriate to minimise the potential for adverse impacts on these environmental values (i.e. exclusion of a creek line from mining).

4.3 Description of the project

4.3.1 Adequacy of the EIS chapter

Chapter 3 of the EIS and supplementary EIS provided a broad overview of the project, such as the location of the project in the regional and local contexts, description of the construction and construction phase of the project, product handling, as well as infrastructure, waste and rehabilitation and decommissioning. The specialist sections on infrastructure (refer to section 4.6—Transport), waste (refer to section 4.7) and rehabilitation (refer to section 4.18) are ach dealt with separately in this assessment report.

The following project description is based on the information provided in Chapter 3 of the supplementary EIS.

4.3.2 Location and site description

The Urquhart Point Mineral Sands Project is located on Lot 1 on SC211, approximately 3km south-west of Weipa, at Urquhart Point on the west coast of the Cape York Peninsula (**Figure 1**). Oresome Australia proposes to undertake sand mining within the Urquhart Point Mineral Sands Prospect (EMP 15268), commencing in the mining lease application (MLA 20669) are within this prospect. The mining lease (ML), if granted, would have a total area of some 366ha, with works expected to impact upon approximately 30% of that area (approximately 134ha).

Urquhart Point is situated on the west coast of the Cape York Peninsula in the north-eastern section of the Gulf of Carpentaria. The proposed mine would be located on a sand peninsula which is partially separated from the mainland by 2 major estuaries, the Hey River and the Embley River. Wooldrum Creek, a tidal inlet adjacent to a narrow sand spit, is located directly to the east of the proposed mining operations, and the mouth of the Embley River lies directly to the north.

The project site has a low topographic relief, dominated by quaternary marine deposits resulting in tidal inlets, beach flats and low beach ridges in relatively sheltered environments. A number of tidal inlets, swamps, and ephemeral creeks drain from the site to the north, east and west, forming minor catchments. Ephemeral freshwater wetlands and salt marsh plains are also present within the mining lease.

There is currently no formal vehicular access to the site; however, boat access is possible along the coastline. Several abandoned derelict beach huts are also present in numerous locations adjacent to the coastline. Dredge spoil originating from the navigation channel has also been previously disposed of in the northern part of the site.

The township of Weipa is located approximately three km to the north-east of the project area, across the inlet of the confluence of the Hey and Embley rivers. Weipa is the major township which was established to provide essential infrastructure and services for mining operations around the Western Cape. The other major settlements in the region are the Aboriginal communities of Mapoon, Napranum and Aurukun.

4.3.3 Resource base and mine life

The project area has an indicated resource to the Joint Ore Reserves Committee (JORC) standard of 2.8 million tonnes of ore with an average heavy mineral sand grade of 7.03%. Whilst the project would be expected to extend for 4 years, the proponent noted that the maximum duration of the project could extend to 6 years. The proposed project would involve treating 700,000 to 800,000 tonnes of sand per annum and the removal by barge of 20,000 tonnes of rutile and zircon per annum over a 4 to 6 year period.

4.3.4 Construction

The construction of the facilities at Urquhart Point would be undertaken during the dry season. Construction activities required to facilitate the proposal would involve the creation of access roads, progressive clearing associated with the mining face and construction of mining infrastructure. To minimise the disturbance footprint, wherever possible, infrastructure required to support the operation of the sand mine would be constructed on areas currently or historically subject to anthropogenic impacts (e.g. areas presently occupied by derelict beach huts on-site). Roads where required for access to and from the mining areas would be aligned over land planned for mining where practicable.

4.3.5 Operation

The proposed mineral sands mine would excavate heavy mineral strandlines which occur to a depth of up to 3m on the site.

Site preparation would include an initial vegetation removal and topsoil removal that would each be separately stockpiled off the mine path. Works would be undertaken using a slot mining methodology and would involve the use of an excavator and an articulated all-wheel drive truck to transport the ore to the mining unit. The mining face would progress at a typical rate of about 8–10m per day. The width of the mining face would typically be about 100 m. Mined pits would be decommissioned on an ongoing basis as resources are exhausted.

The mining rate would be determined by the grade of the ore but the design is for a nominal 300 tonnes per hour (tph). In high grade areas this feed rate is expected to be as low as 150tph. In the lower grade southern area of the project the feed rate is limited to approximately 350tph due to the design of the plant and the size of mobile equipment and power generation capability.

The run of mill (ROM) ore would be transported and dumped next to the mining unit. The stockpiled ore would be placed into the mining unit by a front end loader. The live stockpile would be limited to approximately 100 bulk cubic metres (bcm) to minimise the disturbance of the local area. This methodology has been designed to minimise the excavation footprint at any given time.

The proposed approach to mining and rehabilitation is shown in Figure 2. The mining technique proposed is aimed at minimising both environmental impacts and operating costs. Environmental impacts would be minimised through the implementation of a continuous rehabilitation program that follows the progressing mining face. It is estimated that approximate 3ha of land would be mined each month, with processing and return of sand rejects occurring at a rate that would allow for any given areas to be re-contoured and re-spread with topsoil within 3 months of mining having occurred. The site would be rehabilitated using plant species native to the local area.

Upon processing of the sand and mineral extraction, the heavy mineral concentrate would be removed from the site by barge, and transferred to a larger ocean going vessel for transport. Progressive rehabilitation would be undertaken throughout the life of the project by backfilling of sand rejects into exhausted mining pits and subsequent revegetation of these areas.

Other than the fuel and mobile fleet lubricants no other chemicals would be required in the mining operations. Mining would occur for approximately 10-11 hours per day during daylight hours only.

Infrastructure and main facilities on Urquhart Point would consist of:

- open-cut pits
- sand processing facilities
- topsoil storage dumps
- heavy mineral sands stockpile pads
- a water management system
- tailings return facilities
- a barge loading area
- temporary light vehicle access roads
- temporary heavy vehicle haul roads
- electricity generation and reticulation facilities
- an office building, workshops
- fuel and oil storage facilities
- vehicle wash down facilities.

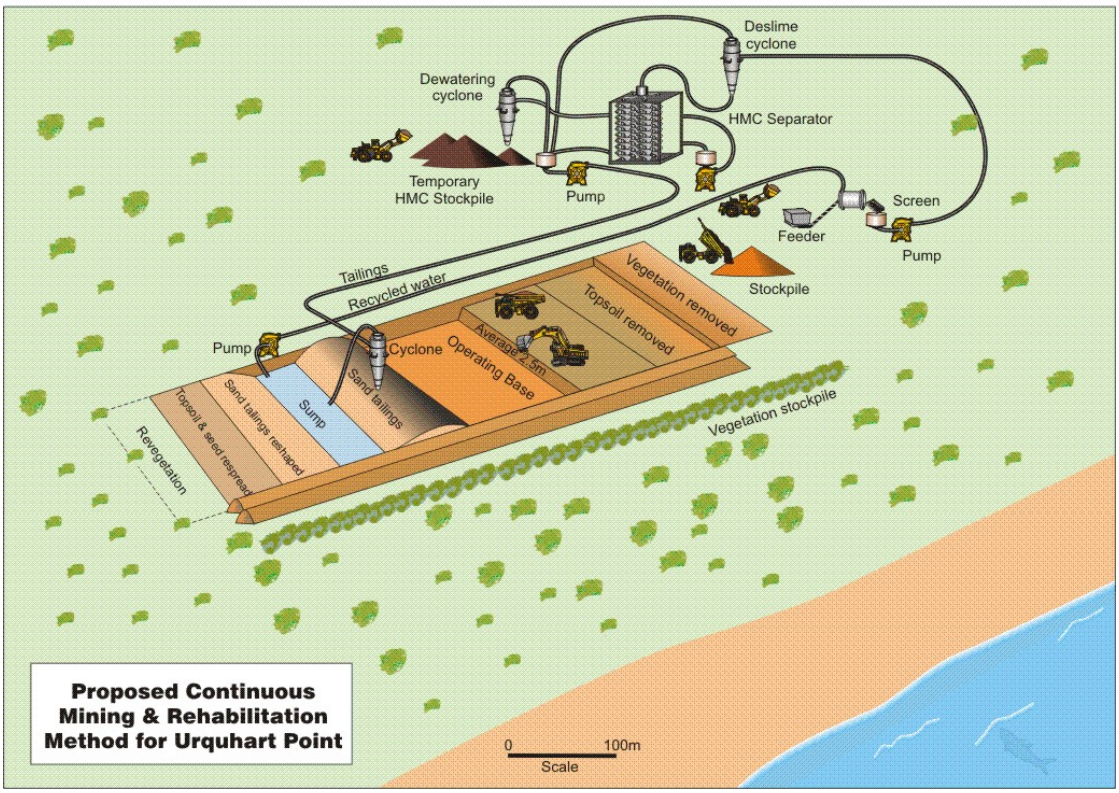

Figure 2 **Proposed continuous mining and rehabilitation method for Urquhart Point (Figure reproduced from the EIS)**

4.3.5.1 Mining schedule

On Year 1, a total of 694,720 tonnes of material would feed the processing plant, standing at an average of 7.8% heavy minerals. A total of 2171 sub-blocks would be mined on Year 1, which corresponds to Blocks 1 to 11 in the Scheduling Plan (Figure 3). The final mine plan would be refined throughout the project's development as the best approach to mining and rehabilitation evolves over the project life. The current plan is to start operations in block 1.

In order to minimise the potential for dune instability and impacts to marine turtle nesting and shorebird activities, blocks 7 to 11 (total 9.11ha) would be mined between the months of May to July and blocks 12–22 (total 22.61ha) would be mined between March and October.

4.3.5.2 Workforce

The labour force would be small and consist of up to 13 employees including contractors, operators and a traineeship. Personnel would be accommodated in nearby towns and transported to the site by boat or barge.

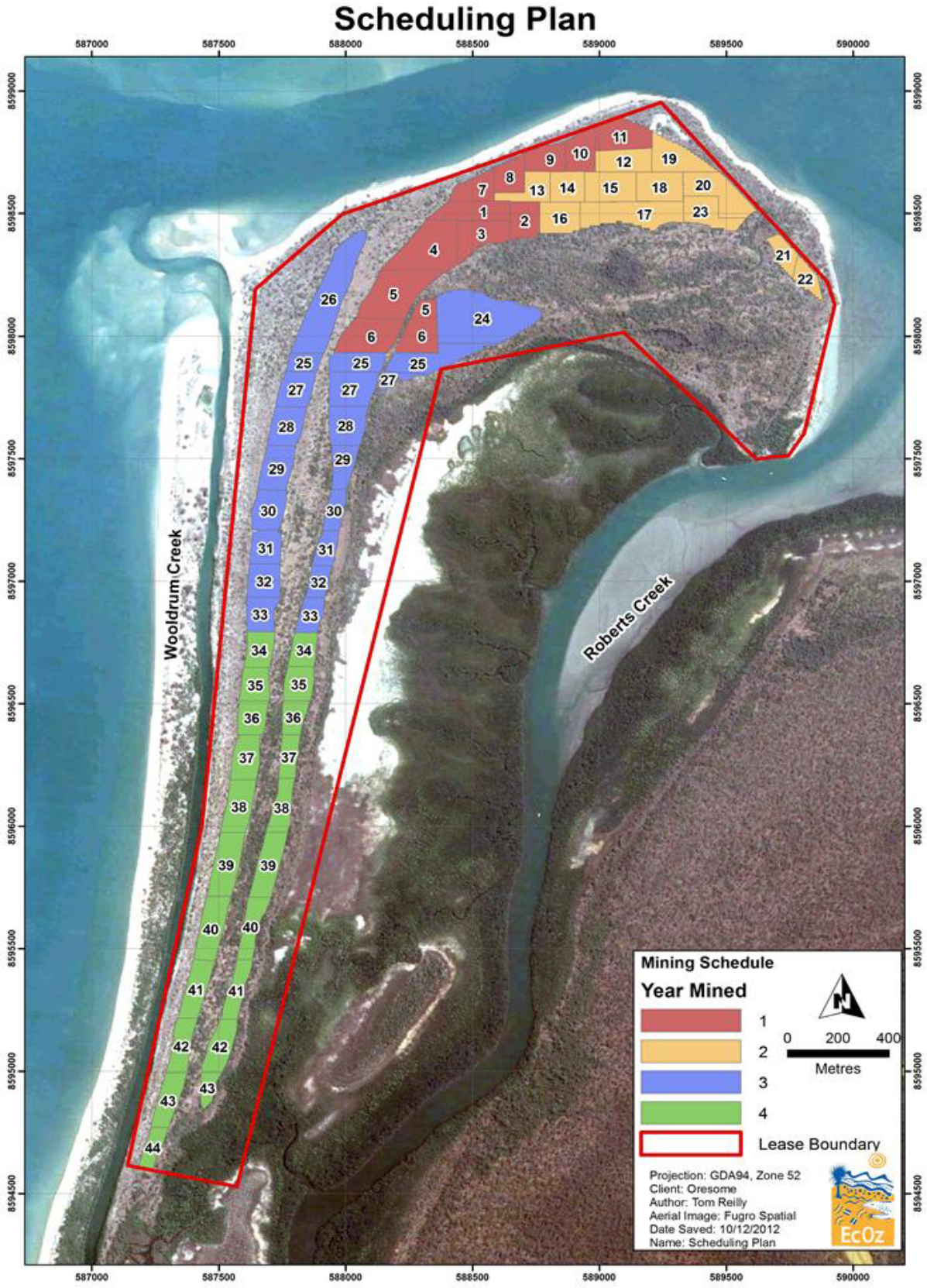

Figure 3 **Proposed scheduling plan for Urquhart Point (Figure reproduced from the EIS)**

4.3.5.3 Decommissioning

The project is expected to run for 4 to 6 years, after which time plant and equipment would be decommissioned and removed from site. The only remaining infrastructure would be the administration office, which would be refurbished to be utilised as a ranger station by the Traditional Owners. Decommissioning of the site is expected to take three months from shutdown, extending the full time employment of 2–3 of the existing workforce.

4.3.5.4 Product description

The final non-magnetic concentrate would be shipped to a second party for further upgrading into marketable zircon and high titanium dioxide (TiO_2) and high titanium (Hi Ti) mineral concentrates.

Zircon's main uses include as a refractory, in the manufacture of ceramic tiles and porcelain products and in the manufacture of zirconium oxy-chloride which is used in the catalytic convertors in motor vehicles' emissions control systems. The Hi Ti product uses include the preparation of pigment for use in paints, plastics and papers and for its reflective properties in sun block; flux on welding electrodes; and titanium metal.

4.3.5.5 Product handling

The non-magnetic concentrate would be stockpiled and allowed to dewater/dry to a moisture level of approximately 2-3%. This would require the product to stand for approximately seven days before being sufficiently dry for shipment.

On an approximately quarterly basis, a 2500 million tonne landing barge would be commissioned to transfer the stockpiled product to a bulk cargo ship. A ramped barge would be positioned on the shore at the nominated location (refer to section 4.6—Transport). The barge would be loaded on the rising tide with the ramp progressively orientating to minimise the beach crossing distance. The site articulated trucks would cross the small section of beach to deposit the product directly onto the deck of the barge, via the front ramp. The trucks would alternate between loading from the stockpile and depositing on the barge to minimise the time taken to load the barge. This method should allow for the barge to be loaded during the rising tide.

When fully loaded, the barge would travel to a self-loading charter bulk cargo ship that would be located at a designated mooring point in Jacksons Channel within the Port of Weipa. The ship's crane would utilise grab buckets to transfer the bulk product from the barge to the ship. To transfer a total of 5000 million tonne of bulk product, this process would be repeated.

4.3.5.6 Energy and fuel

All major site power would be generated through diesel powered generator sets. Units would be sited at three separate locations (the mining unit, the wet concentrator plant and the office building, which would have a back-up generator). As the operation is proposed to be a daylight hour's operation, minimum battery storage would be required. A silenced 10 kVA generator to supply power would be installed as back-up power if required. A solar hot water system would also be installed for supply of hot water system for ablutions.

Two options are being considered for fuel, including the use of containerised fuel storage units (60,000L) bought to site by barge and transferred by the container forklift and a large fixed tank on-site which is filled directly from a fuel barge via a fixed pipeline. The fixed tank would be suitably bunded to contain potential spillages. Fuel would be pumped in to a 2000L trailer used for transfer to the generator unit day tanks and for servicing the mobile fleet.

4.3.5.7 Telecommunications

Telecommunication would be by mobile system with relevant infrastructure to be installed to ensure transmission via Weipa is possible.

4.4 Climate

4.4.1 Adequacy of the EIS chapter

Chapter 4 of the EIS outlined the regional climate characteristics of the project area and surrounds, the potential impacts from climatic conditions and natural hazards on the proposed sand mining development and related infrastructure. Several matters were raised in submissions. Specifically, the concerns were:

- Department of Community Safety (DCS):
  - Preparation of a Bushfire Management Plan required.
  - Bushfire risks and management under the State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide required.

  - Further clarification of the mitigation strategies to ensure the stability of the extractive pits.
- Department of Environment and Heritage Protection (EHP):
  - Request for accurate elevation levels/contour levels in order to map accurately erosion prone areas, tidal inundation, drainage pathways, stormwater management.
  - Further information on storm tide inundation risk assessment for important infrastructure and pits.
- Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC):
  - Information required on the potential impacts of cyclones and storm surges on mined and rehabilitated areas.
  - Outline area potentially subject to periodic tidal inundation and storm surges and overlay with disturbance areas.

The following sections incorporate the changes made in the supplementary EIS in response to the abovementioned comments. No further comments were received as part of the supplementary EIS review and hence, this chapter has been adequately addressed. The following sections provide a brief overview of the climate and extreme weather events, the environmental impact assessment, outcomes, mitigation strategies and proponent's commitments as outlined in the EIS and supplementary EIS.

4.4.2 Climate

The proposed mine site is located in the tropics of northern Queensland. This region is influenced by the monsoon. It has two distinct seasons, a wet season in the warmer months of the year, and a dry season in the cooler months. The wet season is characterised by high rainfall periods between November and April. Cyclonic storms also regularly occur during this season. The dry season occurs between May to October. During this season, rainfall is minimal.

In the dry season, the region tends to have average winds of up to 19.2km/h, tending south-east to easterly. Over the wet season, the winds are generally lighter and are westerly to north-westerly in direction. Strong to gale force winds occasionally occur, but usually in association with a tropical cyclone.

The annual daily evaporation rate averages 6.6 mm. The highest rate of evaporation occurs in the late dry season (September-October). The total annual evaporation (from bare ground or open water) is between 2000–2400 millimetres (mm), which is slightly higher than the average annual rainfall.

4.4.3 Extreme weather events

4.4.3.1 Severe Storms and cyclones

The Bureau of Meteorology records thunder days (days where thunder and lightning has been recorded) as an indicator of thunderstorm occurrence. The average annual number of thunder days for the subject area is 50–60.

Tropical cyclones are low pressure systems that form over warm tropical waters and have well defined wind circulations of at least gale force strength (sustained wind of 63 km/h or greater with gusts in excess of 90 km/h). They pose a threat to via destructive winds, storm surge and through the impact of flooding, as the strongest and heaviest rains are associated with the passage of tropical cyclones. The region surrounding the project site is prone to cyclonic activity in the monsoon (wet) season, between November and April. For the study area, the average frequency is 0.4–0.6 cyclones per year.

The EIS concluded that severe storms and cyclones could present a number of risks to the mine which include:

- Risks to the health and safety of personnel through flash flooding and wind-blown debris.
- Damage to ferry and barge infrastructure from storm surge or waves.
- Damage to mine infrastructure from strong winds and flash flooding.
- Damage to rehabilitated areas from strong winds and erosion by heavy rain.

4.4.3.2 Flood

In the EIS it was concluded that there have been no floods recorded from the Embley River Catchment, in which the mine site is located. A flood study has been undertaken for the site. The potential for fluvial and local catchment flooding and storm surge flooding has been assessed, and the modelling demonstrated that storm surge flooding would be dominant on the site. Flood levels have been mapped and the proposed operations and ore bodies would be located outside of modelled flood levels, with the exception of Ore Block B, which would be located partially within known flood levels. As such, this ore body would be subject to extraction and rehabilitation during the dry

season only.

Small areas of land in the north-eastern section within the MLA could be inundated by the flood and surge events via flooding of the nearby local creek. This included disturbance areas proposed in the EIS. Comments made in EIS submissions from SEWPaC and EHP regarding storm and inundation damage in proposed disturbance areas resulted in a revision of the storm tide risk zone. The supplementary EIS now excludes disturbance from all areas within the zone HAT +0.8m (taking into account state statutory erosion prone areas as well as the storm tide inundation risk lines). Hence, the potentially affected areas are now located outside the proposed disturbance areas.

It was concluded in the EIS that there is the potential of risks to the mining operations due to flooding, including the health and safety of mine personnel, damage to infrastructure and to rehabilitated areas from erosion. The risk of flood damage to people, property and the environment would be mitigated through measures that are consistent with State Planning Policy 1/03—Mitigating the adverse impacts of flood, bushfire and landslide.

4.4.3.3 Drought

The Weipa region experiences times of very low rainfall during the dry season. Due to the monsoonal influence to the weather patterns of the region, the EIS concluded that it would be unlikely that the area would ever be severely affected by drought. Hence, the risk for drought affecting the operation of the Urquhart Point sand mining operations in the future was considered extremely unlikely.

4.4.3.4 Bushfire

Northern Australia typically has a winter-spring fire season. At this time of year, low relative humidity, high winds and lack of rain all contribute to increased fire danger. Bushfire risk maps modelled by the Queensland Fire and Rescue Service indicated that the site would be located within a low to medium bushfire prone area. All proposed infrastructure would be located in areas with a Medium Bushfire Risk Level.

During site investigations undertaken in September 2011, approximately 30–40% of the site was observed to have been burnt in the time elapsed between the March and September surveys. Fires appeared to have been a series of events resulting in a mosaic of burnt and unburnt patches across the site. They have been characterised as low intensity burns which have predominantly affected the ground and shrub layers. Fire scars were noted on several larger trees (i.e. *Melaleuca* spp.), but generally fires have burnt the understorey and ground layers, leaving patchy areas devoid of ground cover vegetation, except for regenerating grass species.

It was concluded in the EIS that uncontrolled fires could pose a risk to life and property during operational hours, and equipment and property during non-operational hours (i.e. non-daylight hours)—particularly given the site's relatively remote nature and corresponding response times. Consequently, an onsite fire fighting capability was provided as part of the hazard and risk analysis (section 4.13—Health and safety).

4.4.3.5 Earthquakes and landslides

No earthquakes or landslips have occurred in the vicinity of the project area. The area is in a geologically stable setting, with no evidence of volcanic or tectonic activity.

A slope analysis of the site determined that the occurring natural landforms were considered very stable with minimal potential for landslip the risk of landslip (grades range from 3–5% over the site). Further engineering investigations have determined that provided the banks of the extractive pits are no steeper than 1 in 4, stability of landforms during operations does not pose a risk. Following cessation of the proposed use, natural profiles would be reinstated and subject to rehabilitation, further minimising the risk of landslip. Consequently, the EIS concluded that landslides resulting from natural causes or the proposed operations are considered extremely unlikely.

4.4.3.6 Climate change adaptation

Commonwealth Scientific and Industrial Research Organisation (CSIRO) climate modelling indicates that the wet season is becoming shorter but heavier and tropical cyclones more frequent. Since the 1950s, rainfall has increased by about 50mm a decade, and for the last 20 years the sea levels have been rising about 7mm a year. By 2050 the sea level could be 37 centimetres (cm) higher than current, and by 2070, 50cm higher.

The expected increase of sea level during the anticipated life of the mining project (approximately 4–6 years) of 28mm is unlikely to affect the operation in any way, nor is the operation likely to impact other factors that may be influenced by this potential rise. There are large degrees of uncertainty with regard to changes in tropical cyclone frequency and intensity projected by climate models, and no predictions are considered robust at this stage.

It was concluded in the EIS that over the short time frame the project is to occur, it would be unlikely that the influence of climate change would be measureable to the mining operation.

4.4.4 Proponent's commitments

In the EIS assessment the most significant risk was considered to be the risk posed by cyclones and other extreme weather events. The risk of fire was also considered to be a potentially major hazard to life and property.

