PROJECT SEA DRAGON

CBC & BMC BYNOE HARBOUR

EN02-MP4001

Environmental Management Plan

Rev 0, 8-May-2019

Project and Document Details

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Declaration of Suitability

I certify that the information contained is, to the best of my knowledge and belief, true, accurate and complete, and that I have sufficient experience and qualifications to be able to assess the environmental risks associated with carrying out the licensed activity and to assess the adequacy of the EMP to facilitate compliance with the conditions of the relevant licences and approvals.

Signed	
Full name (please print)	Marc Andrew Walker
Organisation (please print)	Environmental Management Compliance and Approvals Pty Ltd (EMCA)
Date	8-May-2019

Terms and Abbreviations

AASS	Actual Acid Sulfate Soils
ASS	Acid Sulfate soils
ASTM	American Society for Testing and Materials
DIN	Deutsche Industrie Norm (standard)
EIMP	Environmental Impact Monitoring Program
EMP	Environmental Management Plan
EMS	Environmental Management System
ESCP	Erosion and Sediment Control Plan
FCR	Food Conversion Ratio
NT EPA	Northern Territory Environment Protection Authority
NT DENR	Northern Territory Department of Environment and Natural Resources
PASS	Potential Acid Sulfate Soils
PDCA	Plan-Do-Check-Act
PL	post larvae
PSD	Project Sea Dragon
TPWC Act	Territory Parks and Wildlife Conservation Act (NT)
WQMMP	Water Quality Monitoring and Management Plan
WQO	Water Quality Objective

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ATTACHMENTS

1 INTRODUCTION

1.1 PURPOSE AND SCOPE

This Environmental Management Plan (EMP) is the site specific EMP document for construction and operation of the Project Sea Dragon Core Breeding Centre (CBC) and Broodstock Maturation Centre (BMC), at Point Ceylon, Bynoe Harbour, Northern Territory, and exists under the Project Sea Dragon (PSD) Environmental Management System (EMS).

In this document, the term Project (capitalised) is defined as the Core Breeding Centre and Broodstock Maturation Centre facility, at Point Ceylon, Bynoe Harbour.

The EMS Manual (EN-MN4001) documents the overarching policies and procedures for the management of impacts on the environmental values for the whole of the PSD project, provides project wide commitments and details continual improvement measures. This EMP builds on these procedures by detailing the specific targets to meet the PSD project wide objectives mitigation measures and monitoring requirements, during the construction and operational phases.

The Environmental Impact Statement (EIS) and the Supplementary EIS (SEIS) includes detailed description of the existing environment assessment of impacts, and mitigation measures relevant to this EMP, which are summarised herein. This EMP is consistent with the Project scope outlined in Section 2, and has been prepared with reference to:

- NT EPA Guideline for the Preparation of an Environmental Management Plan (NT EPA, 2015)
- Commonwealth Environmental Management Plan Guidelines (DoE, 2014)
- AS/NZS ISO 14001:2004 Environmental Management Systems - requirements with guidance for use
- AS/NZS ISO 14004:2004 Environmental Management Systems - general guidelines on principles, systems and support techniques.

1.2 PROJECT SEA DRAGON OVERVIEW

Project Sea Dragon is a large-scale, integrated, land-based prawn aquaculture project in northern Australia designed to produce high-quality, year-round reliable volumes for export markets for Black Tiger prawns (Penaeus monodon).

The Project, including each of its components, has been designed in accordance with the Aquaculture Stewardship Council Shrimp Standard (ASC, 2014) and the Environmental Code of Practice for Australian Prawn Farmers (Donovan, 2003). It will also use husbandry practices that are well accepted by government and industry as outlined in the Australian Prawn Farmers' Manual (DPI&F, 2006).

Project Sea Dragon comprises of eight key components including:

Breeding Program Facilities

1. Founder Stock Centre and Back-up Breeding Centre (Exmouth, Western Australia)
2. Core Breeding Centre (Bynoe Harbour, Northern Territory) (this EMP)
3. Broodstock Maturation Centre (Bynoe Harbour, Northern Territory) (this EMP)
4. Hatchery (Gunn Point, Northern Territory).

Production Facilities

1. Grow-out Facility (Legune Station, Northern Territory)
2. Processing Plant (Kununurra, Western Australia)
3. Feed mill (Future stages; Kununurra, Western Australia)
4. Export Facility.

An overview of the integrated project is shown in Figure 1-1 and the location of key components in Figure 1-2.

The breeding, development and ultimate sale of prawns involves the following process:

- Capturing and selection of wild stock (the Founder Stock Centre)
- Developing and selecting high performing prawn stock (CBC and BMC) for use in the hatchery
- Hatchery to develop prawns suitable for the grow-out facility
- The grow out facility at Legune Station, to grow prawns to a size suitable for sale.

Prawns are harvested at Legune and transported to the processing plant and then the export Facility for transport to markets. A feed mill is proposed to provide feed to the prawns once suitable scale has been reached. The Bynoe Harbour CBC & BMC is described in more detail in Section 2.

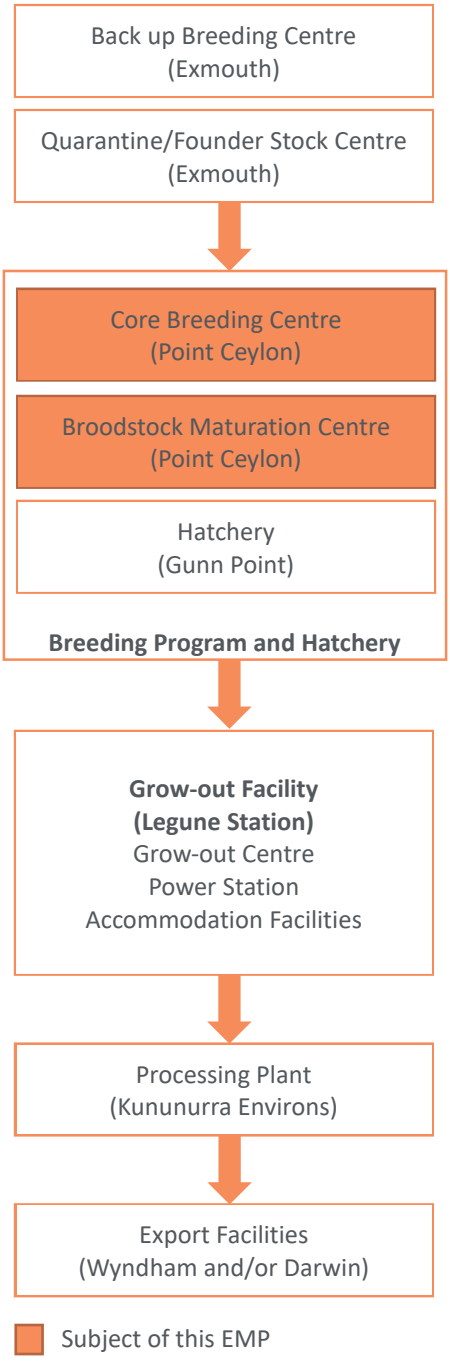

FIGURE 1-1 INTEGRATED PROJECT FRAMEWORK

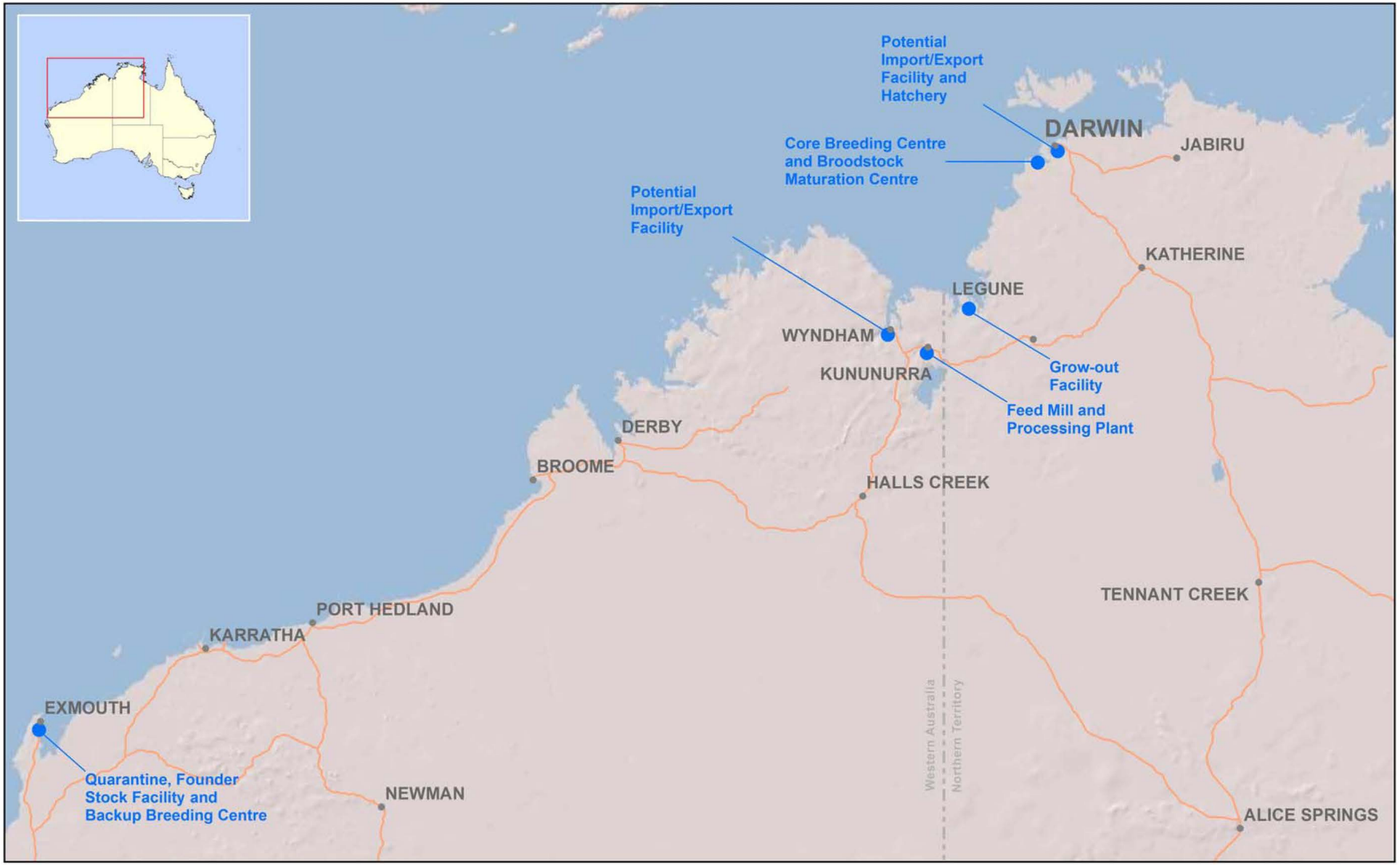

FIGURE 1-2 PROJECT COMPONENT LOCATIONS

1.3 EMS FRAMEWORK

The EMS manual defines the overall management system components relevant to all sites, with additional site specific information contained in site specific management plans and documents. The system covers all actions and activities and achievement of policies, objectives and targets that are environmental in nature – natural environment, social and/or cultural heritage related issues.

The EMS documentation is organised into the hierarchy shown in Figure 1-3 implemented on a site by site basis guided by corporate level policy setting and common procedures and standards. Guidance documents are also provided within the EMS framework but are not a required part of compliance with the EMS unless where specifically noted in EMS documentation. Refer to EN-RG0901 Document Register in the EMS Manual which shows all EMS documentation, including this EMP.

Site specific documentation is nominated by site number, with the Bynoe Harbour site being designated as Site 02.

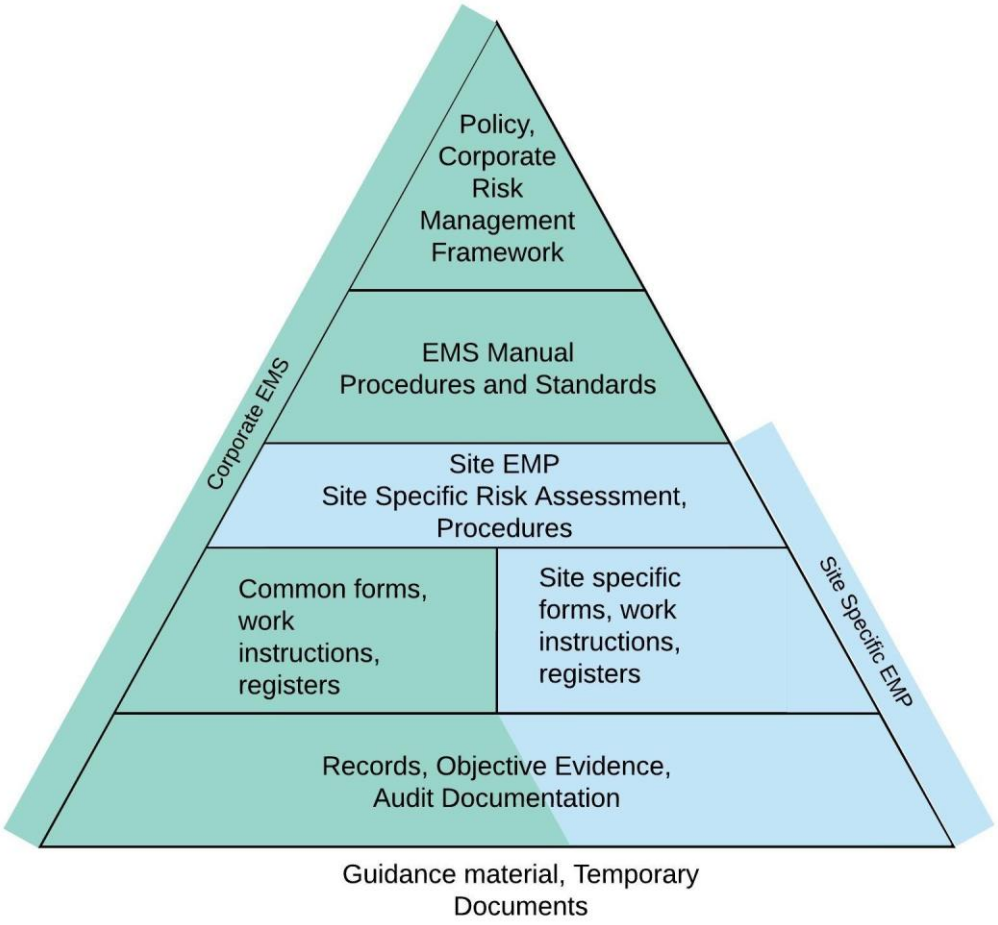

FIGURE 1-3 EMS FRAMEWORK

2 PROJECT DESCRIPTION

2.1 STAGED APROACH TO DEVELOPMENT

The description of the Project provided in Sections 2.2, 2.3 and 2.4 of this EMP, and in the Draft EIS, is for the full scale development of the CBC and BMC. However, through an internal review of the front-end engineering and design of Stage 1 of Project Sea Dragon, Seafarms has identified an opportunity to enable an earlier path to production and project revenues than was originally considered. This review has resulted in a scaling back of the development across each site.

Consequently, development at the CBC and BMC has been scaled back to a level commensurate with the capacity needed to operate one grow-out farm at Legune Station, instead of the three farms that are part of the full Stage 1 proposal. The key difference for the Project is that initially the CBC and BMC facilities will be located within the same area of the site, within separate buildings. However, as the Project progresses the CBC and BMC facilities will be relocated to separate areas on the site, as shown on the full scale Project layout in Figure 2-1 and described below.

2.2 OVERVIEW

The Project is located at Point Ceylon on the south side of Bynoe Harbour, Northern Territory (NT), 42 km south-west of Darwin, on Portion 3192, as shown in Figure 1-2. The closest township to the Project site is Dundee Beach which is 22 km further to the west. The site is located between the localities of Dundee Downs and Bynoe, which are approximately 5 km to the west and east respectively.

The CBC will be used for the development, production and selection of high performing prawn stock. The top performing individual prawns produced at the CBC will be transferred to the BMC to produce commercial numbers of broodstock for use in the hatchery. There are also a number of common facilities on site that will support both facilities.

Figure 2-1 presents a conceptual overview of the Project operations, including water and material flows in and out of the site, with the layout shown in Figure 2-2.

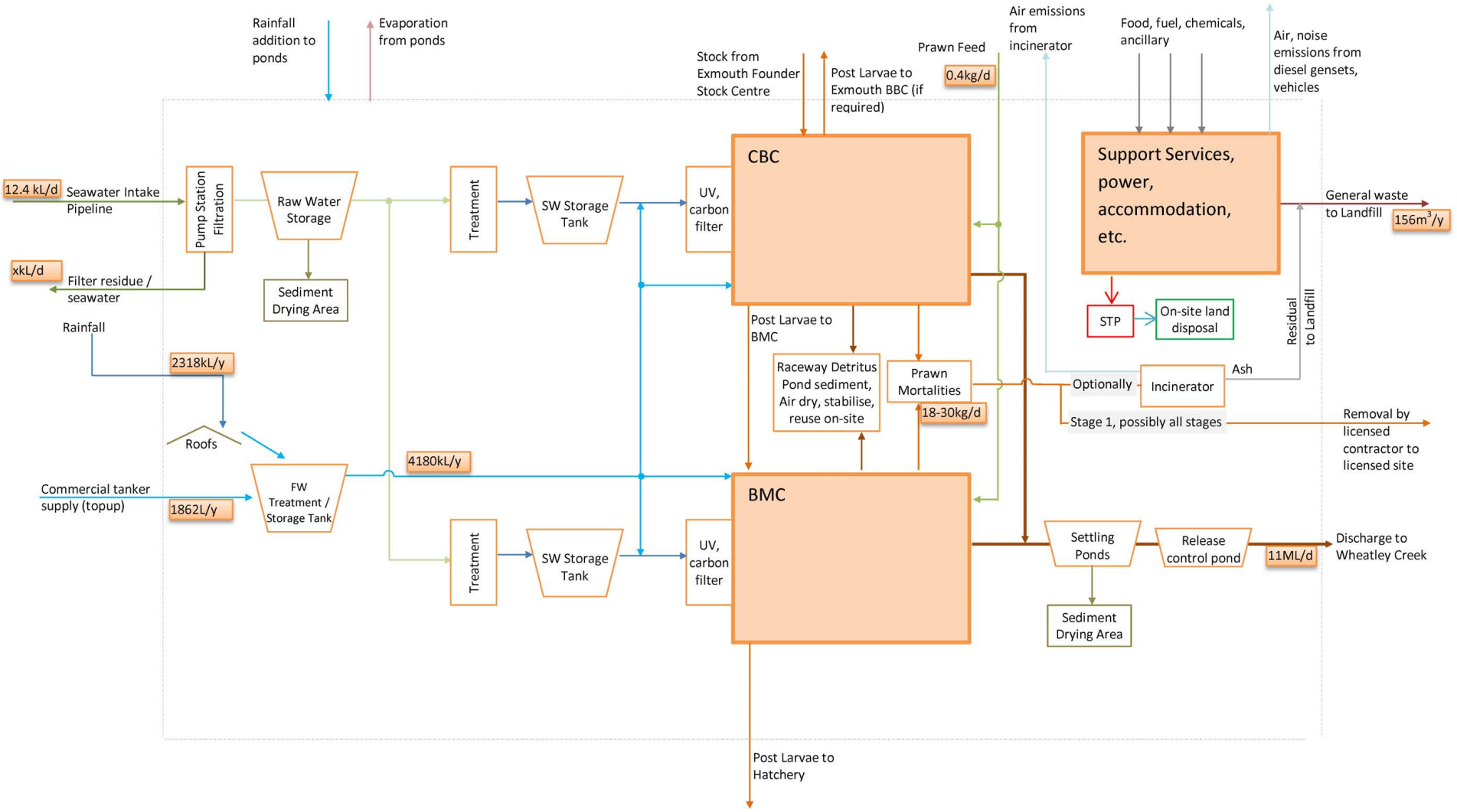

FIGURE 2-1 PROJECT OVERVIEW AND FLOW DIAGRAM

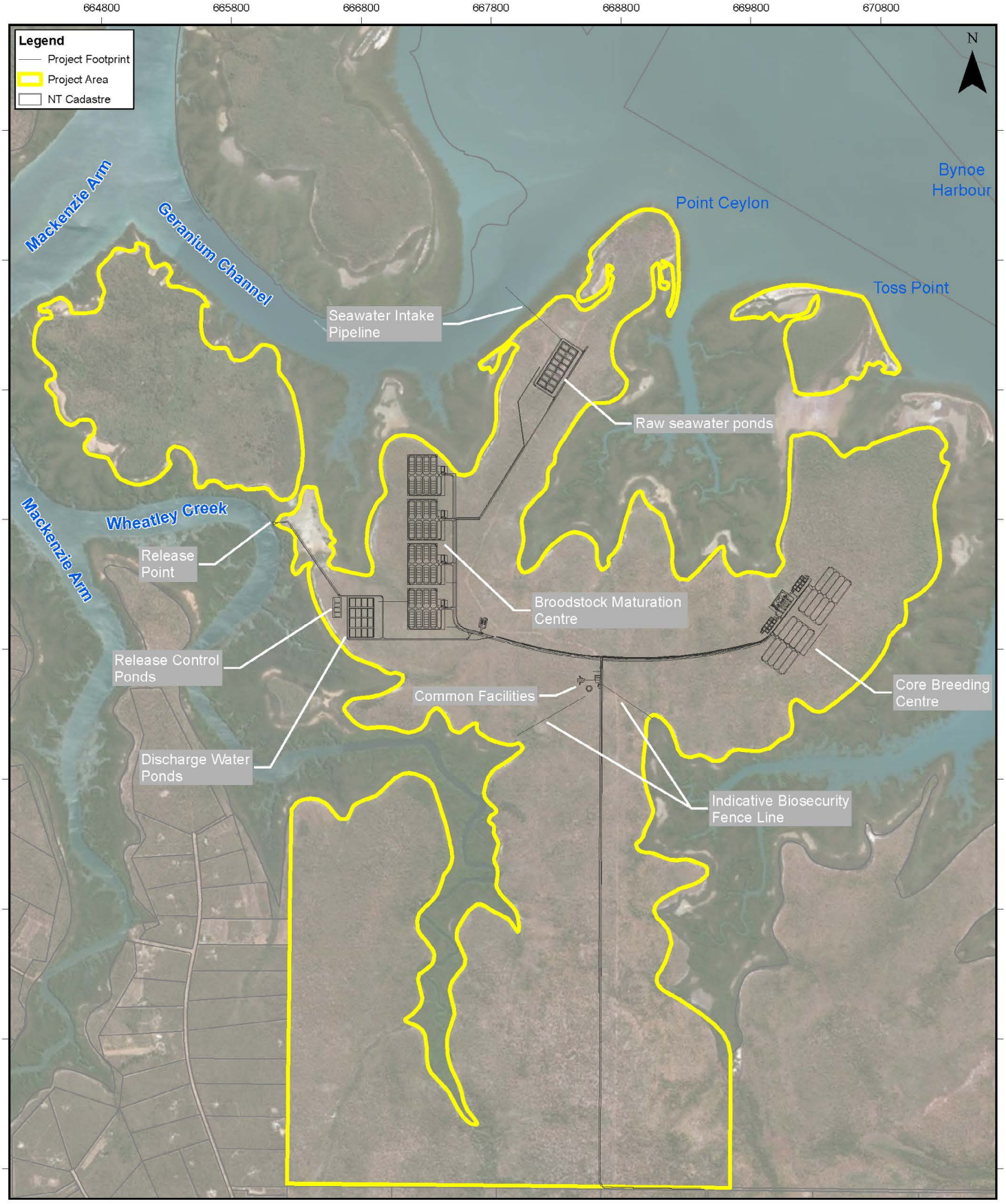

FIGURE 2-2 PROJECT LAYOUT

2.2.1 Core Breeding Centre

Ultimately, the CBC will be located to the east of Point Ceylon near Toss Point (refer Figure 2-2) and will be used for the genetic development, production and selection of high performing Specific Pathogen Free prawns. The prawns for the CBC will be sourced from the Quarantine and Founder Stock Facility in Exmouth, Western Australia . At the CBC, families of prawns will be raised in separate tanks to avoid unmanaged cross-breeding and maintain genetic lineage. Once the prawns reach a certain size they will be tagged and combined without compromising genetics. The top individual performers within the top families will be used to supply the BMC and produce commercial broodstock. At full scale production, the CBC will have capacity for up to 400 families of unrelated genetic signatures. The CBC will be fully biosecure and managed in accordance with the requirements of the PSD Biosecurity Manual.

The CBC will comprise tanks for rearing prawn stock and external covered grow-out ponds or tanks. The majority of activities in the CBC will be contained within the buildings, tanks and enclosures of the module.

At full scale the CBC will include the following:

- culture facilities including local quarantine, nursery, on-growing, maturation, conditioning, spawning and hatchery facilities
- ponds and tanks for the storage, settlement and treatment of intake and release water
- infrastructure for the reticulation of treated seawater through the culture facilities including filters, pipes, valves and fittings pumps, pump house, electrics, monitoring and alarms, lined reservoirs, coverings, filtration, water treatment (ozonation, activated carbon and UV) and temperature control
- infrastructure for the supply of low pressure air into tanks and aeration of ponds
- infrastructure for the storage, growing and/or supply of the various food types (algae, artemia, dry pellets and frozen fish) to prawns
- reticulation of power supplied from the common electrical substation
- back-up supply of freshwater for equipment cleaning, domestic and potable water requirements
- release channel and/or piping to transport water to the release point
- vehicle wash down point
- local laboratory, office and worker amenities.