To minimise major hazards and risks to life and property, the proponent has committed to:

- An emergency management plan which would include
  - an evacuation plan—that would be included as part of the emergency management plan (to be prepared in consultation with relevant authorities)
  - fire response strategies and containment and the transfer of sick or injured personnel to the mainland
  - the RTA Weipa's Disaster Management and Recovery Plan.
- The implementation of standard operating procedures and seasonal restrictions.
- A boat that would be available at all times for evacuation and other purposes, moored at the barge landing area, which has sufficient depths to allow launching of a small vessel on all tides.
- Addressing flooding associated with storm surge in the design, with all ancillary structures and extractive pits setback from known and expected future storm surge levels (associated with rising sea levels).
- Designing land-based infrastructure to suitable ARIs for storms.
- Dam designs based upon guidelines by the Australian National Committee on Large Dams (ANCOLD).
- Ensuring hazardous materials storage areas are designed and constructed in accordance with Australian Standard AS1940—The storage and handling of flammable and combustible liquids.
- Ensuring essential services (electricity, telecommunications, water and sewerage) maintain function during a flood event.
- A fire response/fire fighting capability would be in place at the commencement of the construction period.
- In the event of predicted severe storms or cyclones, the mine would be non-operational for these periods, with shutdown and evacuation procedures in effect and all boat and barge activity suspended.
- A water truck (or similar) would be in place for the duration of operations.
- Installing smoke detectors and fire fighting equipment (hand held extinguishers and fire hoses) in stores, workshops and offices.
- Equipping areas that are a designated fire risk, such as fuel and chemical storage areas, with a fire alarm, fire suppression, and fire fighting systems.

4.5 Land

4.5.1 Adequacy of the EIS chapter

Chapter 5 of the EIS outlined the existing environment values of the land area that may be affected by the project. As part of the EIS assessment the following matters were raised in the submissions:

- Department of Natural Resources and Mines (DNRM):
  - Required an acid sulfate soil (ASS) investigation and the preparation of an acid sulfate soil management plan if ASS if found.
  - Insufficient elevation data for the project area.
- EHP:
  - The EIS did not adequately present the existing landforms and contours of the MLA in order to meet environmental protection and rehabilitation commitments.
  - EHP recommended that an accurate record of the surface contours prior to mining will need to be undertaken.

As a response to these comments, the proponent undertook detailed surveys of the project site and prepared A1 sized coloured plans showing 0.5m contours. However, not all chapters of the supplementary EIS have been updated with the new information (particularly Chapter 5, Land) and hence parts of the supplementary EIS refer to incorrect contours and elevation descriptions. This matter should be clarified in the revised EM PLAN.

The following sections include the information provided in the EIS and updated information of the supplementary EIS.

4.5.2 Land tenure

The Urquhart Point MLA (MLA 20669) lies within Lot 1 on SC211. The registered owner is the Aurukun Shire Council but is part of an *Aboriginal Land Act 1991* freehold package to the Wik and Wik Way People. Native Title has been determined to be held by the Wik and Wik Way People. The prescribed Body Corporate is Ngan Aak Kunch Aboriginal Corporation.

The MLA has a total area of 366.07ha, with works expected to impact upon 134ha of this area. Site access will be via the Embley River through Lot 4 on SP120446 which is leased to the Ports Corporation of Queensland Limited. Lot 4 on SP120446 is owned by the Cook Shire Council and is administered by North Queensland Bulk Ports Corporation.

The Aurukun Shire Council does not have a planning scheme and there are no regional plans that apply to the area; therefore, the site is not subject to zoning or strategic designation under a statutory planning document.

4.5.3 Land use

The project site is located in the north-west of the Cape York Peninsula within Albatross Bay, on a sand spit approximately 3km south of Weipa. Within the Albatross Bay catchment, the largest land uses are cattle grazing and Rio Tinto's bauxite mining operation based in Weipa. The remaining part of the catchment is sparsely populated outside the township of Weipa and the settlement of Napranum, and remains largely undeveloped.

The northern tip of Urquhart Point has been used as an onshore dump site for dredge spoil in the 1960s (herein referred to as the 'existing dredge spoil area'). The area covered by spoil is estimated to be greater than 4ha and has very little regrowth after nearly 60 years.

No properties are located on the MLA. There are extensive beach hut developments across the area, particularly on the eastern end of the project area and along the banks of Wooldrum Creek. These huts have been unlawfully constructed and are now largely abandoned.

There is currently no formal vehicular access to the site; however, boat access is possible along the coastline. A temporary barge landing would be constructed to allow mining infrastructure to the brought to the site, staff access and mineral sands to be transported from the site.

Construction and operation of the mine would affect the ability of Traditional Owners and the general public to access the area for cultural reasons, fishing, hunting and recreational purposes. The restriction on access relates to the need to separate the public from active mining and development areas to maintain safety.

At the completion of mining activities on the site, all infrastructures with the exception of the administration building would be removed. The administration building would be refurbished and handed over to the Traditional Owners for use as a ranger station. The derelict beach huts would also be removed from the site.

The objective for the rehabilitation of areas disturbed by mining activities is to establish a self-sustaining vegetation community using appropriate local native species.

4.5.4 Topography

The project area is defined by coastal landforms, predominantly tidal flats and beaches, estuaries, and coastal dune systems with low ridges and swales. The overall appearance of the project site is one of low topographic relief, dominated by the deposition of quaternary marine deposits resulting in tidal inlets, beach flats and low beach ridges in relatively sheltered environments. A number of tidal inlets, swamps, and ephemeral creeks drain from the site to the north, east and west based on minor catchments. Ephemeral freshwater wetlands and salt marsh plains are also present within the mining lease. North and eastern beaches of the project site are typical tidally-dominated reflective beach types or 'low energy' beaches with coarse sediment and low wave action. The western peninsula beach has a relatively straight profile, wide beach berm, with a steep beach slope immediately above and below the water line inferring a reflective beach type that reflects low wave energy and tidal dominance. The western peninsula is separated from the project site by Wooldrum Creek—a narrow, shallow tidal inlet with relatively steep banks on the western side, and gentle slopes on the eastern side. Beach dunes elsewhere are relatively flat incipient dunes with a low profile. According to the newly supplied topographical map in the supplementary EIS, the highest point of the site is 8.5m above sea level (elevation range: 0-8.5m Australian Height Datum [AHD]).

4.5.5 Mineral resources

The EIS outlined that approximately 2.8 million tonnes of sand (containing 7% heavy mineral sands by weight) would be extracted over the four to six year lifespan of the operation. The valuable heavy mineral sand fraction is dominated by zircon and rutile. Based on all the available analyses of six composite samples from the test drilling, the likely heavy mineral suite would be likely to contain greater than 30% combined zircon and rutile, with most of the remainder being ilmenite and iron oxides. The non-magnetic fraction for all six samples was almost entirely zircon and rutile, with a very small percentage of non-valuable minerals.

4.5.6 Soils

Soil bore logs indicate a variable soil profile. The first metre below the surface is comprised of coarse unconsolidated material predominantly shells, gravel and bauxite. From depths of 2–29m, loose, friable silt and clays are present. From 30–34m, rounded quartz is present – indicating the presence of an active riverbed or seashore. At depths of 35–72m heavy clays are present. The EIS concluded that these conditions are expected to be generally replicated across the site. The low topographic relief and the course, sandy nature of the soils presents a low erosion risk. However, the high rainfall of the area increases the erosion potential, especially just after the topsoil has been reinstated. There is also potential for wind erosion during this period.

4.5.7 Acid sulfate soils

As a result of comments made in the EIS assessment an acid sulfate soils (ASS) investigation was undertaken by the proponent across the project area in November 2012. The investigation was presented in the supplementary EIS. No ASS was detected and the supplementary EIS concluded that high ASS risk areas would occur predominantly outside the mining lease, and particularly in the low lying marshes, and below the ground water level at approximately sea level (refer to Figure 4). The supplementary EIS further concluded that the proposed disturbance areas would not occur in ASS risk areas and noted that the depth of mining is at least 1.0m above the water table. Consequently mining activities would not disturb ASS by direct excavation or by lowering of the water table due to dewatering.

During the review of the supplementary EIS, DNRM contended that the ASS investigation contained errors, such as inconsistent reference to the excavation depth, incorrect sampling techniques and equipment used in the investigation. DNRM also argued that the extraction to the depth outlined in the supplementary EIS would likely disturb ASS material and recommended further investigations as part of the ongoing mining (refer to section 4.5.11 – Outstanding issues).

4.5.8 Contaminated land

Contaminated land refers to land contaminated by hazardous substances that may pose a risk to human health and/or the environment. Land immediately surrounding the project area is relatively undisturbed by development. While there has been beach hut development and rubbish dumping at some locations, there is no known historic land contamination.

A contaminated land search was conducted through the former DERM website on the Environmental Management Register (EMR) and the Contaminated Lands Register (CLR). The site is not included on the CLR and one relevant activity was identified on the EMR – Landfill (disposal of waste).

A number of old oil drums were found within an existing dredge pile. These drums are rusted and it is possible that the contents may have spilled into the soil and groundwater. The proponent made a commitment that, should these drums still contain hazardous substances, care would be taken with their removal and disposal.

Activities identified as being likely to cause land contamination are listed as notifiable activities and discussed in section 3.4.6. These are:

- Drum reconditioning or recycling—a number of old oil drums have been detected within the existing spoil area.
- Petroleum product or oil storage—storing petroleum products or oil in an above ground tank with a storage capacity of more than 25,000L.
- Waste storage, treatment or disposal - temporary storage of regulated waste (hydrocarbons, tyres, batteries).
- Asbestos disposal—it is possible that some of the derelict beach huts have been constructed from asbestos.

A surface gamma radiation survey has been undertaken to establish background levels of radiation at the project site (refer to section 4.13 – Health and safety). Background levels of calculated absorbed gamma dose rates over the mineralized zones were found to be generally negligible to low and only marginally higher than the background levels in the area.

4.5.9 Land use and suitability

The intended land use for the project site after the mine has been decommissioned would be a stable, self-sustaining vegetation community, such that which currently occurs. The intended post-mining land use was determined in consultation with the Traditional Owners and the Wik and Wik Way People.

The administration building and amenities would be refurbished after the mine is decommissioned and handed over to the Traditional Owners. Management of rehabilitated areas would also be handed over to the Traditional Owners at the completion of the mining operations. Access to the site after the mine is decommissioned would be controlled by the traditional owner group. Existing degraded areas, such as the existing dredge spoil area, derelict beach huts, rubbish piles and any areas of weed infestation, would be rehabilitated with the goal of leaving the area in better condition than at present.

4.5.10 Lighting

Mining operations would take place only during daylight hours, reducing potential impacts to nocturnal fauna and marine turtles from light pollution. To reduce the impacts of light pollution on nesting marine turtles, orange, red or yellow low pressure sodium vapour lamps would be used for exterior lighting, except where safety considerations require otherwise. Where other coloured lights are used, the light spilt would be restricted with shades (to prevent sky glow) or orientation (i.e. no lights to face seawards). Minimal light would be visible from the nesting beaches. Pathway lights would be low to the ground and shaded where possible.

4.5.11 Outstanding issues

During the review of the supplementary EIS, DNRM concluded that the ASS investigation contained errors, such as inconsistent reference to the excavation depth, incorrect sampling techniques and equipment used in the investigation. DNRM concluded that the extraction to the depth outlined in the supplementary EIS would likely disturb ASS material.

DNRM recommended the following constraints be applied relating to mining operations:

- EHP to seek ASS testing results along with information on the location and elevation of each sample.
- Where warranted, to avoid ASS a shallower maximum extraction depth may be required in areas.
- Mining staff to be trained in field identification.
- Establishment of formal reporting process if ASS are encountered.

In addition, EHP noted that some figures in the supplementary EIS had not been updated to include new contour information; hence, this matter would need to be clarified in the revised EM Plan for the mining project.

4.5.12 Proponent's commitments

To minimise major impacts on the land, the proponent has committed to:

- Restoring original landform contours (where possible) and re-creating self-sustaining, stable vegetation communities
- Removal of rubbish and derelict beach huts.
- Remediation and rehabilitation of existing dredge spoil site.
- Rehabilitation of the pits and infrastructure (refer to section 4.18).
- Implementation of 'Land Disturbance Rehabilitation Goals and Strategies' (as part of the revegetation strategy).
- Reducing impacts on soils by minimising erosion risk through proposed 'Erosion Potential and Mitigating Measures'.
- Water quality testing at various sites to monitor the quality of the stormwater runoff.
- Fertilising where necessary to replace the nutrients lost during topsoil stockpiling.
- Monitoring of rehabilitation sites for soil salinity as salt water from a processing bore would be used, potentially resulting in salt accumulation.
- Mitigating measures for activities that have the potential to degrade or contaminate the site through the proposed 'Mitigating Measures for Managing Land Degradation'.
- Light mitigation.

4.6 Transport

4.6.1 Adequacy of the EIS chapter

Chapter 6 of the EIS described the proposed use of existing infrastructure to transport materials, products or wastes to and from the project site as well as potential impacts and mitigation measures associated with transport. As part of the EIS assessment the following matters were raised in the submissions:

- Department of Agriculture, Fisheries and Forestry (DAFF):
  - Risk of weed spread along cleared tracks not considered.
  - Risk of introduction of exotic marine pests by bio-fouling through vessels.
  - Insufficient information on water taxi infrastructure.
  - No assessment of risks and potential impacts or contingency plans on impact upon the aquatic fauna and coastal resources, including sea-floor damage due to anchorage or mooring.
- Rio Tinto Alcan:
  - Concerns regarding the location of proposed transhipping anchorages, and any potential impediment on traffic in the port.
- North Queensland Bulk Ports Corporation (NQBP):
  - Information required on barge landing and vessel service.
- Department of Transport and Main Roads (DTMR), including Maritime Safety.
  - Impact of the proposed transhipment location, and issues associated with exposure of a barge at the loading ramp to hydrodynamic interaction arising from passing large vessels.
  - Further information on location of proposed transhipment and barge loading ramp.
  - Requested a management plan that provides detailed information on vessel traffic management, aids to navigation and ship-sourced pollution prevention.
  - Further information required in regards to shop-sourced pollution management, navigational arrangements and maritime infrastructure for all vessel locations.
  - Requesting that proposed transhipment anchorage location at the mouth of Robert's Creek not be pursued, due to its potential impacts on navigation, and suggesting replacement with offshore transhipment points located at Jackson's Channel or the Emergency Anchorage, near Jessica Point.
- SEWPaC:
  - Requested detailed mapping and discussion of the location of landing points, roads and other infrastructure.
  - Further information required regarding bunding, drains and roads, road building materials and how spills would be prevented from disappearing into the sand.
  - Further information on proposed anchorage points for transhipment and possible anchoring impacts, the use of tugs and transhipment, on lighting and navigation marks, zone of beach disturbance at the barge landing, and their potential impacts on matter of national environmental significance (MNES).
  - Further information on potential transport impacts on turtle nests and hatchlings (on and offshore).
  - Further information in the form of a lighting plan.

In response to the comments made by the North Queensland Bulk Ports Corporation, the proponent suggested that the scale of the proposed activity would not involve tug services. However, this was in contradictory to a statement in the supplementary EIS which stated that "once the flat-top coaming barge is fully loaded, a tug would pull the barge from the shoreline to an ocean going vessel anchored in Jacksons Channel within the Port of Weipa". This issue remains unresolved and would need to be addressed as part of the approvals (refer to section 4.6.3 – Outstanding issues) process post EIS.

DTMR was satisfied with the proponent's response to its EIS submissions, but requested that the proponent be required to continue to engage with DTMR through the Regional Harbour Master (Cairns). The North Queensland Bulk Ports Corporation has raised concerns regarding the lack of space at Evan's Landing for parking and laydown.

The following sections incorporate the changes made in the supplementary EIS in response to the abovementioned comments.

4.6.2 Potential impacts and mitigation measures

There are currently no existing transport facilities within the project site. There are no formal existing roads, railways, pipelines or conveyors. Transport and worker access to the mine site would be by boat via the Embley River. No on-site accommodation would be provided and the workers would be required travel to commute to and from the site by water taxi, as described below. The water taxi would be used to transport personnel, light equipment, materials and waste twice daily. Light supplies would be delivered to site by water taxi each afternoon.

To affect the delivery of bulky or larger on-site materials (e.g. fuel, mobile equipment parts etc.) a stabilised ramp would be constructed at the barge landing site. The ramp would be constructed of treated pine timber beams linked together by steel chains down to the low water mark, running to above the high tide mark to allow vehicle traffic access. This would also help to minimise erosion associated with vehicular access.

Loading would commence on the rising tide with the barge progressively orienting its ramp to minimise the beach crossing distance, whilst remaining afloat sufficiently to complete and depart near high tide with sufficient depth to be certain of clearing the beach before tidal levels began to fall. This would minimise sea floor disturbance through remobilisation of sediments, and the barge landing location has been chosen due to an absence of sensitive marine ecological communities such as seagrass and coral communities. When fully loaded the barge would await a suitable high tide to allow it to leave the ramp and travel to a self-loading charter vessel, which would be located at a suitable anchorage point offshore.

On-site roads would be designed to provide access to the water transport facilities, the infrastructure (e.g. the mining unit, process plant, operations/administration building) and the expected mining areas as the project develops. The roads would be aligned over land planned for mining wherever practical. The routes would have minimal preparation works other than vegetation and topsoil removal to allow all wheel drive vehicle access.

Mining would be carried out using a slot mining process. Each mining slot would take approximately two months to excavate. A mining unit would be temporarily located near the mining slot currently being utilised. Therefore, the mining unit would be expected to relocate with each new mining slot. Material would be to be transported to the temporary stockpile near the mining unit by a Cat 980H Wheel Loader, having a capacity of some six cubic metres.

The exporting of materials would be to be carried out by transhipment in bulk. Material would be transferred from the stockpile at the process plant, using articulated trucks, to a ramped barge positioned on the shoreline within the project site. It is expected that 5000 tonnes of mineral sands would be transported from the mine on a quarterly basis.

It is proposed that a flat-top coaming barge with a capacity of 2500 tonnes be used for the project shipment operations. Once fully loaded, a tug would pull the barge from the shoreline to an ocean going vessel anchored in Jacksons Channel within the Port of Weipa. No new berths would need to be constructed as part of the proposed operations.

In the EIS, 2 options were presented for the offshore transhipment point (Robert's Creek and Jacksons Channel). However, as a result from submissions from the North Queensland Bulk Ports Corporation and Maritime Safety Queensland, the Jacksons Channel option was selected.

The transfer of mined material to the ocean going vessel would occur 4 times per year. During each transfer period there would be 2 barge movements (1 loaded and 1 unloaded) between the barge landing area and the transhipment anchorage point in Jackson's Channel.

Transhipment using a ship crane is expected to have a gross rate of 200 tonnes per hour. This rate includes reductions due to trimming residue and spillage, and the need to occasionally move the barge between the ship's hatches. The likely time taken per barge shipment would be approximately 12.5 hours.

The markets for the product are not yet confirmed and, consequently, precise shipping routes were not proposed in the EIS and supplementary EIS.

In the 2009–10 financial year the Port of Weipa handled 380 ships carrying approximately 20.7 million tonnes of bauxite. During that time approximately 70,057 tonnes of fuel and 26,388 tonnes of general cargo were also handled by the Port of Weipa. As shown, the main export of the Port of Weipa is bauxite which is predominantly from the Rio Tinto Alcan mine leases. Rio Tinto Alcan currently has development plans to establish ship-loading to the south of the Embley River, and establish barging and ferry operations between the North Embley to the southern shoreline. Taking into consideration the above shipping movements currently employed and future Rio Tinto Alcan development plans expected for the Port of Weipa, the projects proposed transhipment operations are not expected to impact significantly on the transport operations within the Port.

4.6.3 Outstanding issues

The North Queensland Bulk Ports Corporation outlined in its submission on the supplementary EIS that the proponent will need to clarify if the barge would be pulled from the shoreline by a tug. North Queensland Bulk Ports

Corporation advised that if a tug was to be used the issue would be subject to Port Development Approvals and commercial arrangements with the North Queensland Bulk Ports Corporation.

4.6.4 Proponent's commitments

To minimise impacts through transportation on environmental values, the proponent has committed to implement:

- Weed spread management.
- A shipping impact management plan, consisting of:
  - a vessel traffic management plan
  - aids to navigation management plan
  - a ship-sourced pollution prevention management plan.
- A turtle management plan which includes speed restrictions and lighting.
- As part of the EM Plan —managing transportation issues related to unplanned impacts on the environment.

4.7 Waste

4.7.1 Adequacy of the EIS chapter

Chapter 7 of the EIS described the inventory of all wastes to be generated by the project during the construction, operational and decommissioning phases of the project, including expected total volumes of each waste produced. It also described the existing environment values that may be affected by the project's wastes.

As part of the EIS assessment the following matters were raised in the submissions:

- DTMR – Maritime Safety:
  - Information requested regarding the management of ship-sourced waste.
  - EIS failed to state ship-sourced pollution requirements of the *Transport Operations (Marine Pollution Act) 1995* and associated Regulation 2008.
- EHP:
  - Insufficient information on the waste stream from the sewage treatment system, fate of the sludge produced from the sewage treatment plant, including from portable devices during the construction phase.
- SEWPaC:
  - Requested information on why there has been such poor natural colonization and establishment on the old spoil site. This should include discussion of the character of the spoil and waste on the site and what measures would be required to prevent any damage or further contamination from handling/processing, and a discussion of the required rehabilitation actions.
  - The EIS noted that the dredge spoil could be possibly contaminated and that the mining blocks would extend into this area. Further information is required how disturbance and possible further contamination would be avoided.

The following sections incorporate the changes made in the supplementary EIS in response to the abovementioned comments. No further comments were received as part of the supplementary EIS review and hence, this chapter has been adequately addressed.

4.7.2 Excavated waste

The mining would be undertaken by an excavator that would dig sand to the base of mineralisation and load the extracted sand directly into the mining unit. A vibrating screen would be used to extract the debris. The debris would be stockpiled and finally returned to the rehabilitation area and spread with the topsoil to assist in soil the organic waste (debris) would be re-used on-site.

4.7.3 Tailings or fine rejects

The slurry in the concentration plant would be passed through a series of water irrigated spirals to obtain heavy minerals and sand rejects. From there the heavy minerals would be passed through wet high intensity magnetic separator to obtain heavy minerals and rejected magnetic minerals. The rejects from these 2 processes would be pumped back to the mining area via dewatering cyclones.

Finally, the rejects would be stockpiled at the rear of the mining area to be used for reshaping the landform to its original state. The approximate quantity of sand rejects is estimated to be 650,000 tonnes per annum.

The resulting rejects from the concentration process would comprise of clean sand. The separation process, which includes a centrifugal phase and a magnetic phase, is chemical-free; thus the rejects would contain no chemicals arising from the mining and separation process.

Section 4.15 (Hazards and risks) of this report describes the radiological characteristics of the sand rejects in terms of concentrations of uranium and thorium as well as their likely chemical and physical characteristics.

No planned discharges of sand rejects or associated process waste water are proposed to the surrounding environment, with all sand rejects to be returned to the mining pit. Once this material is re-profiled the topsoil and vegetation would be returned and revegetation using appropriate species would be completed (section 4.18 - Rehabilitation).

4.7.4 Solid waste disposal

Non-hazardous waste generated during construction activities may include clean topsoil and fill, cleared vegetation and residual building materials. Up to 13 operational personnel and contractors would be on-site, generating relatively small amounts of putrescible and inert waste. Waste of a domestic nature would be collected in 240 L bins and periodically transported to Weipa for appropriate recycling and/or disposal. All perishable waste would be transported back to Weipa on a daily basis.

Heavy vehicle tyres would be retread where feasible to maximize their use prior to ultimate disposal. Regulated waste such as tyres, batteries and oily wastes (oily rags, oil filters and other disposable parts) would be placed in 240 L bins identified as regulated wastes. The regulated waste bins would be stored in dangerous goods bund awaiting transport to Weipa for proper disposal. Any wastes arising from spills, such as contaminated runoff and contaminated soil, would be collected and remediated on-site, or transported to a suitable facility for disposal in Weipa.

Some solid wastes, such as cardboard packaging, wooden pallets, and conveyor belts would be reused on-site for other purposes where practical. Scrap steel, batteries, toner cartridges, and other recyclables would be collected, transported to Weipa and sold to a certified recycler.

A waste management plan has been prepared by the proponent that describes the waste streams generated by the proposal, including storage requirements, and quantity and types of waste generated.

4.7.5 Liquid waste

Regulated liquid waste generated during construction activities and subsequently during the mining phase may include hydrocarbons, waste oil and other chemicals such as solvents, paints, fertilisers, pesticides, insecticides, and cleaning products. These regulated wastes would be collected in 205L drums labelled according to the type of chemical and transported to Weipa for proper disposal.

During construction and throughout operations there would be a requirement for portable septic toilets sized appropriately for the workforce. Sludge would be stored in holding tanks and regularly transported to Weipa by a licensed regulated waste disposal contractor for treatment.

The mine site would be serviced by a package sewage treatment plant. A water management plan has been prepared through the EIS process, under which treated effluent (Class A recycled water) would be disposed by surface irrigation to land, within a dedicated effluent disposal area.

Mine production water would be mainly used in the spiral separation and slurrying processes. The water used in the separation process would be recycled as much as possible, and any excess water would be discharged behind the active mining zone, where it would seep back into the water table. Water discharge areas would be located in areas where the potential for environmental impact is minimised. Approximately 280,313 megalitres (ML) of water would be required per year for processing and mining activities.

Bore water and/or recycled saline water (other than treated effluent) would also be utilised for dust suppression along the haul road, by use of a water tanker truck. The water truck would be used as necessary, particularly during dry and windy weather. On the basis of the water truck carrying 20 kilolitres (kL) and wetting down the haul road and other access tracks twice per day, for 6 months per year, it is estimated that dust suppression would consume approximately 4ML of water per year.

4.7.6 Ship-sourced waste

The main ship-sourced waste would be those associated with the normal operation of the coastal-cargo barges used to deliver equipment to site during construction and the transhipment barge and ocean going vessel used to

load the mined material during operation. During operation, the transhipment barge and ocean going vessel would be present for two days at a time, four days per year. Based on the limited amount of time that ships would be servicing the project, the amount of ship-sourced waste is predicted to be relatively small. All ship-sourced waste would be disposed of using existing on-shore services and facilities available at the Port of Weipa, as detailed in the Port Procedures and Information for Shipping – Port of Weipa. It is not expected that the ocean going vessel would take on fuel or at the Port of Weipa, further limiting the potential impact of the project on port services and the potential for ship-sourced pollution.

4.7.7 Proponent's commitments

To minimise impacts through waste on environmental values, the proponent has committed to:

- A waste management plan.
- A waste management hierarchy (as per the EPP Waste).
- Waste monitoring, tracking and auditing.
- Marine suppliers to operate in accordance with legislative and policy obligations.
- Dredge spoil pile characterisation, including contamination assessment and remediation, would be undertaken upon receipt of project approvals as part of the commitment to undertake clean up the site.

4.8 Water

4.8.1 Adequacy of the EIS chapter

Chapter 8 of the EIS described the existing resources and environmental values of water that may be affected by the project. This chapter received the majority of comments during the submission period.

As part of the EIS assessment the following matters were raised in the submissions:

- DCS:
  - Insufficient mitigating measures had been proposed regarding adverse impacts of flood (in relation to the proposed outstation and hazardous material stored or manufactured in bulk).
- Department of Energy and Water Supply (DEWS):
  - Inadequate information on proposed water usage and storage for the project, including the quality and quantity of all water supplied to, or captured at, the site.
  - Insufficient bore yield and drawdown results.
  - The quality of water sourced from the saline aquifer via a bore pump is required .
  - Clarification of water conservation measures required.
  - Treatment of rain water.
  - Sediment and erosion control.
  - Use and disposal of saline process water in areas to be rehabilitated.
- DNRM:
  - Insufficient groundwater assessment, including hydrology.
  - Insufficient depth of groundwater bores.
  - Information on water quality testing results requested.
- Department of Science, Information Technology, Innovation and the Arts (DSITIA):
  - Insufficient surface water quality assessment methods and coastal (estuarine) water quality.
  - Insufficient description of sampling methods.
  - The need to define appropriate water quality objectives.
- EHP:
  - Insufficient surface water sampling regime and surface water quality monitoring results.
  - Insufficient groundwater assessment, including hydrology (subsurface flow and wet season water tables).

  - Insufficient number of groundwater bores.
  - Clarification on water balance for process water used in the process plant.
  - Request for accurate elevation levels/contour levels in order to map accurately erosion prone areas, tidal inundation, drainage pathways, stormwater management.
  - Inadequacy of the one dimensional groundwater flow model.
  - Concerns regarding the use and disposal of saline process water in areas to be rehabilitated and dust suppression.
  - Insufficient information on potential impacts through the disposal of saline process on groundwater quality.
- SEWPaC:
  - Potential impacts of saline waste water on MNES
  - Further information required on the rationale for the use of saline water in mine processes and dust suppression, and further discussion of whether acceptable freshwater sources are available or can be accessed.
  - Inadequate description and discussion of the topography, geology and hydrology of the site.
  - Inadequate information on how the changed hydrology of the site would be managed to avoid erosion and sedimentation.
  - Further information required for the rationale for the placement and depth of the 8 groundwater water monitoring wells, as well as information drawn from the monitoring data for these wells.
  - Insufficient information on subsurface water flows.

As a consequence of these submissions, the water chapter in the supplementary EIS was substantially revised. This section of the EIS assessment report incorporates the changes made in the supplementary EIS. However, in a review of the supplementary EIS and the proponent's response, DNRM, DSITIA and EHP further commented on some outstanding issues relating to water management. These outstanding issues are discussed in section 4.8.7.

4.8.2 Surface water

The proposed Urquhart Point Mineral Sands Mine is located on a sand peninsula approximately 3km south of Weipa, which is partially bisected from the mainland by 2 major estuaries—Hey River and Embley River. Wooldrum Creek, a tidal inlet, adjacent to a narrow sand spit, is located directly to the west of the proposed operations, and the mouth of the Embley River lies directly to the north.

High intensity rainfall can occur as a result of monsoonal troughs, in particular cyclone events and can cause localised flooding. The highest daily rainfall recorded at Weipa was 223mm, recorded in March 1996, associated with the Tropical Cyclone Ethel. 90% of the 1952mm of annual rainfall occurs in the wet season. Catchment analysis indicated that a normal average rainfall year is insufficient to generate any runoff in the dry season (May to October).

Mapped catchments discharge to several water bodies including Wooldrum Creek, Albatross Bay, the Embley River, Roberts Creek and the salt marsh located in the central portion of the site (Table 2). All of these water receiving areas are estuarine and primarily influenced by the marine waters of Albatross Bay and the Arafura Sea in Gulf of Carpentaria. There are two small ephemeral water flow paths and two ephemeral wetlands located at the western and northern areas of the site.

Table 2 Water bodies affected by the project (table reproduced from the EIS)

Name of watercourse	Water characteristics	Catchment affected (%)	Water resource available	Groundwater recharge area
Central Salt marsh	Saline–tidal influence	32%	Potentially seasonally	Yes
Wooldrum Creek	Saline–tidal influence	10%	No	No
Albatross Bay	Saline–tidal influence	52%	No	No
Ephemeral Creek (unnamed)	Fresh water present during part of wet season. Creek discharges into Embley	47%	Potentially seasonally	Yes

Name of watercourse	Water characteristics	Catchment affected (%)	Water resource available	Groundwater recharge area
	River via beach flat.			
Roberts Creek	Saline–Tidal influence	2%	No	No

The likely catchment yield scenario has been estimated for the project. The calculations indicated that surface runoff would constitute a small portion of the rain falling on-site. It was concluded that rainfall is essentially lost from the system through both evapo-transpiration and infiltration.

Following issues raised in the submissions regarding impacts on surface water and existing (unnamed) ephemeral creek line in the north-east of the project site, the disturbance area of ore body has been modified to exclude mining within 50m of the HAT line and/or HAT +0.8m (whichever is the greater of the two extents). Ore blocks in close proximity to the flow paths of this ephemeral creek (i.e. pits 21 and 23) would be scheduled for mining in the dry season (April–October) with rehabilitation completed prior to the wet season (**Figure 3**). This change resulted in the flow path of the ephemeral creek no longer being intersected by ore bodies. This area receives high wet season flows and is likely a locally important fresh water source for flora and fauna. The landform would be returned to its original line and level so as to not interrupt the wet season hydrological patterns.

4.8.2.1 Surface water runoff and erosion

Clearing of vegetation would be required at the site for the mining areas, haul roads, and mining facilities which would increase volumes of run-off generated at the site and could increase erosion at the site.

The EIS outlined that the sand rejects pumped and deposited into the mine slot at the site would be predominantly water, medium and fine-grained sand with minor amounts of silt. The EIS assessment concluded that minimal impact would be expected provided that the material was contained within the mine slot.

Surface water from rainfall events generated upstream of the site would be diverted around the mining area and there is potential for erosion impacts in the area of the drains around and downstream of the mining area. This could also potentially have impacts in areas downstream including areas undergoing rehabilitation. Potential impacts could include concentration of flows, scouring of rehabilitation vegetation, and suspension of sediments in runoff from exposed areas.

The feeder stockpile is expected to move with the mining area. The stockpile has significant potential for erosion and downstream sediment deposition. The heavy mineral concentrate stockpile is expected to remain at one location. It would be bunded and therefore not expected to have significant potential for erosion and downstream sediment deposition.

The proponent committed to implementing management measures to minimise potential surface water runoff and erosion impacts to acceptable levels.

4.8.2.2 Surface water quality monitoring

It was concluded in the EIS that the main potential water quality pollutants from the project would be total suspended solids and hydrocarbons from fuels and oil. Sediment could also be entrained in stormwater due to erosion and be deposited in receiving waters increasing turbidity.

During March and September 2011, a total of 16 fresh and estuarine monitoring locations were sampled. These were representative of different catchment and habitat types, probable mixing zones, and likely discharge points. Locations included the Wooldrum and Roberts creeks, and the contained catchments. As a result of comments made in the EIS submissions, the proponent committed to undertaking further monitoring during the wet and dry seasons in 2013.

DSITIA reviewed the surface water quality monitoring in the supplementary EIS and commented that the baseline monitoring of ongoing surface and ground water monitoring is still not adequate for areas of high ecological value (HEV). While the proponent committed to further sampling, DSITIA considered that important water quality parameters had still not been considered – such as pH, EC, temperature, dissolved oxygen, turbidity, metals (dissolved), such as Al, Ar, Ba, Be, Ca, Co, Cr, Cu, Fe, Pb, Mn, Ni, V, Zn, Hg, and Chlorophyll-a.

4.8.3 Stormwater drainage

In the EIS it was concluded that stormwater runoff would have a negligible environmental impacts through implementation of the following measures:

- The use of small hardstand areas.
- The temporary nature (4-6 years) of the mining project overall.

- The relatively small area to be mined.
- High infiltration rates due to the sandy substrates on the site.
- Implementation of drainage, sediment and erosion control measures.
- Diversion of runoff upstream of mining and stockpile areas by the construction of bunds and diversion drains.
- Minimising the area of open excavation at any given time to minimise the volume of surface water generated in the mining slot and the volume of sediment that can be eroded from disturbed land.
- Constructing internal drainage within the mining slot to collect run-off, prevent soil erosion and sediment transport outside the mining slot by tailings. This would be achieved by grading the mining slot to a sump or low point.
- Backfilling and revegetating mined areas as soon as practicable to pre-development surface levels.
- Maintaining buffer zones between mining activities to adjoining sensitive areas (including water bodies).

In accordance with the erosion and sediment control plan, a construction drainage plan would be prepared for each stage of mining to detail the controls required in response to changes in catchment properties as mining progressed.

4.8.4 Groundwater

In response to the EIS submissions the proponent undertook further groundwater surveys in October and November 2012. These investigations assessed also some of the hydrogeological characteristics of the groundwater regime that underlies the proposed mineral sands mine.

Previous surveys in September 2011 included the construction of eight shallow groundwater monitoring bores to a depth of 3m below ground level. However, these bores did not intersect ground water and future monitoring would be required to ascertain actual groundwater fluctuations. One production bore was drilled up to a depth of 72m below ground level and tested on 3 September 2011.

As a consequence of DNRM's comments on the lack of groundwater assessment and hydrology, the proponent commissioned a drilling program of 12 shallow bores to depths of -1 m AHD (Figure 4). The aims and objectives of this investigation were to:

- Obtain and review relevant geologic, hydrologic and geomorphologic maps, reports and data.
- Undertake bore testing to ascertain the extent of aquifers and characterise relevant hydraulic parameters.
- Profile the bore water columns to determine any changes in salinity with depth.
- Interpretation and assessment of field and laboratory data to ascertain whether mining would pose a significant threat to groundwater resources.
- Compile a technical report, including recommendations for further monitoring during mining operations to ensure that mine rehabilitation and closure can be achieved without unacceptable residual impacts.

The information arising from the new investigation was then used to update information on geology, aquifers, hydrogeology, groundwater levels and flow, groundwater quality and salinity.

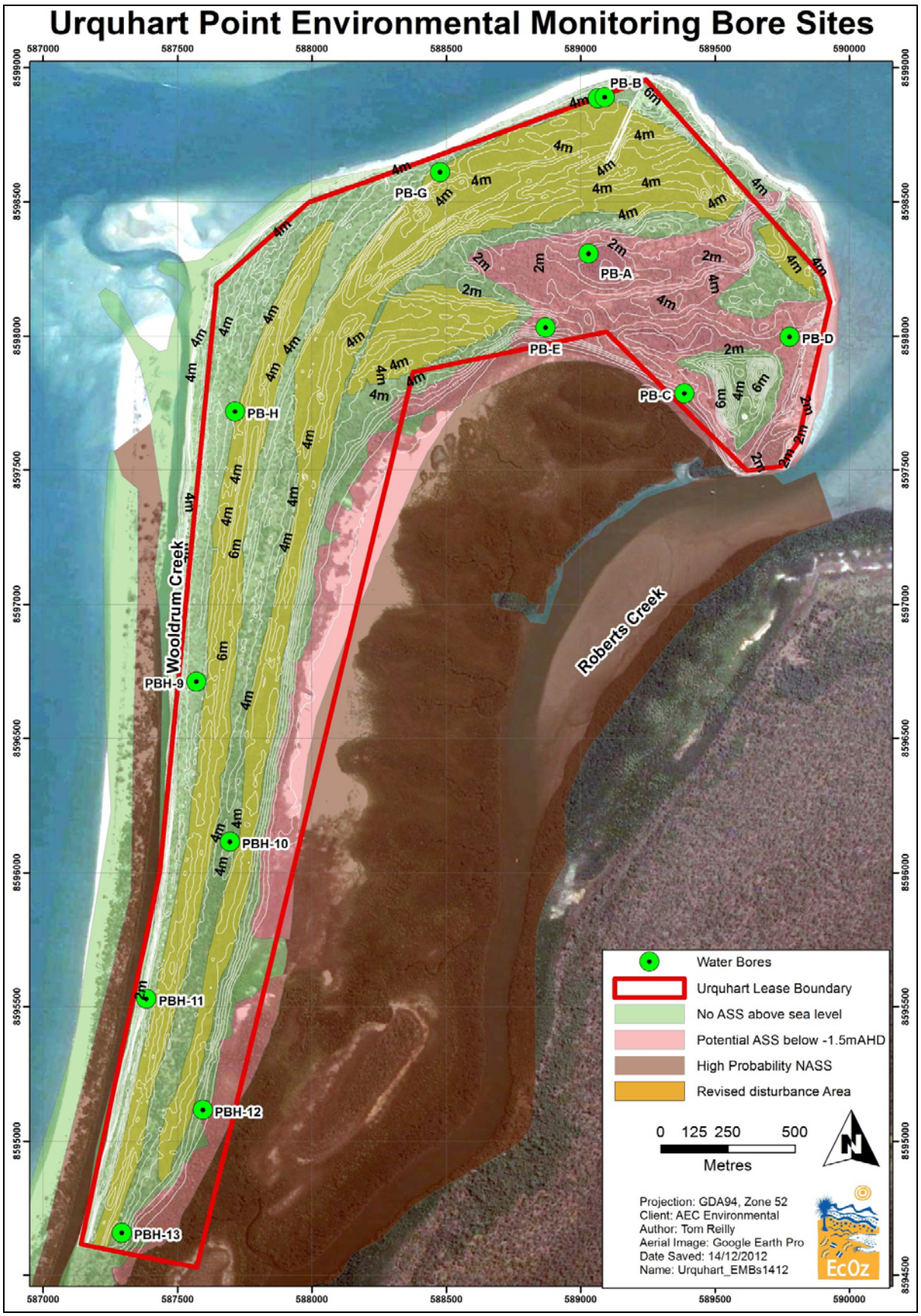

Figure 4 **Groundwater bore locations (Figure reproduced from the EIS)**

4.8.4.1 Geology

The EIS and supplementary EIS based their findings on the regional geology described in the South of Embley

EIS. However, very little information on the local geology (stratigraphy) of the project area was provided. The limited information provided through the EIS process came from data came from the bore logs from the November 2012 groundwater investigation. These logs indicated that near surface soil profiles display a sequence of loose friable sands with occasional hard thin layered coquina. The surficial sands are generally comprised of light grey to pale cream medium to fine grained sand – with occasional lenses of silts, or a variation of silty sands, blanketed by a thin sequence (~0.5m) of grey to dark grey to dark brown medium to coarse grained sands rich with humus and decomposed organic matter.

It remains unclear to what extend any rock formations occur on site and what role they might play in the preservation of freshwater lenses during the dry season. Rock formations do occur at the beach near the proposed barge ramp.

4.8.4.2 Aquifers and hydrogeology

The Gilbert River Formation forms part of the Great Artesian Basin aquifers and is the main artesian groundwater resource within the Weipa region. The aquifer in the Gilbert River Formation is present across the entire Western Cape region, west of the Great Dividing Range. The groundwater bodies within the region have been differentiated as shallow aquifer and artesian aquifer resources. The artesian resources are hosted within the Gilbert River Formation and Garraway Beds, and the shallow aquifer resources are those occurring within the formations above the Rolling Downs Group.

At the site of the proposed mine shallow aquifers are absent and confined to local small pockets of fresh to brackish waters overlying deeper seated saline aquifers. It was concluded in the supplementary EIS that the local coastal dunes and estuarine and delta deposits could not serve as a viable groundwater resource, as extraction would be difficult due to the fine-grained nature of the sediments. Attention was also drawn to the presence of saline groundwater and risk of saltwater intrusion, as being key factors against the utilization of the coastal aquifers.

The shallow aquifers in the project area have been investigated through groundwater level monitoring and aquifer parameter tests. Twelve investigative boreholes were installed and are being used selected for ongoing monitoring. Monitoring for the EIS and supplementary EIS found that the aquifer systems underlying the proposed sand mine:

- Were characterised by a highly permeable and ephemeral shallow groundwater system. The pedological column, particularly at the northern end of Urquhart Point, contained some lenses of fresh water trapped locally in silty-clayey sands underlying a hardened coquina layer (~0.5 m thick). However, these conditions did not extend across the mining area and are highly localised. The vertical extent of the freshwater lenses appears to extend to about 0.5m above sea level.
- That the shallow groundwater system is underlain by a deeper saline aquifer system. The fresh/saline interface was at around 1.0m below sea level, particularly at the northern and southern ends of the site.

The above observations and assessments indicate that mining to between 3.0m and 4.0m would not interfere with the ground water level and would generally be at an average 1.0m above sea level and saline groundwater. Fresh water lenses exist outside the mining footprint and would not be impacted upon.

4.8.4.3 Groundwater levels and flow direction

Groundwater contours and flow direction are shown in Figure 5. Shallow ground water was encountered between 2.2m and 5.5m below surface. It was concluded in the supplementary EIS that, while there appears to be a clear separation and confining layer between the shallow system and the reported deeper aquifers, there was no indication that these lithologies are not interconnected.

Ground water levels in most of the bores were found slightly below sea level with only two bores having water levels above sea level. These elevated water levels suggest the existence of ephemeral water mounds.

Test pits were constructed to observe extent of rooting systems in the Melaleuca and monsoon vine vegetation and to assess whether plant roots penetrate any existing freshwater lenses. Test pits observations found that roots in the Melaleuca and vine forests did not penetrate the B soil horizon and were confined within the top A soil horizon (~ 40cm below ground level), radiating approximately 15m from the trees. Soils within the B horizon were predominantly sandy with large hydraulic conductivities. The supplementary EIS stated that it was likely that annual wet season could result in soil profile saturation and deep waters could be impacted by intruding brackish to salty waters. However, it was also considered that the top 40cm of soil could provide for the entire water uptake of the local vegetation and that no near surface freshwater lenses were present that would not require ongoing management to protect native vegetation adjacent to the mine site.

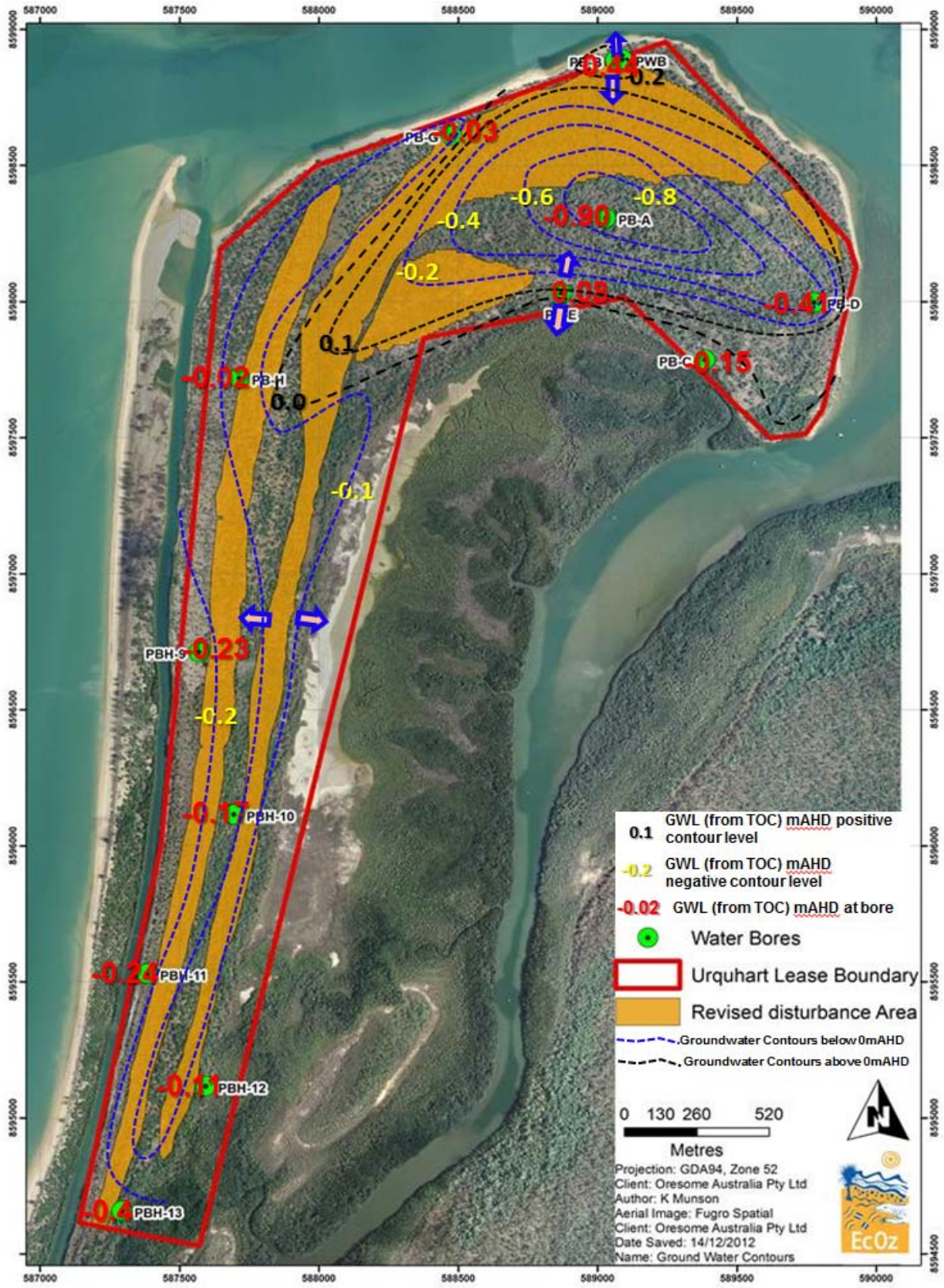

Figure 5 **Shallow groundwater contours (Figure reproduced from the EIS)**

4.8.4.4 Groundwater quality

Ground water quality ranged from fresh to brackish. Field pH ranged between 5.3 and 7.7 averaging 6.9. The lowest pH values were recorded in bores outside the area proposed for mining, and near to low lying marshes in which acid sulfate soils may be present. Electrical conductivities ranged between 171µS/cm and 18,400µS/cm, averaging 197µS/cm. Salinity ranged between 0.1g/kg and 12.2g/kg averaging 2.0g/kg. Concentrations of these parameters related to location with the larger or higher concentrations associated with the salt marshes and mangroves.