2.2.2 Broodstock Maturation Centre

The BMC will be used to mature the selected post larvae (PLs) and larger broodstock supplied from the CBC. The BMC will be located on high ground to the south of Point Ceylon (refer Figure 2-2). The young broodstock entering the BMC from the CBC will be Specific Pathogen Free, in good health and brought up to a suitable size and condition for breeding. The BMC will be responsible for the production of spawners and their mates for the hatchery. The BMC will be fully biosecure and managed in accordance with the requirements of the PSD Biosecurity Manual.

The majority of the activities undertaken at the BMC will be contained in buildings, tanks and enclosures. At full scale the BMC will consist of:

- culture facilities for the maturation, on-growing and conditioning of prawns
- ponds and tanks for the storage, settlement and treatment of intake and release water

- infrastructure for the reticulation of treated seawater through the culture facilities including filters, pipes, valves and fittings pumps, pump house, electrics, monitoring and alarms, lined reservoirs, coverings, filtration, disinfection treatment (ozonation, activated carbon and UV) and temperature control
- infrastructure for the supply of low pressure air into tanks and aeration of ponds
- infrastructure for the storage, growing and/or supply of the various food types (algae, artemia, dry pellets and frozen fish) to prawns
- reticulation of power supplied from the common electrical substation
- seawater supply/transfer pipeline to transport water from the intake point and/or settlement ponds
- back-up supply of freshwater for process requirements
- release channel and/or piping to transport water to the release point
- vehicle wash down point
- local laboratory, office and worker amenities.

2.2.3 Common Facilities

Common facilities will be shared between the BMC and CBC. These facilities will include:

- biosecurity fencing
- vehicle wash-down
- water storage tanks and/or desalination plant for potable water supplies
- infrastructure for the supply, storage and release of seawater and fresh water
- all weather access roads into the site and connecting the administration and accommodation buildings, the BMC and the CBC
- an incinerator for the disposal of prawn mortalities
- administration and accommodation compound.

2.3 CONSTRUCTION

Construction of the Project is anticipated to commence in Quarter 1 of 2019 with commissioning of first stock in Quarter 4 of 2019. Construction will include the following overall process:

Site Establishment

- Site establishment will be timed to coincide with the earliest part of the dry season, to allow earthworks to be completed during the remainder of the dry season in order to minimise erosion and sediment loss from the site.
- All vegetation within the Project footprint will be removed and stockpiled into windrows and burnt (after suitable fire permits are obtained).
- A construction laydown area will be established at each of the works areas.
- It is proposed that a small concrete batch plant be established on site to provide concrete for use in building and equipment foundations, slabs on grade, bases for inlet / outlet structures, and concrete for miscellaneous works. Aggregate for concrete and sand for batching will be trucked in from Darwin.

Civil Works

- All-weather gravelled access roads will be constructed, with roads following catchment boundaries, or using culvert crossings or floodways to minimise any impacts or changes to catchment flows. Outlet drains have also been allowed for to assist the movement of water away from the road in order to minimise the number and extent of crossroad drainage.
- Building foundations will be subgraded before being compacted utilising a cut and fill process, however, final civil work specifications will be confirmed after completion of detailed geotechnical studies of the site. Services and reticulation will be typically trenched into the site where required.
- All structures will be designed to AS 1170, the National Building Code and rated for Cat. Cyclone "C" rating. Notwithstanding the cyclone resistance of all other structures, the common Administration building will be the designated Emergency and Evacuation centre for staff remaining on site during any cyclone Red Alert.
- A helicopter pad will be constructed adjacent to the common facilities for emergency evacuation purposes only.

Seawater Intake Pipeline

- The seawater intake pipeline will extend from the seawater intake ponds approximately 300 m into Geranium Channel, as shown in Figure 2-2. The pipeline will be HDPE pipe, transported to the site by road or barge. A coarse filtration rejects pipe will also be constructed from the pump station back to marine waters.
- The pipeline will be laid over the seafloor with minimal (if any) trenching and secured with anchors.
- The intake point will be protected by a screen inlet box. This box will prevent damage by flotsam and will mitigate the risk of damage to marine fauna.
- Seawater will be drawn from the seawater intake point into a pump station located on shore.

Onshore Seawater and Waste Water Storage

- Ponds for the storage of both raw seawater and waste water will be constructed by excavation into the natural soils, sealed with an impervious liner.
- A minimum of 500 mm high EPDM clad embankment will be constructed around the ponds to divert stormwater runoff.
- Depending on the individual function, ponds will be instrumented for monitoring of required data.
- Any excess spoil from the construction of the ponds will be utilised onsite as fill for other construction activities.

Internal pipelines and services

- Pipelines across the site will be laid on the surface or buried in a shallow trench.
- A riprap lined channel will be installed to direct waters to the release point.
- Services will generally be trenched between buildings / areas, with overhead HV lines.

Chemicals and Hazardous Materials Management

- Chemical and hazardous materials storage will be generally the same as for the operational phase (refer Section 2.4), with temporary storage used until the permanent storage facilities are constructed.

Workforce

- The construction phase workforce is estimated to peak at 70 personnel.

Traffic Requirements

- Construction traffic will be mainly associated with the delivery of construction materials from Darwin, with truck access peaking at 150 truck movements a week.
- Additional vehicle movements will peak at 30 vehicles per day for the movement of personnel during the construction phase with buses driving in and out from the Dundee region and managers/supervisors driving in and out from both Dundee and Darwin.

Water supply

- During construction freshwater will be trucked in by a suitably licenced contractor, and if required raw seawater will be sourced from Geranium Channel.

Borrow Pits

- It has been assumed that onsite materials will be suitable for use in the construction process, though generally the site will be constructed to achieve a cut to fill balance. Should additional fill material be required, it will likely be sourced from a commercial supplier and delivered to site as required.

2.4 OPERATIONS

Operation of the facility comprises the supply of raw seawater and freshwater, development of genetic stocks and breedstock, through to the release of discharge water. Key operational elements are described below:

Intake pipeline

- The intake pipeline will extend from the seawater intake ponds approximately 300 m into Geranium Channel. The intake point will be located at a minimum depth of 4.3 m so that the highest point of the intake manifold is at a minimum depth of 3.2 m relative to chart datum enabling the intake pipe to function 24 hours per day. The intake point will be protected by a screen inlet box to limit the intake of marine debris and fauna, cleaned regularly of biofouling and manually replaced as required. Replacement will require a diver accessing the intake portion of the pipeline.

Seawater Storage

- The intake pipeline will deliver seawater via the onshore pumping station, biased to draw in seawater from mid-tide to high tide daily to minimise solids in intake waters. Course particle filters at the pumping station will remove solids and large particles from the seawater which will be returned to Geranium Channel via an HDPE pipeline laid over the seafloor with minimal (if any) trenching. Approximately 5% of the total seawater intake will be disposed of along with the residual particles.
- A freeboard is designed into each pond, with a cascading overflow from one pond to the next in the event of rainfall above this capacity via lined overflow spill ways. The final release of overflow water is through a lined spill way that discharges into Bynoe Harbour below the high-tide mark.
- Settled solids will be removed via a commercial vacuum truck and disposed of offsite.

Discharge Water Storage

- Waste water will be released from the CBC and BMC to the waste water storage ponds, designed to treat the waste water by settlement, aeration, and utilisation of existing algae in the ponds for nitrogen removal.
- Deposited material will be removed from the settlement ponds and placed in a fully enclosed sediment storage area in accordance with the Environmental Code of Practice for Australian Prawn Farmers, with runoff directed back into the ponds.

- The deposited material will be allowed to sit for approximately six months prior to it being spread as a top dressing. Native vegetation will be encouraged to grow through this top dressing and so avoid loss of the sediment into the general environment through surface erosion.

Discharge Water

- The water to be released will have elevated nutrients (specifically nitrogen and phosphorus) as a result of the accumulation of feed residues, faeces and organic matter through the farming process.
- However, there will be no release of any elements that do not occur naturally in the local environment (e.g. anti-biotics, anti-parasitic or anti-fouling agents). All cleaning products used in the tanks are biodegradable and all water will be held in the settlement ponds until the products have fully broken down.

Water release modelling for the draft EIS and SEIS indicated the optimal location for the discharge point on Wheatley Creek as shown in Figure 2-2. It also indicated that there will be no detectable impact of the waste water in Bynoe Harbour, and that the release will produce very low upper limit long term increases in nutrients at the point of release. A screen affixed to the pipeline will stop prawn escapees being released to the environment.

Other infrastructure and services

- Access to the Project site from the existing road network will be from Fog Bay Road. A speed limit of 80 km/hr or less will apply on all site roads.
- Road maintenance will be undertaken as required to ensure that the road remains fit for all-weather access.
- Onsite power generation will ultimately be from on-site diesel generators with fuel storage, each containerised in a self-bunded and sound attenuating enclosure with connection points for fuel, coolant, and lubricants. Bulk fuel and lubricants will be stored in above ground self bunded tanks.
- On-site fuel storage volume will be approximately 5 to 7 days of consumption. Fuel will be replenished by road tanker from Darwin. On-site company vehicles may be permitted to refuel from this facility.
- Site outside communications will be wireless via a 4G connection. Internal site communications will be supported by a combination of wireless and fibre optic networks.

Freshwater Supply

- The majority of freshwater will be utilised for domestic use with day workers at full scale estimated to demand 6.5kL/d and an additional 5.0kL/d per for use in site accommodation.
- At full scale, the CBC requires approximately 760kL/year for the peak CBC hatchery process which demands water during 4 six week production runs.
- Freshwater water supply will primarily come from onsite rainwater collection in the wet season.
- Any additional freshwater that is required, as in each dry season, or in particularly dry years in the wet season, will be trucked to site from a commercial supplier.

Chemicals and Hazardous Materials Management

- Chemical and hazardous materials storage will be generally in accordance with AS1940 The Storage and Handling of Flammable and Combustible Liquids and the National Standard for the Storage and Handling of Workplace Dangerous Goods (NOHSC: 1015 (2001)). Minor storage volumes will be located at various locations (including CBC, BMC.), plus a central store at the Common Facilities comprising a metal clad shed with concrete bunded floor, sized to contain any possible spillage of chemicals.

- Any hazardous material will be disposed of at an approved treatment facility in Darwin by an accredited waste treatment company.
- The PSD Chemical Management procedures will apply to all chemicals managed at the farms. Spill kits and fire extinguishers / control equipment will be provided at each chemical store, as will training of personnel. A Hazardous Materials Register will be maintained for the whole Project.

Workforce

A workforce of 45 will be required to be employed at the CBC and BMC when operating at full capacity. This will include managers, a geneticist, various technicians, administrators and aquaculture workers.

Traffic requirements

- Operational traffic will be mainly associated with staff movements. Approximately 16 light vehicle and bus movements are required each day at full scale. Light vehicle movements are associated with personnel who are self-accommodated within the region whilst bus movements are associated with personnel accommodated in company supplied accommodation. It is noted that Drive in – Drive out (DIDO) personnel are also likely to commute to Darwin on their rostered days off.
- Fuel will be delivered twice a week.
- Broodstock from the BMC will be delivered on a weekly basis to the Hatchery.
- Founder stock will also be delivered from the facility in Exmouth.
- If removal of waste prawns by a suitably licensed contractor is the preferred option for dealing with the dead prawn waste stream at full scale this would amount to one truck per week.

Waste management

- The non-process solid wastes will be separated on site, similar to urban classifications, with the putrescible waste volumes relatively small as the majority of the workforce will be domiciled off site.
- Recyclable, household and aquaculture refuse will be separated and collected at a designated waste management facility located at the central administration area.
- During full scale production waste will be removed by a commercial contractor on a weekly.
- Compostable wastes will be separated at each facility where feasible and decomposed in tumbler-style composters. Compost will be used in landscape areas.
- Biological waste (i.e. reject prawns) will be generated through either natural mortalities during the growth cycle (CBC and BMC), targeted selection within the CBC (99% of population rejected with 1% selected) and spent broodstock from the CBC Hatchery. The anticipated average biological waste production at full scale production from both the CBC and BMC is 113kg per week. Although considered unlikely, mass mortalities due to disease or infection would result in a once off mortality event ranging between 160 – 380kgs.
- All biological waste is to be incinerated onsite via an incinerator. The incinerator will operate 7 days a week and the ash produced will be disposed of as general waste. Ash will be produced at a rate of 1-3% of mass incinerated.

Sewerage

- Sewage at each facility will be treated locally in appropriately sized treatment systems and land disposal areas.
- Periodically the treatment plants will be de-sludged as part of routine maintenance. The sludge will be trucked to a Waste Management Facility in Darwin.

3 OBJECTIVES AND TARGETS

The overarching Project environmental objectives and targets are provided in the EMS, which have been adopted and extended where necessary for the Bynoe Harbour CBC & BMC Facility, as shown in Appendix B to this EMP (EN02-RG0102 Objectives and Targets Register).

Each of the environmental strategies provided in Appendix C to this EMP also shows the relevant objectives and targets for that strategy from the overriding EN02-RG0102 Objectives and Targets Register.

4 IMPLEMENTATION

This EMP has been prepared as a sub-plan under the overarching PSD EMS. The PSD EMS Manual (EN-MN4001) details general EMS and EMP implementation including:

- Risk Assessment
- Relevant Legislation and Statutory Requirements
- Roles and Responsibilities
- Training and Awareness
- Communication
- Supplier and Sub-contractor Management
- Monitoring and Review
- Non-compliance and Corrective Action
- Complaints Management
- Documentation and Records
- Reporting.

The following site specific elements have been prepared to supplement the above:

- A risk assessment has been conducted specific to the development and design of the Bynoe Harbour CBC & BMC, in order to define site and phase specific risks, and develop appropriate mitigation and management measures. This is shown in Appendix B.
- The Legislation and Approvals requirements are summarised in the legislation register for the site in Appendix B (EN02-RG0301).
- Roles and responsibilities specific to this site as well as communication requirements and protocols have been provided in Appendix C15.1 Communications Plan.
- Management, mitigation and monitoring requirements are shown in the Environmental Management Strategies for each element in Appendix C. These are used in conjunction with the EMS monitoring and review requirements to prepare a site and phase specific monitoring and review schedule (refer to Monitoring and Review register in Appendix D).
- Complaints Management will remain as per the EMS Manual, with the inclusion of site details for lodgement of complaints, to be updated prior to works starting and as any changes occur. A site specific complaints register will be used on the site.

5 SOCIAL AND ENVIRONMENTAL CONTEXT

5.1 OVERVIEW

The Project EIS provides a detailed overview and assessment of the existing environmental and social aspects, potential impacts, and mitigation measures. This section of the EMP summarises the key social and environmental context of the Project, including the key potential impacts.

5.2 ENVIRONMENTAL CONTEXT

5.2.1 Significant Sites or Features

The Project site is bordered by Bynoe Harbour and surrounding estuary systems. There are several significant features in proximity to the site; however, as demonstrated in the Project's EIS none will be impacted by construction or operational activities. These include:

- Indian Island Conservation Area, located 2 km to the north-east of the Project area (a high conservation value area because of its relatively undisturbed state, and as an important breeding habitat for turtles)
- the Finniss River coastal floodplain, approximately 15 km to the south of the Project
- the coastal environment, in close proximity due to the nature of the Project.

The Project area is identified as a storm surge zone, with low lying areas around the perimeter of Portion 3192 subject to both primary and secondary storm surge. However, the CBC, BMC and administration and accommodation compound have all been located out of the primary and secondary storm surge zones.

5.2.2 Climate

The climate is tropical monsoonal, consisting of two predominant seasons:

- The dry season (April to September) influenced by easterly winds generated over inland Australia, resulting in dry and warm conditions, with very little rainfall and low relative humidity.
- The wet season (October to March) influenced by high humidity and thunderstorm activity caused by steady west to north-west winds, bringing moisture and consequent rainfall from the Timor Sea.

The closest long-term weather station to the site is Dum In Mirrie Airstrip (BOM Station No. 014277) located approximately 22 km to the north-west, with data available from 1994 (rainfall) and 1998 (temperature) to the present. Temperature and rainfall statistics from the Dum In Mirrie Airstrip weather station are presented in Figure 5-1.

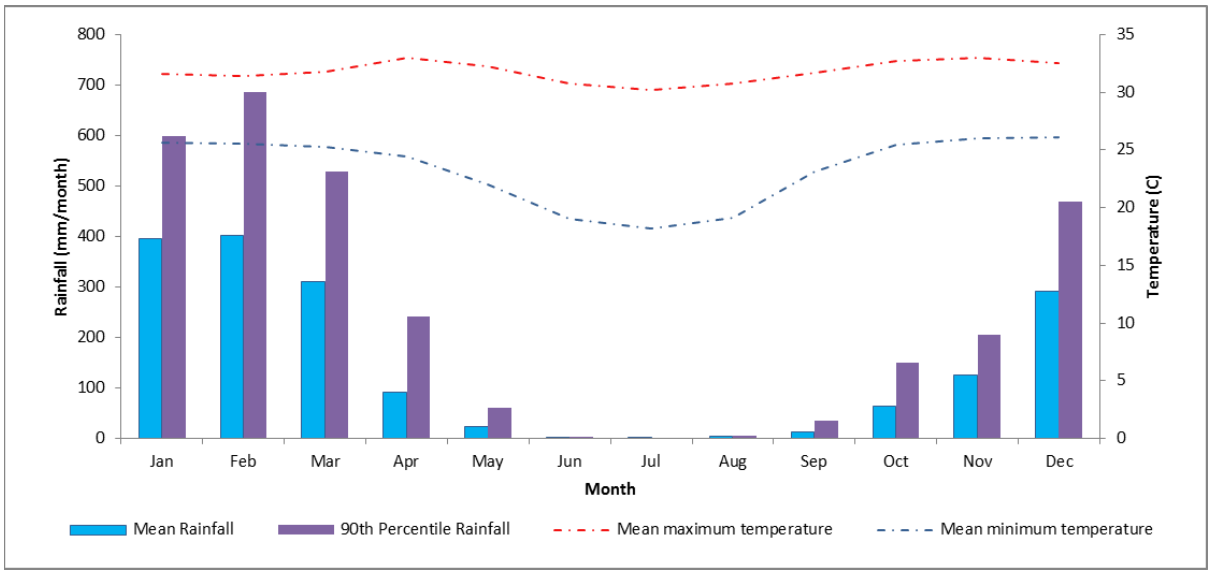

FIGURE 5-1 MONTHLY CLIMATE STATISTICS, BOM STATION 014850

5.2.3 Geology, Geomorphology and Soils

Geology

The proposed facilities are underlain by the Welltree Metamorphics and the Finniss River Group. Together these units consist of a range of rock types including quartz, feldspar, biotite, gneiss, shales, siltstones and phylite. A local intrusion of the Two Sisters Granite Unit consisting of granite, granodiorite and pegmatite occurs in the vicinity of the south-western corner of the Project site. The bedrock is overlain by unconsolidated sands, and ferruginous, clayey, sandy, gravelly soils and laterites. The southern part of Bynoe Harbour, including Point Ceylon, is predominantly lateritic capping with some exposures of the underlying weathered granite and some fine-textured sedimentary rocks.

Geomorphology

The morphology of Bynoe Harbour is the product of marine transgressions, fluvial erosion and deposition. Bynoe Harbour is classified as a drowned river valley estuary, also known as a ria shoreline. Under present conditions, sediments are delivered to Bynoe Harbour primarily during high rainfall and runoff events through the creeks. These sediments are then either carried in suspension out of the harbour by the strong tidal currents, or deposited in the mangrove forests along the shoreline. Sediment samples from the seafloor within Bynoe Harbour indicate a high proportion of sandy and gravel material. Conversely, Port Patterson, located west of Indian Island, has a higher proportion of fines.

Topography

The topography of the development area is generally undulating, rising from sea level to around 37 metres above sea level at the highest point along a peninsula which leads from the Finniss Road to Point Ceylon. There are no steep escarpments on the site. The proposed development areas for the CBC and BMC are between 5 and 25 m above sea level. This is shown in Appendix A.

Site Soils

The soils of Bynoe Harbour catchment can be summarised as highly weathered, low in plant nutrients with acid to neutral pH, and dominated by kaolinitic clays. Ironstone gravels are characteristic of soils associated with lateritic parent materials. Soil mapping for the area of the development (Portion 3192) is shown in Appendix A and are considered to present mostly a low to moderate erosion residual risk.

Soil mapping by HESSE (2018) identified saline and sodic soils (clayey Hydrosols) in intertidal areas associated with the intake and discharge pipeline areas, supporting mangrove vegetation, trending further inland into sandy gravelly colluvium of sandy/clayey Hydrosols, and then into loamy Kandosols, with moderately dispersive subsoils in areas. Minor areas of sandy Tenosols were identified along the access road.

Acid Sulfate Soils

The mapped probability of occurrence of Acid Sulfate Soils (ASS) for the Project area is shown in Appendix A, showing extremely low probability of ASS across most of the infrastructure areas on the site, and high risk along the coastal fringe.

Soil sampling by HESSE (2018) confirmed this high risk of acid sulfate soils in the intertidal mangrove areas, associated with the intake and discharge structures, matching the very low mapped risk for all of the site infrastructure other than parts of the intake and discharge structures above RL5.0m AHD, generally considered the upper limit of Holocene sediments forming ASS.

5.2.3.1 Environmental Values

The ability of undisturbed land systems to be self-supporting, sustainable and stable soil-vegetation systems.

The in-situ topsoils as a resource for land stabilisation and rehabilitation.

Post-Project beneficial landuses (in relation to avoiding ASS oxidation, contamination, etc.).

5.2.3.2 Potential Impacts

- Direct disturbance of soils and landscapes through earthworks and traffic.
- Soil erosion from vegetation clearing and pond works, and bare or imperfectly stabilised surfaces.
- Disturbance and oxidation of acid sulfate soils.
- Soil contamination from leaks and spills.
- Soil structural decline from working and exposure of sodic sub-soils (where present).
- Salinization and sodification of soils subject to saline pond waters.
- Dust generation and management is further discussed in Air Quality below. Design has been undertaken in regard to geotechnical constraints, and is detailed in the Draft EIS, Part A, Chapter 2 - Project Description.

5.2.4 Hydrology

The Project site is located on a peninsula on the southern shore of Bynoe Harbour, surrounded by macrotidal estuary systems, with a maximum tidal range of 7.6 m. The entrance to Bynoe Harbour is located at the northern end of Indian Island, although water also flows into Bynoe Harbour via Port Patterson and the Geranium Channel to the west of Indian Island. A number of small tidal creeks and bays are present along the shore of Bynoe Harbour.

A large rocky outcrop extending more than 450 m off-shore is present at the northern shore of Point Ceylon. The platform is completely exposed during low tide and is inundated during higher tides. The intertidal platform on the headland is a combination of sandy material with some fines, particularly around mangrove areas. Away from the mangroves there are larger cobbles and small rocks.

Review of limited historical aerial images and site observations indicate that the shoreline at Point Ceylon appears to be relatively stable. There are no recent erosion scarps or areas of vegetation loss on the Point which would suggest ongoing erosion.

On the southern side of Indian Island, however, there is some evidence that erosion may be occurring. The main flow path of Geranium Channel in this area is closer to the shore of Indian Island and steep banks to the

low water level can be observed. In addition, during recent onsite observations, dead and dying mangroves were noted as having collapsed into the waterway.

The catchments around Bynoe Harbour are ungauged and relatively small in size. The Wheatley Creek catchment is approximately 33 km2. The total catchment for Bynoe Harbour is approximately 1,000 km2, including Turnball Bay. The Project is located within the Fog Bay Beneficial Use Area (BUA) with beneficial uses noted as aquatic ecosystem protection (environment), recreational water use (cultural) and aesthetics (cultural). Features worth noting within the BUA include Litchfield National Park being located in the headwaters of the BUA, Bynoe Harbour as a recreational fishing area, registered Native Title on the northern side of Bynoe Harbour and the Finniss River Coastal Floodplain (16km southeast).

The proposed operation includes the intake of seawater and the release of discharge waters into Wheatley Creek. Wheatley Creek is approximately 9.5 km long from the confluence at Mackenzie Arm to the upstream end of the mangrove habitat and is fed by ephemeral streams. Stream flows are distinctly seasonal and concentrated during the wet season.

Placement of the intake pipe on the bed will result in minor and localised changes to the bathymetry in deeper water, due to scour and deposition. More significant changes could be observed in the intertidal region where sediments are more mobile.

The release outlet in Wheatley Creek is likely to also involve some removal and disturbance of vegetation, and there may be some visual disturbance owing to the construction of the intake pipe in an area with low level of development, however, minimal impact is expected upon coastal values in the area.

A typical discharge such as used for the Project has the potential to cause scour of the bed and or bank within receiving waterways, however flows will be low compared with tidal currents. Observations/measurements will be undertaken during the initial stages of the Project with a view to designing a weir control structure in later stages if required to control scour and manage timing/mixing of discharge waters.

The macro tidal environment within Bynoe Harbour and Wheatley Creek means that the potential changes to the tidal water levels and currents by the intake or release are low. During a single tide, the intake pipe will remove 0.0002% of the tidal prism from Bynoe Harbour during a spring tide and 0.006% during a neap tide. This is unlikely to have any impact on tidal water levels or currents.

The release into Wheatley Creek represents an addition of 0.1% and 0.55% of the creek tidal prism for spring and neap tides respectively. Again, this is considered unlikely to have any impact on tidal waters or currents.