Groundwater bores were profiled for pH, electrical conductivity and salinity. Most of the water columns in the bores were found not to demonstrate significant profile changes, with circumneutral pHs and low EC, reflecting fresh waters. However, for bore near the marshes, significant changes in salinity concentrations with depth were observed. This was interpreted as showing that fresh ground water near the wetlands, marshes, mangroves and flatlands mix constantly with sea water intrusion and/or residual salty waters from tidal flooding of these areas. The substantially different water qualities reflect two distinctive signatures: a shallow fresh water zone underlain by saline water. After considering the available groundwater water quality data, the supplementary EIS concludes that these zones were separated by a confining layer formed by the kaolinitic white clay, originating from decomposed granites. However, it was also noted that this layer did not extent across the entire site and the high permeability of the surficial sands and sea water intrusion would affect the thin upper fresh water layer.

Hydrogeochemical processes were evaluated using a piper diagram to conclude that there are generally two different water types observed across the site: a Ca-HCO3 type and a Cl-Na type. Whilst the first set of waters indicates fresh recharging waters, the second set indicates end point (saline/brackish) waters. The Cl-Na and K type tend to be associated with lower pH. The Ca-HCO3 type is usually associated with lower salinity.

4.8.4.5 Mineral sand, salinity and groundwater interactions

Following concerns expressed in submissions on the EIS about the proposed use of saline process water, the proponent commissioned an investigation to ascertain whether groundwater quality would deteriorate as a result of such processing and the likely impact on the groundwater regime and the wider environment.

Analysis of leachates derived by washing mineral sands with groundwater (to simulate the quality of process water effluents) indicated that:

- Regardless of the mixture proportions and tumble leaching times, pHs remained circumneutral.
- Electrical conductivities and total dissolved solid concentrations increased due to increased cation exchange activity and calcium carbonate concentrations, with the highest concentrations in leachates from lower grade sands.
- All the major ions (including calcium, chloride, magnesium, potassium, sodium and sulphate) increased to almost twice their initial concentrations in the groundwater.
- Leachable trace metals and metalloids that were above their limits of reporting include arsenic, boron, barium, cadmium, chromium, copper, fluoride, iron, manganese and zinc. Boron, copper, and fluoride concentrations remained steady indicating these ions are neither adsorbed, nor released through leaching and hence that incoming ions will remain in solution. Barium and iron, particularly in the low grade sands, increased by about twofold when compared to their initial concentrations in ground water indicating that these are readily available in sands and will be released in process waters during washing of the sands.
- Manganese is the only metalloid that decreases, particularly in the low grade sands indicating adsorption onto available surface areas presented by finer particulates.

Based on these finding, the recommendations from the specialist report provided with the supplementary EIS were as follows:

- Process waters would be highly saline and should be disposed of into mined out open pits only. These waters should not to be discharged into water bodies on-site or used for dust suppression or revegetation purposes.
- The use of mine pits to dispose, evaporate and infiltrate process water and effluents would require consideration of pit water balances to ensure that upward and lateral migration of process waters are inhibited as these may impact the wider environment.
- Pit monitoring programs should include:
  - pit water chemistry (if and where ponding occurs).
  - visual monitoring of the surrounding coastal environments for discoloration and/or plumes
  - seasonal water chemistry to verify any likely influences by seepages leaving the pits.

4.8.4.6 Ongoing groundwater quality monitoring programs

A groundwater quality monitoring program was developed for the site. Groundwater quality would be regularly monitored within the existing monitoring bores upstream and downstream of the treated effluent irrigation area to observe any impacts of the treated effluent on the groundwater table.

Prior to the commencement of operations on site, baseline monitoring and ongoing monitoring (quarterly) of groundwater quality parameters including, but not limited to, pH, electrical conductivity, sodium , calcium, magnesium, sodium adsorption ratio, chloride, nitrate, nitrite, ammonia, total phosphorous, total nitrogen and *E. coli* bacteria would be undertaken.

4.8.5 Water supply and storage

Process water for the project would be sourced bore from local groundwater. The project would not involve water extraction from natural watercourses, surface storages (e.g. dams and weirs) or any municipal water supplies. The bore pump would draw from a saline aquifer at a depth of 37m and yielding up to 100m^3/hr. The water would be pumped into three separate 1,000,000L (1,000m^3) capacity storage tanks. This would provide approximately 3 days supply of processing water.

Water from processing would be returned to the tanks, via a settling tank, to allow the settling of any sediment present. The settling tank would be sited next to the storage tanks and would have a volume of approximately 200^3. However, the design and size of the settling tank is still subject to engineering. Silt would be recovered from the tank on a regular basis and allowed to dewater. When of a suitable consistency, this silt would be spread over the sand rejects.

Process losses from the system through spills, leaks and evaporation are expected to be 225m^3/hr. A further 90m^3/hr would be lost to groundwater from the sand rejects returned to the mined pits. The combined water loss from the system and therefore daily groundwater demand is therefore 3150m^3 (based on 10 hour operations) or approximately 907ML per year (based on 288 days of operation).

4.8.6 Rainwater and potable water

Rain water would be harvested from the admin building/ranger station roof into a 50,000 L rain water tank for use as potable water in on-site amenities/ablutions. A preliminary estimate for annual potable demand for amenities is 100,000L per annum. On-site drinking water would be obtained from bottled water.

Harvested water would be managed in accordance with, and meet the microbiological, physical and chemical standards, set in the *Public Health Act 2005*. In order to ensure that these requirements are met, various measures would be implemented on site (first flush devices, screens, etc). Treatment of rainwater (such as chemical treatment) is considered to be a final option, with priority given to avoidance and management measures designed to prevent contamination of rainwater.

4.8.7 Outstanding issues (surface and groundwater)

While the EIS concluded that the estimated increase in surface water volume generated by the mine sites would be relatively small, the calculations did not take into account the accumulative nature of clearing and that revegetation will not be complete for many years.

DNRM has reviewed the information provided in the supplementary EIS and commented that the proposed localised, drawdown of saline water would impact on ephemeral water table by altering the natural season variation in levels and water quality. DNRM further recommended that the daily proposed daily abstraction rate of 36.5 litres per second should be demonstrated to be achievable by providing actual pump test observations and that EHP should provide advice on the potential ecological impacts of changes to the ephemeral water table.

EHP, DNRM and DSITIA each provide comments on the updated water monitoring proposal. The was general agreement that ongoing surface and groundwater monitoring would need to be continued during mining operations, operations (not only for 2013, as proposed in the supplementary EIS; Table 8-S1) and would need to include monitoring of the following parameters: Mg, Na, K, Cl, TDS, alkalinity, sulphate, TN, TP, Redox (ORP), total cations and anions. Ongoing monitoring would also need to be carried out in receiving environments, such as those ephemeral wetlands not directly affected by mining. Advice was received that any ongoing leachate monitoring should also include recommendations outlined in the specialist report (refer to section 4.8.4.5 - Mineral sand, salinity and groundwater interactions).

4.8.8 Proponent's commitments

In order to minimise impacts on the water resources in and adjacent to the project site the proponent has committed to:

- An ongoing groundwater and surface water monitoring program.
- An erosion and sediment control plan.
- A construction drainage plan (to be prepared).
- Min pit water balances.
- Extraction of sand would not occur at a depth of below 3 m without further groundwater investigations having been completed.
- Drainage and water quality management measure.

4.9 Air quality

4.9.1 Adequacy of the EIS chapter

Chapter 10 of the EIS described the existing air environment and any environmental values that may be affected by the project. Only a few comments were received from EHP on the adequacy of the air chapter in the EIS. These comments are summarised below.

- EHP:
  - Further information is required on the extent to which dust would be generated from the mineral concentration process and what air pollution control equipment and techniques would be required suppress or minimise dust emissions to acceptable levels.
  - Dust emissions from ship loading activities were not estimated.
  - Further information on emission parameters of diesel powered generator(s).
  - Potential impacts of dust and air emissions on fauna.

No changes have been made to the EIS following the comments made by EHP. However, the proponent responded to each of the comments. These proponent's responses are incorporated in the discussion following:

4.9.2 Dust

The background dust levels (expressed in terms of the most common air quality indicator – PM10) as recorded at the township of Weipa over 2002–03 were compared with the ambient air quality monitoring data recorded at the permanent monitoring stations operated by the state government. The comparison was carried out with consideration of the PM10 monitoring records at the two nearest permanent air quality monitoring stations in Townsville and Mount Isa (there is no permanent air monitoring station at the Cape York Peninsula).

Whilst there were normal fluctuations in the dust concentration from month to month, the annual average dust concentration at both permanent monitoring stations were between 20 and 21µg/m^3. These average dust concentration measurements were adopted by Oresome Australia as the typical baseline dust concentration.

Under conservative air pollution dispersion conditions the dust (TSP, PM10 and PM2.5) emissions from the proposed mine would not contribute to an increase in the dust concentration above the background levels in the ambient air at Weipa and its surroundings. The calculated ground level concentrations of TSP, PM10 and PM2.5 are well within the relevant air quality objective under the EPP(Air).

The dust emissions generated by the mineral sand extraction activities tend to settle close to the mining face with negligible dust deposition at the residential areas of Weipa and its surroundings. Under conservative assumptions a high level of dust deposition is expected within a radius of up to 300m from the mining face. The dust deposition is highly dependent on the prevailing winds and atmospheric stability conditions with maximum dust deposition in a north-westerly direction under calmer overcast conditions.

The dust deposited at close proximity to the mining face was considered in the EIS of primary concern because of its potential to contribute to the overall sediment pollution of the waterways. Sediment control measures (section 4.8 – Water) would be implemented to control the surface runoff sediment as well as any additional sediment load due to dust fallout from the proposed mineral sands mining activities.

Oresome Australia committed to implement best-practice dust control measures in the vicinity of the mining face as well as at the sand rejects and processed material stockpiles in order to minimise dust emissions and the resulting dust deposition in the waterways (i.e. surface water application).

In regards to dust emissions from ship loading activities the proponent replied that because of the even distribution of the coarse, high gravity particles of the mineral sands, there would be negligible airborne dust emissions from the transfer of materials from the stockpiles to the landing barge, and from the landing barge to the cargo ship. The potential for fugitive material would be minimised through safe transfer and storage practices, and as described previously the nature of the mineral sand product would not result in dust emission.

4.9.3 Other air quality indicators

The operation of the mobile (bulldozers, excavators and trucks) and static (power generators, trammel screen, booster pumps) plant are associated with combustion of diesel fuel with consequent emissions to air. The primary diesel fuel consumption emissions are sulphur dioxide and nitrogen dioxide. The EIS concluded that the operation of the Urquhart Point Mineral Sands Mine would not contribute to significant additional sulphur dioxide and nitrogen dioxide emissions which may cause exceedance of the relevant air quality objective at the nearest sensitive areas. Modelling of calculated ground level concentrations of sulphur dioxide and nitrogen dioxide were within the relevant ground level concentration criteria for human health and ecosystem protection on site.

Hydrocarbons (mainly benzene) and the odorous emissions were considered minor emissions, because of the scale of activities and distance of few kilometres to any sensitive receivers. No further investigation of the hydrocarbon or odorous emissions was carried out in the EIS considering the very limited potential for impact on the existing air quality at the nearest sensitive areas.

The greenhouse gas emissions (GHG) were investigated as part of the overall air quality impacts. The operations were mainly associated with direct (point source) GHG emissions such as fuel (diesel) used in the stationary (mainly power generators) and mobile plants (excavators, bulldozers and trucks). The EIS concluded that there would be no indirect emissions of GHG, as the proposed mineral sands mine would not purchase any electricity from external sources. The GHG emissions from the disturbed land (cleared land) as part of the sand mining activities were considered to be minor. The total annual GHG emissions were estimated at approximately 6 kilotonnes.

Possible impacts through surface gamma radiation in airborne particles is discussed in section 4.13 – Health and safety.

4.9.4 Proponent's commitments

In order to minimise impacts on air quality in the project site the proponent has committed to:

- Dust control and suppression.
- Dust monitoring of individuals.
- Reducing GHG emissions through emission control systems.
- Radioactivity level monitoring, training and appropriate PPE.

4.10 Noise and vibration

4.10.1 Adequacy of the EIS chapter

Chapter 11 of the EIS described the existing environmental values that may be affected by noise and vibration from the project. No comments were received specifically for this chapter; however, comments on the potential impacts of noise on fauna were included in the SEWPaC submission. These are discussed in section 4.17 – Ecology.

No further comments were received as part of the supplementary EIS review and hence, this chapter has been adequately addressed. The following sections summarised the information provided in the EIS and updated information of the supplementary EIS.

4.10.2 Noise and vibration impacts

The proposed sand mine would be located at a distance of approximately 5 to 7km from the nearest sensitive receptors, the suburbs of Nanum and Mission River in Weipa. The noise sensitive areas of the closest commercial buildings would be located in the port of Evans Landing, approximately 3km south-east of the project.

A noise propagation modelling was carried out with consideration of the nearest residential and commercial areas in Nanum, Mission River and Evans Landing as well as the site office as commercial place on-site. In addition the

potential operational noise impact on the wildlife and their habitats was considered.

Under conservative modelling assumptions and considering the distances to the residences at the suburbs of Nanum, Mission River and Evans Landing, the calculated noise levels at those noise sensitive places were very low and fully compliant with the requirements of EPP (Noise).

The mineral sands extraction would be carried out by dry mining of fine sand that is available for loading via excavator directly from the extraction face. There would be blasting, drilling or crushing of the resource. The operation of the mobile (bulldozers, excavators and trucks) and stationary (power generators, trammel screen, booster pumps) plants; however, would be associated with localised ground vibration. However any ground vibration caused by the operation of the plant and equipment would be readily attenuated by the resilient properties of the sandy soil. Due to the distances to any residential areas, an investigation of any ground vibration impacts at the township of Weipa was not carried out.

The noise propagation modelling results indicated rapid reduction of the noise emissions from the mining face (extraction area), process area and ready product dispatch area. At distances of approximately 100m from the boundary of the active operation areas, the noise emissions would be reduced below 60dB(A), which is considered a noise level that does not cause birds to leave their habitats. Similarly, it was concluded in the EIS that vibration would not impact on fauna due to the attenuation by the resilient properties of the sandy soil.

4.10.3 Proponent's commitments

In order to minimise impacts on noise and vibration the proponent has committed to:

- Undertaking noise control measures in the vicinity of the mining face, sand rejects and processed material stockpiles in order to minimise noise emissions and the potential impacts on fauna habitats.

4.11 Cultural heritage

4.11.1 Adequacy of the EIS chapter

Chapter 13 of the EIS described the cultural (Indigenous and European) heritage and any cultural heritage values that may be affected by the project. Under s86 of the *Aboriginal Cultural Heritage Act 2003*, an Indigenous cultural heritage plan is being prepared by the proponent in accordance with the requirements of Part 7 of that Act.

One private submission was received on the adequacy of the cultural heritage chapter and included the following comments:

- Management of cultural heritage values: E.g. consultation with Alngith People not undertaken; unidentified story places, damage to archaeological sites beneath the sand, greater consideration of the Weipa Shell Mound Province.
- Further community engagement and cultural heritage management needed.
- Further evidence needed of the nature of consultation and community engagement that would be associated with the management of cultural heritage and the assessment of the significance of specific places to Traditional Owners is necessary.

With respect to the comments made, the proponent responded that the Wik & Wik Way People were determined to be the Native Title holders of the land and waters comprising the Mining Lease Area, pursuant to the Approved Determination of Native Title made on 13 October 2004 which came into force and effect on 23 March 2005. Hence, the proponent would not necessarily become involved in discussions between the Wik and Wik Way and Alngith Peoples. The proponent does; however, have an agreement with the Native Title Holders referred to as 'Urquhart Point Mineral Sands Project Ancillary Agreement for MLA20669 between Ngan Aak-Kunch Aboriginal Corporation RNTBC, on behalf of the Wik and Wik Way People, and Oresome Australia Pty Ltd'. As such, any agreement that the Native Title holders come to with the Alngith people would be given due respect by the proponent.

As part of the proponent's commitment to the protection of cultural heritage, a Cultural Heritage Management Plan is scheduled to the Urquhart Point Mineral Sands Project Ancillary Agreement for MLA20669 between Ngan Aak-Kunch Aboriginal Corporation RNTBC, on behalf of the Wik and Wik Way People, and Oresome Australia.

The proponent also stated that the respondent's statement that 'members of the adjacent Aboriginal community (i.e. Napranum) have not been formally engaged' is incorrect. The proponent responded that they have undertaken direct engagement with several members of the Napranum community, including meetings and site visits.

No further comments were received as part of the supplementary EIS review and hence, this chapter has been adequately addressed. The following sections incorporate the changes made in the supplementary EIS in response

to the abovementioned comments.

4.11.2 Native Title

The mining lease application area is owned by the Aurukun Shire Council but is part of an *Aboriginal Land Act 1991* freehold package to the Wik and Wik Way People. The Wik and Wik Way people are the Native Title holders of all land and waters subject to Oresome Australia mining lease application. The Ngan Aak-Kunch Aboriginal Corporation acts as the Wik and Wik Way People's representative for matters in relation to Native Title.

An exploration agreement was entered into by the Traditional Owners and Oresome Australia in 2007. The Traditional Owners have supported the pegging of the mining lease (conducted in August, 2010) for the purpose of the mining application and are negotiating terms and conditions for the granting of the lease. These terms and conditions would be discussed in the CHMP, which is currently being developed. Once completed and executed by all parties, the CHMP would be lodged with EHP.

4.11.3 Identified Indigenous and non-Indigenous cultural heritage

The EIS indentified the relevant Aboriginal parties for the project area, summarised the known cultural heritage information and outlined the management for the cultural heritage areas within the project site. A full heritage surveys were conducted within the project area in 2007.

Twelve registered or nominated places of cultural significance were identified. There have been several archaeological studies in the regional around the project site, such as Weipa Peninsula, Andoom Peninsula and on Norman Creek. Most were conducted as part of mining lease applications. A systematic cultural heritage field survey of the project site was undertaken in 2007 as part of the exploration permit for minerals (EPM 15268). This survey identified the following of Indigenous cultural significance:

- 2 shell midden clusters
- 52 shell scatters
- 1 stone artefact
- 1 memorial cross to a local person.

Natural resources that supported the economic and cultural systems of Aboriginal people who lived in the area of the project site were also identified. These included:

- a variety of native plants with documented or orally reported aboriginal uses
- native animals that provided food.

Based on the archaeological survey, no known significant non-Indigenous cultural heritage artefacts or places were identified on the project site. The database searches revealed one place of natural cultural significance; Cape York Peninsula. Cape York Peninsula is not legally registered, although is nominated for inclusion onto the National Heritage List. The results of its assessment are still pending.

4.11.3.1 Impacts to Indigenous cultural heritage

The EIS reported that Indigenous cultural heritage sites have been adversely impacted by the construction of the beach huts. Some of these huts were built on or around middens or shell scatters. Shell scatters and middens continue to be effected on by scrub fowl building nesting mounds and physical damage from human activity, cattle and feral pigs.

The EIS outlined that while it is intended to not impact upon cultural heritage sites, given the number of shell scatters and their size, it would be possible that there would be some impact to a few of these sites during the mining operations.

The proponent has given a commitment that, in the event that unrecorded cultural heritage sites or materials are discovered in surface or subsurface deposits during mining operations, work at that particular location would cease until Traditional Owners were contacted to provide advice on the significance of the finds and to discuss management and mitigation options.

4.11.3.2 Impacts to non-Indigenous cultural heritage

No significant non-Indigenous cultural heritage places or artefacts were found on the project site. However, should any historic items be discovered during the mining operations, appropriate procedures would be followed in accordance with the relevant legislation.

4.11.4 Cultural heritage management plan

A cultural heritage management plan (CHMP) has been prepared as a schedule to the agreement with the Native Title holders referred to as 'Urquhart Point Mineral Sands Project Ancillary Agreement for MLA20669 between Ngan Aak-Kunch Aboriginal Corporation RNTBC, on behalf of the Wik and Wik Way People, and Oresome Australia Pty Ltd'. In addition, cultural heritage management requirements would be included in the EM Plan

The proponent indicated that the CHMP would be revised following project approval to incorporate all cultural heritage matters raised through the EIS process and established as conditions of approval.

The EIS outlined that as part of the review of the environmental management plan (EM Plan), the Wik and Wik Way People Native Title holders have advised that:

- They support Oresome Australia's approach to its proposed mining and rehabilitation activities on the mining lease application as outlined in the EMP.
- The activities proposed to be undertaken have appropriate and acceptable management plans and practices.
- The Wik and Wik Way People Native Title holders recognise the current state of lands at Urquhart Point and acknowledge that the additional rehabilitation of the mining lease area would enhance the area's environmental aspects.
- The Wik and Wik Way People Native Title holders are not aware of any environmentally sensitive areas within the mining lease application area and are confident if any are found, would be appropriately managed.

4.11.5 Proponent's commitments

In order to minimise impacts on Indigenous and non-Indigenous heritage the proponent has committed to:

- Preparing a cultural heritage management plan.
- Develop a cultural heritage policy specific to the mining operations on Urquhart Point.
- Offering operator positions and traineeship to Traditional Owners and surrounding Indigenous communities.
- Ensuring cultural values are included in the rehabilitation of the project area.
- Development of a program of cultural heritage clearance.
- 'Historical cultural awareness training' for all employees and contractors.
- Obligations to notify the site environmental advisor of any cultural heritage finds.
- Inform the site environmental advisor of their obligations to notify and seek advice from EHP with regard to any historical artefact find.
- Any culturally significant sites would be avoided during exploration and mining activities.
- Members of the Traditional Owners group would be employed to assist in the exploration program, particularly in the identification of sites and in determining the location of suitable drill locations.
- Carbon 14 dates should be obtained from different layers of the large midden in the south east corner of the project area.
- A program of surface and sub-surface sampling would be undertaken prior to commencement of mining. This would involve sub-surface sampling of a group of shell scatters across the area to determine whether the scatters extend under the surface, and the nature of these deposits.
- Should skeletal material suspected of being of human origin be discovered, all operations within 100 m of the remains would cease immediately upon discovery and procedures outlined in relevant legislation would be followed.
- The memorial cross should be avoided during exploration and mineral extraction.
- Management and protection of cultural heritage after the mine is decommissioned.

4.12 Social values

4.12.1 Adequacy of the EIS chapter

Chapter 14 of the EIS identified the anticipated social and cultural impacts on Weipa and the surrounding region, which could result from the proposed Urquhart Point Mineral Sands Project. The assessment described the social and cultural baseline values of the identified area of influence, it evaluated the positive and negative impacts associated with the proposal upon these baseline values, and included mitigation strategies and monitoring plans to manage the identified impacts. A social impact assessment and management plan has been prepared as a result of this assessment.

As part of the EIS assessment the following matters were raised in the submissions:

- DTESB:
  - Requested a copy of the local industry participation plan, once developed.
- QH – Radiation Health Unit:
  - Recommended that the potential impact 'Extractive industries may expose radioactive material and pose public health risk' described under 'Community Health and Wellbeing' section should also be included under the 'Employee Health and Wellbeing' section.
  - Requested additional information regarding a complaints management system so that rising health issues can be efficiently and effectively reported, identified, and corrected.
- Skills Queensland:
  - Recommend the development of a more detailed workforce development plan.
- Rio Tinto Alcan:
  - Rio Tinto Alcan commended Oresome Australia for their commitment to local Aboriginal people via business development opportunities through tender and contract processes and employment and training in partnership with Myuma. Rio Tinto Alcan will continue to engage with Oresome Australia regarding the Urquhart Point Project and work together on matters such of joint concern such as the recreational permit system.
- SEWPaC:
  - Requested further information on the proposed Urquhart Point ranger program, including its objectives and benefits for MNES and what commitments are made for funding and managing it.
  - Requested to update the cumulative impacts as some of the projects in the vicinity of the project have changed.
  - Requested more information on the whether 'Wik and Wik Way People C/- HWL Ebsworth Lawyer', with whom numerous meetings were held, represent all of the Traditional Owner interest and provide further information on the issues raised during the consultation process and the outcomes.