High tidal currents will also necessitate the anchoring of the intake pipe to the bed to prevent damage through movement.

In terms of site terrestrial hydrology, the design includes road alignment to catchment boundaries, and use of culverts and floodways to avoid changing existing site hydrology.

5.2.4.1 Environmental Values

- Marine and estuarine aquatic ecosystems.
- Recreation and aesthetics, in relation to water quality and fisheries resources in areas adjacent to the site for public use.
- Human consumers (primarily for fish species, crabs and other fauna).
- Cultural and spiritual values of marine and estuarine waters, fresh waters and floodplains, including ecosystems and biota.
- Suitable salt water supply to support the Project (i.e. intake waters).

5.2.4.2 Potential Impacts

- Potential erosion and changes to coastal landform and bathymetry in the vicinity of the proposed intake and release points.
- Direct impacts from the Project intersecting drainage lines and causing changes to flooding, flowpaths, flow velocities and volumes, and providing barriers to fish movement. These will be minor drainage lines only, with all affected areas subject to culverts and floodways to mitigate any changes.

5.2.5 Water Quality

Based on existing literature review, and the Project water quality monitoring program, the water quality in the region can be characterised as follows:

- Salinity within Bynoe Harbour and around Point Ceylon is primarily influenced by offshore salinity levels during the dry season, and catchment runoff during the wet season. Salinity near the intake pipe ranges between 28 and 37 parts per thousand (ppt). Following larger flood events the salinity can drop to around 20 ppt and has been measured as low as 12 ppt. Data collected by Seafarms in December 2015, within the vicinity of the proposed site, indicates very little vertical stratification within the waterbody.
- Turbidity within Bynoe Harbour is seasonal, with runoff from the catchment contributing to high turbidity levels during the wet season, with visibility through the water column following a large flow event as low as 0.3m using a Secchi disk. During the dry season, turbidity reduces and a maximum Secchi depth of 8m has been recorded. Turbidity is also influenced by the tide. High tidal currents act to keep suspended sediment entrained within the water body, and moderate to high turbidity levels are common throughout the year. Turbidity data from Woods Inlet and the West Arm of Darwin Harbour ranges from 2 to 6 Nephelometric Turbidity Units (NTUs).
- Based on the PSD monitoring program data, water quality levels (with the exception of one potential outlier TN value in Mackenzie Arm) at all sites are relatively consistent with values available from the literature in the general region.

In November 2015 PSD commenced a sampling program to establish existing water quality conditions within the receiving environment and its associated waterways. A range of physico-chemical parameters are being measured including hydrocarbons, BTEX, heavy metals, organochlorine pesticides and nutrients. Further information is provided in the Water Quality Monitoring and Management Plan (WQMMP).

5.2.5.1 Water Quality Objectives

In order to assess the impacts of the Project upon the receiving environment, the performance objectives set out in the Water Quality Objectives for the Darwin Harbour Region (DNRETAS, 2010) were adopted. These were chosen since no locally specific water quality guidelines were available for Bynoe Harbour.

Much of the data which underpins the establishment of the water quality guideline values for Darwin Harbour has been collected from relatively un-impacted catchments of the Harbour, similar to Bynoe Harbour, as is required when defining water quality objectives. As such these interim water quality objectives were used in the modelling assessment.

These are being updated and refined as outlined in the WQMMP.

5.2.5.2 Modelled Discharge Water Quality

The potential impacts of the proposed release into Wheatley Creek were assessed via the formulation, application and interpretation of a calibrated, near and far field, two-dimensional hydrodynamic and advection dispersion modelling tool built using the MIKE 21 Flexible Mesh hydrodynamic model. This is described in more detail in the Draft EIS, Part B, Chapter 11.

The numerical modelling was based on a conservative tracer, which allowed the dilution and dispersion of the effluent to be understood. This conservative approach allows for a worst-case assessment of dispersion, but does not allow for uptake (biological or physico-chemical), deposition, settlement or entrainment, or turbulent dispersion associated with, for example, depth varying flow around river bends. In addition, the maximum proposed licenced limits were adopted as release concentrations, rather than the expected mean values.

Notwithstanding the above, the modelling found that water quality was compliant with the interim water quality guidelines for total nitrogen, and marginally exceeded the total phosphorus objective in the dry season. Wet season modelling showed that the worst-case outcomes were found in the dry season, and so no further description of the wet season results was required. An assessment of the refined site specific trigger values developed in the WQMMP was undertaken, confirming the findings of the above modelling (refer to WQMMP).

When the additional effect of initial mixing, biological assimilation and particulate matter deposition is taken into account, it is considered unlikely that the proposed release will have significant water quality, or water quality related ecological impacts to Wheatley Creek, Geranium Channel or any other waterways in the Bynoe Harbour area.

5.2.5.3 Environmental Values

- Marine and estuarine aquatic ecosystems.
- Recreation and aesthetics, in relation to water quality and fisheries resources in areas adjacent to the site for public use.
- Human consumers (primarily for fish species, crabs and other fauna).
- Cultural and spiritual values of marine and estuarine waters, fresh waters and floodplains, including ecosystems and biota.

5.2.5.4 Potential Impacts

- Changes to estuarine water quality due to releases, both planned and unplanned.
- Runoff of sediment laden water during construction, from erosion and sediment loss from exposed surfaces.
- Leaching of oxidising acid sulfate soils, though unlikely to be large enough volumes to affect estuarine and marine tidal areas.
- Leaks and spills into fresh, estuarine and marine waters.

5.2.6 Groundwater

The Finniss Sub-Region, in which the Project area is located, has limited groundwater potential. NT Department of Land Resource Management records indicate that there is an existing bore on the Project site, RN23176, estimated to pump 2.0 L to 5.0 L per second.

Local consultation has identified two active (and at least two collapsed wells) still used for potable water by fishers staying at Point Ceylon. This water was previously assessed by Suntay Aquaculture in around 2003, as being of potable quality.

At this stage it is not proposed to use groundwater, and there are no anticipated impacts of the construction and operation of the Project on groundwater.

5.2.6.1 Environmental Values

- The ability of groundwater resources as a water supply for the site, and if post-land uses are required, for uses commensurate with existing levels of use.

- The ability of ecosystems dependent on groundwater to continue to be functionally and ecologically sustainable.

5.2.6.2 Potential Impacts

- Direct contamination of groundwater, from general spills and leaks, and leakage of saline and nutrient rich waters from dams and other infrastructure.
- Contamination of groundwater from effluent disposal areas.
- Changes to hydrology, affecting recharge zones and therefore groundwater recharge.

5.2.7 Biodiversity

Appendix A contains a tabulated list of conservation significant species listed under the *Territory Parks and Wildlife Conservation Act 2006* (TPWC Act) (NT) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Cwth) that were identified as being potentially present on the Project site in the Draft EIS. Additional ground-based assessments have been conducted, and the following sections summarise the findings.

5.2.7.1 Threatened Flora and Vegetation

The Project area is dominated by mid to tall open Eucalypt spp. woodland with a mid-storey of *Livistona humilis* over *Eriachne spp*., *Sorghum spp*., and *Heteropogon triticeus*. This vegetation type represents over 80% of vegetation within the Project footprint. The mapped vegetation communities on the site are shown in Appendix A.

No threatened ecological communities listed under the EPBC Act are known to occur within or surrounding the proposed Project area.

Two threatened flora species, the Armstrong's Cycad (*Cycas armstrongii*) and *Arrowleaf Monochoria* (*Monochoria hastata*), have been identified as having the potential to occur in the Project area and surrounds. These were not found in earlier studies, and pre-clearance field surveys in November 2018 by Astrebla (2018a) found neither present in the vegetation clearing area (including 20m buffer). As such, these are considered not present in the vegetation clearing area, and no further controls are required for these species.

5.2.7.2 Threatened Fauna

Fauna surveys of the terrestrial Project area were undertaken during 2002 and 2003 by GHD. No threatened fauna species listed under the EPBC Act and/or TPWC Act were recorded during these field surveys. Nevertheless, additional desktop assessments of the following sources were undertaken to further assess the likelihood of threatened fauna species utilising the Project site, with the results shown in the table in Appendix A.

5.2.7.3 Aquatic Ecosystems

Marine megafauna of conservation significance listed under the TPWC Act that are considered likely or possible to occur include:

- Four species of marine turtles
- Four species of fish

These species are all transient or migratory animals that will not be confined to one area. The marine habitat to be affected by the Project is restricted to the footprint of seabed over which the intake or outlet pipelines will be placed. The ability of marine megafauna to transit through the Project area is not likely to be affected by a change in the seabed habitat in these locations.

5.2.7.4 Weeds and Pest Animals

The Project plus a 200m buffer area were surveyed for weeds in February 2018 by Astrebla (2018b). This, combined with results from an earlier survey by Harvey and Morris (2003), found that the survey area was predominately free of all exotic species, including declared weeds. In general, undisturbed areas of the site were determined to be weed free and appeared to be intact and in good remnant condition.

A number of declared weed species were found across the site, with the area and density identified in Appendix A.

The greatest risk of weeds being introduced and spread will occur during the construction of the Project. Vegetation clearing, soil disturbance and vehicle movements are considered likely to create opportunities for weeds and an increased potential for weed incursion into adjacent native vegetation.

In terms of pest animals, GHD recorded wild pigs (*Sus scrofa*) and Asian house gecko (*Hemidactylus frenatus*) in the study area in 2003.

5.2.7.5 Environmental Values

- Vegetation community diversity.
- Flora and fauna species and species diversity.
- Aquatic community and species diversity.
- Habitat (terrestrial and aquatic) for flora and fauna.
- Land / soil stability (potentially degraded after clearing).

5.2.7.6 Potential Impacts

- Reductions in vegetation community and flora species diversity, through additional or unintentional clearing or damage to flora outside clearing limits.
- Direct disturbance of habitat for aquatic flora and fauna (terrestrial and aquatic) from vegetation clearing and earthworks.
- Loss of habitat for flora and fauna (terrestrial and aquatic).
- Land degradation from acid sulfate soils, upslope land clearing or runoff leading to vegetation die-back.
- Removal of woody or deep rooted vegetation resulting in the rising of the water table, and surface soil salinity, although again impacts from this source are considered unlikely.
- Dust deposition on vegetation and communities (considered minor given existing dust impacts at the site).
- Introduced flora and weeds from vehicles, machinery, personnel, resulting in a negative change to community diversity.
- Weeds, introduced and pest species (flora and fauna) may cause changes in natural systems diversity and community structure. Introduced flora may potentially out compete species and communities, and introduced fauna may outcompete and over predate on native fauna (particularly protected or important).
- Entrainment or impingement of aquatic fauna in intake pipes during operation.
- Localised short-term noise and vibration disturbance during construction.
- Changes in water quality resulting from:
- vegetation clearing and earthworks
- release of used seawater from the facility

- spills of hydrocarbons or other contaminants, including oxygen reducing substances (such as cement) and treated or untreated effluent directly to waterways.
- Light spill from facilities or construction vessels affecting migration or navigation Proliferation of pest plants.
- Escape of prawn stock and/or diseases and pathogens from the facilities.
- Increased risk of boat strike, and interruption of movement, for turtles and other large slow moving surface marine creatures during construction.
- Increase in plastic litter and debris resulting in ingestion and entanglement.

5.2.8 Air Quality

Air quality for the area is very good, with no sources of industrial pollution for 40 km. During the dry season, smoke from bushfires will contribute particulate matter to the atmosphere. The impact of this smoke will depend on the distance the fire is from the site of the proposed infrastructure.

The primary emissions generated during the construction of the Project will be dust, through mechanical disturbance from vehicles and equipment, and wind erosion of exposed, disturbed soil surfaces.

Emissions from the operation of the Project will result primarily from the operation of the diesel power generators to be used on the site, plus emissions from the proposed biological waste incinerator. The nearest sensitive receptor to the incineration and power generation facilities is the accommodation facility located approximately 60 m to the southwest. A screening level air quality assessment was undertaken using AUSPLUME assuming worst-case meteorological conditions, which found a buffer of 300 m from the power facility is needed in order to reduce the maximum predicted impact to the criteria level (of 246 µg/m3).

Prawn mortalities from the Project facilities will also require disposal, either via removal off-site using a suitable licensed contractor, or incineration on site, via a proposed incinerator. The incinerator would be located in close proximity to the power facility fuel storage and be housed in a shed. A risk assessment conducted as part of the EIS has identified very low residual impact upon the environment. Residual risk associated with potential impact can be managed through the adoption of standard operating procedures that require the facility to be operated when favourable winds limit exposure to accommodation facilities.

Based on the outcomes of the noise assessment, the power station (and the incinerator if used) will be located approximately 520 m from the accommodation village, enabling the air quality criteria to be met .

Odorous emissions could also occur from sewage treatment plants and potentially waste pond sediments as they are dried. However, sewage odours would generally only occur when the systems are not operating efficiently. Both sources would still avoid any impacts with a suitable off-set distance applied.

5.2.8.1 Environmental Values

As the Project Area is remote, the only potentially sensitive receptors in relation to air quality are the site workers and on-site accommodation.

5.2.8.2 Potential Impacts

There are no expected impacts from air quality during the operation of the facility, if the required separation distance is adopted in the detailed design, any incinerator (if used) and sewage treatment plants are operated effectively, and suitable offsets are applied for sewage treatment plants and sediment drying beds.
Construction of the facility could result in some minor, localised impacts from earth moving machinery and construction machinery/tools.

5.2.9 Noise and Vibration

Ambient noise levels are very low, with only natural noise occurring within the region, except along roads and in residential areas. During construction, normal noise generating activities will be undertaken, though given the lack of nearby sensitive receptors, this is not expected to cause any impacts, and normal controls are to be adopted.

During the operation of the site, noise impacts could occur to the on-site receptors, namely the accommodation village. The most likely source for this would potentially be the power station, which would be running day and night. A preliminary noise model was prepared to gain an understanding of predicted noise levels at the accommodation village and also how far the power facility should be from the accommodation to minimise potential noise impacts. The model results showed that the predicted noise level at the accommodation facility, moved 520 m from the accommodation village as required for air quality requirements, could meet the noise criteria.

5.2.9.1 Environmental Values

As the Project Area is remote, the only potentially sensitive receptors in relation to air quality are the site workers and on-site accommodation.

5.2.9.2 Potential Impacts

There are no expected impacts from noise or vibration during the operation of the facility, if the required separation distance is adopted in the detailed design. Construction of the facility could result in some minor, localised impacts from earth moving machinery and construction machinery/tools. These will be confined to business hours and are expected to be short lived in duration.

5.2.10 Climate Change Assessment

Increased concentrations of greenhouse gases are projected to cause a warming of the atmosphere and oceans, which in turn are projected to drive a range of other changes to the earth's climate and the climate variability. A risk assessment was undertaken to identify the relevant threats to the coastal environment associated with climate change, determine the aspects of the proposed development that could potentially be exposed to those threats and assess the overall risk of the exposure.

The potential climate change effects that could impact the physical processes operating on the coastal environment of the Project area are:

- sea level rise, and
- tropical cyclone intensity and frequency.

Global average sea level rose by approximately 0.17 m during the 20th Century, with the average global rate of sea level rise between 1950 and 2000 at 1.8 ± 0.3 mm/year. The net relative sea level trend since installation of the tidal gauge in Darwin Harbour in June 1992 is 7.6 mm/year at Darwin.

The main impacts associated with the projected increase in mean sea level at Bynoe Harbour are considered to be shoreline recession and increase in storm tide elevations.

In terms of cyclone intensity, the spatial and seasonal distribution of cyclone occurrence is expected to remain approximately similar to present, whilst the frequency of tropical cyclone formation may actually decline under climate change.

Predicted storm tide elevations at Bynoe Harbour were determined at 0.8 m through to 1.5 m by 2100. This increase is comprised of 0.8 m of mean sea level rise and an additional meteorologically induced component of 0.1 m for the 1 in 100 year Average Recurrence Interval (ARI) event and 0.7 m for the 1:500 ARI year event.

The main components of the CBC and BMC, and the coastal environment, that are considered to be exposed to the impacts of sea level rise and tropical cyclone intensity and frequency are the:

- intake and release infrastructure
- land based facilities
- water quality and circulation.

The consequences of changes to the shoreline are likely to be minimal at the intake pipe location as the pipe will be secured to the bed. Changes to the shoreline at the release point, and for some infrastructure near the existing shoreline, could result in more significant consequences, and could include redesign and relocation costs and inconvenience. As a result of the climate change assessment, the BMC, CBC and administration and accommodation facilities have been located on high ground away from the existing shoreline. Storm tide inundation might similarly affect these structures, with damage and rectification costs, or similar redesign and relocation requirements if required.

Increased wave energy on the bed could lead to increase scour and movement of the intake pipeline, potentially causing damage to the pipe and loss of production. Similarly, changes in circulation could lead to a change in dispersion of material from the outlet and higher concentrations could occur within Bynoe Harbour. In the event that sea levels rise as predicted, numerical modelling taking into account the change in the frequency of connectivity between the Geranium Channel and Wheatley Creek could be undertaken. Outcomes of the modelling could be used to derive engineering solutions, such as:

- moving the release to a more optimal location
- timing the release to minimise dispersion during times of connectivity between the Geranium Channel and Wheatley Creek
- elevating the land in the area around the release point to minimise connection of the two channels to extreme water level events only.

As such, while the above potential impacts do exist, their mitigation involves monitoring and observation, followed by design and rectification works.

5.2.10.1 Potential Impacts

- Climate Change Assessment - the key threats to the Project from climate change are sea level rise and increases in tropical cyclone intensity and frequency. These climate change impacts are likely to result in:
- shoreline recession
- increase in storm tide elevations.

5.2.11 Waste Management

5.2.11.1 Waste Characterisation

The Project will produce a number of different solid and liquid wastes during both construction and operations. The key waste types and the potential quantities have been identified and a management strategy to deal with them has been devised.

5.2.11.2 Waste Management Strategy

Waste Minimisation

The overarching strategy to be implemented on the site is one of minimisation, in the following order of preference (with those listed first preferred over each of the following practices): avoid, reduce, reuse, recycle, recover, dispose. The following sections describe how this strategy will be implemented.

Waste Management and Infrastructure

A site wide integrated waste management system will be developed on the site, with the key elements to be initiated as soon as practicable during construction. Until all elements are installed and operational, construction waste will be dealt with by nominated waste storage locations on-site, prior to removal off-site to licensed landfills or recycling / reprocessing facilities.

The overall waste strategy is specified within Appendix C9 - Waste Management Strategy (and C9.1 Site Waste Management Plan).

Wastewater Management

Wastewater on the site will comprise:

- Non-sewage wastewater:
- Waste oils and oil/fuel contaminated water from oil-water separators, from refuelling areas, workshops and vehicle wash down.
- Waste liquid chemicals or water/chemical mixes, from laboratories, workshops and vehicle wash down.
- Sewage wastewater: from the Common Facilities, CBC and BMC staff use.

Sewage wastewater will be treated in wastewater treatment plants on-site, and disposed to designed land disposal areas. Non-sewage wastewater will be either treated in the on-site wastewater treatment plants or removed to the hazardous waste facility for later removal from the site.

5.2.11.3 Environmental Values

- The quality of air, land and water environments.
- The quality and aesthetic value of the environment, including social and culturally significant sites and landscapes.

5.2.11.4 Potential Impacts

The potential impacts of inappropriate waste management can range from nuisance impacts from noise, odour and dust, through to land and water contamination, attraction and breeding of pests, and human health impacts due to landfill gas asphyxiation or explosion.

Inappropriate handling and storage of waste can result in a range of impacts, including:

- release of dust and odour, causing nuisance impacts to nearby sensitive receptors, primarily the construction camp and work areas
- breeding of vermin, with impacts to the natural environment, and nuisance impacts to site workers (flies, rats)
- contamination of groundwater from inappropriately stored or disposed waste, particularly putrescible and/or chemical (oil, fuel, other chemicals) waste.

5.3 SOCIO-ECONOMIC CONTEXT

5.3.1 Socio-economic

The Project is located within the Dundee Region, in the Finniss-Mary Area, which is a constituent of the Top End Region - the largest unincorporated area in the Northern Territory. This area is not governed by Local Government under the Local Government Act 2008 (NT), and municipal services are provided by the Northern Territory Government.

The Dundee Region is home to around 800 residents and a large number of weekenders. The population is estimated to grow to around 1,200 each weekend. It is also a popular destination for tourists, with the population swelling to more than 2,000 people on public holidays and long weekends.

The Dundee Region is characterised by:

- high population growth (56.6%) in the last six years
- low cultural diversity with low proportions of Language Other than English at home (7.9%) or individuals that were born overseas (14.4%)
- low income levels ($604 is the median weekly household income) and high unemployment levels (25.5%)
- a large retired community and an ageing population profile, with a median age of 48 years old.

The main attraction of Dundee is fishing, with an abundance of land and sea-based fishing and crabbing opportunities available to residents and visitors. In the Bynoe area, access to fishing is via numerous boat ramps and land-based fishing areas on creeks, rivers and the beach. At Dundee Beach itself, there is a boat ramp located at The Lodge of Dundee. A large number of people also fish from the beach, creeks and rivers from Patterson Point in the north to the Finniss River mouth in the south.

The Top End Region also includes the statistical areas of Alyangula, Darwin Waterfront, East Arm, Finniss-Mary, Nhulunbuy and Yulara. The total population of this Unincorporated Top End Region at June 2011 was 9,500 people. The dominant industries in the Top End Region are tourism and agriculture. The unemployment rate in the broader Finniss statistical area is approximately 8% which is higher than the unemployment rate across the whole of the Northern Territory (3.4%).

Community consultation has been undertaken within the Dundee area which includes Dundee Beach, Dundee Forest, Dundee Downs and Bynoe Haven. The consultation process identified a number of key stakeholders including residents and landowners, local clubs and associations, local retail businesses and community groups.

Those consulted during this process were overwhelmingly supportive of the Project so long as the main concerns were addressed, particularly that fishing and crabbing activities will not be impacted.

The intake pipe alignment has been designed to avoid the Paspaley oyster leases in Bynoe Harbour. Seafarms have discussed the implications of such proximity with Paspaley. Paspaley have been encouraging of the proposed development and see potential for future shared use of infrastructure. Paspaley have also shared local water quality data with Seafarms and allowed Seafarms to anchor water quality loggers to their infrastructure. Seafarms will continue to liaise with Paspaley as the Project progresses.

Based on this analysis, the development of the Project will not result in any significant negative social impacts. Conversely, development of the Project has the potential to result in positive social impacts, particularly through the generation of economic benefits and employment opportunities.

5.3.1.1 Social and Community values

Social and community values relevant to the Project include:

- Indigenous employment and business opportunities within the region
- local employment and business opportunities within the region
- recreational fishing and tourism, and
- community safety.

5.3.1.2 Potential Impacts

During construction and operation, potential negative social impacts may arise, including:

- Negative community relations, due to insufficient communication and community involvement on the progress of the Project.
- Failure to meet Indigenous and general local community employment and business expectations.
- Restriction of community access to fishing, crabbing, and other recreational and tourism activities.
- Damage to locally significant areas, particularly in relation to fishing areas, and other areas that have been commonly accessed or can be seen by the public.
- Inadequate attention to community safety, particularly in relation to product transport on public roads.

5.3.2 Historic and Cultural Heritage

An archaeological survey of the Project area was undertaken by Begnaze Pty Ltd in 2002. Only one site was identified during the surveys, a shell scatter of approximately 40 *Telescopium telescopium* shells on a chenier ridge that runs south on the eastern side of Ceylon Point. The site, known as Point Ceylon 1, is considered to be of low archaeological significance. The site is located approximately 500 m from the proposed water storage area and will not be impacted by the Project.

There are no known recorded instances of Macassan archaeological sites or artefacts in, or in proximity to, the Project area.

Non-indigenous heritage relates to the places or objects associated with the European settlement of the area. No non-indigenous heritage sites are listed on the Commonwealth Heritage Database or on the NT Heritage Register as occurring on the Project area.

There are no anticipated impacts to cultural heritage.

5.3.2.1 Cultural values

The cultural heritage values requiring protection as part of the Project works include:

- Indigenous objects, sites or places of cultural heritage value.
- Non-indigenous historically important sites and objects that may be discovered during site investigations or construction.
- Land access by local indigenous people for fishing, hunting and for cultural reasons.

5.3.2.2 Potential Impacts

The potential impacts to cultural heritage values mainly occur due to the removal and/or damage of cultural items or sites, associated with ground disturbing activities conducted during the construction phase. This may occur to known objects or sites, or to chance finds discovered during construction works.

Construction (and operation) also has the potential to limit important site access by Traditional Owner / local indigenous persons, particularly for fishing activities, or accessing culturally important sites. The degree of impact in this regard (as well as mitigation) will depend on ongoing discussions and negotiations with local indigenous people.

5.3.3 Traffic and Transport

Traffic generation estimates have been made for the construction and operational phases of the Project. The forecast total generation of 30 vehicles per day and 16 vehicles per day during construction and operation, respectively, plus a very small number of truck movements, will not have a significant impact on the road network.

6 ENVIRONMENTAL MANAGEMENT

6.1 ENVIRONMENTAL MANAGEMENT STRATEGIES

Environmental management strategies have been prepared based on the environmental risks identified in the Risk Assessment in Appendix B to this EMP, and potential impacts, mitigation measures and monitoring identified in the EIS and summarised in Section 5. These environmental management strategies consolidate and summarise the relevant commitments made as part of the EIS and SEIS, the Project approval conditions and legislative requirements, and are used to guide the development of site specific management procedures for the Project.

Table 6-1 shows the potentially impacting aspects of the Project and the relevant environmental management strategy to manage each. Construction and operational impacts are grouped together and management strategies are contained in Appendix C. During operations, all construction type works (earthworks, excavation, etc.) will continue to operate under construction phase controls where relevant.

The strategies are as follows:

- C1 - Erosion and Sediment Control
- C2 - Land and Soils Management
- C3 - Acid Sulfate Soil Management
- C4 - Vegetation Management
- C5 - Weeds and Pests
- C6 - Fauna Management
- C7 - Surface Water Management
- C9 - Waste Management
- C10 - Air and Noise Management
- C11 - Effluent Management
- C12 - Hazardous Materials Management
- C13 – Bushfire Management
- C14 - Traffic Management
- C15 - Social Impact Management
- C16 - Cultural Heritage Management
- C17 – Biting Insect Management Strategy

An additional two site specific strategies have been developed to support the above:

- C9.1 Site Waste Management Plan – containing the current waste inventory and general management of each waste stream as well as a brief site-specific description of the waste system on the site, and
- C15.1 Communications Plan – providing the key contacts, internal and external communications, and stakeholder identification.

The Biosecurity Plan will be developed during detailed design and, while part of the larger integrated management system for the Project, is not further considered here.

TABLE 6-1 ENVIRONMENTAL MANAGEMENT STRATEGIES

Potential Impact/Effect	Environmental Management Strategies
Geology, Geomorphology and Soils	
Earthworks and traffic disturbance	C1 - Erosion and Sediment Control C14 - Traffic Management
Soil erosion	C1 - Erosion and Sediment Control
Disturbance and oxidation of acid sulfate soils	C3 - Acid Sulfate Soil Management
Soil contamination from leaks and spills	C2 - Land and Soils Management C12 - Hazardous Materials Management Spill Management (Appendix E, Contingency Response Plan)
Hydrology	
Potential erosion and changes to coastal landform and bathymetry in the vicinity of the proposed intake and release points	C7 - Surface Water Management
Direct impacts from the Project altering floodplain hydrology and providing barriers to fish movement.	C7 - Surface Water Management Addressed in design, Part A, Chapter 2 - Project Description of the Draft EIS
Water quality	
Changes to estuarine water quality due to releases into Wheatley Creek	C7 - Surface Water Management
Erosion and sedimentation of waterways	C1 - Erosion and Sediment Control
Leaching of oxidising acid sulfate soils into freshwaters	C3 - Acid Sulfate Soil Management
Leaks and spills into fresh, estuarine and marine waters	C1 - Erosion and Sediment Control C7 - Surface Water Management C12 - Hazardous Materials Management Spill Management (Appendix E, Contingency Response Plan)
Groundwater	
Spills and leaks leading to direct contamination of groundwaters	C12 - Hazardous Materials Management Spill Management (Appendix E, Contingency Response Plan)
Contamination of groundwater from effluent irrigation areas	C11 - Effluent Management
Changes to hydrology, affecting recharge zones and therefore groundwater recharge	C7 - Surface Water Management
Biodiversity	
Reductions in vegetation community and flora / fauna species number and diversity through additional or unintentional clearing or damage to flora outside clearing limits	C4 - Vegetation Management
Vegetation clearance leading to habitat loss or mortality	C4 - Vegetation Management C6 - Fauna Management

Potential Impact/Effect	Environmental Management Strategies
Changes in water quality from vegetation clearing and earthworks; release of used seawater; spills, leaks or waste/litter movement off-site; or releases of treated or untreated effluent directly to waterways	C7 - Surface Water Management C6 - Fauna Management
Land degradation from acid sulfate soils, upslope land clearing or runoff leading to vegetation die-back and water quality impacts	C1 - Erosion and Sediment Control C3 - Acid Sulfate Soil Management
Disturbance associated with noise and visual stimulation	C6 - Fauna Management C10 - Air and Noise Management Lighting design, Part A, Chapter 2 - Project Description of the Draft EIS
Dust deposition on vegetation and communities	C1 - Erosion and Sediment Control C10 - Air and Noise Management
Removal of woody or deep-rooted vegetation resulting in the rising of the water table, and surface soil salinity.	C4 - Vegetation Management
Entrainment or impingement of aquatic fauna in intake pipes during operation	C6 - Fauna Management C7 - Surface Water Management
Increased risk of boat strike, and interruption of movement, for turtles and other large slow moving surface marine creatures during construction	C6 - Fauna Management
Introduced flora and weeds resulting in a negative change to community diversity Degradation of habitat value or mortality due to introduced species	C5 - Weeds and Pests
Establishment or spread of pest fauna, particularly cane toads, impacting on existing flora and fauna values, particularly threatened and near threatened species	C5 - Weeds and Pests
Bushfire Risk if elevated due to Project works	C13 - Bushfire Management
Escape of prawn stock and/or diseases and pathogens from the grow-out facility	Biosecurity Plan C7 - Surface Water Management Appendix E – Contingency Response Plan
Air & Noise	
Excessive dust and noise emissions from construction	C10 - Air and Noise Management C1 - Erosion and Sediment Control
Excessive noise and air quality impacts from operations	C10 - Air and Noise Management Detailed design phase (adopting recommended offset distances)
Excessive odour from pond operations	C10 - Air and Noise Management
Excessive odour from sewage treatment plants	C10 - Air and Noise Management C11 - Effluent Management

Potential Impact/Effect	Environmental Management Strategies
Climate Change Assessment	
Excessive generation of greenhouse gases from the Project	Ecologically Sustainable Development, outlined in the Draft EIS, Part A, Chapter 5 C10 - Air and Noise Management
Sea level rise and increases in tropical cyclone intensity and frequency	This has been incorporated into design elements, outlined in the Draft EIS, Part A, Chapter 2, and discussed in Part B, Chapter 7
Waste Management	
Nuisance impacts from noise, odour and dust, land and water contamination, attraction and breeding of pests, and human health impacts due to landfill gas asphyxiation or explosion.	C9 - Waste Management C12 - Hazardous Materials Management Spill Management (Appendix E, Contingency Response Plan)
Socio-economic	
Negative community relations	C15 - Social Impact Management
Failure to meet Indigenous and general local community employment and business expectations	Discussed in the Draft EIS, Part A, Chapter 2 and Part B, Chapter 14
Restriction of community access to fishing, crabbing and other recreational and tourism activities	C15 - Social Impact Management
Damage to locally significant areas, particularly in relation to fishing areas, and other areas that have been commonly accessed or can be seen by the public	C15 - Social Impact Management
Inadequate attention to community safety, particularly in relation to product transport on public roads	C15 - Social Impact Management C14 - Traffic Management
Health and nuisance impacts from biting insects	C17 - Biting Insect Management
Historic and Cultural Heritage	
Removal and/or damage of cultural items or sites, associated with ground disturbing activities	C16 - Cultural Heritage Management Unexpected Findings Protocol (Appendix E, Contingency Management)
Limiting important site access by Traditional Owner / local indigenous persons, particularly for fishing and hunting activities, or accessing culturally important sites	C16 - Cultural Heritage Management

6.2 MONITORING AND REVIEW

A monitoring and inspection program has been developed to measure the performance of the works in relation to this EMP, described in each management strategy above. A monitoring and review checklist is included in Appendix D, which includes monitoring required to meet the reporting requirements for EMS level monitoring and review, and site level monitoring and review requirements, as well as reporting requirements relevant to each.

This EMP is to be updated as required to ensure that it complies with relevant statutory requirements (including notably all approval, licence and permit conditions) and its stated objectives, with the strategies able to suitably manage potential environmental risks. Should any changes occur, such as to the Project, legislative

requirements, approvals or site conditions, a review should be conducted of the suitability of the EMP to continue to meet its objectives.

6.3 CONTINGENCY PLANS

Appendix E contains a contingency response plan that shall be carried out in the event of unexpected incidents or occurrences on the site (e.g. chemical or fuel spills). It is intended as a guide only, and actual responses must be tailored to the incident and situation.

A detailed site disaster management plan is to be prepared and utilised where appropriate, overriding this contingency plan where required.

Health and Safety concerns will always take precedence when managing an incident. If a situation is not safe, personnel will not enter the area. Emergency response is to be undertaken in accordance with a site OH&S Management Plan. Environmental emergencies not identified within the contingency plans are to be dealt with as soon as practical to avoid or minimise environmental harm.

7 REFERENCES

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APPENDIX A RELEVANT DRAWINGS, PLANS AND DATA

TABLE A1. THREATENED FLORA AND FAUNA SPECIES LISTED UNDER THE TPWC ACT AND EPBC ACT THAT MAY OCCUR IN THE PROJECT AREA

Scientific Name	Common Name	EPBC Act Status	TPWC Act Status	Likelihood of Occurrence
Flora				
Cycas armstrongii	Armstrong's cycad	-	V	Considered likely to occur, however survey of the project clearing area in November 2018 (Astrebla, 2018a) did not find any of these species present. Should the clearing area change, additional survey may be required in unsurveyed areas. The species occurs in the Darwin region and west to Finniss River in the same Darwin stringybark and Darwin woollybutt woodland that occurs on this site. One individual found on site immediately prior to issue of the Draft EIS
Monochoria hastata	Arrowleaf Monochoria	-	V	Considered to possibly occur, however survey of the project clearing area in November 2018 (Astrebla, 2018a) did not find any of these species present. Should the clearing area change, additional survey may be required in unsurveyed areas – this species was recorded 16 km to the south of the project area.
Fauna				
Insects				
Ogyris iphis doddi	Dodd's Azure Butterfly	E	E	Possible - potential habitat exists in project area and surrounds.
Fish				
Carcharodon carcharias	Great White Shark	V, Mi	-	Possible - potential habitat exists in Bynoe Harbour.
Manta birostris	Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray	Mi	-	Possible - potential habitat exists in Bynoe Harbour.
Rhincodon typus	Whale Shark	V, Mi		Possible - potential habitat exists in Bynoe Harbour
Glyphis garricki	Northern River Shark, New Guinea River Shark	E	E	Possible - potential habitat exists in Bynoe Harbour.
Pristis clavata	Dwarf Sawfish, Queensland Sawfish	V	V	Possible - potential habitat exists in Bynoe Harbour.

Scientific Name	Common Name	EPBC Act Status	TPWC Act Status	Likelihood of Occurrence
Pristis pristis	Largetooth Sawfish, Freshwater Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish	V	V	Possible - potential habitat exists in Bynoe Harbour.
Pristis zijsron	Green Sawfish, Dindagubba, Narrowsnout Sawfish	V	V	Possible - potential habitat exists in Bynoe Harbour.
Marine Reptiles				
Caretta caretta	Loggerhead Turtle	E, Mi	V	Possible - potential habitat exists in Bynoe Harbour.
Dermochelys coriacea	Leatherback Turtle, Leathery Turtle, Luth	E, Mi	CE	Possible - potential habitat exists in Bynoe Harbour.
Eretmochelys imbricata	Hawksbill Turtle	V, Mi	V	Likely – the species is known to occur in Bynoe Harbour
Lepidochelys olivacea	Olive Ridley Turtle, Pacific Ridley Turtle	E, Mi	V	Likely – the species is known to occur in Bynoe Harbour.
Chelonia mydas	Green Turtle	V, Mi	-	Likely – the species is known to occur in Bynoe Harbour.
Crocodylus porosus	Salt-water Crocodile, Estuarine Crocodile	Mi	-	Likely – the species is known to occur in Bynoe Harbour.
Natator depressus	Flatback Turtle	V, Mi	-	Likely – the species is known to occur in Bynoe Harbour.
Marine Mammals				
Dugong dugon	Dugong	Mi	-	Likely - known to occur in Bynoe Harbour.
Orcaella brevirostris	Irrawaddy Dolphin	Mi	-	Possible - potential habitat exists in Bynoe Harbour
Orcinus orca	Killer Whale, Orca	Mi	-	Possible - potential habitat exists in Bynoe Harbour. The species has been recorded in Fog Bay, approximately 65 km from the project site (Faggion and La Canna 2015).
Sousa chinensis	Indo-Pacific Humpback Dolphin	Mi	-	Likely – the species is known to occur in Bynoe Harbour
Stenella attenuata	Spotted Dolphin, Pantropical Spotted Dolphin	Mi	-	Possible - potential habitat exists in Bynoe Harbour
Tursiops aduncus (Arafura/Timor Sea populations)	Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)	Mi	-	Possible - potential habitat exists in Bynoe Harbour

Scientific Name	Common Name	EPBC Act Status	TPWC Act Status	Likelihood of Occurrence
Terrestrial Reptiles				
Varanus panoptes	Yellow-spotted Monitor	-	V	Likely – the species has been recorded 3 km to the south-west of the project area. Widespread in the NT
Birds				
Actitis hypoleucos	Common Sandpiper	Mi	-	Likely – the species is known to occur in Bynoe Harbour
Apus pacificus	Forked-tailed Swift	Mi	-	Likely – records of the species exist with 5 km of the project area.
Ardea alba	Great Egret, White Egret	Mi	-	Likely – the species is known to occur in Bynoe Harbour.
Ardea ibis	Cattle Egret	Mi	-	Likely – potential habitat exists in the project area and there a number of records of the species to the south of the project area.
Arenaria interpres	Ruddy Turnstone	Mi	-	Likely – the species is known to occur in Bynoe Harbour.
Calidris alba	Sanderling	Mi	-	Possible - potential habitat exists in Bynoe Harbour.
Charadrius veredus	Oriental Plover, Oriental Dotterel	Mi	-	Likely – potential habitat exists in the project area and the species has been recorded in similar habitat within the Lower Finniss Region.
Gelochelidon nilotica	Gull-billed Tern	Mi	-	Likely - recorded 4 km to the east of the project area.
Glareola maldivarum	Oriental Pratincole	Mi	-	Likely – potential habitat exists in the project area and surrounds. The species has been recorded in similar habitat within the Lower Finniss Region.
Hirundo rustica	Barn Swallow	Mi	-	Possible - potential habitat exists in the project area, however, there are no records of the species within the Lower Finniss Region.
Hydroprogne caspia	Caspian Tern	Mi	-	Likely - the species is known to occur in Bynoe Harbour.
Limosa limosa	Black-tailed Godwit	Mi	-	Likely – potential habitat exists in the project area. The species has been recorded in similar habitat within the Lower Finniss Region.
Merops ornatus	Rainbow Bee-eater	Mi	-	Known – the species has been recorded in project area (GHD 2003).
Numenius phaeopus	Whimbrel	Mi	-	Known – the species has been recorded in project area (GHD 2003).
Pandion cristatus	Eastern Osprey	Mi	-	Likely - potential habitat exists in the project area and the species is known to occur in Bynoe Harbour.

Scientific Name	Common Name	EPBC Act Status	TPWC Act Status	Likelihood of Occurrence
Pluvialis squatarola	Grey Plover	Mi	-	Likely – the species is known to occur in Bynoe Harbour.
Rhipidura rufifrons	Rufous Fantail	Mi	-	Possible - potential habitat exists in the project area, however, there are no records of the species within the Lower Finniss Region.
*Rostratula australis**	Australian Painted Snipe	E, Mi	V	Unlikely - no suitable habitat for the species (i.e. shallow freshwater wetlands) exists on the project area and there are no records of the species within the Lower Finniss Region.
Sterna hirundo	Common Tern	Mi	-	Likely – the species is known to occur in Bynoe Harbour.
Sternula albifrons	Little Tern	Mi	-	Likely – the species is known to occur in Bynoe Harbour.
Tringa brevipes	Grey-tailed Tattler	Mi	-	Likely - potential habitat exists in the project area and there are records of the species within 5 km of the project area.
Tringa nebularia	Common Greenshank	Mi	-	Likely – the species is known to occur in Bynoe Harbour.
Calidris canutus	Red Knot	Mi	V	Likely – the species is known to occur in Bynoe Harbour.
Calidris tenuirostris	Great Knot	Mi	V	Likely – the species is known to occur in Bynoe Harbour.
Charadrius leschenaultii	Greater Sand Plover	Mi	V	Likely – the species has been recorded 4 km to the east of the project area.
Charadrius mongolus	Lesser Sand Plover	Mi	V	Likely – the species is known to occur in Bynoe Harbour.
Limosa lapponica	Bar-tailed Godwit	Mi	V	Likely - the species is known to occur in Bynoe Harbour.
Numenius madagascariensis	Eastern Curlew	CE; Mi	V	Likely - the species is known to occur in Bynoe Harbour. The nearest record of the species is 5 km to the north-east of the project area.
Erythrotriorchis radiatus	Red Goshawk	V	V	Possible - potential habitat exists in the project area.
Erythrura gouldiae	Gouldian Finch	E	V	Possible – potential habitat exists in the project area.
Geophaps smithii smithii	Partridge Pigeon	V	V	Likely – potential habitat exists in the project area and surrounds and the species has been recorded in similar habitat within the Lower Finniss Region. The nearest record is 8 km to the south-east of the project area.

Scientific Name	Common Name	EPBC Act Status	TPWC Act Status	Likelihood of Occurrence
Tyto novaehollandiae Kimberli.	Masked Owl	V	V	Possible - potential habitat exists in project area and surrounds however there are no records within the Lower Finniss Region. The nearest record is 20 km to the south of the project area (DLRM 2015).
Terrestrial Mammals				
Conilurus penicillatus	Brush-tailed Rabbit-rat, Brush-tailed Tree-rat, Pakooma	V	E	Possible - potential habitat exists in project area and surrounds however there are no records within the Lower Finniss Region.
Dasyurus hallucatus	Northern Quoll	E	CE	Likely – potential habitat exists in project area and surrounds and the species has been recorded in similar habitat within the Lower Finniss Region.
Mesembriomys gouldii gouldii	Black-footed Tree-rat (Kimberley and mainland NT), Djintamoonga	E	V	Possible – potential habitat (i.e. tall forest of Darwin Woolybutt and Darwin Stringybark) exists in project area and surrounds. The nearest record is in Litchfield National Park, approximately 50 km to the south-west of the project area.
Phascogale pirata	Northern Brush-tailed Phascogale	V	E	Possible - potential habitat (i.e. tall forest of Darwin Woolybutt and Darwin Stringybark) exists in project area and surrounds. The nearest record is in Litchfield National Park, approximately 50 km to the south-west of the project area.
Saccolaimus saccolaimus nudicluniatus	Bare-rumped Sheathtail Bat	CE	-	Possible - potential habitat exists in project area and surrounds. No nearby records.
Xeromys myoides	Water Mouse, False Water Rat, Yirrkoo	V	-	Possible - potential habitat exists in project area and surrounds. No nearby records.

Legend

- Project Footprint
- ProjectLots
- HSSE 2018 Sites
- SALI soil sites

Dominant Soil Type

- Hydrosols - Waterlogged Soils
- Kandosols - Red and Brown Earths
- Tenosols - Sandy Soils
- Rudosols - Very Shallow Soils

Source:
Dominant Soils: DLRM 2008 | HSSE Soil Sites: HSSE 2019
Basemap: ESRI World Imagery, ESRI World Topo
Geology: NT Government | Footprint: Seafarms / CO2

0 0.35 0.7 km
A4 Scale 1:36,000
GDA 1994 MGA Zone 52

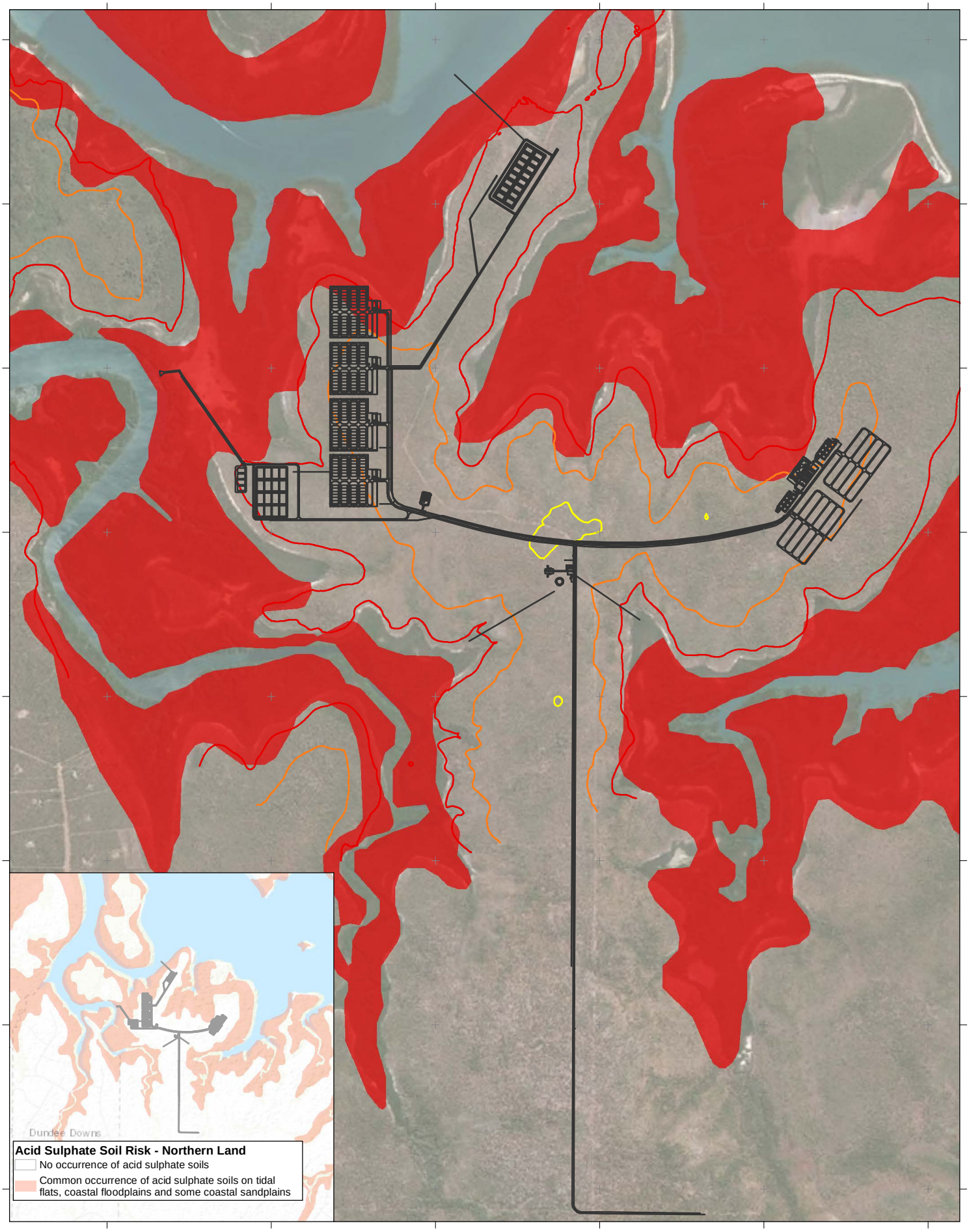
N

Project Sea Dragon - Bynoe Harbour CBC & BMC

Site Soils

EN02-MN4001-DRA02	Rev. D	Drawn by M.W.	Date 08.05.19

EN02-EN4001-DRA01 Soil



Legend

- Project Footprint

Elevation

- 5
- 10
- 20

Acid Sulfate Soil Risk

- High
- Medium
- Low
- None

Source:
ASS Risk: DLRM 2012 | ASS Risk Northern Land Systems: DLRM 2008 | Basemap: ESRI World Imagery
Footprint: Seafarms / CO2

0 0.3 0.6 km

A4 Scale 1:30,000
GDA 1994 MGA Zone 52

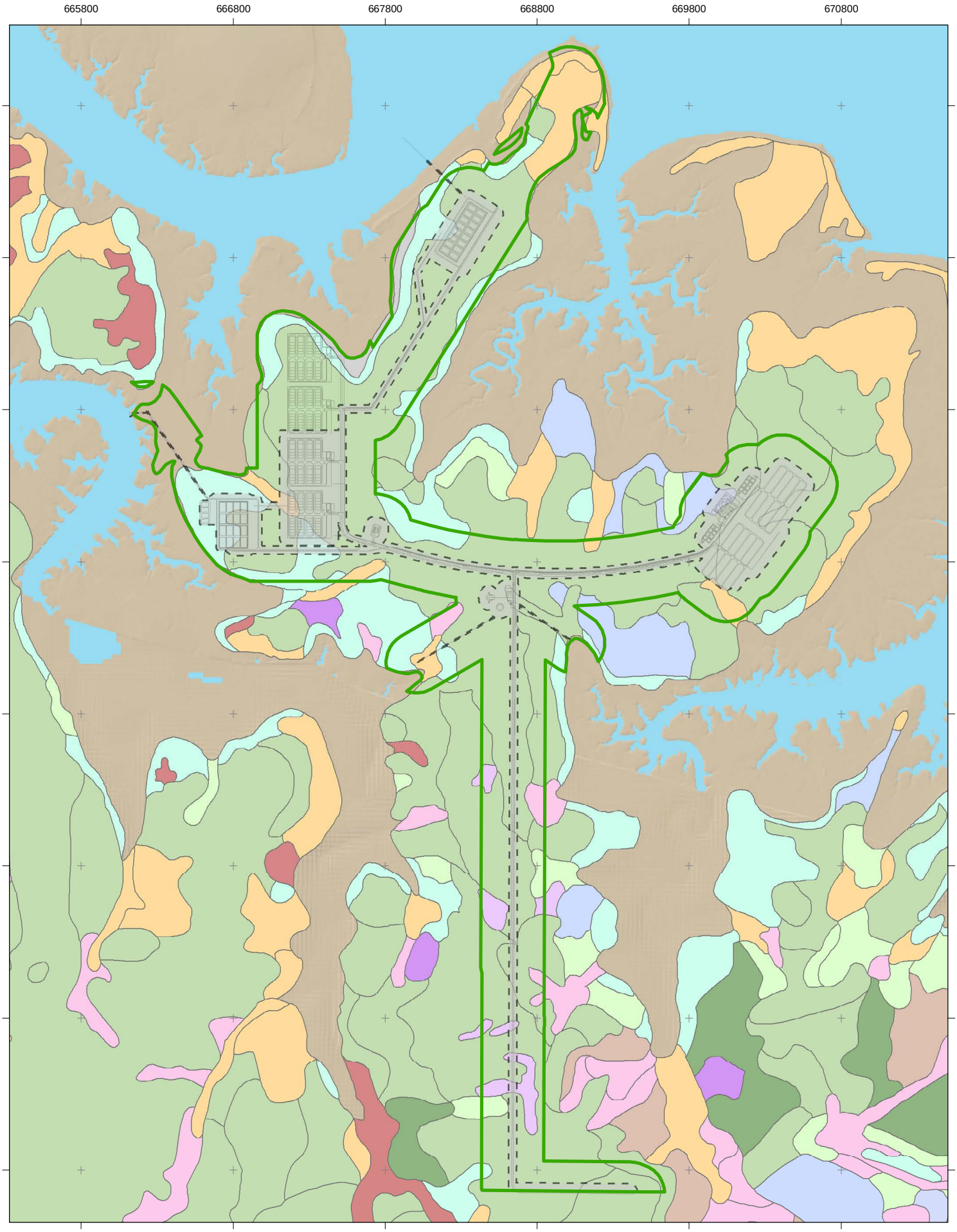
N

Project Sea Dragon - Bynoe Harbour CBC & BMC

Acid Sulfate Soils

	Rev.	Drawn by	Date
EN02-MN4001-DRA02	B	M.W.	08.05.19

EN02-MN4001-DRA02 ASS



Legend

- Project Footprint
- Permitted Clearing Area
- Weed Control Area

Vegetation Description (Table A1)