Oresome Australia responded that they are committed to undertaking the development of a local industry participation plan, which would detail its strategy to utilise local services and markets. This would be developed upon receipt of an EA for the project, and a copy would be provided to the DTESB as requested.

In regards to the potential exposure to radioactive material the proponent responded that the requested changes have been incorporated. However, rather than state the likelihood as 'likely' Oresome Australia has described this as 'possible' as they did not agree with this assessment of likelihood. Potential impacts on health and safety regarding radioactivity are discussed in more detail in section 4.13 – Health and safety.

In response to the other comments listed above, the chapter on social values has been updated. No further comments were provided as part of the supplementary EIS review and hence, this chapter has now been adequately addressed. The following sections provide a brief overview of the social impact assessment, its process and outcomes.

4.12.2 Social impact assessment

The social impact assessment (SIA) was carried out in order to predict, anticipate and understand the potential impacts of development and to recommend strategies for mitigating and managing those impacts. In general a SIA process seeks to balances social, economic and environmental objectives of proposals, and increasingly maximise opportunities for the community to benefit.

The EIS outlined that Oresome Australia has taken a proactive approach to community and stakeholder engagement, with over two years of discussion and meetings prior to the development of this EIS. Oresome Australia has also sought to take a constructive and effective approach to mitigation, by attempting to develop the project from the outset with consideration to the life cycle of the mine, in ways that minimise disruption and maximise benefits to the community, in particular the Traditional Owners and the Wik and Wik Way Peoples.

4.12.2.1 Stakeholder engagement

Oresome Australia commenced a substantial stakeholder engagement program following the projects inception in early 2006. The key objectives of this program were to:

- Engage the Traditional Owners for the site (the Wik and Wik Way People), in order to recognise their traditional rights and support their aspirations for the project to contribute to social, economic and cultural gain for their communities.
- Identify all relevant project stakeholders and facilitate their involvement in the consultation process.
- Provide information to assist the community in understanding the project, to enable them to provide informed input into development of the project.
- Obtain relevant stakeholder feedback by providing a number of mechanisms by which community members and other relevant stakeholders may provide comment.
- Ensure that relevant stakeholders and the community are involved in the development of the project, including preferred social and cultural outcomes.
- Demonstrate Oresome Australia's commitment to stakeholder and community engagement and participation.

Key stakeholders with a potential interest in the project included the Traditional Owners, Wik and Wik Way People, the Cape York Land Council, Rio Tinto Alcan, council authorities, state government departments and service providers, natural resource bodies and residents of the identified impact area. Project team members also consulted with the Social Impact Assessment Unit of the former Department of Employment, Economic Development and Innovation (DEEDI) (now managed under the Department of State Development, Infrastructure and Planning) during the preparation of this assessment.

4.12.2.2 Employment opportunities to local Indigenous communities and Traditional Owners

Oresome Australia proposed to develop the Urquhart Point Mineral Sands Project as a model for business development in remote Aboriginal lands. The project would offer opportunities to local Aboriginal communities for training, employment and business development. The project would endeavour to maximise these opportunities through extensive and ongoing consultation with these communities.

Seven full-time Indigenous employees would receive training at the Myuma facility for three months. Myuma Pty Ltd are a not for profit corporation which is owned and managed by Indigenous Traditional Owners, and which has identified the need to provide pre-employment skills to Indigenous people in the north-west of Queensland to actively build sustainable communities in the region.

An Indigenous ranger would commence during the construction phase to supervise cultural heritage management, and remain for the life of the mine to supervise environmental and cultural heritage management.

Following the mine's closure, the administration building would be converted to a ranger station and Indigenous rangers would remain on site to protect and manage the area, delivering environmental outcomes using Indigenous traditional knowledge, as well as providing a sustainable employment source.

Appropriate partnerships with the Australian Government's 'Working on Country' program, and collaborations with the North Australian Indigenous Land and Sea Management Alliance (NAILSMA) would be formed to deliver an integrated service and help to secure ongoing support and training. NAILSMA supports Aboriginal and Torres Strait Islander land and sea management through the delivery of programs and projects which provide a strategic approach to caring for country, with an emphasis on practical management by Traditional Owners. Indigenous ranger groups in the region include the Mapoon Aboriginal Council, Napranum Aboriginal Shire Rangers, Wik and Kugu Ranger Service Aurukun. It is expected that the Ranger on-site could partner with appropriate groups to provide a Ranger service in the Urquhart Point region.

Several existing ranger groups in the region are also partners in GhostNets Australia, which is an alliance of 22 Indigenous communities from coastal northern Australia within Queensland, the Northern Territory, and Western Australia. The program was established in 2004 with funding from the federal government, and supports Indigenous rangers to remove beach-washed nets, and prevent them from returning to the sea.

4.12.2.3 Contribution to local economy

Urquhart Point Mineral Sands Project would be a small scale project compared to other mining operations in the region. The project is estimated to produce a gross output of around $41 million per annum at current prices for four years. This equates to around 0.45% of Gross Regional Product of the Far North Region based on 2005–06 figures or 1.35% of the local Western Cape economy.

4.12.2.4 Skills and training issues in the Weipa locality

In the EIS it was concluded that although there appears to be an adequate supply of workers in the region, the pool of skilled labour and technical personnel remains more limited. Whilst this is not anticipated to negatively impact upon the proposal, the EIS recognised that the project may attract workers away from other vocations or industries.

4.12.2.5 Population projections, demographics, socio-economic data

Projections released in 2011 by the Office of Economic and Statistical Research (OESR) indicated that by 2016 the expected population of Weipa will be between 3921 and 4338 persons. By 2021, this is expected to increase to up to 4784 persons. Population increases arising directly from the project are expected to be negligible (i.e. up to 13 persons), and temporary, given that the majority of the workforce is to be drawn from the Urquhart Point impact area.

4.12.2.6 Identified impacts and mitigation measures

Several impacts have been identified in the EIS. The following section discusses the main impacts on social values. Other impacts, for example on health and safety, cultural heritage or transport, are discussed in the relevant sections of this EIS assessment report.

Potential impacts arising from land and water access (fishers, campers, pig hunters) would be mitigated by restricting access to persons on authorised mine related business. This would help alleviate the problem of any continued use of the beach huts prior to demolition, or the erection of any new structures within the project area. It is worth noting that Traditional Owners have expressed concern to the proponent regarding the access of the public to the coastline surrounding Urquhart Point, particularly with respect to the erection of illegal structures, and also by persons on quad bikes, which are thought to damage turtle nests and disrupt wildlife. This project would provide opportunities for Traditional Owners to be involved in formalised land and sea country management and implementation activities through the development of an Indigenous ranger position and ranger station.

Possible impacts on employment, education and training were classified in the EIS as generally positive as the project would provide direct and indirect employment opportunities. Possible impacts on population and demographic profile was classified as unlikely as the majority of personnel would be sourced from communities within the impact area, and the absence of temporary workers (fly-in/fly-out) resulting in no changes of the temporary or permanent population changes. Impacts on the economy were rated as positive due to the direct and indirect flow-on effects.

4.12.3 Proponent's commitments

In order to minimise impacts on social values arising from the project the proponent has committed to:

- Employment opportunities to local Indigenous communities and Traditional Owners.
- Regular communications with Traditional Owners.
- Stakeholder engagement program.
- Conversion of the proposed site offices to an outstation and ranger station subsequent hand-over to Traditional Owners when mining ceases.

4.13 Health and safety

4.13.1 Adequacy of the EIS chapter

Chapter 15 of the EIS described the existing community values for public health and safety that would be affected by the project. It assessed the potential impacts on the community in terms of health, safety, and quality of life from project operations and emissions, including odour, dust and noise, potential impacts on public health in the short and long term, and the cumulative impacts on public health either in isolation or by combination with other known existing or planned sources of contamination. Particular emphasis was given on the assessment of potential impacts on the project workforce from exposure to radioactive material contained in the minerals sands.

As part of the EIS assessment the following matters were raised in the submissions:

- QH – Radiation Health Unit:
  - Identified severe errors in the description of the radioactive material, exposure levels as well as potential impacts, its measurement and the need for radiation monitoring, sampling, and radioassay to be conducted by a suitable qualified and experienced person.
  - Recommended that the potential impact 'Extractive industries may expose radioactive material and pose public health risk' described under 'Community Health and Wellbeing' section should also be included under the 'Employee Health and Wellbeing' section (refer also to section 4.12 – Social values).
  - Requested additional information regarding a complaints management system so that rising health issues can be efficiently and effectively reported, identified, and corrected (refer also to section 4.12 – Social values).
  - Identified several issues relating to radioactivity in the EMP.
- EHP:
  - Further information requested on the surface gamma data referred to in this chapter.
  - Further information on the potential for impacts or potential increased levels of radio-activity in the environment as a result of mining and on measures that would ensure that any risks are minimised.
  - Insufficient information on the waste stream from the sewage treatment system, fate of the sludge.
- SEWPaC:
  - Requested further clarification on whether the mineral sand concentrate is radioactive and its removal would reduce overall radioactivity, or the radioactivity would increase in the reject sands.
  - Further clarification and discussion on the implications for radioactivity levels in the mining blocks, sediments, dust, mineral sand concentrate spills and the ecosystem.

In response to the comments listed above, the chapter has been updated. No further comments were provided as part of the supplementary EIS review and hence, this chapter has now been adequately addressed. The following sections include the information provided in the EIS and updated information of the supplementary EIS.

4.13.2 Potential impacts and mitigation measures

This section summarises the potential risks to health and safety and the proposed mitigating measures during the construction, operation, decommissioning and rehabilitation phases of the mine. Sections in the supplementary EIS describing the potential health and environmental risks of exposure of radioactive material have been updated, including clear commitments for the proponent to engage a suitably qualified and experienced person to undertake further analysis of the heavy mineral concentrate, the reject material and the blended waste material for radionuclide content during operations. Based upon this assessment action would be taken accordingly for the radiation management of the different streams.

The following sections incorporate the changes made in the supplementary EIS in response to the abovementioned comments.

4.13.2.1 Environmental radiation

Mineral sands contain small amounts of naturally occurring radioactive material (NORM) which is mainly uranium and thorium and their natural decay products. Mineral sands can consist of up to 10% heavy minerals, of which 1–3% is monazite. Monazite is a rare earth phosphate containing a variety of valuable rare earth oxides (particularly cerium) and thorium oxide xenotime, containing yttrium. This subsequently means when separated from some mineral sands and the other mineral products it can contain between 5 and 7% radioactive thorium (232Th) and between 0.1 and 0.3% uranium (238U), occurring as ThO2 and U3O8. The levels of uranium and thorium in these sands are concentrated in the high and low grade ore product (zircon and rutile). Although during the processing of the sands a substantial amount of the radionuclide component would be removed in the export product, a significant amount of radionuclides would also remain in the ilmenite and the other wastes. As the material is concentrated in the process of separation and production, the radiation levels are increased because of the subsequent concentration of radiation material, usually monazite. Although monazite is only present as a minor mineral in unmined ore bodies, with each stage of processing more sophisticated measures must be introduced to control increasing radiation risks to workers, especially from ionising radiation from thorium. During this process, the Code of Practice for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing would be complied with.

A surface gamma radiation survey was undertaken in November 2011 to establish background levels of radiation at the project site pre-mining. Over 1200 measurements were taken over five days to establish the baseline gamma radiation levels over this portion of the mining lease.

Background levels of calculated absorbed gamma dose rates over the mineralised zones were found to be generally negligible to low and only marginally higher than the background levels in the area. The low gamma dose rates may be caused by 2 main factors: Firstly, the area does not have high concentrations of naturally occurring radionuclides in the surface materials. Secondly, there may have been a significant amount of moisture present in the surface and subsurface material caused by recent rainfall and which would significantly prohibit the emanation of radon from the ground, thus reducing the response to the radon decay product Bi-214.

The residues would be blended with other, non-radioactive solid material such as the original light sands from the initial separation process, mine spoil, soil or sand so the resulting material has a similar radioactivity of the back ground survey material. The blended material would then be sent back to the mine site for backfilling.

The proponent committed to ongoing measurements and assessment of radioactivity of all waste products and the ore concentrate stockpiles once ore processing begins. Depending on these results, appropriate radiation mitigation measures would then be implemented based on these assessments and outcomes.

The transport of material in the Australian mineral sands industry was not considered to pose a significant risk to the workers and the general public.

As a consequence to the comments made in the abovementioned submissions, a number of monitoring and mitigation measures would be implemented by the proponent. These include:

- Monitor radioactivity levels during the mining operations.
- Monitor doses received by individuals working in close association with the mineral sands.
- Inform staff of the precautions necessary to control their exposure to radiation and avoid accidents.
- Encourage female staff to notify management if they become pregnant so steps can be taken to limit exposure of the foetus.
- Ensure adequate dust suppression.
- Conduct all operations in accordance with relevant legislation, guidelines, code of practice and licensing conditions.
- Blend radioactive residues with non-radioactive sands from the initial separation process or mine spoil so the resulting material has a similar radioactivity level to the background survey material. Blended sand would be used in backfilling activity.
- Appropriate personal protective equipment would be made available if necessary.

All transport of radioactive material would be carried out in accordance with the Code of Practice for the Safe Transport of Radioactive Material.

Taking all the mitigation measures into account, it was concluded in the supplementary EIS that the risk of radiation exposure to personnel would be low.

4.13.2.2 Sewerage

The administration building (and proposed ranger station) and associated ablutions would have an on-site sewerage treatment system plant capable of achieving tertiary treatment to meet the statutory requirements. Treated effluent from the sewage treatment plant would be reused on-site for dust suppression and irrigation purposes. A preliminary water balance has been constructed in order to determine the size of the sewage treatment plant and the land area required for effluent irrigation.

All accumulated sludge within the proposed sewage treatment plant system would be pumped out periodically or as per manufacturers requirements by a licensed contractor and taken off site for disposal at a licensed waste disposal facility.

4.13.2.3 Effluent quality and monitoring

Due to the high permeability of soils within the area, and high ecological values within the site, advanced wastewater treatment and disinfection is considered the most suitable treatment for wastewater within the site. It is proposed that effluent disposal would be via surface irrigation on dedicated effluent disposal area within the operations area. Due to the high permeability of the natural soils onsite, the proposed wastewater treatment system would need to incorporate nutrient removal.

The effluent would be treated to a minimum Class A standard, as such potential health issues arising from contact with pathogens and viruses are expected to be limited.

4.13.2.4 Irrigation area management

Irrigation would be managed so as to not negatively impact on vegetation, soils and groundwater. Regular visual inspections of the vegetation condition within the effluent disposal area by the site manager/supervisor and/or suitably a qualified contractor would be a sufficient monitor of the vegetation condition. If irrigation area vegetation is clipped, clippings would be disposed away from the irrigation area and any site flow paths.

4.13.2.5 Other health and safety measures

A summary of the potential health risks, their potential impact and mitigation measures were adequately summarised in the EIS.

4.13.3 Proponent's commitments

In order to maintain a healthy and safe environment the proponent has give a commitment to:

- Conduct inductions to ensure all personnel, visitors and contractors are aware of the health and safety risks and the use of appropriate PPE.
- Conduct regular drug and alcohol screening of mine personnel.
- Provide suitable food storage facilities.
- Provide appropriate PPE.
- Conduct routine sampling of respirable crystalline silica exposures.
- Ensure chemicals and fuels stored appropriately and a register is kept.
- Ensure safety of rainwater supply by installing a first flush system, mesh screening on water tank inlets and monitor regularly.
- Implement control measure for biting insects.
- Monitor waste water system.
- Implement an appropriate on and off-site waste disposal system.
- Determine background radioactivity levels and regularly monitor such levels throughout the life of the project.
- Conduct regular vehicle inspection checks.
- Ensure correct procedures and controls for unloading and handling of fuel are used.
- Address all relevant legislative and Australian Standard requirements.
- Conduct site audits.
- Conduct radioactivity level monitoring (quarterly), as well as training, of staff and contractors.
- Conduct a full gamma survey at the end of the project – which would be compared with baseline survey data collected pre-mining.
- Monitor and report on compliance with relevant standards, policies and legislative requirements.
- Ensure continual improvement of strategies used to minimize risk to the health and safety of the environment and to their employees through analysis of audit reports.
- Review and monitor all incidents and accidents affecting health and safety events in accordance with the Health and Safety Vision of the company.

4.14 Economy

4.14.1 Adequacy of the EIS chapter

Chapter 16 of the EIS described the existing local, regional or national economies that may be affected by the project. No comments were received regarding this chapter and hence, this chapter has been adequately addressed.

The following sections outline the information provided in the EIS.

4.14.2 Summary of the potentially affected economies

The EIS outlined that the proposed project would have both positive and negative impacts on affected economies. The proposed project is a relatively small scale project compared to other mining operations in the region. The project is estimated to produce a gross output of around $41 million per annum at current prices for 4 years. In 2005–06 this equated to around 0.45% of Gross Regional Product of the Far North region, or 1.35% of the local Western Cape economy.

Mining accounted for 77% of the total economic output of Weipa in 2006 of which Rio Tinto Alcan was the sole contributor. So although the Urquhart Point venture would be small compared to other mining operations in the immediate region, the EIS outlined that the Urquhart Point Mineral Sands Project would complement the well developed mining sector.

During the mine's operation there would be a requirement for services from local businesses, and environmental assessment and ongoing licence approvals from government. Additionally, Queensland Mining and Safety would provide regulatory oversight, safety inspections and issue directives in respect of the mine. The cost to government of additional services required of this project was estimated to be minimal. There is no need for additional government provided infrastructure for this project. Oresome Australia has a policy to actively source goods and services from Queensland wherever possible.

The proponent concluded that the skills and experience gained by Indigenous employees engaged by Oresome Australia would allow these people to compete more effectively for employment with other, larger mining companies in the region beyond the life of this mine. The presence of skilled mine workers resident in the region would be a benefit to these larger companies as it would allow them to recruit locally.

4.14.3 Proponent's commitments

The proponent has made the following commitments:

- Maximising benefits to local and regional economies.
- Engagement with its workforce.
- Targeted training to residents of the shire.

4.15 Hazard and risk

4.15.1 Adequacy of the EIS chapter

Chapter 17 of the EIS described the potential hazards and risk to people and property that may be associated with the project. During the EIS submission period only a few comments were received from the Department of Community Safety (DCS) on the adequacy of this chapter:

- DCS – Queensland Fire and Rescue Service
  - Provided guidance on risk management, relevant legislation and guidelines.
  - Requested development of safety management plans and emergency response procedures in consultation with state and regional emergency service providers.
- DCS – Queensland Ambulance Service
  - Required to develop a Standard Operating Procedure dealing with site access and the use of a proponent supplied barge to access the site – in relation to evacuation of casualties from a remote site with limited access.

In response to the comments listed above, the chapter has been updated. No further comments were provided as part of the supplementary EIS review and hence, this chapter has now been adequately addressed. The following sections incorporate the changes made in the supplementary EIS in response to the abovementioned comments.

4.15.2 Potential impacts and mitigation measures

The focus of the chapter was the identification of hazards affecting people and property, and the assessment of the risks arising from those hazards. It also included risks to the environment as a result of discrete events or incidents that are outside the normal mine operation, such as fires, equipment malfunction, emergency evacuations and extreme weather events. The objective of the assessment was to identify those risks that might have the potential to adversely affect the project, its stakeholders, the environment and the local community.

The risk assessment carried out indicated that the residual risk profile for the project would be generally negligible to medium with the exception of safety risks from cyclones, which was rated as high risk to life and property even after the implementation of mitigation measures. It was concluded in the EIS that the management of risks posed from cyclones requires further consultation with relevant authorities, and would be addressed in detail in the emergency management plan.

No extreme risk scenarios were identified. The EIS noted that controls can reduce the probability but not the consequences of risks and hazards occurring. These risks are common to all mining operations, would also incorporate strategies and preventative procedures addressing the other key risks identified as having 'Extreme' consequences in the risk assessment—specifically bushfire and the care and treatment and transfer of critically ill or injured personnel, subcontractors or visitors from the mine site.

4.15.3 Proponent's commitments

In order to minimise hazards and risk the proponent has made the following commitments:

- Emergency management plan (to be finalised).
- Hazard and incident reporting.
- Site-based risk register.
- Monitoring, review and audits.

4.16 Coastal environment

4.16.1 Adequacy of the EIS chapter

Chapter 9 of the EIS described the existing coastal environment that may be affected by the project in the context of coastal resources and values identified. Impacts to coastal and marine flora and fauna assemblages were also described, including their likelihood, consequences, mitigation measures and cross references to other sections of the EIS where appropriate. This chapter received numerous comments during the EIS submission period. These included comments on MNES under the EPBC Act assessment, which do not form part of this EIS assessment. However, as the matters under the EPBC Act and under the EP Act overlap considerably, findings have been included, where relevant, in this assessment.

The following issues were raised in submissions on the EIS:

- DAFF:
  - Insufficient information on buffer zones for the salt marsh communities.
  - Potential disturbance of mangrove communities and required offsets.
  - Justification why the Melaleuca vegetation and ephemeral wetlands would need to be removed and why the disturbance of these wetlands cannot be avoided.
  - Further information on proposed remediation of wetland areas after mining has been completed.
- DSITIA:
  - Several comments on the presentation of water quality monitoring data.
  - Lack of information on water quality measurements and sampling techniques.
- EHP:
  - Lack of information on erosion prone areas and coastal hazard buffer widths/zones.
  - Lack of metals data for ambient water quality.
  - Clarification on likely disturbance to mangrove communities.
  - Identification of the Pine River Bay as declared fish habitat area.
  - Information on the off mining lease access for the barge landing area.
  - Exclusion of the administration building from erosion and inundation prone areas.
- SEWPaC:
  - Further information on the proposed buffer zones and lightening plan for turtles.
  - Further information on how to avoid landing the barges on turtle nests and to avoid running other equipment

over nests or interfering with the movement of hatchlings.

- Further information on rationale for setting the go-slow zone.
- Lack of wet season marine water sampling information.
- Further information on potential impacts on seagrass beds or corals than and the implications for MNES.
- Further information of ASS (refer also to section 4.5 – Land).

As a consequence of these submissions, this chapter has been revised. However, in a review of the supplementary EIS and the proponent's response, DAFF and EHP further commented on some outstanding issues relating to coastal management matters. These outstanding issues are discussed in the relevant sub-section below (section 4.16.9 – Outstanding issues).

The following sections incorporate the changes made in the supplementary EIS in response to the abovementioned comments.

4.16.2 Coastal morphology

The project would be located in the north-west of the Cape York Peninsula within Albatross Bay; a large shallow tropical embayment with extensive estuarine systems, varying in depth from 0–20m. The main rivers that discharge into the bay are Pine River to the North, and the Mission, Hey and Embley Rivers to the east.

The project site is characterised by well drained deep siliceous sands which are thought to be aeolian in origin, and form a series of low elongated shore-parallel ridges. These ridges overlie deposits of coarse sand, bauxite and ironstone nodules and shells, similar to beach ridge plains in the region. Sands which form the ridges are thought to originate from westerly winds redepositing beach sand deposits to form low dune ridge sequences landward of the frontal dunes. Shell remnants are thought to be largely a result of Aboriginal occupation over the site; however, may also be a result of past shoreline retreat resulting from sea level rise in recent decades.

North and eastern beaches of the project area are typical tidally-dominated reflective beach types or 'low energy' beaches with coarse sediment and low wave action. Beaches are long and wide with a moderate level of protection. The western peninsula beach has a relatively straight profile, wide beach berm, with a steep beach slope immediately above and below the water line inferring a reflective beach type, which reflects low wave energy and tidal dominance. The western peninsula is separated from the project site by Wooldrum Creek: a narrow, shallow tidal inlet with relatively steep banks on the western side, and gentle slopes on the eastern side. Waterway entrance instability is unlikely to be pronounced at this latitude (i.e. tidally dominated). Beach dunes elsewhere are relatively flat incipient dunes with a low profile. Beach sediments generally consisted of unconsolidated shell and coarse material including bauxite, with some consolidated material forming rocky ledges at points and parts of the beach.

4.16.3 Marine sediments

Marine sediment sampling was carried out to detect baseline levels of parameters of concern, in order that any impacts associated with pollution events may be detected away from the point source into receiving waters/sediments. Marine sediment sampling was undertaken in the intertidal zone from nine coastal locations from Roberts Creek to Wooldrum Creek during the September 2011. Sample sites represented different habitat types, likely discharge points, and potential impact points (such as the barge landing area).

Results in general indicated that sediments within the area were of relatively good quality, with little anthropogenic influences. This is most likely due to the relatively undeveloped catchments within the area, low population and mining of bauxite (a relatively inert mining product). The majority of samples contained medium fine sands, with all other samples containing medium coarse sands. Broadly, sediment composition in the intertidal zone can be described as shelly, fine to coarse medium grained siliceous and carbonate sands. These results are likely to be replicated partially into the subtidal zone on the coastal extents of the site. The EIS outlined that there is a very low potential for a fuel or chemical spill which could potentially affect marine sediment quality.

The proponent committed to an ongoing marine sediment monitoring program. As part of this program variations during the wet season will be compared with the results obtained from the dry season.

4.16.4 Coastal water quality

During September 2011, a total of eight estuarine monitoring locations were sampled representing different catchment and habitat types, probable mixing zones, likely discharge points, and potential water quality impact zones (such as the barge landing areas).

The results showed that the water quality adjacent to the mining lease appeared to be generally within relevant guidelines and of a high standard. This result was expected, given the low levels of disturbance to the project site and intact riparian vegetation. Results indicated that there have been minimal anthropogenic influences within the project waters (as seen with the low concentrations of dissolved metals). The results also showed naturally high levels of turbidity and nutrients which were expected as this is typical of conditions experienced within a tropical embayment.

The EIS stated that marine water quality are unlikely to be affected by the proposal, with the exception of localised, temporary and infrequent impacts (i.e. increased turbidity) in the location surrounding the barge landing area. The EIS further acknowledged that there would be a very low potential of a fuel or chemical spill which could also potentially affect marine water quality. The remobilisation of sediments associated with failure of sediment control devices and through barge movements may also result in temporary increases in turbidity.

The proponent committed to an ongoing coastal water quality monitoring program. As part of this program variations in water quality during the wet season would be sampled and compared with the results obtained from the dry season.

4.16.5 Coastal ecology

As part of the ecology assessment of coastal environmental values, the following surveys were conducted:

- Seagrass surveys at low tide (survey areas based on previous investigations by others).
- Opportunistic observations of marine plants (excluding salt marsh and mangrove communities which were surveyed as part of initial flora investigations) whilst walking/surveying nearshore environments.
- Benthic macroinvertebrate surveys in the intertidal zone.
- Periodic surveys of migratory waders and seabirds at likely foraging and nesting sites.
- Surveys for marine turtles along the western peninsula and northern beaches at the northern extent of the project area during both the March and September 2011 surveys.
- Opportunistic observations on seabirds, shorebirds, cetaceans and other marine fauna.

The findings of these surveys, any potential impacts and proposed mitigation measures as well as information on the proposed offset strategy on coastal values are further described in section 4.17 – Ecology and in section 4.19 – Biodiversity offset strategy of the EIS.

4.16.5.1 Significant coastal and marine habitats

Seagrass was found to be present immediately adjacent to the mining lease, on the eastern coastline of Urquhart Point, and within close proximity in the Embley River and Roberts Creek. The seagrass species *Thalassia hemprichii* was found in sparse to dense monospecific meadows adjacent to the north-eastern beach in a shallow, sheltered embayment. These meadows were only visible at low tide. This seagrass species is a known food source for dugongs and green turtles. Macroalgae were observed from all beach environments, indicating the presence of macroalgal communities in close proximity. North beaches (including the location of the barge landing site and ancillary facilities) did not show evidence of seagrass growth based on visual observations. These beaches are adjacent to the navigation channel which is regularly dredged, and was therefore considered unfavourable for seagrass formation. It was concluded in the EIS that no impacts are expected on seagrass, given that the barge landing area would be located several hundred metres from existing seagrass beds. Discharge of processing material, and sedimentation and erosion would be strictly controlled so that impacts on the water quality of local waterways and therefore potentially on seagrass meadows located in the north-eastern extent of the site are prevented.

Fringing coral reefs are present in Albatross Bay and were documented as occurring along much of the southern foreshore of the bay, and in the lower reaches of the Embley and Mission rivers. Mapping shows reefs as occurring to the north-east and south-west of the site. Reefs in the region do not appear to have been well studied but have been documented as providing habitat for a number of reef-associated fish. Evidence of the presence of reefs in proximity to the project site was noted whilst conducting turtle nesting surveys of the western sand spit, with a number of sponges, echinoderms, and zooxanthellate corals observed amongst the drift line on the beach. Extensive areas of coral rubble were also noted on the north-eastern beaches indicating the presence of coral reefs in the vicinity of these areas. Based on limited studies of reef communities in the Albatross Bay region, the reefs are likely to be marginal systems, consisting of a relatively thin veneer of corals growing over rocky substrates, rather than true coral reefs (i.e. the corals forming the reef structure). Coral rubble present on the beaches of the project site was noted to consist generally of encrusting, plate or massive corals from the families Turbinaria and Faviidae, with limited instances of branching corals observed. Given the distance from Urquhart Point to fringing reef communities, impacts are considered unlikely.

Soft sediment habitats were found throughout all of the intertidal and subtidal areas flanking the project site, including Wooldrum Creek, These intertidal and subtidal zones of Albatross Bay contain sedimentary soft bottom habitats (sand and mud) provide habitat for a diverse assemblage of invertebrates, including polychaete worms, bivalves, crustaceans and echinoderms which are part of the food chain for fish and birds. Soft sediment communities could also be affected by localised increases in turbidity, and sustained minor or major pollution events. The EIS outlined that no structures or dredging would be located on the banks or beds of any estuarine or tidal creeks or rivers. The barge and water taxi movements to and from the site; however, are expected to cause localised and temporary increases in turbidity in the vicinity of the proposed barge landing area.

Thirty-six hectares of mangrove forest were found to be located mainly in the south-eastern extent of the site, as well as being present as narrow tracts (i.e. 5–10m width) fringing intertidal areas. This community would remain intact as the proposed ore bodies and ancillary facilities are located outside of mangrove communities; however, a small portion in the southern extent of the site is currently identified to be disturbed associated with extraction of an ore body in this region (approximately 0.25 ha). The mangrove forest provides essential habitat for a range of listed threatened species under the EP Act, notably the estuarine crocodile (*Crocodylus porosus;* vulnerable). Alluvial mud flats on the fringes of this community are also considered to provide favourable habitat for the radjah shelduck (*Tadorna radjah;* near threatened) and the black-necked stork (*Ephippiorhynchus asiaticus;* near threatened).

Salt marsh vegetation was found in the centre of Urquhart Point, toward the eastern boundary of the mining lease. The salt marsh community is not proposed to be subject to extraction; however one ore body is located in close proximity to the salt marsh in the central area of the site. Salt marshes provide essential habitat for a range of listed threatened species under the EP Act, notably the radjah shelduck and the black-necked stork. Sediment control mechanisms were proposed to minimise and prevent mobilisation of sediments and changes in sediment transport dynamics associated with the extraction of mineral sands.

The project site is flanked to the north and east by estuarine waterways including Wooldrum Creek, Roberts Creek and the Embley River. Estuarine waters support highly diverse fish assemblages and act as nurseries for many fish species, including penaeid prawn species, several of which are commercially important. Wooldrum Creek was also noted as providing fishing habitat for the black-necked stork. Sediment control failure could potentially result in mobilisation of sediments and changes in sedimentation patterns (i.e. increased suspended sediment levels in estuarine waterways (i.e. Wooldrum Creek) particularly during the wet season. The EIS outlined the implementation of appropriate sediment control mechanisms in ore bodies adjacent to estuarine waterways to minimise and prevent mobilisation of sediments and changes in sediment transport dynamics associated with the extraction of mineral sands. Estuarine fauna could also be affected by localised increased in turbidity, and sustained minor or major pollution events

Open marine waters are present adjacent to the northern section of Urquhart Point and Roberts River. Small pods of dolphins (likely Indo-Pacific humpback dolphin, *Sousa chinensis*) were recorded at a number of occasions adjacent to the navigation channel and Roberts River. Dolphins and other marine species are commonly observed by local fisherman and boaters. These areas are also considered to provide habitat for a number of listed threatened marine species. No structures or dredging are proposed to take place in open marine waters adjacent to the mining lease area.

Sand/shingle or pebble beaches are located throughout the Albatross Bay region, and form the dominant beach type of the project area, including estuarine areas and the western extent of the project site. These beaches provide important foraging and roosting habitats for a number of seabirds, as well as nesting habitat for marine turtles. These beaches provide essential habitat for a range of listed threatened species under the EP Act, notably the little tern (*Sternula albifrons;* endangered) and beach stone-curlew (*Esacus magnirostris;* vulnerable). A number of old turtle nests were also located on the western beach facing Albatross Bay, adjacent to the mining lease. No permanent structures or extractive uses were proposed on beaches adjacent to the mining lease. A stabilised ramp would be located at the proposed barge landing area to enable the loading and unloading of equipment and product. The EIS concluded that impacts on soft sediment communities and marine macrofauna utilising the site would be expected to be low. However it was acknowledged that some disturbance to species present on the beaches in proximity to this area may occur (i.e. migratory waders).

Rocky substrates are present in the intertidal zone of the Albatross Bay region, along much of the Weipa Peninsula between the Embley and Mission estuaries, and as rock bars present in estuaries. These habitats are considered to provide food and shelter for fish, crustaceans and other invertebrates including oysters. On the project site some rock ledges were found in Wooldrum Creek, but a cursory inspection did not reveal the presence of notable macroalgal or epibenthic communities. Rocky ledges were also located along most of the northern beaches, in some locations forming prominent features of the beach environment. These ledges were generally hosting blacklip oyster (*Pinctada margaritifera*) communities. It was concluded in the EIS that rocky substrates would remain unaffected by the operations given that the barge landing area would be located on a sandy substrate, and no other impacts are expected.

Freshwater wetlands typified by ephemeral Melaleuca swamps are located throughout the upper reaches of estuarine areas in the Albatross Bay region, and on alluvial mud flats landward of mangrove and salt marsh communities. Freshwater wetlands adjacent to mangrove and salt marsh habitats are thought to have seasonal connectivity with adjoining marine systems, dependent on seasonal rainfall. On the project site Melaleuca woodland were located within the northern third of the site, and as a narrow tract bordering monsoon vine forest at its eastern extent. It was considered that this community would form seasonal wetland habitats during the wet season, providing suitable foraging habitat during the wet season for the radjah shelduck and the black-necked stork, both of were observed elsewhere on the site. Melaleuca woodlands are located within the areas that the ore bodies are located, and thus there would be an overall reduction in the area of ephemeral freshwater wetlands on the site. The project would require disturbance of approximately 15ha of Melaleuca woodlands within the mining lease.

4.16.5.2 Potential impact on marine and coastal habitats

In summary, the EIS outlined that the extent of disturbance resulting from the proposed mining operations has been determined by the location of suitable ore bodies. All efforts have been made to limit the impacts on coastal environments whilst still ensuring the project remains viable. Since submission of the EIS, the extent of the proposed mining/disturbance area has been reduced by 10.42ha in response to concerns relating to coastal erosion and protection of threatened marine turtle and shorebird species. No areas within 50m landward of the HAT line would be disturbed.

Some removal of Melaleuca vegetation and ephemeral wetlands would be required within ore blocks 5, 6, 21 and 24–27. Mining, re-contouring and respread of topsoil would occur during the dry season in these areas in order to minimise the potential impacts associated with erosion and sedimentation. These commitments would be included in the EMP. The proponent is also committed to developing a detailed rehabilitation management plan for approval by EHP and SEWPaC prior to commencement of mining. This plan would include details of approaches to rehabilitation in all vegetation communities that occur within the disturbance footprint.

4.16.5.3 Significant coastal and marine flora and fauna species

The following significant coastal and marine species listed under the *Nature Conservation Act 1992* (NC Act) were encountered within or immediately adjacent to the project area during the survey:

- Cooktown orchid (known as *Dendrobium bigibbum* or *Vappodes bigibba*, vulnerable)
- little tern (*Sternula albifrons*, endangered)
- beach stone-curlew (*Esacus magnirostris*, vulnerable)
- estuarine crocodile (*Crocodylus porosus*, vulnerable)
- green turtle (*Chelonia mydas*, vulnerable)
- flatback turtle (*Natator depressus*, vulnerable)
- Indo-Pacific humpback dolphin (*Sousa chinensis*, near threatened)
- radjah shelduck (*Tadorna radjah*, near threatened)
- black-necked stork (*Ephippiorhynchus asiaticus*, near threatened).

Albatross Bay also hosts a number of migratory waders and seabirds listed under the EPBC Act which utilise the East Asian–Australasian Flyway, and are listed under bilateral international agreements such as JAMBA (Japan Australia Migratory Bird Agreement), CAMBA (China Australia Migratory Bird Agreement), and ROKAMBA (Republic of Korea Australia Migratory Bird Agreement).

4.16.5.4 Potential impacts on coastal and marine flora and fauna species

This paragraph provides a short overview of the potential impacts on coastal and marine species in general. For a full discussion on impacts, mitigation and offset measures for listed threatened species refer to section 4.17 – Ecology, section 4.18 –Rehabilitation and in section 4.19 – Biodiversity offset strategy.

Desktop reviews have identified a number of significant flora species which potentially occurring on the project site. None of these species are considered to be specifically coastal or marine in their habitat requirements. One significant flora species was identified on the subject site during surveys, the Cooktown orchid which was abundant throughout coastal vine thickets of the site. Extraction of the ore bodies would require the removal and translocation of stems of the Cooktown orchid.

Potential impacts on cetaceans associated with the project would include displacement and disturbance associated with daily boat traffic to and from the site (water taxi) and regular shipping (barge), including physical and acoustic disturbance, and a slightly increased risk of boat strike. The risk of boat strike to cetaceans was considered low in the EIS given most cetacean species are highly mobile and would actively avoid approaching vessels.

Female turtles are thought to emerge from the water to nest in response to light regimes and once hatched, marine turtle hatchlings rely on lighting cues to move from the beach dunes toward the ocean horizon. Altered lighting regimes can therefore affect hatchlings orientation, resulting in turtles heading inlands towards light sources as opposed to towards the ocean, resulting in subsequent mortality. Inappropriate lighting of ancillary facilities may therefore affect marine turtles, which are known to nest on the beaches adjacent to the projects operations. The project operations would be limited to daylight hours only, and appropriate lighting design should prevent such impacts occurring. A turtle management plan would be prepared by the proponent, which would include a marine turtle lighting plan.

It was concluded in the EIS that estuarine crocodiles are unlikely to be impacted significantly by the project; however, a minor loss of habitat would occur with the removal of a small area of ephemeral wetlands. Whilst individual crocodiles may be temporarily disturbed by shipping activities, such impacts are not expected to be significant given background levels of shipping activity in the region, and limited activity on a daily basis. It is expected that most animals would move off or cross-shore in response to approaches from small or large vessels.

The EIS acknowledged that the project may result in temporary disturbance to seabirds or shorebirds (i.e. migratory waders) which may include physical or noise disturbance.

Whilst some shark and ray species may be temporarily disturbed by shipping activities, the EIS concluded that such impacts are not expected to be significant given background levels of shipping activity in the region, and the limited activity arising directly as a result of the operations. It is expected that most animals would move off or cross-shore in response to approaches from small or large vessels. Impacts on bony fish fauna are expected to be minimal.

The EIS outlined also that impacts on soft sediment assemblages associated with barge movements to and from the site are also likely to be both minor and localised in nature. Soft sediment assemblages have generally been demonstrated to be highly dynamic and resilient communities, with rapid recolonisation of disturbed areas generally occurring once the disturbance ceases.

4.16.6 Marine protected areas

No marine protected areas (i.e. marine parks administered by the state or Commonwealth) are located within the waters adjacent to the subject site or within the greater Albatross Bay region. Queensland Fisheries have recently declared an area comprised of the northern section of Albatross Bay and Pine River Bay as a fish habitat area (FHA); known as the Pine River Bay declared FHA. The FHA is located approximately 7.74km north of the project site.

4.16.7 Introduced marine species

The EIS summarised information on introduced marine species from available literature. The following introduced marine pests were recorded within the Weipa Port Authority limits in 1999: 1 algal species (*Caulerpa racemosa*), 1 introduced barnacle and 2 gammarid species. As all species were present in low numbers and were not thought to pose an ecological threat and no control measures were proposed. Ongoing monitoring of marine pest species is undertaken by the Biosecurity division of the Queensland Department of Agriculture, Fisheries and Forestry (DAFF) and the Ports Corporation Queensland.

The Australian Ballast Water Management Requirements details the requirements to prevent the introduction of invasive or pest marine species into Australian waters, which are implemented through the *Quarantine Act 1908* and administered by the Australian Quarantine Inspection Service (AQIS). All vessels and barges are to comply with all relevant requirements with respect to the management of ballast water.

The EIS concluded that there is a potential for exotic marine species to be introduced to waters adjacent to the subject site from the increase in barge activity and through ballast water. Given the site's location within the Weipa Port limits, and its proximity to the existing navigation channel, such impacts were not expected to be significant in the context of background levels of shipping activity in the region.

A ballast water management plan would be prepared by the proponent.

4.16.8 Potential Impacts and mitigation measures

The EIS outlined that because no dredging or coastal structures are proposed, significant changes to coastal processes (erosion and deposition) would not be anticipated. Infrastructure, except for the chain and timber ramp used for the barge, would be located outside of all Queensland coastal setback lines, including erosion prone and storm tide areas. Coastal erosion would be further minimised through access restrictions including use of 4WD and ATV vehicles on beaches (all vehicles to be excluded except for those travelling to and from the barge landing site from the ancillary facilities). A stabilised ramp would be located at the proposed barge landing area to enable the loading and unloading of equipment and product and minimise the disturbance footprint. Mining of ore blocks within 100m of the coastal foredune areas (north) and salt marsh communities (east) would be confined to the dry season. Reinstatement of natural ground levels and ecological restoration post disturbance were also proposed.

There would be the potential for cyclonic rains and periodic heavy monsoonal rains to potentially result in increased sediment loads entering tidal water bodies. However, with appropriate sediment and erosion controls the potential for this to occur would be expected to be minimised. Cyclone procedures would be prepared as part of the emergency management plan for the site.

The mobilisation of sediments from shipping activity would result in sediment resuspension and may result in some localised effects on benthic in-fauna due to increased shipping activity; however these would occur over a relatively small timescale. However, it was concluded that in-faunal soft sediment assemblages are generally resilient to small scale disturbances and recover quickly.

Localised changes to patterns of sediment deposition were regarded as minor impacts given the existing nature of the benthos in the barge landing area (i.e. no sensitive communities such as seagrass or coral reefs are present within several hundred metres). Furthermore, seagrass and coral communities within the port boundary are subject to naturally high turbidity levels, therefore the minor additional shipping movements resulting from the proposal are unlikely to impact on meadows to the east.

As boat traffic as a direct result of the operations were expected to be minor, the risk of boat strike or acoustic pollution would not expected to be magnified greatly. Mitigation measures, such as mandatory go slow zone 6 knots within 100m of shore, would be imposed to limit any boat traffic impacts. It was also expected the risk of pollution incidents could be managed appropriately through site based environmental management plans.

The risk of transfer of invasive species would also expected to be minor given the use of local barges for transport. Cumulatively therefore the impacts to fisheries were expected to be negligible.

Light pollution may pose a risk to marine turtles nesting in beaches adjacent to ancillary facilities; however mitigation measures e.g. lightening plan) were proposed to limit any impacts.

Impacts on some migratory and resident shorebirds and seabirds may occur, generally related to acoustic and physical disturbance. Such impacts may result in temporary disruption to normal behavioural activities, and temporary or permanent displacement for the life of the mine. It was noted that the potential impact on fauna would limited to a distance of approximately 200m from the ore bodies while in use and along a strip of not more than 100m from internal haulage roads.

Risks to fisheries activities, fish stocks, stock migration, migratory species, benthic species or species utilising the littoral or sub-littoral environment were considered generally minor, with the exception of potential impacts on marine turtles and threatened seabirds and shorebirds. The project would require the removal of some coastal vegetation communities as described above. The proponent has prepared several mitigation measures in order to ameliorate or minimise any potential impacts on flora and fauna (refer to section 4.17 – Ecology, section 4.18 – Rehabilitation and in section 4.19 – Biodiversity offset strategy.

4.16.9 Outstanding issues

In a review of the supplementary EIS, EHP identified on conflicting information in the proponent's commitments to ensure that ore blocks 7, 8, 9, 10 and 11 are mined and rehabilitated within a single dry season. EHP recommended that the correct timing for mining and stabilising vulnerable dune areas would need to be clearly identified in a scheduling plan.

Further outstanding issues were the inconsistent and incorrect definition of erosion prone area in the supplementary EIS (as per Erosion Prone Area Plan for the Aurukun, Pormpuraaw and Kowanyama Shire; Plan No: APK1A). This information would be important in order for EHP to assess whether the administration building would be located outside the erosion prone and storm tide inundation areas. EHP requires clarification on the exact location of the erosion prone area in relation to the administration building.

DAFF and EHP also require information on any proposed disturbance to mangrove communities as conflicting information was provided during the EIS and supplementary EIS. While the proponent's response to submissions clearly indicated that no mangroves would be removed, the supplementary EIS states the potential clearing of 0.25ha of mangrove forest would occur.

4.16.10 Proponent's commitments

In order to minimise the environmental impacts on the coastal environment, the proponent committed to:

- Ecological monitoring plan.
- Ongoing water quality and sediment programs.
- Vegetative buffer zones.
- Mining schedule that avoids extractive operations in sensitive areas during turtle breeding.
- Daylight operation.
- Marine turtle management plan.
- Standard incident reporting for marine turtle encounters.
- Restriction of access by personnel on beaches outside barge and vessel landing areas.
- Mandatory go slow zone of 6 knots within 100m of shore.
- Indigenous ranger program.
- Erosion and sediment control program.
- Rehabilitation management plan.
- Cyclone procedures as part of the emergency management plan.
- Ballast water management.
- Mining of ore blocks within 100m of the coastal-foredune areas (north) and salt marsh communities (east) confined to the dry season only.

4.17 Ecology

4.17.1 Adequacy of the EIS chapter

Chapter 12 of the EIS described the existing ecological values that may be affected by the project. It also addressed ecological values in terms of terrestrial and aquatic (freshwater and marine) ecosystems, and their interaction, biological diversity, the existing integrity of ecological processes, including habitats of listed threatened or near threatened species and the integrity of landscapes and places, including wilderness and similar natural places. The EIS further assessed potential impacts on the ecological values of the area arising from the construction, operation and decommissioning of the project, including proposed coastal infrastructure, increased shipping traffic volumes, clearing, salvaging or removal of vegetation. Impacts to coastal, marine and terrestrial flora and fauna assemblages were also described in this chapter, including their likelihood, consequences, mitigation measures and cross references to other sections of the EIS where appropriate. The ecology chapter, together with the coastal and rehabilitation issues, received the second highest number of comments (after water resources) during the EIS submission period. These included comments on MNES under the EPBC Act assessment, which do not form part of this EIS assessment. However, as the matters under the EPBC Act and under the EP Act overlap considerably, findings have been included, where relevant, in this assessment.

As part of the EIS assessment process the following matters were raised in the submissions:

- Private submitter:
  - Discussion on conservation value of the Cape York Peninsula and opposition to the project.
  - Discussion on threatened species potentially occurring on the project site.
  - Cumulative impacts not sufficiently addressed.
  - The need of weed management.