- A1
- A2
- A3
- B1
- C1
- D1
- E1
- G1
- H1
- J1
- L1
- P1
- P3

Source:
Vegetation: DENR 2000 | Mangroves/saltmarsh: DENR 2000
Basemap: Geoscience Australia 2015
Footprint, Clearing, Weed Control Area: Seafarms / CO2 2018

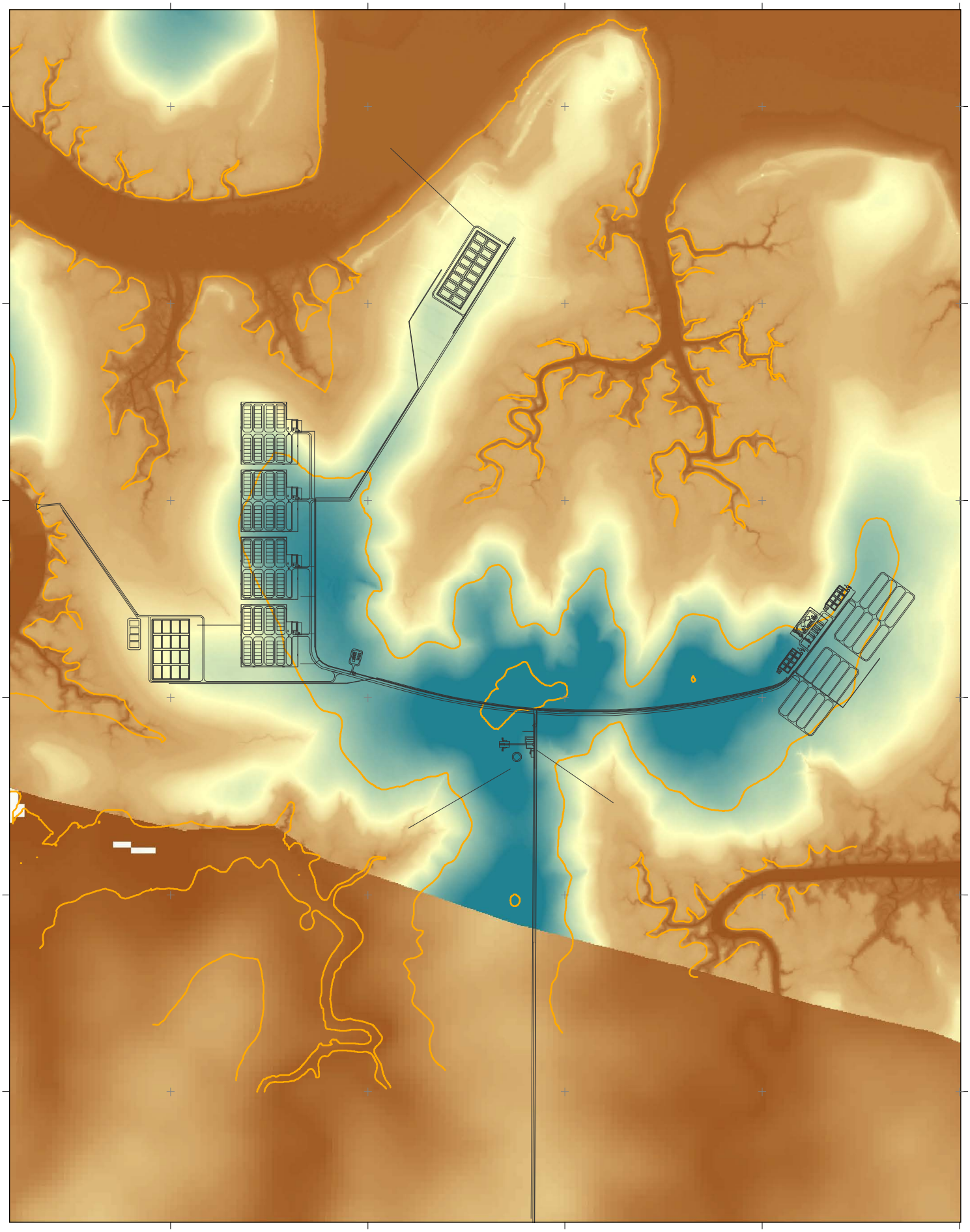
0 0.3 0.6 km
A4 Scale 1:32,000
GDA 1994 MGA Zone 52

N

Project Sea Dragon - Bynoe Harbour CBC & BMC

Vegetation

EN02-MN4001-DRA03	Rev.	Drawn by	Date
	B	M.W.	08.05.19



Legend

- Project Footprint
- 10m Contours

Source:
DEM: Geoscience Australia, 2009 (fine), 2011 (coarse - SRTM) | Footprint: Seafarms / CO2

Project Sea Dragon - Bynoe Harbour CBC & BMC

0 0.25 0.5 km

A4 Scale 1:25,000
GDA 1994 MGA Zone 52

N

Topography

EN02-MN4001-DRA04	Rev.	Drawn by	Date
	A	M.W.	08.05.19

COX PENINSULA AND BYNOE HARBOUR - USE AND ACCESS MAP

Northern Land Council
45 Mitchell Street
Darwin, NT. 0801

Category Notes

Refer to key to Categories (bottom right).

Category 1: *Kenbi Aboriginal Land Trust - Aboriginal Land.* No access except on public roads. All access requires a permit.

Category 2: *Ida Bay, Knife Island and Crocodile Isand.* No public access - not part of the Kenbi Open Area.

Category 3: *Sacred Sites - Roche Reef, Middle Reef, Simms Reef, CharlesPoint, channel between Dum-in-mirre Island and Beer Eetar Island, and Turtle Island.* No access is permitted to beaches. There is no anchoring, no sea-bed disturbance and no landing on reefs and Turtle Island.

Category 4: *Outstation area on the west coast of the Cox Peninsula.* Observe sacred site restrictions - see Category 7.

Category 5: *Grose Island, Beer Eetar Island, Dum-in-mirre Island, Warramali Island, Windirr Island and residual coast of the Cox Peninsula.* Observe sacred site restrictions - see Category 7. No access to private lease areas.

Category 6: *Indian Island and Bare Sand Island (Sacred Site).* Observe sacred site restrictions - see Category 7.

Category 7: *Sacred Site Restricted Area - No Access.* All sacred sites are protected in accordance with the Northern Territory Aboriginal Sacred Sites Act (1989). Access to sacred sites will be restricted in accordance with AAPA Authority Certificate Nos C2018/015 and C2018/016. There is no access granted, no works can take place and no damage can occur. This map does not constitute permission for works.

Category 8: *Sacred Sites - Keswick Pt and Rankin Pt.* No new works can take place and no damage can occur. Use and maintennance of existing infrastructure is permitted.

CHARLES POINT
ONE FELLA CREEK
GILRUTH POINT
HARNEY BEACH
TWO FELLA CREEK
WAGAIT BEACH
KELLEWAY REEF
Longitude 130°36'15"E (GDA94)
Charles Point Road
TAPA BAY
MANDORAH
OAK POINT
DARWIN
POINT MARGARET
MIDDLE REEF
INLET
TALC HEAD
IDA BAY
Longitude 130°35'35"E (GDA94)
WOODS
COX PENINSULA ROAD
MOIRA REEF
QUAIL ISLAND
DELISSAVILLE/ WAGAIT/ LARRAKIA ABORIGINAL LAND TRUST
BARE SAND ISLAND
DJAJALBIT ISLET
Latitude 12°32'45"S (GDA94)
TALC HEAD ACCESS
TOWER BEACH ACCESS
WEST POINT
SIMMS REEF
BURGE POINT
HERBERT POINT
TOWER BEACH
GROSE ISLAND
ROCHE REEF
SPENCER POINT
WINDIRR ISLAND
MASSON POINT
BEER EETAR Is
TURNBULL BAY
COX PENINSULA ROAD
DUM IN MIRRIE ISLAND
TURTLE ISLAND
INDIAN ISLAND
RAFT POINT
RAFT Pt ACCESS
BYNOE HARBOUR
BYNOE HARBOUR ACCESS
WARRAMALI ISLAND
KESWICK POINT
RANKIN POINT
CROCODILE ISLAND
PIONEER BEACH
KNIFE ISLAND
MIDDLE ARM
WEST ARM

Public Access
Indicative Landward Boundary of Kenbi Open Area - from best available data
Future Kenbi Freehold Land

KEY TO CATEGORIES

Refer to category notes (top left) for details.	Fishing in intertidal zone	Beach access to secondary sand dune	Camping on beach	Fire
Category 1	N/A	N/A	N/A	No
Category 2	No	No	No	No
Category 3	Yes	No	No	No
Category 4	Yes	No	No	No
Category 5	Yes	Yes	No	No
Category 6	Yes	Yes	Yes	No
Category 7	No	No	No	No
Category 8	Yes	Yes	No	No

0 4 8 16
Kilometres
N
Coordinate System: GDA94
GIS: 2016_0369_V6_A3_March_2018
Date: 28/03/2018

130°20'0"E 130°25'0"E 130°30'0"E 130°35'0"E 130°40'0"E 130°45'0"E 130°50'0"E
12°20'0"S 12°25'0"S 12°30'0"S 12°35'0"S 12°40'0"S 12°45'0"S

APPENDIX B EMP IMPLEMENTATION

EN02-RG0101 OBJECTIVES AND TARGETS

Objectives	Targets	Key Performance Indicators
O1. Develop a long term sustainable aquaculture project O1.1 Ensure plans are in place for decommissioning and rehabilitation	T1.1 Conduct periodic reviews of sustainability and identify opportunities for improvement T1.2 Targets for resource and energy usage set and reviewed periodically T1.3.1 Decommissioning and rehabilitation plan prepared and approved within 12 months of commencement	Food Conversion Ratio (%) Supply chain resource usage (mass, volume) Waste volumes and destination (recycled, landfill) Net energy usage (kJ) Net $CO_{2,equiv}$. emitted (kg) Approved DRP in place and implemented
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments	T3.1 Compliance with environmental standards T3.1.1 Comply with the discharge criteria in the Water Quality Monitoring and Management Plan (WQMMP) T3.1.2 EIMP program shows no significant impact on receiving waters T3.1.3 Sewage treatment plant effluent quality meets land disposal criteria T3.2 Releases and spills T3.2.1 No significant releases of chemicals or spills T3.2.2 No unplanned or unauthorised releases off-site T3.2.3 All potentially hazardous or contaminating materials contained on the site T3.3 No Complaints T3.4 Flora and Fauna impacts T3.4.1 No clearing of vegetation outside of approved clearing areas T3.4.2 Minimise impacts on fauna and vegetation, particularly listed threatened species and sensitive/significant habitats T3.5 Land and Soils	# of complaints # of non-compliances or incidents Maps showing location and extent and area/number calculations Degree of change over time – groundwater, soil Assessment against waste targets

Objectives	Targets	Key Performance Indicators
	T3.5.1 No soil contamination T3.5.2 No oxidation of acid sulfate soils or generation of acidic leachate from acid sulfate soils T3.5.3 No deterioration in flora and vegetation community health in areas of retained vegetation T3.5.4 Minimise impacts on soil quality and structural integrity of soils in the Project footprint T3.6 Erosion and flooding/hydrology T3.6.1 Minimise changes between pre- and post-development hydrology T3.6.2 Approved ESCP in place and fully implemented for all land disturbance works T3.6.3 Minimise bank scour and erosion T3.7 Groundwater T3.7.1 No negative changes to groundwater quality due to project operations Weeds T3.8 No increase in weed or pest distribution or number in the Weed Control Area T3.9 Waste T3.9.1 All waste stored in appropriately contained areas, including potentially contaminated waste drums or containers T3.9.2 All putrescible waste removed within 7 days either to landfill or for soil / waste conditioning on or off-site T3.9.3 Waste targets, including recycling targets, met T3.9.4 Hazardous wastes removed from site or fully contained under cover and above flood levels before the wet season T3.9.5 All listed wastes stored in appropriately contained areas on-site or removed from the site appropriately tracked Heritage and Social	

Objectives	Targets	Key Performance Indicators
	T3.10 No damage or disturbance to objects or sites of cultural significance T3.11 Maintain existing access to sites of local or cultural significance where practicable, taking into account security and biosecurity requirements T3.12 No increase in traffic incidents during construction and operation compared to baseline (including normal growth) at start of construction T3.13 Bushfire Management T3.13.1 No human-induced bushfire ignitions that cause loss of life, and/or damage to property and the environment T3.13.2 Maintain fuel management zones including low fuel loads in asset protection zones (e.g. assets, fire access trails and property boundary) T3.13.3 Maintain adequate separation distances between hazardous vegetation and Class 1-3 and 10a buildings in accordance with AS 3959-2009 T3.13.4 Manage fuel loads taking into consideration ecological impacts on listed species known to be fire-sensitive T3.13.5 Prepare, maintain and review a detailed Bushfire Management Plan	
O4. Develop an effective workplace culture built on continuous improvement, teamwork and a commitment to sustainability, quality and profitability	T4.1 Incidents/complaints addressed in the required timeframes T4.2 Zero incidents, zero complaints T4.3 Training needs identified and training conducted within required timeframes	# incidents/complaints % of training and awareness programs completed to schedule
O5. Maintain positive stakeholder, community and workforce relations	T5.1 Meet all government reporting requirements T5.2 Local communities provided with information relevant to their needs T5.3 Set, review and implement regular community and stakeholder communication schedule	% of reports submitted to schedule # of complaints # of negative media reports # of stakeholder meetings per year

Objectives	Targets	Key Performance Indicators
O6. Maximise local recruitment and training and local businesses participation, and enable indigenous training, employment and advancement opportunities in the project	T6.1 Targets for local workforce and for indigenous employment set and reviewed periodically T6.2 Implement indigenous employment, training and advancement program within the organisation T6.3 Maximise opportunities for local sourcing T6.4 No workforce disputes	% of workforce that is local or domiciled locally % of workforce that is indigenous % of supply from local sources # of complaints or disputes
O7. Complete all review, monitoring and inspections required	T7.1 Review, monitoring and inspections undertaken: - At the frequency required - Covering the sites required, and - Including the parameters or scope required.	# not completed to schedule
O8. Address any non-compliances, complaints and incidents in a reasonable and timely manner	T8.1 Monitor all non-compliances until closed out T8.2 Address all actions within the stipulated time	% of actions not completed within the stipulated time Average delay time

EN02-RG-EM0301 Approvals Register

Jurisdiction	Name	Relevant Act	Administered by*	Reference or notes	Granted	Anniversary Date	Expires
Approvals, Permits and Licences							
Northern Territory	Aquaculture Licence	Fisheries Act	DPIR Fisheries	C1/554	1-Dec-17	1-Nov	30-Nov-27
Northern Territory	Environmental approval	Environmental Assessment Act	NT EPA	Assessment Report 81	27-Mar-17	-	-
Northern Territory	Waste discharge licence	Water Act	DENR	WDL242	7-Feb-18	7-Feb	6-Feb-21
Northern Territory	Vegetation clearing approval	Planning Act 1999	Development Consent Authority - DIPL	Development Permit DP17/0371, Vegetation Clearing	20/10/2017 Amendment application lodged	-	19-Oct-19
Northern Territory	AAPA Certificate	Northern Territory Aboriginal Sacred Sites Act 1989	AAPA, Minister for Environment and Natural Resources	AAPA Authority Certificate, ref: 2015/1208, Doc: 201514092, C2016/059	3-Jun-16	-	Project has substantially commenced - no expiry
Northern Territory	Permit to erect structures below the high water mark	Marine Act	DIPL	Granted	30-Jul-18	30-Jul	n/a
Northern Territory	Occupation licence	Crown Land Act	Crown Land Estate (DIPL)	Short term tenure option which allows the occupation and use of Crown Land for an approved purpose.	Application submitted	-	-
Northern Territory	Environment protection approvals and licences	Waste Management and Pollution Control Act	NT EPA DENR	Approval and licence required for the proposed incinerator (if used) and for facilities storing pond waste. Pond water and pond sludge (which contains or which may contain prawn waste) is considered by the NT EPA as a listed waste (Animal effluent and residues (abattoir effluent, poultry and fish processing waste) - Schedule 2 of the Regulation). On 18 February 2019, PSD applied for an Environmental Protection Approval (EPA) for the CBC and BMC discharge pipe, settlement ponds and sediment drying area.	To be obtained	-	-
Northern Territory	Seabed lease	Crown Land Act	Crown Land Estate (DIPL)	To permit the construction and operation of the seawater intake pipeline.	To be obtained	-	-
Determined not to be required							
Commonwealth	Commonwealth EPBC Approval or 'not a controlled action' designation	Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	DoE	Referral 2017/8092 lodged, and Minister for the Environment determined the project is not a controlled action. No approval under EPBC Act required.	13-Sep-16	-	-
Northern Territory	Indigenous Land Use Agreement	Native Title Act 1993 (Cth)	Cwth, NLC, Native Title Claimant Group	Native Title claim extinguished (Seafarms 2016a). No requirement for an Indigenous Land Use Agreement	Not required	-	-
Northern Territory	Surface Water Extraction Licence	Water Act	DENR	Not required as the intake point is to be located in waters best described as tidal water within the meaning in the Water Act.	Not required	-	-

* Definitions are as follows:
AAPA NT Aboriginal Areas Protection Authority
DENR NT Department of Environment and Natural Resources
DIPL NT Department of Infrastructure, Planning and Logistics
DoE Commonwealth Department of the Environment
DoH NT Department of Health
DPIR NT Department of Primary Industries and Resources
NLC Northern Land Council
NT EPA NT Environment Protection Authority
PWC NT Parks and Wildlife Commission

EN02-RG0301 Legislation, Standards and Guidelines Register

Name	Administered by*	Short Description	Relevance
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (Cwth)	DoE	The Commonwealth's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, defined in the Act as matters of national environmental significance (MNES). The nine MNES are: - world heritage properties - national heritage places - wetlands of international importance (often called 'Ramsar' wetlands) - nationally threatened species and ecological communities - migratory species - Commonwealth marine areas - the Great Barrier Reef Marine Park - nuclear actions (including uranium mining) - a water resource, in relation to coal seam gas development and large coal mining development.	The project has been determined to be not a controlled action.
National Greenhouse and Energy Reporting Act 2007 (Cwth)	Australian Government - Clean Energy Regulator	A mandatory reporting system for corporate greenhouse gas emissions and energy production and consumption, with the first reporting period having commenced on 1 July 2008. Key features are: - Reporting of greenhouse gas emissions, energy consumption and production by large corporations. - Public disclosure of corporate level greenhouse gas emissions and energy information. - Consistent and comparable data available for decision making, in particular, the development of the Carbon Pollution Reduction Scheme	Currently, the National Greenhouse and Energy Reporting Scheme applies to facilities that emit 25 kilotonnes (kt) or more of carbon dioxide equivalent (CO2-e) or produce or consume 100 tetrajoules (TJ) or more of energy or corporations that emit 50 kt or more of CO2-e or produce or consume 200 TJ or more of energy. Should the project facilities trigger these thresholds, Seafarms will report all energy use and greenhouse gas emissions under the National Greenhouse and Energy Reporting Scheme.
Native Title Act 1993 (Cwth)	Commonwealth, Northern Land Council	Provides for the recognition and protection of the traditional rights and interests of Aboriginal and Torres Strait Islander people to land and water and contains processes for effecting native title claims. The Native Title Act sets out the processes by which native title rights are established, protected and compensation determined, in addition to facilitating Indigenous Land Use Agreements (ILUA) between native title parties and other interest holders	Native title has been extinguished on the site nd there is no need for an ILUA.

Name	Administered by*	Short Description	Relevance
Protection of Movable Cultural Heritage Act 1986 (Cwth)	DCA	Movable cultural heritage includes objects that people create or collect, known as cultural property and can be artistic, technological, historical or natural in origin. There are strict guidelines on conditions for the export from Australia of objects considered to be of cultural heritage, with some prohibited. Any project that may involve the removal of cultural property will need to determine an object's eligibility and then obtain a permit.	Should significant aboriginal cultural heritage items be discovered, these will not be disturbed and the finding reported to the appropriate authorities and/or managed under the Cultural Heritage Management Plan. No export will be undertaken.
Aboriginal Land Act 1978 (NT)	DIPL	An Act to provide for access to Aboriginal land, certain roads bordered by Aboriginal land and the seas adjacent to Aboriginal land. A permit is required to undertake certain activities on Aboriginal land in the Darwin-Daly-Wagait, West Arnhem, East Arnhem, Katherine, Victoria River District, Ngukurr or Borroloola-Barkly regions of the NT. This includes entering Aboriginal land for any purpose, entering and visiting a community or travelling through Aboriginal land. A permit is not required to travel on a public road through Aboriginal Land.	The site is not considered Aboriginal land - as noted in the EIS, the former Department of Lands, Planning and the Environment (DLPE) advised that Native Title is considered to be extinguished over the area due to provisions relating to exclusive rights to land within previous leases issued over the parcel (Seafarms 2016a). There are aboriginal lands in close proximity to the site, with access restrictions in place - refer to Appendix A to the EMP for these areas. Some waivers may be in place for certain tidal areas in the region.
Agricultural And Veterinary Chemicals (Control Of Use) Act (NT)	DPIR	Regulates the use of the agvet product after retail sale. The Department controls how agvet chemical products are used in the NT including the manufacture, sale and use of fertilisers and stock foods, to manage land and agricultural produce contaminated by chemicals, and for related purposes.	A licence may be required to use certain agricultural and veterinary chemicals within the NT, including the use of chemicals added to stockfeed and for ground and aerial application of pesticides.
Biological Resources Act 2006 (NT)	DPIR	Provides for and regulates bioprospecting in the NT and for related purposes. A permit is required which authorises the observation, collection, surveillance or monitoring of wildlife in the wild for research purposes. A deed of agreement under the Act may also be required if the activity has a commercial purpose.	While not relevant for the project at this stage, a permit may be required for the taking of prawn broodstock from the wild for commercial breeding purposes if taken from NT waters (rather than interstate as in the current operation). If this becomes the case, a permit application to assess the activities needs to submitted, to determine if it would be considered bioprospecting. If so, then a benefits sharing arrangement will be entered into. Other written permissions and approvals/agreements will be required with this permit application.
Bushfires Management Act (NT)	Bushfires NT, a branch of DENR	Relates to the prevention and suppression of bushfires. Bushfires NT's primary roles are to administer the provisions set out in the Bushfires Act and support landholders in fire mitigation and management. The Bushfires Act stresses the need for individual landholders, be they public or private, to have fire management plans in place to prevent and manage large and intense fires.	A Bushfire Management Plan will be developed which will detail measures to prevent and manage bushfires in and surrounding the Project Area.
Crown Lands Act 1992 (NT)	DIPL	Outlines the provision associated with acquisition of Crown Land in the Northern Territory. This includes land acquisition by fee in simple, lease, easement and reservations.	Seafarms has applied for an Occupation Licence over the land which the Project is proposed (NT Portion 3192) to permit access and use of the site. Seafarms has submitted a direct sale application in accordance with the Act.

Name	Administered by*	Short Description	Relevance
Dangerous Goods Act 1998 (NT)	Department of the Attorney-General and Justice	The Act regulates how dangerous goods are stored, handled and transported, although most hazardous chemicals are regulated under the Work Health and Safety (National Uniform Legislation) Act (refer below) other than explosives and LP Gases.	No explosives would be used, but the Act would apply to the storage of LP gas (compliance with relevant standards), and requirements for the equipment and fittings to be supplied and undertaken according to the licensing requirements under the Act.
Environmental Assessment Act 1982 and Administrative Procedures (NT)	NTEPA	Establish the framework for the assessment of potential or anticipated environmental impacts of development	EIS assessed under the Act, and NTEPA Assessment Report issued
Fisheries Act (NT)	DPIR	Provides for the regulation, conservation and management of fisheries and fishery resources so as to maintain their sustainable utilisation, as well as regulating the sale and processing of fish and aquatic life. An aquaculture licence is required under the Act for the breeding or farming of fish or aquatic life for sale.	An aquaculture licence is required (and has been obtained) to operate the facility.
Food Act 2005 (NT)	DoH	The ACT aims to ensure food for sale is both safe and suitable for human consumption, and implements the Food Standards Code in the NT, containing requirements for the those managing or in control of the manufacture of food for human consumption. All food preparation at construction camps will be required to conform to this Act, and the Food Standards Code.	All food preparation at construction and accommodation camps will be required to conform to this Act, and food safety standards. Registration of a food business (including accommodation camp food preparation area) is required. Treated drinking water is also required, subjected to an annual test for microbiological parameters, and a 5-yearly test for chemical parameters. Water quality testing results are required to be provided with food business registration and renewal.
Heritage Act (NT)	Department of Tourism and Culture	Provides a system for the identification, assessment, protection and conservation of the NT's natural and cultural heritage. The Act affords protection for two classes of cultural heritage: - all places and objects formally assessed and added to the NT Heritage Register and - all Aboriginal and Macassan archaeological sites and/or objects. Approval must be sought under the Heritage Act to carry work on, disturb or salvage heritage places or objects declared or protected under the Act.	No places or objects listed under the Heritage Act have been identified within the immediate Project area. The Cultural Heritage Strategy for the Project and the unexpected findings protocol is in place for unexpected finds. The Act will apply contain procedures in the event that a place or object protected under the Heritage Act is identified
Marine Act (NT)	DIPL	Approval is required to erect structures below the high water mark or attach structures to the sea floor (jetty, wharf, pontoon or mooring) in NT waters. Approval may be subject to conditions.	Approval under the Marine Act is required (and has been obtained) for the construction of the intake pipeline which will be constructed below the high water mark in Bynoe Harbour. The discharge structures may also trigger the need for approval. Under the Marine (Sheltered Waters) Regulation, Bynoe Harbour is defined as partially smooth waters.

Name	Administered by*	Short Description	Relevance
Marine Pollution Act (NT)	DENR	The Act (and Regulations) regulate water pollution at sea in order to protect the marine and coastal environment by minimising intentional and negligent discharges of ship-sourced pollutants into coastal waters, and for related purposes. They apply to all vessels in NT Waters, generally 3 nautical miles to seaward of the low water mark. Under the Act, all reportable incidents must be notified to the Marine Safety Branch. Section 50 of the Act defines a reportable incident as: - a discharge or probable discharge from a ship of oil or noxious liquid substance, or - jettisoning from a ship a harmful substance that is carried in packaged form.	Should PSD operate a vessel in NT waters, the proposed vessel operators must comply with the requirements of the Act and associated regulations, including the notification requirements in Section 50.
Northern Territory Aboriginal Sacred Sites Act 1989 (NT)	AAPA Minister for Environment and Natural Resources	Provides for the location, recognition, description and protection of sites sacred under Aboriginal tradition. All sacred sites are protected under the Act (even those which have not been registered) and it is an offence to enter or carry out work on a sacred site without an authority certificate issued by the AAPA. The authority certificate sets out conditions for any works undertaken on or near sacred sites.	An AAPA Authority Certificate to undertake works is required (and has been obtained)
Planning Act 2005 (NT)	DIPL	An Act to provide for appropriate and orderly planning and control of the use and development of land, and for related purposes. It establishes the Northern Territory Planning Scheme and provides for a development approval process. Some of the relevant aspects of the Act include: - Native vegetation clearing on freehold, crown and Aboriginal land tenures in excess of 1ha requires a development approval under the Act - Subdivision of pastoral leases for non-pastoral uses requires a change of tenure - A development approval is required for the construction of facilities and infrastructure for zoned land	An approval under the Act is required for relevant matters - including vegetation clearing. This has been obtained.
Public and Environmental Health Act and Regulations (NT)	DoH	Creates a framework for the regulation of particular activities to protect public health in the NT	Accommodation facilities including food preparation facilities and potable water sources for the Project will be required to comply with the Act. An on-site wastewater system with a capacity up to 8000 equivalent persons (EP) requires product approval under the Regulations to be able to be sold and installed in the NT.
Soil Conservation and Land Utilisation Act 1969 (NT)	DENR	An Act to make provision for the prevention of soil erosion and for the conservation and reclamation of soil	Project activities must comply with this legislation to manage erosion on construction sites
Territory Parks and Wildlife Conservation Act 1976 (NT)	Department of Tourism and Culture DENR (Part IV, Div 1 - 5)	Lists those species of plants and animals that are protected within the Northern Territory. Under the TPWC Act, permits are required to take or interfere with protected plants or animals. The TPWC Act may apply if protected flora or fauna are encountered during the Project's life	Permits and approvals for removal of protected plants and animals may be required under the Act

Name	Administered by*	Short Description	Relevance
Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) (NT)	Department of the Attorney-General and Justice	Regulates the transport of dangerous goods by road or rail, and for related purposes, requiring: - A Dangerous Goods Driver Licence for anyone intending to drive a vehicle carrying bulk dangerous goods with the capacity of more than 500L or 500kg goods in a single receptacle - Class 1 - Explosive; Class 2-9 (excluding class 1 and 7) with optional Class 5 Security Sensitive Ammonium Nitrate (SSAN). - A vehicle licence to transport Dangerous Goods.	The Act must be complied with for the movement of dangerous goods in the NT on PSD as well as public property.
Waste Management And Pollution Control Act 1998 (NT)	DENR	The purpose of the Act is to protect the environment through the encouragement of effective waste management and pollution prevention and control practices. It facilitates the implementation of national environment protection measures made under the National Environment Protection Council (Northern Territory) Act 1999, and incorporates environmental compliance plans and audits. Environmental protection approvals and licences are required under the Act for activities listed in schedule 2 of the associated with: - the disposal of waste by burial - the collection, transportation, storage, recycling, treatment of disposal of listed waste - the processing of hydrocarbons so as to produce, store or dispatch liquefied natural gas or methanol. Environment protection approvals are granted for works associated with the construction phase and environment protection licences are granted for the operational phase of projects. The Act also establishes a process for notifying the NT EPA about incidents causing, or threatening to cause pollution.	Environment protection approvals may be required for the construction phase of the development, and an environment protection licence for the operational phase. Waste management controls and response procedures for potential environmental incidents will be developed for the Project in the Environmental Management Plans.
Water Act 1992 (NT)	DENR	Provides for the investigation, allocation, use, control, protection and management of NT's surface water and groundwater resources. The regulatory functions of the Water Act cover: - the discharge of waste to water - the extraction of water from surface water sources - the drilling and abstraction of groundwater from bores - construction or alteration works undertaken within a waterway (i.e. dam construction and/or roadworks).	A waste discharge licence is required (and has been obtained) to discharge waste water from the facility into Wheatley Creek. No Surface Water Extraction Licence is required (as the intake point is to be located in waters best described as tidal water within the meaning in the Act). As no groundwater is proposed to be used for the Project, no groundwater extraction licence is required under the Act.

Name	Administered by*	Short Description	Relevance
Water Supply and Sewerage Services Act (NT)	DoH (provisions about water quality standards)	Provides for the protection of the NT's water supply system or any water source from which water is drawn for human consumption. Any abstraction or diversion of water from the NT supply system must not be undertaken unless authorised by the appropriate authorities: - Department of Treasury and Finance for the Water Supply and Sewerage Services Act (provisions about economic regulation) - Minister for Essential Services for the Water Supply and Sewerage Services Act (provisions about supply and service provision under licence) - Department of Health for the Water Supply and Sewerage Services Act (provisions about water quality standards).	The provision of water for human consumption, whether sourced from surface or ground water, must comply with the water quality standards set out in the Act.
Weeds Management Act 2001 (NT)	DENR	An Act to protect the Territory's economy, community, industry and environment from the adverse impact of weeds. Owners and occupiers of land are responsible for weed management and have a general duty to control weeds. Persons must dispose of potential weeds only on their own land or at a designated weed disposal area. Under Section 32 of the Act, a person much not move or drive an animal or vehicle that contains a declared week on a public road or from the person's land to another person's land unless the animal or vehicle has been cleaned in accordance with a declared weed management plan.	PSD will have a responsibility for the management and control of weeds on the properties it manages.
Work Health and Safety (National Uniform Legislation) Act (NT)	NT Worksafe	The Act and associated regulations aim to promote health and safety in the workplace, including the storage, handling and notification related to hazardous chemicals, including maintenance of a hazardous chemical register	A Health and Safety Plan will be developed for the Project to comply with the Act. Storage and handling of hazardous chemicals must comply with the requirements of the Act.
Relevant Standards			
AS 1940—Storage and handling of Flammable & Combustible Liquids	Standards	Relates to minor storage on a site	Relevant to minor storage on the site
AS/NZS 1547 - On-site domestic wastewater management	Standards	Relates to on-site sewerage management on a site, of a small typically domestic sized nature	Relevant to small on-site systems on the site

Name	Administered by*	Short Description	Relevance
Relevant Guideines			
Northern Territory Environmental Protection Authority Guidelines	NT EPA	NT EPA have developed a series of draft and current guidelines related to the Environmental Assessment Act and Waste Management and Pollution Control Act. The NT EPA guidelines are policy documents that describe the minimum expectations of the NT EPA in relation to a particular matter. Potentially relevant guidelines include: - Guidelines for the Preparation of an Economic and Social Impact Assessment - Guidelines for Assessment of Impacts on Terrestrial Biodiversity - Guidelines on Conceptual Site Models - Guidelines on Mixing Zones - Guidelines on Environmental Offsets and Associated Approval Conditions - Draft Guideline for the Preparation of an Environmental Management Plan - Noise Guidelines for Development Sites in the Northern Territory	
Northern Territory Department of Land Resource Management Guidelines	DLRM	Standardised methodologies for surveying vertebrate fauna and flora in the NT, including: - Guidelines and Field Methodology for Vegetation Survey and Mapping (Brocklehurst et. al. 2007) - Guidelines for Surveying Terrestrial Vertebrate Fauna in the Northern Territory	
Guidelines for Preventing Mosquito Breeding Sites Associated with Aquaculture Developments in the NT	DoH	A guideline for developers and regulators to ensure development processes are carried out in a manner that minimises the creation or exacerbation of mosquito breeding, targeted at aquaculture developments.	
Guidelines for Preventing Mosquito Breeding Associated with Construction Practice near Tidal Areas in the NT	DoH	A guideline intended as a checklist for planners, engineers or any supervisory officers, responsible for the planning or implementation of any construction activity near tidal areas, in order to prevent the creation of mosquito breeding sites.	
Australian Drinking Water Guidelines	NHMRC	Primary guideline related to achieving safe and compliant drinking water supplies in Australia	
Public and Environmental Health Guidelines for Public Accommodation	DoH	A guideline to ensure that businesses provide public accommodation that is designed, constructed, operated and maintained to consistently high public and environmental health standards to minimise the risk of disease, injury and other health-related complaints. In the guidelines, 'public accommodation' includes 'mining camps', and so presumably accommodation camps for other (non-mining) workplaces where used, such as for the Project.	Related to camp accommodation

Name	Administered by*	Short Description	Relevance
Soil management, erosion and sediment control information	DENR	The Department of Land Resource Management provides facts sheets on its website for guidance on works and rehabilitation measures to manage soil and erosion: https://nt.gov.au/environment/soil-land-vegetation/soil-management-erosion-sediment-control	Construction phase erosion and sediment control
Waste Management Guidelines for Small Communities in the Northern Territory	NTEPA	The information included in this document is focused on improving the delivery of waste management services of communities with less than 1,000 people. For populations greater than 1,000, the 'Siting, Design and Management of Solid Waste Disposal Sites in the Northern Territory' guideline is relevant. http://www.lgant.asn.au/policy-programs/sustainability-environment/waste-management-in-remote-regional-indigenous-communities	Relevant to the design, construction and maintenance of the proposed landfill on the site
Best Practice Erosion and Sediment Control 2008	IECA	Erosion and Sediment Control for Construction Sites http://www.austieca.com.au/	Referred to by the NT Government for ESC on Construction Sites
Erosion and Sediment Control for Rural Development and Clearing	DENR	Model Erosion and Sediment Control Plans https://nt.gov.au/environment/soil-land-vegetation/erosion-and-sediment-control-for-rural-development-and-clearing	
Erosion and Sediment Control for Rural Development and Clearing	DENR	Model Erosion and Sediment Control Plans https://nt.gov.au/environment/soil-land-vegetation/erosion-and-sediment-control-for-rural-development-and-clearing	
Draft Guidelines for Wastewater Works Design Approval of Recycled Water Systems	DoH	Applies to the development of an on-site facility with a minimum capacity of 8,000L/day. For <8000L/day refer to Code of Practice for Small On-Site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent http://www.health.nt.gov.au/library/scripts/objectifyMedia.aspx?file=pdf/35/63.pdf&siteID=1&str_title=Guidelines%20for%20Wastewater%20Works%20Design%20Approval%20of%20Recycled%20Water%20Systems.pdf	
Code of Practice for Small On-Site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent	Territory Health Services	Applies to any on-site wastewater system or part thereof (including land-based disposal or reuse of recycled water) with a maximum daily flow of 8000 litres. For >8000L, refer to Draft Guidelines for Wastewater Works Design Approval of Recycled Water Systems. http://www.health.nt.gov.au/environmental_health/wastewater_management/index.aspx	
Guidelines for Land Capability Assessment for On-site Wastewater Management	DoH	http://www.health.nt.gov.au/environmental_health/wastewater_management/index.aspx	
Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)	NRMMC, EPHC, AHMC	National guidelines for reuse of recycled water, upon which the NT Draft Guidelines for Wastewater Works Design Approval of Recycled Water Systems is based. http://www.ephc.gov.au/sites/default/files/WQ_AGWR_GL__Managing_Health_Environmental_Risks_Phase1_Final_200611.pdf	

Name	Administered by*	Short Description	Relevance
Environmental Code of Practice for Australian Prawn Farmers	Donovan, 2003	A Code of Practice formulated by the Australian prawn farming industry through their national body, the Australian Prawn Farmers Association, to provide a set of standards for the sustainable development and operation of prawn farms in Australia.	

* Definitions are as follows:
AAPA NT Aboriginal Areas Protection Authority
AHMC Australian Health Ministers Conference
DCA Commonwealth Department of Communications and the Arts
DIPL NT Department of Infrastructure, Planning and Logistics
DLPE NT Department of Lands, Planning & Environment
DLRM NT Department of Land Resource Management
DNREAS Department of Natural Resources, Environment, the Arts and Sports
DoE Commonwealth Department of the Environment
DoH NT Department of Health
DoT NT Department of Transport
DPIR NT Department of Primary Industries and Resources
EPHC Environment Protection and Heritage Council
NHMRC National Health and Medical Research Council
NLC Northern Land Council
NRMMC Natural Resource Management Ministerial Council
NT EPA NT Environment Protection Authority
PWC NT Parks and Wildlife Commission

PROJECT SEA DRAGON PTY LTD
CORE BREEDING CENTRE AND BROODSTOCK MATURATION CENTRE, BYNOE HARBOUR

APPENDIX 7 -
RFI 1 ATTACHMENT 4:
BYNOE HARBOUR BMC AND CBC RISK ASSESSMENT

seafarms

PROJECT SEA DRAGON –

CORE BREEDING CENTRE AND BROODSTOCK MATURATION CENTRE

RISK ASSESSMENT

APRIL 2016

CONTENTS

LIST OF TABLES

1. INTRODUCTION

On 19 February 2016, Project Sea Dragon Pty Ltd lodged a Notice of Intent (NOI) for the Breeding Facilities for Project Sea Dragon (PSD) with the Northern Territory (NT) Department of Primary Industries and Fisheries. The NOI provided the details of the development of full scale operations for the Core Breeding Centre (CBC), Broodstock Maturation Centre (BMC) and associated infrastructure proposed to be developed at Point Ceylon, in Bynoe Harbour in the NT.

On 7 March 2016 Dr Bill Freeland, Chair of the NT Environment Protection Authority (EPA) wrote to PSD's Executive Director, Chris Mitchell, to request additional information to inform a decision as to whether an Environmental Impact Statement (EIS) under the *Environmental Assessment Act* is necessary for the proposed action, or whether the assessment is at an end point and regulation of the proposed activity can proceed through an Environmental Management Plan under the *Fisheries Act*.

As part of the request for additional information (RFI), a risk assessment that explores the potential risks arising from construction and operation of the proposed action was requested. As such, an environmental, social and cultural heritage risk assessment has been completed and is documented herein.

The notable risks of interest mentioned in the RFI were:

- the risks of impact from the waste discharge water to Wheatley Creek – in particular to benthic and mangrove habitats;
- the risk of impact to the neighboring pearling operations;
- the level of risk to biodiversity values – in particular the risks to terrestrial and marine species associated with land clearing and wastewater discharge.

The findings of the studies that have underpinned this risk assessment have shown that there is no potential to impact the neighbouring pearling operations, hence it is not specifically considered herein.

2. PROJECT DESCRIPTION

The Project Description can be found in the NOI, which was lodged with the NT Department of Primary Industries and Fisheries on 19 February 2016, hence is not replicated herein. Supplementary information to that in the NOI, can also be found in the response to the RFI, and associated appendices.

3. RISK ASSESSMENT PROCESS AND METHODOLOGY

3.1. RISK ASSESSMENT METHODOLOGY

This risk assessment provides an assessment of the risks to environmental, social and cultural heritage values associated with construction and operation of the proposed action, to assist the NT EPA to make a decision of whether an EIS under the *Environmental Assessment Act* is required, or whether the proposed activity can proceed through an Environmental Management Plan under the *Fisheries Act.*

The methodology employed was a standard semi-quantitative risk assessment consistent with AS/NZS ISO 31000:2009 'Risk Management – Principles and Guidelines'. The risk assessment process draws upon inputs from a range of technical studies and specialists with the necessary skills and experiences to identify and address the risks associated with the proposed action. In relation to the key risks identified in the RFI, the risk assessment draws chiefly upon information contained in reports by Water Technology (2016) and GHD (2016) that were commissioned by Seafarms to inform the NOI. These reports are contained in the Appendices to the RFI.

3.2. RISK IDENTIFICATION

The risks were identified on the basis of the understanding of the construction methods and the site based operations and discharge regime, as well as the understanding of the receiving environment and environmental, social and cultural heritage values within the site and surrounding areas.

Decommissioning was not considered specifically, as it would simply involve de-stocking the tanks where live food and prawns were grown, followed by flushing and cleaning so that the facilities can dry-out and be maintained in a stable, idle condition until sold, or disassembled (see Section 3.11 of NOI). This is simply an extended version of the standard Seafarms operating procedure used between batches of livestock, and as such the risks involved with de-stocking are captured under the risk assessment of operational activities.

As mentioned above, the technical studies contained in the appendices to the RFI provide the assessment of the potential impacts that underpins the understanding and identification of the risks. The identified risks are presented in the Project Risk Register for Site Preparation and Construction and the Project Risk Register for Operation – see Section 1.4.

3.3. RISK ANALYSIS AND CHARACTERISATION

The risk assessment addresses the potential impacts and consequences to environmental, social and cultural heritage values of the construction and operational phases of the project with standard environmental control measures in place, as would be described in the project EMP.

The risk assessment identified potential risks and impacts arising from the project to a number of environmental, social and cultural heritage aspects. For the purposes of this risk assessment these are defined as the 'consequence aspect'. The consequence aspects identified were:

- General Ecological Values
- Conservation Significant Species

- Cultural Heritage
- Amenity
- Soils
- Marine and Intertidal Water
- Ground Water

Table 1 describes the types of consequences that have been identified for each consequence aspect. The consequence definitions are based upon similar consequence definitions for recent Risk Assessments for Environmental Impact Assessments in the Northern Territory (for example, Rangers Deeps 3 Underground Mine and the Mount Todd Gold Project), and were customised to align with the particular environmental, social and cultural sensitivities of the proposed project location at Bynoe Harbour.

Likelihoods have been categorised around the probability of occurrence, within the context of reasonable timeframes and frequencies given the nature of the anticipated project life. These are outlined in Table 2.

The overall risk rankings are derived from the severity of the potential consequences and the likelihood of occurrence/exposure as detailed in the risk matrix at Table 3.

A brief description of each overall possible risk classification is provided below.

Extreme

A ranking of Extreme represents an unacceptable risk, which is usually critical in nature in terms of consequences (e.g. extensive and long term environmental harm, permanent sacred site damage) and is considered possible to almost certain to occur. Such risks significantly exceed the risk acceptance threshold and require comprehensive control measures, and additional urgent and immediate attention towards the identification and implementation of measures necessary to reduce the level of risk.

High

High risks typically relate to significant to critical consequences (e.g. a major amount of environmental or heritage damage) that are rated as possible to almost certain to occur. These are also likely to exceed the risk acceptance threshold, and although proactive control measures are usually planned or implemented, a very close monitoring regime and additional actions towards achieving further risk reduction is required.

Medium

As suggested by the classification, medium level risks span a group of risk combinations varying from relatively low consequence / high likelihood to mid-level consequence / likelihood to relatively high consequence / low likelihood scenarios across environmental, social and economic areas. These risks are likely to require active monitoring as they are effectively positioned on the risk acceptance threshold.

Low

Low risks are below the risk acceptance threshold and although they may require additional monitoring in certain cases, are not considered to require active management. In general such risks represent relatively low likelihood, and low to mid-level consequence scenarios.

Very Low

Very Low risks are below the risk acceptance threshold and would, at the most, require additional monitoring and in many cases would not require active management. These risks can include unlikely to rare events with minor consequences, and in essence relate to situations around very low probabilities of relatively minor impacts occurring.

TABLE 1 CONSEQUENCE CLASSIFICATION SCALE

Consequence aspect	Consequences				
	Very Low	Low	Moderate	High	Very High
General Ecological Values	Minor local habitat and/or resource modification and/or disruption of ecological processes	Moderate local resource and/or habitat modification and/or local short-term decrease in abundance of some species with no lasting effect on local population.	Substantial local resource and/or habitat modification and/or local long-term decrease in abundance of some species resulting in some permanent change to community structure.	Moderate resource and/or habitat modification and/or regional decrease in abundance of some species resulting in some changes to community structure.	Substantial regional resource and/or habitat modification and/or loss of numerous species resulting in the dominance of only a few species.
Conservation Significant Species	Minor local habitat modification and/or lifecycle disruption for a listed species No loss of individuals of conservation significant fauna species.	Moderate local habitat modification and/or lifecycle disruption for a listed species Minor local decrease in size of populations of species of conservation significance	Substantial local habitat modification and/or lifecycle disruption for a listed species Moderate lasting decrease in size of populations of conservation significant species	Moderate regional habitat modification and/or lifecycle disruption for a listed species Substantial local decrease in size of populations of conservation significant species	Substantial regional habitat modification and/or lifecycle disruption for a listed species Moderate or substantial regional decrease in size of populations of conservation significant species
Cultural Heritage	Insignificant effect.	Repairable damage to site or item of low cultural significance.	Irreparable damage to site or item of low cultural significance. Relocation of archaeological findings in agreement with heritage regulation.	Repairable damage to site of cultural significance. Infringement of heritage regulation as a result of ignoring the cultural GIS.	Irreparable damage to AAPA listed site or item of cultural significance.

Consequence aspect	Consequences				
	Very Low	Low	Moderate	High	Very High
Amenity	**Visual:** No noticeable change to vista as viewed from sensitive premises. **Noise:** Negligible noise level increase at closest affected receiver <1 dBA (not noticeable by all people).	**Visual:** Near-source and short-term change to vista as viewed from sensitive premises. **Noise:** Marginal noise level increase at closest affected receiver 1dBA to 2 dBA (not noticeable by most people).	**Visual:** Near-source and medium-term or local and short term change to vista as viewed from sensitive premises. **Noise:** Moderate noise level increase at closest affected receiver 3 dBA to 10 dBA (not noticeable by some people).	**Visual:** Near-source and long term or local and medium-term change to vista as viewed from sensitive premises. **Noise:** Appreciable noise level increase at closest affected receiver 5 dBA to 10 dBA (noticeable by most people).	**Visual:** Local and long-term change to vista as viewed from sensitive premises. **Noise:** Significant noise level increase at closest affected receiver >dBA (noticeable by nearly everyone).
Soils	Near surface soils are confined and short-term impact. Promptly reversible.	Near-surface soils confined and medium-term reversible impact. May take < 1 year to remediation.	Near-surface soils confined and long-term recovery impact. May take > 1 year for full remediation.	Impact most likely affecting deep soil profiles and requiring long-term recovery, leaving residual damage. May take years for full remediation.	Impact most likely affecting deep soil profiles and requiring long-term recovery leaving major residual damage. May take decades for full remediation
Marine and Intertidal Water	Minimal near source (at point of discharge) eutrophication, or other water quality change with no significant loss of quality.	Local (within 1 km distance of discharge) short-term eutrophication or other water quality change above approved Water Quality Objectives. No discharge of chemicals or other toxicants.	Local (within 1 km distance of discharge) long-term eutrophication or other water quality change above approved Water Quality Objectives. No discharge of chemicals or toxicants. Short term local changes to water quality as a result of discharge or spillage of chemical or toxicants	Regional (extending outside of 1 km distance of discharge) long-term eutrophication or other water quality change above approved Water Quality Objectives. No discharge of chemicals or toxicants. Short term regional changes to water quality as a result of discharge or spillage of chemical or toxicants	Regional (extending outside of 1 km distance of discharge) long-term eutrophication, turbidity or other water quality change via discharge of chemicals or toxicants Long term regional changes to water quality as a result of discharge or spillage of chemical or toxicants

Consequence aspect	Consequences				
	Very Low	Low	Moderate	High	Very High
Ground Water	**Quality:** Near-source contaminants confined and promptly reversible impact. **Drawdown:** Insignificant effect.	**Quality:** Near-source contaminants confined and medium-term reversible impact. May take < 1 year to remediate. **Drawdown:** Near-source minor change in recharge patterns within sub-catchments.	**Quality:** Near-source contaminants confined and medium-term impact. May take > 1 year to remediate. **Drawdown:** Near-source major change in recharge patterns within sub-catchments.	**Quality:** Large volumes of or deep-seated contaminants requiring long-term recovery. May take years for full remediation. **Drawdown:** Local major changes in recharge patterns within sub-catchments.	**Quality:** Large volumes of or deep-seated contaminants requiring long-term recovery. May take decades for full remediation. **Drawdown:** Regional major changes in recharge patterns.