- DAFF – Fisheries Queensland:
  - Concerns regarding the removal of Melaleuca vegetation and ephemeral wetlands.
  - Recommended the restoration of the wetland areas (reprofiling if necessary), reinstating connectivity and re-planting species. Ongoing monitoring and restoration would also be necessary to ensure the area returns to its pre-disturbed state.
- EHP:
  - The sensitive ecological environment and high biodiversity across this site would need to be managed very carefully before, during and post-mining and it is recommended that comments provided by EHP would need to be adequately addressed in management plans.
  - Limited information on rehabilitation success criteria and measure of progress.
  - Impacts of local surface water and ground water on fauna and flora not sufficiently identified.
  - Mitigation measures not sufficiently described.
  - Insufficient information on environmental commitments (including weed and feral animal control measures).
  - Further clarification sought on mining impacts on protected bird species.
  - Insufficient buffer zones and surveys for shorebirds and marine turtles.
  - The need of a marine turtle management plan, including a lighting plan, and a marine turtle offset plan.
  - The need for boat strike mitigation.
- SEWPaC:
  - Insufficient information on the ecology of the landscape and the presence of variation in the vegetation and the presence of ephemeral wetlands.
  - Required modelling of noise and dust impacts for noise and dust sensitive species.
  - Activity in the beach area is not adequately addressed.
  - Lack of information on the importance of the ephemeral wetland associated with the salt marsh area in the south-east of the site and ephemeral freshwater bodies on-site for listed threatened species (flora and fauna). Discussions required on any indirect impacts (e.g. surface water quality impacts) likely to affect habitat for any individual threatened species and how these would be appropriately mitigated and managed.

As a consequence of these submissions, this chapter was revised and changes were incorporated in the supplementary EIS. However, after reviewing the supplementary EIS and the proponent's response, DAFF, EHP, DNRM and DSITIA and SEWPaC identified outstanding issues. These outstanding issues are discussed in section 4.17.6 – Outstanding issues.

The following sections incorporate the changes made in the supplementary EIS in response to the abovementioned comments.

4.17.2 Environmentally sensitive areas

Environmentally sensitive areas mapping (DERM) showed approximately two-thirds of the site as containing marine plants (as listed under the *Fisheries Act 1994*) and hence the mine site is therefore considered a Category B environmentally sensitive area.

Flora surveys of the site have determined that marine plants, such as mangroves and salt marsh vegetation, do not occur as extensively as that mapped on the certified DERM map. Salt marsh vegetation occurs on approximately 19 ha, none of which would be impacted by the sand mining process. The supplementary EIS outlined that mangrove forest occupied approximately 16ha within the project site, of which only 0.25ha is expected to be disturbed by the mining process. However, the proponent also committed to not clearing any mangrove forests in their response to the supplementary EIS. This issue remains unresolved and would need to be clarified as part of the EA conditions (refer to section 4.17.6 – Outstanding issues).

4.17.3 Terrestrial flora and fauna

4.17.3.1 Terrestrial vegetation communities and flora species

Six vegetation communities were identified in the general project area during surveys. All are classed as remnant vegetation under the *Vegetation Management Act 1999* (VM Act). An overview of the existing REs, their conservation status under the VM Act and EP Act, and their total area and area to be cleared is found in Table 3.

The Cooktown orchid was encountered in several locations within RE 3.2.5a/3.2.25 (Acacia woodland), RE 3.2.2 (vine thickets) and RE 3.2.3 (Melaleuca/Acacia open forest). The vine thickets (RE 3.2.2) were considered as the main habitat for this orchid species.

RE 3.2.3 and RE 3.1.1a/3.1.3/estuary were found to provide suitable foraging habitat during the wet season for the radjah shelduck and the black-necked stork and the estuarine crocodile.

RE 3.2.24 and 3.2.32 provide habitat for estuarine crocodile (which was observed from several locations within this vegetation community), little terns, beach stone-curlew, green turtle, radjah shelduck, and black-necked stork. This community occurs outside of the mineral lease boundary along the foreshore, but has been included in the vegetation description due to its close proximity to the project.

Table 3 Regional ecosystems found in the project area

Regional ecosystem	Description	VM Act class[1]	Biodiversity status[2]	Total area on project site (ha)	Area to be cleared (ha)
3.2.5a/3.2.25	*Acacia crassicarpa* +/- *Syzygium suborbiculare* +/- *Parinaria nonda* woodland on beach ridges and sparse herbland of mixed herbaceous species on foredunes and beach ridges	Of concern (subdominant)	Of concern	50.85	12.73
3.2.2	Semi-deciduous vine thicket on coastal dunes and beach ridges	Least concern	Of concern	192.8	107.4
3.2.3	*Melaleuca dealbata* and *Acacia crassicarpa* +/- open forest on dune swales	Of concern	Of concern	80.01	13.22
3.1.1a/3.1.3/ estuary	Closed forest of *Rhizophora stylosa* +/- *Bruguiera gymnorhiza and Ceriops tagal* +/- *Avicennia marina* low closed forest	Least concern	No concern at present	15.87	–
3.1.6	Sparse herbland or bare saltpans associated with salt plains or saline flats	Least concern	No concern at present	18.61	–
3.2.24/3.2.32	Closed herbland of mixed graminoids and forbs on exposed foredunes and *Lepturus repens* closed herbland, restricted to sand clays	Of concern	Of concern	Outside MLA[3]	–

[1]VM Act Class – Conservation status under the VM Act.
[2]Biodiversity status – Conservation status under the EP Act.
[3]RE 3.2.24/3.2.32 community occurs outside the mining lease area and would not be impacted by the proposed project.

101 native flora species were recorded during wet and dry season surveys. Only one listed threatened flora species under the NC Act was encountered during field investigations, namely the Cooktown orchid (vulnerable). Six other listed threatened flora species were regarded as potentially occurring on the project area from database searches, but only four species would have suitable habitat on site. None of these species were found during field surveys:

- *Acacia fleckeri* (near threatened), suitable habitat available on site.
- Rainforest Habenaria *Habenaria hymenophylla* (near threatened), suitable habitat available on site.
- *Lepturus geminatus* (near threatened), suitable habitat available on site.
- *Solanum dunalianum* (vulnerable), suitable habitat available on site.
- *Acacia ommatosperma* (near threatened), no suitable habitat available on site.
- *Calophyllum bicolour* (vulnerable), no suitable habitat available on site.

4.17.3.2 Terrestrial fauna species

The wet and dry season surveys recorded a total of 134 fauna species, including nine amphibian species, 25 reptile species, 86 bird species, and 5 terrestrial mammal species (excluding bats). Five bat species (all listed as least concern) could be identified down to species level with a further 2 species identified to genus level (long-eared bats *Nyctophilus* spp and sheath-tailed bats *Saccolaimus* spp). This is because bat identification based on acoustic monitoring is not always possible for all species. Some bat species produce echolocation calls which overlap and hence are not species-specific. In these circumstances, bat calls are identified down to groups. The correct identification of the sheath-tailed bats is in the context of the EIS assessment was important as the 3 possible species have different conservation status: The Papuan sheath-tailed bat (*S. mixtus*) is listed as near threatened under the NC Act, the bare-rumped sheathtailed bat (*S. saccolaimus nudicluniatus*) listed as endangered under the NC Act and critically endangered under the EPBC Act, while the yellow-bellied sheath-tailed bat (*S. flaviventris*) is not listed as threatened under both state and Commonwealth Acts. Identification down to species level would have implications on the offset requirements under state and Commonwealth legislation.

Given that there was the potential for a bat species listed as critically endangered under the EPBC Act on the project site, additional targeted bat surveys were carried out in August 2012 (post EIS submission). Up to 8 bat species were recorded on the project site. The assemblage mostly comprised species that roost during the day in trees, with the exception of the eastern bent-winged bat *(Miniopterus orianae oceanensis*), which ranges over long distances during its nightly foraging activity following dusk emergence from roosts in caves. Echolocation call recordings of sheath-tailed bats were most likely attributable to the Papuan sheath-tailed bat.

4.17.3.3 Marine megafauna

One estuarine crocodile (vulnerable) and was observed from several locations within the estuarine vegetation community RE 3.1.1a/3.1.3/estuary, especially along the creek line.

One green turtle (*Chelonia mydas*) was found at the entrance of Wooldrum Creek that had fatal injuries from a (likely) crocodile attack during the dry season survey. During boat transfers to and adjacent to the project area, turtles were observed surfacing from a distance near Evans Landing and in Roberts Creek, though these could not be conclusively identified at the time.

A number of old turtle nests were observed during the wet season surveys on the western peninsula, and turtle tracks and nests were also observed during the dry season surveys, identified to be Flatback Turtles (*Natator depressus*) based on track and nest morphology. Both marine turtle species are listed as vulnerable under the NC Act, and vulnerable and migratory under the EPBC Act.

A small pod of Indo-Pacific humpback dolphins (*Sousa chinensis*) were identified close to Urquhart Point and Roberts Creek during the March survey, and a solitary individual was also sighted multiple times during the September survey fishing adjacent to the northern beaches. This species is listed as near threatened under the NC Act. Marine species have also been discussed in section 4.16 – Coastal ecology.

4.17.3.4 Significant flora and fauna species

A total of 11 listed threatened species under the NC Act were identified within or directly adjacent to the project area, predominantly recorded from marine waters, creek banks or mangroves. Of the 11 species listed under the NC Act, 2 are concurrently listed under the EPBC Act, namely the green turtle and flatback turtle (vulnerable, EPBC Act). While MNES was not assessed in this EIS assessment report they have been mentioned for purposes of completeness.

The following listed threatened species scheduled under the NC Act were encountered within the project area during surveys:

- little tern (*Sternula albifrons*, endangered)
- Cooktown orchid (known as *Dendrobium bigibbum* or *Vappodes bigibba*, vulnerable)
- beach stone-curlew (*Esacus magnirostris*, vulnerable)
- estuarine crocodile (*Crocodylus porosus*, vulnerable)
- green turtle (*Chelonia mydas*, vulnerable)
- flatback turtle (*Natator depressus*, vulnerable)
- Indo-Pacific humpback dolphin (*Sousa chinensis*, near threatened)
- radjah shelduck (*Tadorna radjah*, near threatened)
- black-necked stork (*Ephippiorhynchus asiaticus*, near threatened)

- Papuan sheath-tailed bat (*Saccolaimus mixtus*, near threatened)
- robust burrowing snake (*Antairoserpens warro*, near threatened).

4.17.3.5 Weeds and pest species

A total of 6 weed species (i.e. non native to Cape York Peninsula bioregion) were recorded on the project site. None of the species recorded are declared under the *Land Protection (Pest and Stock Route Management) Act 2002* or are declared as a Weed of National Significance (WONS).

However, 3 declared weed plants as listed under the *Land Protection (Pest and Stock Route Management) Act 2002* have been recorded within a 10km radius of the site. Measures would be implemented in accordance with the pest species and weed management plan to prevent the introduction, spread and establishment of these species within the site.

Five introduced fauna species were recorded from the project site and immediate surrounds:

- cattle (*Bos taurus*)
- dog (*Canis familiaris*)
- Asian house gecko (*Hemidactylus frenatus*)
- cane toad (*Rhinella marina*)
- feral pig (*Sus scrofa*).

Of these species identified only the cane toad and feral pig were considered to be having a large impact on native fauna populations. Ecological effects of cane toads include: Lethal toxic ingestion by native species including birds, reptiles (in particular frog eating snakes), and small mammals; direct predation on a wide variety of ground-dwelling native species, predominantly large volumes of invertebrates but also insects, frogs, small reptiles, mammals and birds; and competition both in the tadpole and adult phases, particularly with native frog species.

Evidence of feral pigs was observed from almost every vegetation community on the site and wallows were evident within several of the ephemeral waterways and wetlands. Feral pigs have a wide range of impacts on native ecosystems through physical disturbance (i.e. rooting and digging behaviour and wallowing) leading to a number of impacts such as destruction of native vegetation, soil loss, weed establishment, decline in water quality and spread of disease. Of particular concern on the project site is the likely destruction of bird and turtle nests, as well as egg and young predation, and competition with native species for resources.

4.17.4 Potential impacts and mitigation measures

4.17.4.1 Terrestrial vegetation communities and listed threatened flora species

The project would require clearing a total of 133.35ha of vegetation (Table 3). A number of potential impacts were identified in the EIS which may affect the vegetation communities and associated habitat values of the vegetation communities:

- Decreased connectivity of arboreal habitat limiting movement of arboreal fauna species.
- Erosion/sediment intrusion on surrounding aquatic environments.
- Removal of vegetation during the construction phase of the development would have the potential to cause injury and/or death to fauna present in extractive areas.
- Introduction or facilitating the spread of weed species in the project area via introduction or spread by machinery or personnel.
- Removal of arboreal microhabitat (i.e. tree hollows, fissures, exfoliations) and arboreal feeding resources for nectivores and folivores.
- Increased fire risk from operations and personnel.
- Removal of terrestrial microhabitat (i.e. ground hollows, rocks, and vegetation).
- Removal of vegetation associated with ephemeral wetlands or wetland margins.

The proponent proposed general measures to protect vegetation that would be included in the flora management plan, such as GPS units on all machinery (showing the boundaries of the disturbance areas and ore blocks boundaries). To mitigate the potential impacts of weeds introduced from ex-situ sources and litter, a high standard of grounds keeping, housekeeping and landscape management would be implemented as part of the pest species and weed EMP.

The Cooktown orchid was a common epiphyte observed within the majority of vine thicket copses throughout the site, and adjacent vine forest ecotones. The EIS concluded that although the operations would result in the removal of a number of specimens of this species, impacts on a regional scale would be expected to be minimal due its extensive geographic range and local abundance.

The operations could have the potential to significantly impact upon the population of a threatened species—*Solanum dunalianum*—if present, given its restricted geographic range. Whilst this species was not detected during site surveys, suitable habitat exists within the mining lease and therefore further investigations have been recommended as part of subsequent investigations.

The following mitigation measures for impacts on observed or expected listed threatened species were proposed:

- Disturbance buffers of 50–100m.
- Minimise area of disturbance by ensuring that all machinery operators have a GPS loaded with clearing boundaries and displaying large-scale maps of the mine site in site offices.
- Mining of the eastern side of ore blocks 24–43 (within 100m of the saltmarsh community) in the dry season (March and October).
- Clearing of Melaleuca woodland communities present in parts of ore blocks 5, 6, 21 and 24–27 during the dry season.
- Ore blocks 7–11 and 19–22 would be mined, re-contoured and re-spread with topsoil during the dry season.
- Ensure that prior to works commencing the transplantation of all specimens of Cooktown orchid.
- Where specimens of listed threatened flora species are encountered during pre-clearing vegetation surveys in areas, all individuals would be translocated to suitable habitat.
- Implementation of the erosion and sediment control program (EMP).
- Designated pathways (pedestrian and vehicular traffic).
- Strict weed hygiene practices, including weed monitoring and management program.
- Eradicate listed environmental weeds from the project area to the largest extent practically possible.
- Identify and target key flora species for revegetation and seeding programs.
- Stockpile topsoil prior to mining.
- Reinstate topsoil as soon as possible after mining is completed and ideally within 3 months of stockpiling.
- Implement rehabilitation management plan.

4.17.4.2 Listed threatened terrestrial and marine fauna species

A number of general impacts were identified in the EIS which may affect fauna species:

- Disruption to species breeding and seasonal movements.
- Vehicular strike.
- Noise and light pollution.
- Accidental pollution events resulting in contamination of land or stormwater runoff.
- Fauna utilising or being trapped in extractive areas (i.e. pits during operations).
- Pest fauna invasion in cleared areas and adjacent areas.

The EIS concluded that the potential for any significant disturbance to fauna species that might result from activities associated with the proposed development could be satisfactorily mitigated by implementing the following measures:

- Operation would be restricted to daylight hours only (to reduce impacts on nesting turtles).
- The requirement for artificial lighting would be restricted to security lighting on the administration building. All lighting would be installed in accordance with best practice to avoid any change to the natural light horizons. A lighting plan would be implemented as part of the marine turtle EMP.
- Mining of ore blocks 7–11 and 12–22 would be scheduled to occur during the dry season in order to avoid period of peak nesting (between late November and early December) and hatching activity (late December to early March).

- Disturbance buffers of 50–100m to nesting beaches.
- Minimising the disturbance area by implementing progressive rehabilitation.
- Revegetate with appropriate plant species that would provide food resources for local fauna.
- Disturbance buffers of minimum 50m from sensitive areas including swamps, creeks, mangroves, salt marsh, beaches.
- Implement of an erosion and sediment control program, including covering stockpiles.
- Return old logs and large rocks salvaged during vegetation clearing to rehabilitated areas.
- Speed restrictions of vehicles.
- Installation of broadband reversing alarms on equipment to reduce noise.
- The use of dump trucks, the screening plant, and excavator strictly on an as-needs basis to minimise noise.
- Minimise the development of new track networks and rehabilitate cleared open areas and riparian fringes to assist in slowing the spread of cane toads.
- Go-slow zone of 6 knots, 100m from shore to minimise the potential for boat strike.
- Pest control and management.
- A licenced fauna spotter-catcher would undertake a pre-disturbance fauna trapping program and relocate all vertebrate fauna found to appropriate location.
- Creation of an exclusion zone around the section of Wooldrum Point utilised by little terns during nesting and breeding season.

As a consequence of all mitigation measures and based on the EIS impact assessment on all listed threatened fauna species present of likely to be present on the project area, it was concluded that the operations would have no significantly impact on any of the listed threatened fauna species.

4.17.5 Ecological monitoring program

An ecological monitoring program would be developed and undertaken by the proponent as part of the EA conditions. The monitoring program would focus on the ecological health of communities adjacent to the proposed extractive areas and incorporate the water quality testing results, baseline flora and fauna data collected as part of the preparation of this EIS and any other relevant data. This program should incorporate pre-construction baseline data in order to inform the subsequent monitoring program.

Oresome Australia committed to establishing an Indigenous ranger program on the site, which would undertake the majority of monitoring activities as well as feral pig control. Oresome Australia is also committed to monitoring marine turtle populations and would report any strandings, mortality, and entanglements in ghost nets to the Wildlife Stranding and Mortality Database, as well as actively conducting a ghost net removal program on the western peninsula. A marine turtle nest relocation and protection program may also be established in consultation and partnership with EHP.

4.17.6 Outstanding issues

In a further review of the supplementary EIS, EHP, DNRM and DSITIA commented on the updated water monitoring proposal. These agencies considered that ongoing surface and groundwater monitoring would need to be continued during operations. EHP and SEWPaC were especially concerned regarding indirect impacts on ephemeral wetlands not directly affected by mining. Any impacts on change of water tables and increased salt contents may have a delayed impact on the receiving environment downstream of impact areas.

EHP was further concerned about the reduced buffer zones of 50m to some of the turtle nesting grounds. EHP recommended that ongoing monitoring would be required in order to assess any potential impacts on nesting turtles and a re-evaluation of the proposed buffer zones, if necessary. This could be carried out as part of the turtle management plan.

DAFF and EHP also require more information on any proposed disturbance to mangrove communities as conflicting information was provided during the EIS and supplementary EIS stage. While the proponent's response clearly indicated that no mangroves would be removed, the supplementary EIS still states the potential clearing of 0.25ha of mangrove forest.

4.17.7 Proponent's commitments

In order to minimise impacts on the natural environment and to protect environmental values the proponent has given committed to:

- Preparing and implementing a turtle management plan, including marine turtle lighting plan.
- An ecological monitoring program.
- Feral species, pest and weed control.
- An ongoing Indigenous ranger program.
- Vegetated buffer zones.
- Exclusion zones around breeding and nesting areas.
- Mining of the northern pits outside of the turtle breeding season.
- Further migratory bird and freshwater macroinvertebrate surveys.
- Removal of rubbish, illegal fishing huts.
- Remediation and rehabilitation of existing dredge spoil site.
- Implementation of disturbance buffers.
- Implementing an erosion and sediment control program.
- Engagement of a spotter catcher prior clearing.

4.18 Rehabilitation

4.18.1 Adequacy of the EIS chapter

The EIS did not contain a dedicated chapter on rehabilitation. Instead, rehabilitation approaches and methods for progressive and final rehabilitation of the environment disturbed by the project were described in several chapters, including project description, coastal environment and ecology, but also in the chapter on MNES (EPBC Act assessment; not part of this EIS assessment). However, as the matters under the EPBC Act and under the EP Act overlap considerably, findings have been included, where relevant, in this assessment.

Many comments in EIS submissions concerned rehabilitation success of the existing vegetation communities occurring on Urquhart Point. These comments are briefly summarised below:

- Private submitter:
  - General concern regarding rehabilitation, including defining end-point criteria for rehabilitation that would result in clear measurable ecological targets and the high uncertainty about the re-instatement of these ecosystems.
- DAFF:
  - Suggested that a weed survey and removal/destruction of plants to be undertaken prior to any vegetation removal and stockpiling, as well as stockpiling of top-soil, to minimise the spread of declared weeds during the operational phases and during rehabilitation.
  - Requested further information on what management procedures would be put into practice to manage the rehabilitation of areas after decommissioning.
  - Restoration of the wetland areas (reprofiling), reinstating connectivity and re-planting species.
  - Ongoing monitoring and restoration of wetland areas to ensure the area returns to its pre-disturbed state.
- EHP
  - Limited information on rehabilitation success criteria and measure of progress.
  - Rehabilitation/revegetation program not adequately developed.
  - Concerns regarding the use and disposal of saline process water in areas to be rehabilitated.
  - Concerns regarding wet season mining and rehabilitation of ore blocks 7–11 (dune instability and disturbance of nesting turtles).
  - The need of accurately show disturbance and rehabilitation across the four years of mining.

  - Accurate topographical information required to enable appropriate revegetation.
- QH – Radiation Health Unit:
  - Insufficient information on radionuclide concentrations on rehabilitated land.
- SEWPaC:
  - Insufficient information on topography in terms of potential implications for stability and rehabilitation efforts.
  - Lack of information on rehabilitation goals, how rehabilitation would be achieved and post mining land use would be managed into the future.
  - Unclear timeframes (e.g. how long it would take to get rehabilitated areas back to pre clearing condition and when rehabilitation would be considered successful and complete).
  - Recommendation of monitoring rehabilitation success 5 years post-mining.
  - Concerns regarding the use and disposal of saline process water in areas to be rehabilitated and whether freshwater resources are available.

As a consequence of these submissions, any sections relating to rehabilitation in the supplementary EIS have been revised. However, in a review of the supplementary EIS and the proponent's response, EHP and SEWPaC further commented on some outstanding issues relating to rehabilitation. These outstanding issues are discussed in the relevant sub section below (section 4.18.10 – Outstanding issues).

The following sections incorporate the changes made in the supplementary EIS in response to the abovementioned comments.

4.18.2 Rehabilitation objectives

The post-mining land use objective for the site is to restore it to its pre-mining condition; therefore, the primary objective of the rehabilitation program is to rehabilitate the impacted areas to a stable landform with a self-sustaining vegetation cover that reflects the pre mining native vegetation communities and their listed threatened species. The rehabilitation objectives are:

- to minimise the area of land disturbed and to progressively rehabilitate disturbed areas as soon as possible
- to create a post-mining landform with a land use similar to that prior to disturbance
- to ensure the land is made stable to prevent wind and water erosion
- to establish self-sustaining vegetation communities that reflects the pre-clearing vegetation occurring with the disturbance footprint and surrounding areas.

4.18.3 Proposed rehabilitation strategy for areas impacted by mining

Progressive rehabilitation would be undertaken throughout the life of the project by backfilling of sand rejects into exhausted mining pits and subsequent revegetation of these areas.

Vegetation and topsoil removal would occur approximately 1 day per week to minimise exposed areas during the mining process. Prior to the removal of vegetation, localised surveys of species diversity and composition would be undertaken to inform future rehabilitation of the areas to be cleared. A licenced fauna spotter-catcher would be engaged to undertake a pre-disturbance fauna trapping program and relocate all vertebrate fauna found to an appropriate location, as well as relocation of any valuable habitat features found on site.

The preliminary stage of the mining process would involve the clearing of vegetation within the area to be mined by a bulldozer. The cleared vegetation would be stockpiled off the planned mining area, on the windward side, to minimise the effects of wind on exposed surfaces (Figure 2). Topsoil would be removed to a minimum depth of 50mm and stockpiled for later use in site rehabilitation. A root rake would also be used by the bulldozer to recover root matter from below the topsoil layer and combined with the topsoil stockpile.

Following excavations and handling the dewatered sand rejects would be used to re-profile the ground followed by replacement of topsoil, vegetation and replanting. It is expected that it would be possible for any given area to be re-contoured and respread with topsoil within 3 months of mining. This timeframe may be extended during the wet season as it may take longer for sand rejects to be sufficiently stabilised to allow for machinery to access the area. The progressive approach to rehabilitation would therefore allow for monitoring of early rehabilitation success/failure so that rehabilitation could be adapted over the project life.

The sand rejects would be analysed for their radionuclide concentration activities. If the levels are the same or less, the sand rejects can be returned to the original location for backfilling and rehabilitation. If they have a higher level of radiation this material would have to be disposed of as per relevant legislation and regulations.