TABLE 2 LIKELIHOOD CLASSIFICATION

	Likelihood				
	Rare	Unlikely	Possible	Likely	Almost Certain
Frequency Interval (multiple events)	1/100 years	1/10 – 1/100 years	1/year – 1/10 years	2/years – 1/year	>2/year
Probability (single events)	<0.1%	0.1%-1%	1%-10%	10%-25%	>25%

TABLE 3 RISK ASSESSMENT CLASSIFICATION MATRIX

Likelihood	Consequences				
	1 – Very Low	2 – Low	3 – Moderate	4 – High	5 – Very High
5 – Almost Certain	Medium	Medium	High	Extreme	Extreme
4 - Likely	Medium	Medium	Medium	High	Extreme
3 – Possible	Low	Medium	Medium	Medium	High
2 – Unlikely	Very Low	Low	Medium	Medium	Medium
1 – Rare	Very Low	Low	Low	Medium	Medium

3.4. RISK REGISTER

The Risk Register provides an inventory of the current status of the project risk profile, taking into account the controls which will be implemented. The Project Risk Register is a live inventory of risk information which can be subject to ongoing review throughout the construction and operation of the Project. The risk register for site preparation and construction activities is presented at Table 4, while the risk register for operation is presented at Table 5. The two tables combined constitute the Project Risk Register.

TABLE 4 ENVIRONMENTAL AND CULTURAL HERITAGE RISK REGISTER FOR SITE PREPARATION AND CONSTRUCTION ACTIVITIES

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategies	Evaluation Rationale
Vegetation clearance to facilitate construction leads to change or loss of biodiversity values for terrestrial flora and fauna	General Ecological Values	5	2	Med	▪ Adhere to buffer widths recommended by the NT Land Clearing Guidelines where possible, with regard to riparian vegetation in drainage lines. ▪ Install structures that would capture sediment downstream of development. ▪ Stage clearing of vegetation to minimise areas of bare ground and clear land only as required and in accordance with ESCP. ▪ Develop and implement Vegetation Clearing sub plans which include areas not to be cleared (no-go areas) and make all workers aware of them through EMP and site work briefings. ▪ Clearly mark limits of clearing ▪ Avoid land clearing for construction during the Wet Season (Dec-May) if practicable.	The vegetation to be cleared is well represented and widespread in the local area. The maximum amount of vegetation required to be cleared would be 126.64 ha, which represents 0.28% of the vegetation within a 10 km radius of the project, and 0.12% of the vegetation within the entire Lower Finniss Region. The majority of this vegetation (around 80%) is made up of vegetation Community Code A1. Again, this community is widespread across the region and the clearing that would be required to facilitate the project would constitute 0.86% of the extent that occurs within a 10 km radius of the project, and 0.3% of the extent within the Lower Finniss Region. These amounts are considered maximums and as detailed design of the project progresses, it is expected that the footprint would be reduced, thus lessening the impacts to vegetation.
	Species of Conservation Significance	3	2	Med		Although not recorded on the site, the site provides suitable terrestrial habitat for the following conservation significant species: ▪ one insect ▪ one reptile ▪ four mammals; and ▪ four birds. Of these, the reptile - the Yellow-spotted Monitor - and one bird - the Partridge Pigeon are considered likely to utilise the site. However, the vegetation clearing required to facilitate the project is considered unlikely to pose a significant impact to any conservation significant species, as the vegetation type is common and widespread in the

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategies	Evaluation Rationale
						local area, with the clearing required comprising less than 0.3% of the extent of vegetation within 10 km of the project area. Hence, the site would not represent critical habitat or possess any unique values for conservation significant species. The construction and operation of the proposed facility would not contribute to any other threatening processes, such as the increase of cane toads, the spread of weeds or altered fire regimes.
On site construction activities (clearing, heavy machinery movement) leads to introduction, or spread of existing, weeds	General Ecological Values	2	3	Med	▪ Weed Management sub plan implemented. ▪ Environmental inductions for workforce. ▪ Vehicle and equipment wash-down procedures on site.	
Mortality or injury of flora species during clearing and construction activities	General Ecological Values	5	2	Med	▪ Clearly mark limits of clearing. ▪ Develop and implement Vegetation Clearing sub plans which include areas not to be cleared (no-go areas) and make all workers aware of them through EMP and site work briefings.	
	Species of Conservation Significance	2	2	Low	In addition to the measures listed above for general ecological values: ▪ Preclearance flora surveys by appropriately qualified botanist/flora ecologist. ▪ Relocation of threatened species if any found.	Two threatened plant species have the potential to occur within the habitat on the site. The EMP will provide that preclearance surveys to search for them would be undertaken prior to clearing or earthworks. Should either of these species be discovered, work would cease and a relocation plan would be put in place. As mentioned above, clearing of the vegetation would constitute less than 0.3% of the vegetation within 10 km of the site, hence this area would not represent critical habitat for these species, should they occur on the site.

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategies	Evaluation Rationale
Mortality or injury of terrestrial fauna and avifauna species during clearing and construction activities	General Ecological Values	5	2	Med	▪ Provision of Fauna Management sub-plan within EMP. ▪ Preclearance fauna surveys by appropriately qualified fauna spotter. ▪ Relocate animals to nearest adjacent habitat if animals found that will not move of their own accord.	
	Species of Conservation Significance	2	2	Low		
Mortality or injury of marine megafauna species (e.g. via boat strike) during construction of intake and outfall structures	Species of Conservation Significance	2	2	Low	▪ Visual surveillance for megafauna during all vessel movements. ▪ Use of reduced speed to avoid collision interaction as needed.	
Disturbance to marine megafauna due to noise and vibration during construction of intake pipeline or outfall structure	Species of Conservation Significance	3	1	Low	▪ Limit vessel use as far as possible. ▪ If practicable, timing of works to be undertaken outside of breeding or migration periods.	The noise emitted during construction has the potential to cause behavioural changes (e.g. swimming away from the area) by marine fauna, with the most sensitive species being cetaceans. Any behavioural impact caused by the vessel noise is likely to be localised and temporary, with marine species expected to resume normal behavioural patterns in the waters surrounding the project area in a short time-frame.
Lighting impacts on turtles	Species of Conservation Significance	1	3	Low	▪ Manage spill of lights (if required) into marine areas via use of directional lighting. ▪ Lighting to be limited to only that which is essential.	Given that turtles do not nest within the project area or adjacent habitats (the nearest nesting beach is located 15 km from the project area), it is unlikely that artificial light, if required for construction, would interfere with navigation to nesting beaches or hatchling behaviour or, therefore, their breeding success and population longevity.

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategies	Evaluation Rationale
					▪ Lighting to be installed low in the vertical plane and using the lowest intensity practicable. ▪ If required for vessels, lighting is to be restricted as far as practicable, whilst maintaining lighting required in accordance with navigation and vessel safety standards.	
Increased turbidity caused from construction of intake and outfall structures	Marine and Intertidal Waters	3	2	Med	▪ Once pipe anchoring design is determined, ensure control measures appropriate to that construction technique are included in the EMP to manage and mitigate the potential turbidity during construction.	The local hydrodynamics, seabed and subsurface geotechnology will determine the pipeline anchoring design. The plan is to use either or both concrete collar anchor blocks strapped to the pipe or a weighted geotech matting to retain the pipe in its alignment. Piling is a last resort for securing the pipe location and hence is unlikely to be used.
	General Ecological Values	3	2	Med		
	Species of Conservation Significance	3	1	Low	▪ As above and, if practicable, timing of works to be undertaken outside of breeding or migration periods.	
Contaminants from construction activities such as inappropriately handled fuel and chemicals enters waters	Marine and Intertidal Waters	2	2	Low	▪ Regular inspections and maintenance. ▪ Appropriate handling and disposal of chemicals and fuels as specified in EMP. ▪ Daily checks for construction vessels and other machinery to identify potential leaks or faults.	
	General Ecological Values	2	2	Low		
	Species of Conservation Significance	2	2	Low		
	Groundwater	2	2	Low		

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategies	Evaluation Rationale
					▪ Development and implementation of oil or other PAH spill response plan. ▪ Develop and implement waste management sub-plan for EMP to ensure appropriate management of wastes and chemicals.	
Sediment run off during construction impacts surface water quality	Marine and Intertidal Waters	2	2	Low	▪ Limit excavation to necessary areas. ▪ Appropriate management of excavations and stockpiles enshrined in erosion and sediment control plan within the EMP. ▪ Avoid excavating in the wet season.	
	Amenity	2	2	Low		
Sediment run off during construction impacts surface water quality and leads to Avoidance, modification or reduction of habitat and resources	General Ecological Values	2	1	Very Low		
	Species of Conservation Significance	2	1	Very Low		
Introduction or spread of marine pests through ballast water and/or biofouling	General Ecological Values	1	4	Med	▪ Use locally based construction companies for construction activities requiring the use of vessels. ▪ Seafarms will stipulate that the construction contractor will not use vessels that have been used in areas with marine fouling.	
Disturbance of cultural heritage site	Cultural Heritage	1	4	Med	▪ Clearly mark the Aboriginal heritage site on site plans and on the ground to prevent	Construction activities will not occur in close proximity to the known sacred site as it is located 500 m from the nearest proposed project infrastructure

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategies	Evaluation Rationale
					disturbance during vegetation clearing activities. AAPA Authority Certificate.	An application for an Authority Certificate has been submitted to AAPA for the project work. Work will not commence until the Authority Certificate has been issued.
Noise and dust from traffic, earthworks and construction	Amenity	2	2	Low	Implement (and include in EMP) dust suppression techniques such as the periodic application of water and/or proprietary products in dry conditions to protect vegetation, worker health and amenities. Confine construction and earthworks activities to business hours.	Construction of the facility could result in some minor, localised impacts from earth moving machinery and construction machinery/tools. These will be confined to business hours and are expected to be short lived in duration.
Exposure and inappropriate management of ASS impacts upon surface waters	Marine and Intertidal Waters	1	2	Low	If after detailed design and more detailed geotechnical investigation, it is deemed that PASS is likely to be encountered in construction, the designs will be modified if required to avoid any disturbance. For example, the seawater intake pipeline could be laid on the surface in the intertidal zone and armoured for protection and stability. The discharge structure could be constructed of rock and earth laid on the surface marine clays without excavation into any PASS material.	Site inspections carried out by PSD have not found any evidence of Acid Sulfate Soils Geotechnical advice received is that the risk of finding ASS is limited to the intertidal zone and along water courses. Therefore the highest area of risk for exposing ASS is at the discharge structure, and to a lesser degree the seawater intake. All other works are to be placed above the 5.0m AHD contour thus reducing the risk of encountering any ASS.

TABLE 5 ENVIRONMENTAL AND CULTURAL HERITAGE RISK REGISTER FOR SITE OPERATION

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategy (Additional treatment)	Evaluation Rationale
Lighting impacts on turtles	Species of Conservation Significance	1	3	Low	▪ Lighting to be limited to only that which is essential and directed away from the marine environment. ▪ Lighting to be installed low in the vertical plane and using the lowest intensity practicable. ▪ Automated controls (e.g. timers and motion detectors) to be used as appropriate to minimise lighting. ▪ Consider designing ground-level path lighting for use where practicable.	Given that turtles do not nest within the project area or adjacent habitats (the nearest nesting beach is located 15 km from the project area), it is unlikely that artificial light would interfere with navigation to nesting beaches or hatchling behaviour and, therefore, the breeding success and population longevity of these fauna
Contaminants from operational activities such as inappropriately handled fuel and chemicals enters waters	Marine and Intertidal Waters	1	2	Low	▪ Regular inspections and maintenance. ▪ Appropriate storage, handling and disposal of chemicals and fuels as specified in EMP. ▪ Development and implementation of oil or other PAH spill response plan. ▪ Develop and implement waste management sub-plan for EMP to ensure appropriate management of wastes and chemicals.	
	General Ecological Values	1	2	Low		
	Species of Conservation Significance	1	2	Low		
	Groundwater	1	2	Low		
	Soils	1	2	Low		
Discharge to Wheatley Creek causing changes in water quality	Marine and Intertidal Waters	5	2	Med	▪ Feeding strategies to be planned and managed to optimise Food Conversion Rates, productivity and	
	Amenity	3	4	Med		

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategy (Additional treatment)	Evaluation Rationale
					▪ minimise the associated nutrient levels in discharge water. ▪ Optimise the location of the outfall ▪ Design the discharge structure to increase initial mixing within Wheatley Creek ▪ Settling of water prior to discharge to reduce sediment and nutrients ▪ Monitoring of receiving waters and settlement ponds in in accordance with surface water monitoring plan ▪ Provision of local water quality objectives adaptive management plan	
Change in water quality as a result of discharge to Wheatley Creek leads to change or loss of biodiversity values	General Ecological Values	5	2	Med	▪ Feeding strategies to be planned and managed to optimise Food Conversion Rates, productivity and minimise the associated nutrient levels in discharge water. ▪ Optimise the location of the outfall ▪ Design the discharge structure to increase initial mixing within Wheatley Creek ▪ Settling of water prior to discharge to reduce sediment and nutrients	It is considered likely that there will be some change in community structure of phytoplankton, bacteria and invertebrates within the initial mixing zone, which is conservatively predicted to extend for around 750 m upstream and 750 m downstream of the proposed discharge location (see Water Technology Memorandum -Attachment 6 of RFI). These are considered to be the primary mechanism controlling nutrient concentrations in creeks receiving shrimp farm effluent (see McKinnon et al., 2002)1. However, it is considered unlikely that this would lead to significant impacts on the mangrove
	Species of Conservation Significance	5	2	Med		

[1] *McKinnon, A. D., Trott. L. A., Alongi, D. M. & Davidson, A. 2002. Water Column Production and Nutrient Characteristics in Mangrove Creeks Receiving Shrimp Farm Effluent. Aquaculture Research 33, 55-73.*

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategy (Additional treatment)	Evaluation Rationale
					▪ Monitoring in accordance with surface water monitoring plan ▪ Monitoring to be designed to provide for greater understanding of background water quality and mangrove processes in receiving environment ▪ Provision of local water quality objectives ▪ Provision and implementation of adaptive management plan	community of Wheatley Creek, or on larger organisms, such as marine megafauna. Initial discharge stages will be considerably smaller than the ultimate flow of 11,000 m³ per day. This will provide ample opportunity to better understand background water quality and associated mangrove processes and also for further investigations of the dilution and decay of materials within the earlier stages of the discharge to Wheatley Creek to confirm the observations and conclusions of the studies that have underpinned this risk assessment.
Changes to water quality as a result of stormwater runoff from land-based operations or washdown facilities	Marine and Intertidal Waters	2	2	Low	▪ Appropriate erosion and sediment control management via ESCP in EMP	
	Amenity	2	2	Low		
	General Ecological Values	2	2	Low		
	Species of Conservation Significance	2	1	Low		
Intake and outfall structures and/or discharge of water from facility changes local hydrology causing scouring and movement of channel/bank	Marine and Intertidal Waters	2	1	Low	Mitigate the potential for scour across the discharge structure and around the pipe bedding and across the discharge weir by ensuring appropriate scour protection is considered during the detailed design phase.	
	General Ecological Values	2	1	Low		

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategy (Additional treatment)	Evaluation Rationale
Pond failure leads to large amount of untreated nutrient and sediment enriched water leaving site in uncontrolled manner	Marine and Intertidal Waters	1	4	Med	Ponds are designed such that there is negligible risk of wall failure. Ponds are connected in a series to neighbouring ponds, and discharge can only occur via the final retention (mixing) pond.	
	General Ecological Values	1	4	Med	All infrastructure is sited at elevations to avoid exposure to storm surge, above the 1 in 100 year ARI event level of 4.1m AHD.	
	Species of Conservation Significance	1	4	Med		
Drawdown of groundwater causing unknown impacts to the local aquifer	Groundwater	2	3	Med	Investigations to determine reliable source that does not impact upon other users.	The project will investigate the site's groundwater capacity, and groundwater will not be utilised unless a reliable supply that does not impact upon the aquifers used by the local community proves feasible. If such a resource is found, Seafarms will seek to drill an additional production bore to supplement the existing one on site
Desalination plant discharge of saline waters causes changes to local water quality	Marine and Intertidal Waters	5	2	Med	• Investigation to determine optimal location and method of discharge. • Waste brine to be mixed with the process wastewater stream at the BMC settling pond. This will be controlled to ensure sufficient dilution to not exceed the upper natural salinity range of the receiving seawater.	A desalinisation plant would only be contemplated if groundwater extraction proves unviable. The desalination plant would be sized for 2.7l/s. Hydrodynamic modelling would be undertaken to determine the optimal method of discharge and to determine that no significant impacts to marine and intertidal values, ecology, species of conservation significance or amenity would result from the construction or operation of the desalination plant. It is envisaged that waste brine would be mixed with the process wastewater stream at the BMC settling pond. This could then be controlled to ensure sufficient dilution to not exceed the upper natural salinity range of the receiving seawater. However

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategy (Additional treatment)	Evaluation Rationale
						modelling would also contemplate the benefits and impacts of a separate discharge stream
Physical entrapment at the water intake pipe	General Ecological Values	3	1	Low	Provision of fixed intake screen mesh is proposed for all seawater intake points.	
	Species of Conservation Significance	3	2	Med		
Introduction of diseases via diseased prawns, feed or water quality discharge	General Ecological Values	1	3	Low	▪ Specific Pathogen Free animals only used in the production system. ▪ Biosecure facility managed as specified in the PSD Biosecurity Manual. ▪ Filters placed over all outlets to the settlement ponds to prevent the accidental escape of prawns from the CBC and BMC into the surrounding environment. ▪ In the event of a disease outbreak within the production system, any diseased prawns identified will be euthanized and disposed of either through incineration or ensiling (dissolving in organic acids).	Both the BMC and CBC facilities will be fully biosecure and will be managed in accordance with the Project Sea Dragon Biosecurity Manual. The biosecurity strategy for Project Sea Dragon is premised upon developing a domesticated and selectively bred population of animals that has been screened for a suite of known pathogens, satisfying the 'Specific Pathogen Free' condition. Unscreened animals will not be used within the production system.

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategy (Additional treatment)	Evaluation Rationale
Increase in pest species through inappropriate waste management and rubbish treatment	General Ecological Values	2	2	Low	▪ Compostable wastes will be separated at each facility where feasible and decomposed in tumbler-style composters. Compost will be used in landscape areas. ▪ Recyclable containers, office and domestic material will be separated and collected at the central administration area, for transporting off site. ▪ Wastes that cannot be treated and disposed of on site will be taken to the Shoal Bay, Leanyer commercial waste processing station, under a term contract. ▪ Biological (prawn bodies) waste is to be incinerated and the ash disposed of on site, or alternatively handled through or ensiling (dissolving in organic acids) and the waste disposed of off-site at an appropriate facility. ▪ Store feed in a manner that will not attract pest species.	The putrescible waste volumes will be relatively small as the majority of the workforce will be domiciled off site
Contamination of soils from inappropriate/poorly managed chemical or waste storage	Soils	2	2	Low	Facilities for the collection, sorting and transfer of other solid wastes to the nearest approved waste station.	
Increased night time noise and light disturbance	Amenity	2	2	Low	Operational lighting will be minimal and directed away from the marine environment. Sensors and ground level path lighting will be considered.	

Risk Description	Consequence Aspect	Likelihood	Consequence	Risk Level	Control Strategy (Additional treatment)	Evaluation Rationale
Reduction in fishing access to site	Amenity	5	1	Med	Land based fishing will no longer be available due to not allowing public access through the facility. No limitation on offshore fishing.	The proposal will not impact upon boat based fishing and crabbing access. Only the land area itself will have limits on access.
Intake and Discharge Structures may cause visual impact	Amenity	5	1	Med	▪ Minimise the visual impact of the intake pipe as much as is practicable across the intertidal bank. ▪ Design of the discharge infrastructure will seek to minimise the loss of vegetation and visual intrusion of the discharge into Wheatley Creek.	
Disturbance of cultural heritage site	Cultural Heritage	1	4	Med	Consider fencing/signage to avoid inadvertent disturbance by operations personnel if there is considered any likelihood that operational activities could occur near the site	Operation of the facility will have no impact upon the known sacred site as it is located 500 m from the nearest proposed project infrastructure

3.5. DISCUSSION OF KEY OUTCOMES

The risk assessment is considered to provide a good understanding of the project risk profile. The findings of the risk assessment are consistent with the conclusions regarding risks and impacts, of the technical studies that were commissioned to support the NOI (included as appendices to the RFI).

A total of 55 environmental, social and cultural heritage risks were identified and evaluated. Twenty-five of these were evaluated for the construction phase of the project, while 30 were evaluated for the operational phase.

The breakdown in terms of the number of different risk scenarios identified and assessed for each consequence aspect are as follows:

- General Ecological Values (16)
- Conservation Significant Species (15)
- Marine and Intertidal Water (10)
- Amenity (7)
- Cultural Heritage (2)
- Ground Water (3)
- Soils (2)

3.6. RISK ASSESSMENT RESULTS

The specific impact and consequence scenarios, based on a reasonable assumption of effective implementation of the control measures listed in Tables 4 and 5, are summarised in Table 6 below.

TABLE 6 SUMMARY OF RISKS

Risk Level	Site Prep. & Construction Risks	Operational Risks	No. of Risks Total
Extreme	Nil	Nil	Nil
High	Nil	Nil	Nil
Medium	9	13	22
Low	14	17	31
Very Low	2	Nil	2

As can be seen from Table 6, the risks are range from Very Low to Medium, with no High or Extreme risks identified.

3.7. DISCUSSION

Low to Medium risks are usually able to be successfully managed through standard operational procedures and integration into management plans.

Ongoing monitoring and management will be required to test the effectiveness of the nominated controls, audit their implementation and identify other measures or different approaches that may be required to achieve and maintain acceptable risk levels. Measures to do so will be outlined in the Project EMP.

In particular, the Medium risks (22), which are, by definition, on the risk acceptance threshold, will have inspection, reporting and / or monitoring programs, and many will have specific management programs associated with them. All management, mitigation and monitoring measures will be enshrined within the EMP which will be subject to continuous review and updates / improvement depending on circumstances and performance.

3.7.1. Site Prepara and Constru

The majority of the medium risks for construction activities fall within the General Ecological Values (6) consequence aspect. There is one medium risk each for the Species of Conservation Significance, Marine and Intertidal Waters and Cultural Heritage consequence aspects.

The proposed controls for medium risks for site preparation and construction, to be incorporated into the EMP, are detailed below:

- Adhere to buffer widths recommended by the NT Land Clearing Guidelines where possible, with regard to riparian vegetation in drainage lines.
- Install structures that would capture sediment downstream of development
- Stage clearing of vegetation to minimise areas of bare ground and clear land only as required and in accordance with ESCP
- Develop and implement Vegetation Clearing sub plans which include areas not to be cleared (no-go areas) and make all workers aware of them through EMP and site work briefings
- Clearly mark limits of clearing
- Avoid land clearing for construction during the Wet Season (Dec-May) if practicable
- Develop and implement Weed Management sub plan for EMP
- Environmental inductions for workforce
- Vehicle and equipment wash-down procedures on site
- Provision of Fauna Management sub-plan within EMP
- Preclearance fauna surveys by appropriately qualified fauna spotter
- Relocate animals to nearest adjacent habitat if animals found that will not move of their own accord
- Once pipe anchoring design for the intake pipeline is determined, ensure control measures appropriate to that construction technique are included in the EMP to manage and mitigated the potential turbidity during construction
- Use locally based construction companies for construction activities requiring the use of vessels
- Seafarms to stipulate that the construction contractor will not use vessels that have been used in areas with marine fouling

- Clearly mark the Aboriginal heritage site on site plans and on the ground to prevent disturbance during vegetation clearing activities
- No works to commence until AAPA Authority Certificate is obtained.

3.7.2. Site Opera

The medium risks for operational activities are spread over a number of consequence aspects:

- Marine and Intertidal Waters (3)
- Amenity (3)
- General Ecological Values (2)
- Species of Conservation Significance (3)
- Groundwater (1)
- Cultural Heritage (1).