The proponent proposed the following rehabilitation measures:

- Prior to clearing, detailed surveys of the mining area would be undertaken to ascertain species diversity.
- Seed would be collected from the vegetation within the mining area wherever possible, stored and used in rehabilitation.
- A nursery would be established on site to propagate seedlings for supplementary planting.
- The mining area would be cleared ahead of the mining face, with the vegetation and topsoil would be stockpiled.
- Sand rejects would be placed back into the mined areas and the landform would be reconstructed to the original profile. Surface contours would be retained and drainage re-established.
- The stockpiled topsoil and cleared vegetation would be spread with additional erosion control measures to be trialled and utilised as appropriate such as brush matting, fencing, 'terolas' or similar emulsion spraying, and the use of sterile seed mixes for primary cover crops.
- Direct seeding and fertilising.
- Supplementary planting with nursery stock would be undertaken would be undertaken using species identified during pre-mining surveys.
- Fauna habitat, such as logs and large rocks, salvaged during clearing operations would be placed in rehabilitated areas.
- Rehabilitation of areas associated with mine infrastructure would be carried out at the completion of mining.
- Water supply bores would be decommissioned.
- Weed species would be monitored and controlled as necessary.
- Rehabilitation areas would be regularly monitored to assess the success of the rehabilitation strategy.

The proponent committed to a rehabilitation program that would be undertaken in accordance with best practice protocols and would adopt an adaptive management approach. They considered that potential barriers to achieving the rehabilitation objectives would be ameliorated.

Following project approval, a rehabilitation management plan would be developed which would outline rehabilitation objectives, indicators and completion criteria as well as details of onsite rehabilitation trials that would be conducted to inform species selection, seeding/planting rates and establishment methodologies. The plan would be developed for approval by EHP, with the rehabilitation methods to be refined over the life of the project in response to the results of a rehabilitation monitoring program.

4.18.4 Soil salinity constraints

Following comments made in the EIS, the supplementary EIS addressed concerns regarding the use and disposal of saline process water in areas to be rehabilitated.

The water would be extracted from a processing bore containing salt water. A consequence of salt water use in washing of the sand and in dust suppression control on the road, salt would accumulate in the receiving environment. Where saline materials are being excavated and placed in an above-ground landform, capillary rise of salt into topsoil layers and saline seepage can occur. This has the potential to affect revegetation success as elevated salinity can prevent seed germination, retard plant growth and reduce ecosystem diversity.

The EIS concluded that sandy soils tend to be less saline because the salts do not attach to sand particles and are leached through the soils. As salts are leached, surface salinity levels drops. The high rainfall of the area would assist in leaching salt down through the soil profile. If the reinstated topsoil dries out, there would be the potential for salt movement upwards from the saline soils below. Soil salinity may be a constraint to vegetation establishment during the dry season when leaching of the salts from rainfall would be minimal.

Any potential impacts from salinity would be monitoring on initial rehabilitation sites in order to determine if the addition of calcium, in the form of gypsum, would be required. Calcium added to the soil can leach sodium from the soil.

The supplementary EIS considered EHP and SEWPaC's concerns over rehabilitation proposals for the project site and the proponent committed to review of other mineral sand operations, with particular reference to stability and salinity management issues. The proponent accepted that EHP and other agencies require further assurance that the organic additives proposed by the applicant (e.g. green waste, biosolids and biochar) would actually increase soil water holding capacity decrease pH, increase organic matter and enhance vegetation development (as is claimed in the supplementary EIS). This information would be specified in the rehabilitation management plan.

4.18.5 Proposed rehabilitation strategy for infrastructure areas

Access tracks would be revegetated. Rehabilitation sites subject to compaction by vehicles have low plant establishment, hence comprehensive compaction relief, through deep ripping for example, may be required on these sites.

The site office and amenities would be left for use as a ranger station by the Traditional Owners. Derelict beach shacks and pre-existing refuse dumps present on the site would be removed. These areas would be rehabilitated in a manner similar to that for mined areas. The existing dredging spoil on the northern tip of the point would also be rehabilitated and revegetated. The Traditional Owners would be given the option to also maintain some of the road or other infrastructure areas for their ongoing use.

4.18.6 Maintenance

Rehabilitated areas would be regularly monitored to identify any areas in need of maintenance. Rehabilitation maintenance activities would include:

- re-seeding or re-planting
- weed management
- pest animal control
- erosion and sediment control.

4.18.7 Monitoring

A rehabilitation monitoring program would be developed prior to the commencement of mining onsite. The program would comprise monitoring of both short-term and long-term indicators of rehabilitation success, which are to be defined in the rehabilitation management plan.

In the early stages of the project, the rehabilitation monitoring program would focus on monitoring of rehabilitation trials, soil chemical properties (salinity), landform stability and compatibility with the pre-mining profile and extent of vegetation regeneration from re-spread topsoil. Over-time the monitoring program would expand to incorporate assessment of the several parameters across the disturbance area, such as plant establishment, growth, diversity and cover, native species recruitment, presence of weeds and pest animals, evidence and type of erosion, and hydrological functioning.

4.18.8 Success criteria

The objective of developing success criteria is to demonstrate that rehabilitated areas are trending towards stable and sustainable ecosystems consistent with the defined completion criteria.

To assess the success of the rehabilitation process, rehabilitation indicators and completion criteria have been developed and include:

- compatibility with agreed post-mining land use
- re-establishment of the pre-mining native ecosystem (as closely as possible)
- long-term safety
- stability
- rubbish clean-up
- management of heritage sites.

4.18.9 Decommissioning

Decommissioning would occur at the cessation of mining operations and would involve the removal of mine infrastructure and services, and the rehabilitation of all disturbed areas. Decommissioning and rehabilitation would be undertaken in a manner that prevents environmental harm and risk to human health. Any dangerous goods or chemicals would be removed from site and any contaminated areas would be managed and rehabilitated to ensure that there is no danger posed to the wider public.

A final rehabilitation and decommissioning report would be prepared prior to the surrender of the mining lease and the hand-over of retained infrastructure to the Traditional Owners.

4.18.10 Rehabilitation management plan and outstanding issues

The proponent committed to providing a detailed rehabilitation management plan, including monitoring program, prior to any disturbance on site. This would include defined timeframes and rehabilitation targets. The plan would be submitted to EHP and SEWPaC for approval.

However, there are a few outstanding issues outlined during the supplementary EIS review, which would need to be addressed in the rehabilitation management plan. These are summarised below.

- EHP
  - The potential impacts of using highly saline processing water/ highly saline sand on the rehabilitation success. High salt levels in mine spoils have been identified in other locations in Queensland as severely limiting factor to plant re-establishment following mining.
  - The potential impacts of salt on existing groundwater aquifers and its dependent wetlands. These wetlands would not be directly affected by the mining operations. However, it is unknown how the saline water resulting from the operations would impact on the ephemeral freshwater lens inland.
  - There are many unknown factors which are important in the success of revegetation, such as wind, low fertility of sand, sediment grading, water holding capacity of sand, pH, grazing of regrowth (e.g. though wallabies).
  - Effective reinstatement of the soil profile (50cm minimum), hydrological regime and rainforest species.
  - Effective maintenance of revegetation.
  - Effective exclusion of fire.
  - Establishment of an acceptable endpoint of rehabilitation process.
  - Groundwater hydrology still not understood in the project area—important in success of revegetation (and potential impacts on existing vegetation).
  - Existing dredge spoil from the 1960s is still not covered in vegetation after 50–60 years in some places.
- SEWPaC
  - Outlined the potential for a number of significant impacts on terrestrial and marine MNES if effective rehabilitation and erosion, sediment and contaminant control would not be achieved. Sedimentation is seen as a significant risk to adjacent marine habitats.
  - Lack of information regarding sediment control and rehabilitation to ensure protection of MNES.
  - The proposed rehabilitation plan was deemed inadequate as no evidence was available how successful rehabilitation would be possible and little commitments regarding post-mining rehabilitation.
  - The proposed translocation of species (i.e. the Cooktown Orchid) as an effective mitigation measure would not be accepted unless it can be clearly demonstrated based on scientific evidence to be effective for an individual species.
  - Request for management plans and raw data associated with proposed management plans (e.g. monitoring data on success of rehabilitation, recordings of MNES) to be made publically available.
  - SEWPaC noted that Oresome Australia had identified that high salt levels in mine spoils could be a severely limiting factor to plant establishment following mining, and that the extent to which salinization of topsoils is likely to occur at the project site is currently unknown.
  - Requested further information on a worst-case scenario for rehabilitation failure or erosion and sedimentation into marine and terrestrial environments and a contingency plan in the event that rehabilitation or erosion and sediment control would be unsuccessful. As a minimum SEWPaC would expect offsets in the event of impacts to terrestrial or marine MNES as a result of unsuccessful rehabilitation or management of erosion or sedimentation.
  - Rehabilitation must be continued until the overarching rehabilitation objective for EPBC Act purposes is met in respect of MNES. This must be reflected in the rehabilitation management plan.

The proponent has demonstrated an understanding of many of the outstanding issues but is still reliant on a rehabilitation management plan (which is yet to be proposed). EHP noted and accepted the commitments proposed by Oresome Australia.

To address the outstanding issues, appropriate conditions would need to be included in the EA, including for:

- appropriate rehabilitation strategy
- ongoing monitoring of rehabilitated areas
- ongoing monitoring of potential impacts on vegetation communities, including wetlands, adjacent to mining pits
- provision of an appropriate financial assurance.

4.18.11 Proponent's commitments

In order to fulfil the rehabilitation commitments, the proponent undertook to:

- Develop a rehabilitation management plan.
- Progressively rehabilitate mined areas.
- Develop an ecological monitoring program, including monitoring rehabilitation success.
- Remediate and rehabilitate the existing dredge spoil site.
- Revegetate with native plant species.
- Relocate any valuable habitat features found on-site (e.g. large fallen logs, log piles, rock piles) into adjoining undisturbed habitat and/or rehabilitation area.
- Implement feral species, pest and weed control.
- Introduce an Indigenous ranger program overseeing the rehabilitation progress and success.
- Implement a weed and pest management and eradication program prior to starting any works on the site.

4.19 Biodiversity offset strategy

4.19.1 Adequacy of the EIS chapter

Chapter 22 of the EIS described the offsets proposed by Oresome Australia to counterbalance any remaining loss of environmental values. The purpose of offsets is to increase the long-term protection and viability of the state's biodiversity where residual impacts from the proposed project on significant biodiversity values cannot be avoided.

Where SEWPaC requires an offset for an activity that is considered a 'controlled action' under the EPBC Act, an additional offset for the purpose of the Queensland Biodiversity Offset Policy (BOP) is not necessary where the same State significant biodiversity values are being impacted. However, where this is the case, the offset provided must achieve the same (or greater) outcomes for the values impacted as what would be required by the BOP. As offsets under the EPBC Act and under the EP Act overlap considerably in this project, offsets for MNES have been included, where relevant, in this assessment.

As part of the EIS assessment the following matters were raised in submissions:

- Private submitter:
  - Did not accept the proposed offset area as a legitimate offset. Adopting the principle of offsetting like for like, would be a more appropriate offset to secure protection for a large area containing the same regional ecosystems (e.g. Vrilya Point).
- DAFF – Fisheries Queensland
  - Recommended appropriate offsets for the loss of marine plants (mangrove communities) under the new offset policy Marine Fish Habitat Offset Policy 2012.
  - Requested information on how the Indigenous ranger program would be funded after the mine's closure.
- EHP
  - Lack of information on state significant values impacted by the project.
  - Offset requirements for each of the state significant biodiversity values not addressed.
  - Implementation of a marine turtle management plan and marine turtle offset plan due to the potential occurrence of listed threatened marine turtle species in the vicinity of the project.
  - Inclusion of the Papuan sheath-tailed bat and the bare-rumped sheath-tailed bat, if found to be present, in the biodiversity offset strategy.

- SEWPaC
  - Insufficient information on offsets proposed under the EPBC Act.
  - Requested further information on the ranger program as a proposed offset activity, its proposed program and objectives, including administration, funding and infrastructure.

As a response to the comments made above, the supplementary EIS addressed the outstanding issues. However, it was outlined that in assessing the suitability of areas external to the site as offset areas, the proponent had identified a number of constraints that mean provision of fully compliant direct land offsets is not possible or practical. Most of the habitat similar to that identified within the development area that can be found in the region is relatively undisturbed. This vegetation is mapped as remnant vegetation and therefore does not meet the offset criteria of the BOP. That would implicate that an offset area may be proposed within another bioregion. In addition, the land tenure of much of Cape York does not easily allow for the standard offset mechanisms to be applied. Hence, the supplementary EIS proposed an alternative biodiversity offset strategy that would incorporate offsets under state and Commonwealth matters.

In response to DAFF's submission the proponent responded that the project would not remove any marine plants (i.e. mangroves), and hence no offsets for the loss of marine plants in accordance with the Marine Fish Habitat Offset Policy 2012 would be required.

In response to EHP's request to a marine turtle offset plan the proponent responded that whilst a number of activities were proposed to improved nesting success (e.g. supporting a ranger program and reducing nest predation) direct marine turtle offsets would not be proposed as the project has been assessed as unlikely to cause significant impact to any of the marine turtle species that are likely to nest in the area.

The following sections of the EIS assessment report incorporates the changes made in the supplementary EIS in response to the above-mentioned comments. However, further discussions with the proponent will be necessary to finalise offsets and to offset conditions as part of the EA process (refer to section 4.19.4 – Outstanding issues).

4.19.2 Offset assessment

Impacts to listed threatened fauna under state and Commonwealth legislation would be mitigated by scheduling mining activities near to seasonally sensitive areas (i.e. the northern foreshore, ephemeral wetlands and eastern salt flats) outside of the wet season and the application of the range of mitigation measures. The success or failure of mitigation measures in protecting listed threatened flora, fauna and habitats would be monitored. If monitoring would indicate a significant impact on these species that was not predicted, areas of habitat would be offset in accordance with the requirements detailed in this strategy.

The following state significant biodiversity values (as per the BOP) were identified in the supplementary EIS as potentially be impacted by the proposed project:

- Regional ecosystems (RE):
  - Clearing of 25.95ha of 'of concern' REs (RE 3.2.5a/3.2.25 and RE 3.2.3).
- Wetland or Significant Wetland:
  - Clearing of 107.4 ha of 'least concern' RE 3.2.2.
- Fauna:
  - little tern (*Sternula albifrons*)
  - grey goshawk (*Accipiter novaehollandiae*)
  - palm cockatoo (*Probosciger atterimus*)
  - radjah shelduck (*Tadorna radjah*)
  - robust burrowing snake (*Antairoserpens warro*)
  - sooty oystercatcher (*Haempatopus fuliginosus*)
  - estuarine crocodile (*Crocodylus porosus*)
  - beach stone curlew (*Esacus magnirostris*)
  - flatback turtles (*Natator depressus*)
  - Papuan sheath-tailed bat (*Saccolaimus mixtus*).

- Flora:
  - Cooktown orchid (known as *Dendrobium bigibbum* or *Vappodes bigibba*).

4.19.3 Proposed offset strategy

The supplementary EIS outlined that the proponent had carefully considered its obligations under the relevant state and Commonwealth Acts and intends to develop the Urquhart Point Mineral Sands Project as a model for business development in remote Aboriginal lands. The proponent acknowledged that the proposed offset strategy does not meet the criteria for an indirect offset under BOP but, due to the lack of potential opportunities to truly protect some suitably relevant habitat similar to that being impacted, this proposal is being offered as the best possible offset outcome, despite it not satisfying the policy.

The proposed offset strategy for the Urquhart Point Mineral Sands Project would be comprised of three major components: An Indigenous ranger program, a 250ha offset area immediately south of the project area, and an ongoing turtle monitoring program.

4.19.3.1 Indigenous ranger program

The proponent proposed to establish and support an ongoing Indigenous ranger program for the project area to deliver ongoing environmental outcomes. Appropriate partnerships with the Australian Government's 'Working on Country' program, and collaborations with the North Australian Indigenous Land and Sea Management Alliance would be formed to deliver an integrated service and help to secure ongoing support and training. The ranger on site would partner up with appropriate groups to provide a ranger service in the Urquhart Point region. The supplementary EIS outlined that an Indigenous ranger would commence employment with Oresome Australia during the construction phase to supervise environmental and cultural heritage management, and would remain for the life of the mine to supervise environmental and cultural heritage management.

Following mine closure, the administration building would be converted to a ranger station and Indigenous rangers would remain on site to protect and manage the area, delivering environmental outcomes using Indigenous traditional knowledge, as well as providing a sustainable employment source. The Indigenous ranger(s) would provide environmental services including ghost net removal and recovery, feral pig control and turtle nest protection, environmental monitoring programs (in particular, nesting shorebird and sea turtle nest counts), control of visitor access, and weed control and revegetation programs to enhance biodiversity. The supplementary EIS outlined that in addition to cultural heritage management, a ranger on-site would help to facilitate similar partnerships and functions, in collaboration with other groups and with appropriate training provided.

4.19.3.2 Offset area

The supplementary EIS proposed an offset area of 250ha, which would be located immediately south of the project area. The size of the proposed offset area would be greater than the proposed disturbance area of the project. This area is held within an exploration permit by the proponent and the site is not prospective and therefore is not intended to be mined at any stage in the future.

4.19.3.3 Turtle management plan

As mentioned above, the offset proposal included turtle management along the existing 13km of identified as turtle nesting beach surrounding the proposed project area. This would include actively and regularly monitoring of turtle nests; management of threatening processes that may impact on nesting success and/or hatchling mortality rates; feral and possibly native animal exclusion from nests; the removal of pollution and disturbances such as washed up fishing nets; and the prevention or minimisation of direct human impacts. Detailed nesting data would be collected as part of the proposed monitoring program.

4.19.4 Outstanding issues

EHP acknowledged that it would be difficult to meet the criteria for an indirect offset under BOP in Cape York and accepted in general the offset strategy proposed by Oresome Australia. However, additional information is required to finalise the strategy. For example, little information has been given on the proposed 250ha offset area, its vegetation communities and other environmental values, in order to assess if this area would be a suitable offset area. Discussions with the proponent would be necessary to finalise the offset strategy and offset conditions as part of the approval process.

SEWPaC has indicated it is generally supportive of the proposed offset strategy but also requires specific information on several aspects of the proposal.

4.19.5 Proponent's commitments

To offset impacts on state significant biodiversity values, Oresome Australia is committed to finalise the offset strategy to the satisfaction of EHP and SEWPaC prior to the commencement of mining activities.

This would include an Indigenous ranger program, an offset area and an ongoing turtle monitoring program. The proponent also committed to:

- Identification of any land-based offsets and legally secured them within 12 months of the issuing of the EA or a pre-identified interval consistent with the environmental authority and offset strategy.
- Payments of any offset payments to the Balance the Earth Trust within four months of the issuing of the EA or a pre-identified interval consistent with the EA and offset strategy.

5 Adequacy of the environmental management plan

The environmental management plan (EM Plan) developed through this EIS process has included input from EHP, other state government departments, the Commonwealth, local organisations, industry and the public. Throughout the EIS process, the proponent was advised of a range of deficiencies in the EM Plan. Those deficiencies have been progressively improved to the extent required for the EIS process to conclude. This assessment report has identified a number of outstanding matters that would need to be addressed before the EM Plan is finalised.

The draft EMP as submitted with the EIS should be revised, taking into account the recommendations made in this report and proponent's commitments outlined in this report. Provision of a revised EM Plan will be required prior to EHP considering granting of an EA and formulation of draft EA conditions for the project under the EP Act.

6 Recommendations about the suitability of the project

In this EIS process the detailed information compiled by Oresome about the environmental values associated with the Urquhart Point Mineral Sands Project and the potential impacts on those values due to mining project activities have been scrutinised by representatives of state and local government, industry and members of the public through an open, public review process.

The proponent has also met the EIS process requirements for public notification, responding to comments and submissions, as required by Chapter 3 of the EP Act.

The EIS has substantially complied with the TOR set for the EIS and has outlined a range of mitigation measures to avoid or minimise environmental impacts to an acceptable degree. While most issues have been addressed satisfactorily in the EIS and in the proponent's responses to the submissions and revised documents, a number of issues are not yet fully resolved. These issues and the further information required, are clearly outlined in this EIS assessment report. This report recommends that these outstanding matters be addressed prior to the project proceeding.

7 Recommendations for conditions for any approval

Section 202 of the EP Act states that a purpose of the EMP is to propose environmental protection commitments to help the administering authority prepare a draft environmental authority for the project under the EP Act. The submitted EM Plan for the Urquhart Point Mineral Sands Project contains a number of general and specific commitments or conditions that are broadly acceptable to EHP. Some conditions were revised in the EIS assessment process and some additional conditions were recommended. Section 59 of Act requires that this EIS assessment report 'recommends conditions on which any approval required for the project may be given'. Matters for which either new or revised conditions should be developed were discussed throughout this report, but should include the following matters:

- Ongoing Acid Sulfate Soils (ASS) testing and monitoring (to be conditioned in the EA).
- Newly surveyed contour information partially provided in the supplementary EIS would need to be updated on all figures in the EM Plan.
- Surface and groundwater testing, monitoring and reporting.
- Rehabilitation management plan, including:
  - financial assurance for guaranteeing the ability to reach an acceptable rehabilitation end-point
  - potential impacts of using saline processing water/ saline sand on the rehabilitation success and ongoing

monitoring of potential impacts on vegetation communities, especially wetlands adjacent to mining pits.

- Delineation of erosion prone areas.
- Mining of erosion prone areas to be carried out only in the dry season.
- Analysis of drums and associated material in the spoil area for contamination hazardous substances, prior removal and commencement of mining.
- Clarification if the 0.25ha of mangroves identified in the supplementary EIS would be cleared as part of the project. Any clearing of mangroves would require approvals under the *Fisheries Act 1994* and offsets under DAFF's Marine Fish Habitat Offset Policy (2012).
- Clarification on whether a tug boat would be used to tow the barge containing product minerals from the project. The use of a tug boat would need further port development approvals from North Queensland Bulk Ports Corporation.
- Biodiversity offset strategy requirements.

Additional or revised conditions relating to these matters will be developed once a finalised EM Plan has been submitted that substantially addresses the matters identified in Part 5 of this report. Conditions will be developed by the responsible delegate from EHP's Northern Region (Cairns) in consultation with Oresome Australia and other state government departments.

8 Suitability of the project

EHP has considered the submitted EIS, all submissions and the standard criteria under the EP Act. The project is assessed as being suitable on the basis of the Environmental Management Plan being completed in keeping with the relevant recommendations made in this report and any subsequent environmental authority being conditioned suitably to implement the specific environmental protection commitments set out in the EIS and as described in this report. Consequently, the project is considered suitable to proceed to the next stage of the approval process, noting that the recommendations of this EIS assessment report should be fully implemented.

9 Approved by

The EIS process is completed when this EIS assessment report is approved by the delegate for the chief executive and given to Oresome Australia Pty Ltd.

Lindsay Delzoppo	3 April 2013
Signature	Date

Lindsay Delzoppo
Director, Statewide Environmental Assessments
Department of Environment and Heritage Protection
Delegate of the chief executive
Environmental Protection Act 1994

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Appendix A: A Summary of changes to Queensland government departments

Former departments	New department(s) (as of 3 April 2012)[1]
Department of Employment, Economic Development and Innovation	Department of State Development, Infrastructure and Planning Queensland Treasury and Trade Department of Agriculture, Fisheries and Forestry Department of Water Supply
Department of Environment and Resource Management	Department of Environment and Heritage Protection Department of Natural Resources and Mines Department of Energy and Water Supply Department of Science, Information Technology, Innovation and the Arts Department of National Parks, Recreation, Sport and Racing
Department of Education and Training	Department of Education, Training and Employment
Department of Local Government and Planning	Department of Local Government, Community Recovery and Resilience)
Department of Communities	Department of Communities, Child Safety and Disability Services
Department of Public Works	Department of Housing and Public Works
No changes: Department of Transport and Main Roads Department of Community Safety Queensland Police Service Queensland Health	
New departments:	Department of Housing and Public Works Department of Aboriginal and Torres Strait Islander and Multicultural Affairs Tourism, Major Events, Small Business and the Commonwealth Games

[1]Based on The Public Service Departmental Arrangements Notice (No1) 2012, Queensland Government.