The proposed controls for medium risks for site operation, to be incorporated into the EMP, are detailed below:

- Feeding strategies to be planned and managed to optimise Food Conversion Rates, productivity and minimise the associated nutrient levels in discharge water
- Optimise the location of the discharge outfall
- Design the discharge structure to increase initial mixing within Wheatley Creek
- Settling of water prior to discharge to reduce sediment and nutrients
- Provision of local water quality objectives
- Provision, and implementation of, adaptive environmental management plan with strong focus on discharge water management
- Monitoring of receiving waters and settlement ponds in accordance with a surface water monitoring plan
- Monitoring to be designed to provide for greater understanding of background water quality and mangrove processes in receiving environment
- Investigations to determine reliable groundwater source that does not impact upon other users
- Investigation to determine optimal location and method of discharge for desalination plant, if required
- If desalination plant is pursued - waste brine to be mixed with the process wastewater stream at the BMC settling pond. This will be controlled to ensure sufficient dilution to not exceed the upper natural salinity range of the receiving seawater.
- Provision of fixed intake screen mesh is proposed for all seawater intake points
- No limitation on offshore fishing
- Minimise the visual impact of the intake pipe as much as is practicable across the intertidal bank

- Design of the discharge infrastructure to seek to minimise the loss of vegetation and visual intrusion of the discharge into Wheatley Creek
- Consider fencing/signage of cultural heritage significant site to avoid inadvertent disturbance by operations personnel if there is considered any likelihood that operational activities could occur near the site.

Contact Us

Seafarms Group Limited

Level 11, 225 St Georges Terrace
Perth WA 6000

PO Box 7312
Cloisters Square WA 6850

T. +61 8 9321 4111
F. +61 8 9321 4411
E. info@seafarms.com.au

APPENDIX C ENVIRONMENTAL MANAGEMENT STRATEGIES

C1 Erosion and Sediment Control Strategy

REF: EN02-PR4310, REV. J

TABLE C1.1 - EROSION AND SEDIMENT CONTROL STRATEGY

Element	Detail
Applicable site activities Land disturbing works Site establishment and construction activities Vegetation clearing and earthworks Site stabilisation and rehabilitation	
Aim Ensure that land, soil and water resources are protected both now and in the future, such that the ecological health and land uses, and the health, welfare and amenity of people are maintained	

Objectives	Targets	Key Performance Criteria
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - Minimise erosion and sediment loss due to site works	T3.6.2 Approved ESCP in place and fully implemented for all land disturbance works	Results of audit against approved ESCP - # of non-compliances # of exceedances of discharge water quality requirements (where set)

CONSTRUCTION PHASE	
Responsibility	Construction Manager
Actions / Mitigation Measures	**Preparation of ESCP** Detailed Erosion and Sediment Control Plans (ESCPs) are to be prepared by a person who holds current certification as a "Certified Professional in Erosion and Sediment Control" (CPESC) with the International Erosion Control Association (IECA) and in accordance with the Key Principles of erosion and sediment control as specified in the IECA Best Practice Erosion and Sediment Control Guidelines 2008 (IECA, 2008). ESCPs are to include all phases of development works including land clearing, site establishment, bulk earthworks, construction activities, site stabilisation, rehabilitation of all disturbed areas, monitoring and reporting. The plans are to be prepared to comply with relevant approval and permit conditions, particularly Development Permit DP17/0371 (including conditions 2, 3, 4 and 5). ESCPs prepared for earth disturbing activities associated with permitted vegetation clearing works are to be reviewed by another person who holds current certification as a CPESC with IECA (the Auditor CPESC) and provide written confirmation of compliance that the ESCP is in accordance with the Key Principles of erosion and sediment control as specified in the IECA (2008) guidelines. The identity of these persons to be provided to NT DENR prior to engagement. The detailed ESCP must apply the general principals below, and ensure compliance with other relevant plans and strategies, including (but not limited to): ▪ C2 Land and Soils Strategy ▪ C3 Acid Sulfate Soil Strategy ▪ C4 Vegetation Management Strategy ▪ C5 Weeds and Pests Strategy ▪ C7 Surface Water Management Strategy.

Element	Detail
	The CPESC certified plans and written confirmation from the Auditor CPESC are to be provided to the Consent Authority prior to commencement of any earth-disturbing activities (including works associated with the installation of erosion and sediment controls and any preparatory works associated with clearing works). **Implementation of ESCP** Implement the ESCP prior to any ground disturbing works. Ground-truth the location of material stockpiles and erosion and sediment controls shown in the ESCP and adjust if necessary. Implement all monitoring and reporting outlined within the ESCP. **General Approach** The overall approach will focus on four main areas of control: - Access and Traffic Controls - to minimise the impact of traffic on site soils, particularly where fragile, and manage movement of soil and weeds on and off-site through targeted entry and exit points from the site - Drainage Controls - management of runoff volumes and velocity, to control erosion through concentrated flows forming rills and gully erosion, including diversion of clean upslope waters - Erosion Controls - minimising and protecting exposed surfaces to reduce erosion through raindrop impact and surface water flows, using vegetative or other ground covers - Sediment Controls - trapping and settling / retaining sediments that have become mobile, before movement off-site Erosion and Sediment Controls to be used on the site are provided in Table C1.2. Generally: - The location of laydown areas, exit and entry points to the site, and trafficable areas of the site will be defined prior to works starting - The ingress to and egress from the site will be confined to a minimum number of stabilised access points required for the works - Divert clean water around disturbance areas where possible, or provide least resistance and controlled drainage through disturbance areas - Form contour banks, ditches or similar across cleared slopes to direct run-off towards surrounding vegetation or sediment dams, and away from waterways - Unstable exposed surfaces, particularly batter slopes must be stabilised by sufficient surface roughening and topsoil application followed by re-vegetation (locally native vegetation preferred), or alternatively by utilising jute mesh, rip-rap or similar. This to be initiated as soon as practicable following final forming of the surface *Site Establishment* Ground-truth the location of material stockpiles and erosion and sediment controls shown in the above detailed site plans and adjust if necessary. Nominate areas for parking, storage of materials, areas to avoid disturbing, and other similar matters. All erosion and sediment controls to be installed and operated according to the detailed site ESCP. Site works will not start until the erosion and sediment control works are installed and functional. All weather access roads will be constructed before the start of the wet season for key access areas required during wetter periods. *Vegetation Clearing and Earthworks, General Construction* Minimise vegetation clearing, earthworks and stockpiling of soil where possible. Progressively stabilise exposed areas as works progress - areas that are cleared for construction, but not required to be cleared for operations should be rehabilitated as soon as practical. Utilise native vegetation where possible. Protect stockpiles from erosion, particularly topsoils to be used for rehabilitation.

Element	Detail
	In-stream Works and Waterway Crossings Where the works cross flowing waters (or waters that may flow during the works), controls will be installed to avoid erosion and blocking streamflow, which may include: - Dam and pump systems – bund upstream and pump waters past the works (a second downstream or semicircular bund encompassing works may be needed). More suitable to smaller stream systems where works are of short duration only. A fish screen will be required for the pump inlet. - Dam and divert systems –similar to the above, except that flows are safely passed from upstream to downstream in a diversion system, comprising an earthen channel, or pipe. - Temporary watercourse diversions –divert watercourse around a worksite through temporary drainage structures, allowing works within the main channel prior to reinstatement - Stabilised outflow structures or flow spreaders to avoid downstream erosion - Installation of sediment fencing on the edges of the construction zone, and silt curtains in standing downstream waters where there is a risk of sediment movement into these waters *Dewatering* Dewatering of temporary waterway crossing controls (see above) and excavation works may be required. These to be managed as follows: - Where practicable, decant surface clean waters first. If clean, discharge to the environment, preferably over vegetated areas. Where not clean, dewater to sediment retention structure - Pump remaining waters to sediment retention structure - Stabilise entry to the retention structure to avoid erosion, allow sediment to settle out, and test prior to release to the environment - Where possible, reuse waters on-site (e.g. for dust suppression)
Monitoring	**CPESC Audits** - The Auditor CPESC identified in 'Actions / Mitigation Measures' above shall monitor the implementation of the certified ESCPs, during clearing works, in accordance with the monitoring requirements outlined in the certified ESCP (or more frequently). - The Auditor CPESC must also inspect the site not later than one day after post clearing site stabilisation measures have been implemented. **General Monitoring requirements** Monitoring identified within the ESCP shall be implemented, and shall include: - Regular (weekly) site inspections to ensure erosion and sediment controls are in place, and to identify any rectification works required - Site inspections to be undertaken also after any rain event to check for integrity and maintenance requirements for erosion and sediment controls, and other site features - Check any stream diversion structures for trapped fish or other aquatic wildlife - An incident-complaint register including for all spills and leaks, reviewed regularly, to keep track of and where required improve spill management on the site
Reporting	- The Auditor CPESC is to provide confirmation to the Consent Authority of compliance with the detailed ESCPs associated with the above CPESC Audits within 7 days of each inspection. - Visual site inspections will be recorded in the Site Manager's logbook, or the site visual inspection form in Appendix F (or similar). - Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up. - All monitoring results (soil, water quality, etc.) will be retained, with an annual monitoring review conducted and report prepared for reporting to the Seafarms environmental management team.

Element	Detail
OPERATIONAL PHASE	
Responsibility	Site Manager
Actions / Mitigation Measures	Adopt the construction phase controls for construction, earthworks and similar land disturbing activities. Otherwise, mitigation and monitoring during the operational phase will involve inspection and maintaining existing structures from erosion and instability. Continued erosion control and rehabilitation may be required after each wet season, including topping up and reshaping works. Topsoils may be replaced with stabilised pond spoil (mixed with coarser sandier materials where required) to reform topsoil where required for vegetation growth.
Monitoring	Regular visual monitoring of the site will be conducted, with potential issues identified and entered into the corrective action system for rectification.
Reporting	Visual site inspections will be recorded in the Site Manager's logbook, or the site visual inspection form in Appendix F (or similar). Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up. All monitoring results (soil, water quality, etc.) will be retained, with an annual monitoring review conducted and report prepared for reporting to the Seafarms environmental management team.
ALL PHASES	
Corrective Actions	Corrective Action Triggers will include: ▪ Sediment loss from the site, including turbid waters or plumes in receiving waters or drainage lines (due to site works) ▪ Damaged or failing erosion and sediment controls, including breaches in drainage controls, sediment fences or sediment ponds ▪ Excessive sediment build-up in sediment ponds or other structures (including sediment fences, drains) ▪ Evidence of loss of litter and other contaminants from the site Corrective Actions: ▪ Repair erosion and sediment controls, stabilise exposed surfaces and reinstate drainage or other controls ▪ Drain and dig out accumulated sediment in sediment controls, and dispose of material in an area that will not re-erode and move off-site ▪ Undertake general site housekeeping to tidy up loose rubbish, ineffective stockpile controls, etc. ▪ Review the site erosion and sediment controls

References

IECA (2008). *Best Practice Erosion and Sediment Control 2008*. International Erosion Control Association. http://www.austieca.com.au/

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DLRM (2016). *Soil management, erosion and sediment control information*. Department of Land and Resource Management. Accessed 12 September 2016 at https://nt.gov.au/environment/soil-land-vegetation/soil-management-erosion-sediment-control

DNREAS (2010) *Land Clearing Guidelines*. Technical Report No. 20 / 2009D, Department of Natural Resources, Environment, The Arts and Sport, Northern Territory.

Element	Detail
Leersnyder, H., Bunting, K., Parsonson, M., and Stewart, C. (2016). *Erosion and sediment control guide for land disturbing activities in the Auckland region*. Auckland Council Guideline Document GD2016/005. Prepared by Beca Ltd and SouthernSkies Environmental for Auckland Council.	

TABLE C1.2 – GENERAL GUIDE TO EROSION AND SEDIMENT CONTROLS

Aspect	Control[1]
Access and Traffic	Stabilised site access and egress points - define access points to the site, and stabilise to avoid movement of soil / weeds on or off-site Traffic control plan - define trafficable and no-go areas on the site All weather access tracks, and road/track drainage Cleaning of trucks and other vehicles sufficient to minimise sediment movement off-site. Sweep and otherwise remove sediment from sealed roads where present due to the Project works.
Drainage Controls	Diversion Banks - locate upslope of construction areas, stockpiles and hazardous material storage locations Open Drains - to control drainage paths and directions on the site Contouring - use on long overland flow paths on slopes to avoid rill and gully erosion Check Dams - install in drainage channels to slow runoff velocity in drains to minimise erosion Controlled Discharge - stabilised discharge points, energy dissipater or flow spreaders to avoid erosion in discharge points
Erosion Controls	Surface Roughening - short term surface control Revegetation - longer term stabilisation Synthetic materials, relatively small high risk areas (e.g. jute mesh) Drainage protection – geofabric, jute mesh, HDPE liner, rock armouring to protect against high velocity erosive flows
Sediment Controls	Sediment fences - to guide runoff into other control structures, and to hold water and allow sediment to drop out. Suitable for small areas, or at the foot of stockpiles Sediment ponds and basins located to capture sediment runoff and settle out sediments Vegetated areas to slow flows and capture sediment (not suitable for high value conservation species/areas)
Works near or in Waterways	Dam and pump: In-stream dam bunds, sump / pump inlet control, fish screens, pump and pipeline, stabilised outflow or flow spreader Dam and divert: In-stream dam bunds, diversion channel or pipe(s), stabilised outflow or flow spreader Temporary waterway diversion: stabilised diversion channel, lined with geotextile cloth, HDPE liner or similar; non-erodible dam in upstream and downstream ends of existing channel (sandbags, sheet piles, lined earthen banks, etc.); controlled inlet and outlet points; rehabilitation of in-stream morphology Coffer dam diversions: non-erodible dam structure (sand bags, sheet piles, lined earthen banks) Dewatering: all of the above structures may require dewatering (see below)
Dewatering	Pump and sump system, including surface decant where clean surface waters can be removed first Sediment retention structure – skip bin or tank, sediment fencing, earth bunded area for small works, sediment ponds for larger works Energy dissipation, flow spreaders etc. for inflow to above structures (where required to control erosion)

Table notes:
1 refer to IECA (2008) Design Fact Sheets (Volume 4) and Standard Drawings (Volume 6); DLRM (2016) Technical Notes; Leersnyder et al (2016) guideline and example design drawings

C2 Land and Soils Strategy

REF: EN02-PR4401, REV. E

TABLE C2.1 - LAND AND SOILS STRATEGY

Element	Detail
Applicable site activities Site establishment Vegetation clearing and earthworks Site stabilisation and rehabilitation Operations, particularly for saline ponds and channels, and in relation to leaks and spills	
Aim Ensure that land and soil resources are protected both now and in the future, such that the ecological health and land uses, and the health, welfare and amenity of people are maintained	

Objectives	**Targets**	**Key Performance Indicators**
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments - Minimise impacts on the quality and structural integrity of land and soils - Protect soil-vegetation systems outside the project footprint	T3.2.1 No significant releases of chemicals or spills T3.4.1 No clearing of vegetation outside of approved clearing areas T3.5.1 No soil contamination T3.5.3 No deterioration in flora and vegetation community health in areas of retained vegetation T3.5.4 Minimise impacts on soil quality and structural integrity of soils in the Project footprint	# of incidents: - spills, leaks or releases - areas where pond sludge placed outside of identified conditioning areas Maps showing location and extent and area/number calculations: - Contaminated or potentially contaminated areas - Change over time of erosion / scalding areas and vegetation systems outside of project footprint
O1. Develop a long term sustainable aquaculture project - Ensure plans are in place for decommissioning and rehabilitation	T1.3.1 Decommissioning and rehabilitation plan prepared and approved within 12 months of commencement	Approved DRP in place and implemented

Responsibility	**Construction**: Construction Manager **Operation**: Site Manager
Actions / Mitigation Measures	**Construction** <u>Soil Contamination</u> Implement *C12 Hazardous Materials Management* and *C9 Waste Management* Strategies, and Spill Response in the Contingency Response Plan (Appendix E). <u>Soil Dispersion and Sodicity</u> While many of the soils are coarse or earthy textured, the risk of dispersion will be managed by conducting pre-construction testing of soils (representative sites), and adopting suitable controls (compaction, gypsum ameliorant, etc.).

Element	Detail
	Topsoil Management Where topsoil is not utilised in earthworks, it should be dispersed onto prepared landscaping and revegetation areas immediately to minimise deterioration of soils. Where topsoil is to be stockpiled: - Stockpiles should have a maximum height of 2m; - Stockpiles should be revegetated to prevent soil erosion and weed invasion and to maintain soil microbes; and - Stockpiles should be located well away from works areas, access paths and overland flow paths. Topsoil should be dispersed onto landscaping and revegetation areas, evenly spread and ripped to bind soil layers and avoid compaction. Implement the Weeds and Pests Strategy. **Operation** Adopt the construction phase controls for construction, earthworks and similar activities. Otherwise, mitigation and monitoring during the operational phase will involve monitoring and maintaining existing structures from erosion, instability / cracking, and avoidance of soil contamination or structural decline. Continued erosion control and rehabilitation including topping up and reshaping works after each wet season. Topsoils may be replaced with stabilised pond spoil (mixed with coarser sandier materials where required) to reform topsoil where required for vegetation growth. **Land Application** Application of material to land, including sediments from aquaculture settlement ponds, must not be added where the nutrient or contaminant levels are beyond the ability of soils to accommodate this addition. In terms of nutrient addition to soils, the NLAR (Nutrient Limited Application Rate) will be considered in any land application (as well as the CLAR, the Contaminant Limited Application Rate where necessary) from the Victoria EPA (2004) *Guidelines for Environmental Management of Biosolids Land Application* or similar.
Monitoring	**Pre-Construction** Representative sampling of soil profiles for fertility characterisation, salinity, sodicity and acid sulfate soils will be undertaken prior to earthworks commencing for the purpose of characterising soils for construction, impact assessment during operations, and rehabilitation post-closure (should this be required). A pre-construction site reconnaissance inspection will be undertaken for all construction areas. This will include identifying: - Unstable, shallow or otherwise problematic soils, or evidence of soil contamination - Drainage lines and watercourses, and other prominent site features - Excavation test pits or bores to the depth of excavation + 0.5m to confirm soil depths and types to be encountered. Number of pits based on uniformity of the land type, and type of works to be conducted, and at the discretion of the construction manager (inadequate survey will cause delay to construction works rather than potential for environmental harm). **Construction** Monitoring will include: - Regular (weekly) site inspections to identify any signs of land or soil deterioration or contamination, and any rectification works required - An incident-complaint register including for all spills and leaks, reviewed regularly, to keep track of, and where required, improve spill management on the site - Regular tank integrity testing for all large fuel, oil, chemical and waste storages - Implementation of the Unexpected Findings Protocol provided in the Contingency Response Plan (Appendix E)

Element	Detail
	▪ All topsoil will be tracked unless used locally in the course of cut to fill earthworks, to ensure that the source and fate of all topsoils across the site are known – where topsoil is removed from weed infested areas, this will not be spread across the site, to limit spread of weed seeds. **Operation** ▪ Regular visual monitoring of the site will be conducted, with potential issues identified and entered into the corrective action system for rectification.
Reporting	Visual site inspections will be recorded in the Site Manager's logbook, or the site visual inspection form in Appendix F (or similar). Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up. All records of tank integrity testing, soil or other testwork, waste removal, etc. will be retained. All monitoring results (soil, water quality, etc.) will be retained, with an annual monitoring review conducted and report prepared for reporting to the Seafarms environmental management team. Audit reports will be prepared and maintained, with copies to Seafarms management team.
Corrective Actions	Corrective Action Triggers will include: ▪ An Unexpected Finding of contamination or other soil issue during construction (typically vegetation clearing / earthworks) ▪ Evidence of structural failure, erosion ▪ Dispersing soils, evidenced by excessively cloudy runoff or ponding waters, surface crusting and waterlogging (beyond what is currently found on the site) ▪ Spills or leaks of potential contaminants. Corrective Actions: ▪ Stop works and implement the Unexpected Findings Protocol provided in the Contingency Response Plan (Appendix E) ▪ Implement the Spill Management process within the Contingency Response Plan (Appendix E) ▪ Instigate repair works, which may require harvest and draining of a pond in worst case situations ▪ Investigate the source of any pollution or dispersive soil runoff, ameliorate surface soils by application of ameliorant (e.g. gypsum), surface planting, stabilisation and/or compaction ▪ Review the land and soils management strategy.

References

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C3 Acid Sulfate Soil Strategy

REF: EN02-PR4402, REV. F

TABLE C3.1 - ACID SULFATE SOIL STRATEGY

Element	Detail
Applicable site activities	Site Establishment (minor) Earthworks, particularly the seawater pump station, and other areas where excavation may extend below 5m AHD
Aim	Ensure excavation works involving acid sulfate soils are appropriately managed to minimise the risks of environmental pollution and that land and soil, surface and ground water resources are protected both now and in the future, such that the ecological health and land uses, and the health, welfare and amenity of people are maintained

Objectives	Targets	Key Performance Indicators
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - Minimise oxidation of acid sulfate soils and loss of acidic leachate from the site resulting from these soils	T3.5.2 No oxidation of acid sulfate soils or generation of acidic leachate from acid sulfate soils	# of non-compliances: - acid sulfate soils exposed but not treated - exceedances of water quality results for pH in leachate, runoff and receiving waters - laboratory neutralisation results showing net acidity remaining after treatment

Responsibility	**Construction**: Construction Manager **Operations**: Site Manager
Actions / Mitigation Measures	**Pre-Construction** Pre-construction monitoring will be conducted for all areas of excavation that will or may extend to or below 5m AHD. This will involve testing to the depth of disturbance + 1.0m in accordance with Ahern *et al* (1998) (field and oxidised pH at 0.25m intervals, chromium reducible sulfur suite analysis at 0.5m intervals). Based on this investigation and in relation to the construction plan, identify areas at risk of intercepting ASS, and prepare an ASS Management Plan in accordance with the Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines v4.0 (Dear *et al*, 2014). The ASSMP must be prepared by a Certified Professional Soil Scientist (CPSS) with Soil Science Australia. The Consent Authority must be advised of the identity of this person prior to engagement, and the ASSMP submitted to the Consent Authority. **Implementation** Implement the ASSMP. In general, no excavation is to occur at or below 5m AHD without testing for ASS (refer Monitoring - pre-construction below).
Monitoring	Implement the monitoring outlined in the above ASSMP
Reporting	The ASSMP is to be provided to the Consent Authority prior to implementation of the ASSMP. All test results shall be retained on-site and electronically by PSD. Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up.

Element	Detail
Corrective Actions	As outlined in the ASSMP

References

Ahern, C.R., Ahern, M.R. and Powell, B. (1998) Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998. QASSIT, Department of Natural Resources, Resource Sciences Centre, Indooroopilly.

Dear S.E., Ahern C.R., O'Brien L.E., Dobos S.K., McElnea A.E., Moore N.G. and Watling K.M. (2014). Soil Management Guidelines in Queensland Acid Sulfate Soil Technical Manual (QASSIT), Department of Science, Information Technology, Innovation and the Arts, Queensland Government, June 2014.

DLRM (2016). Soil management, erosion and sediment control information. Department of Land and Resource Management. Accessed 12 September 2016 at https://nt.gov.au/environment/soil-land-vegetation/soil-management-erosion-sediment-control

C4 Vegetation Management Strategy

REF: EN02-PR4310, REV. E

TABLE C4.1 - VEGETATION MANAGEMENT STRATEGY

Element	Detail
Applicable site activities Site Establishment Vegetation Clearing and Earthworks Site stabilisation and rehabilitation works	
Aim To maintain the conservation status, abundance, diversity, geographic distribution and productivity of flora and fauna at species and ecosystem levels through the avoidance or management of adverse impacts on the Project area and on adjacent areas that may be impacted. To minimise the risk of Significant Impacts to threatened species and communities, and migratory species listed under the EPBC Act, and species listed under the TPWC Act.	

Objectives	Targets	Key Performance Indicators
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - Minimise the area of clearing to that necessary for the construction and operation of the Project - Protect soil-vegetation systems outside the project footprint - Minimise impacts on flora and fauna communities	T3.4.1 No clearing of vegetation outside of approved clearing areas T3.4.2 Minimise impacts on fauna and vegetation, particularly listed threatened species and sensitive/significant habitats	Maps showing location and extent and area/number calculations: - as-cleared area and location of clearing compared to vegetation clearing plans - # and/or area of rare or important flora, vegetation communities or wetland areas cleared/damaged - Change over time of soil-vegetation systems outside of project footprint

Responsibility	**Construction**: Construction Manager **Operations**: Site Manager
Actions / Mitigation Measures	**Pre-construction** Undertake pre-construction flora and vegetation surveys as outlined in Monitoring below. Should any of the target species be identified within the Project footprint, develop a plan to either alter the project footprint, translocate individuals, provide offset, or other solution determined as acceptable after liaison with the relevant NT government agencies. Based on detailed design and vegetation clearing approvals, site specific Vegetation Clearing Plans will be developed, with the extent of clearing and 'no go' areas clearly defined. Boundaries of clearing and 'no go' areas will be clearly pegged/flagged on the ground prior to clearing starting. Training for all personnel will include information on identifying these marked areas. Obtain ownership or landowners consent prior to any vegetation clearing works. Notify DENR of the estimated start date for the clearing of vegetation and contact details of the person who will be undertaking the clearing.

Element	Detail
	Vegetation Clearing Vegetation clearing will only commence after receipt of vegetation clearing approvals for the site, and clearing may only be undertaken in areas expressly permitted in these clearing approvals. The following approved and (where required) certified plans must be available prior to vegetation clearing commencing, and be on-site during clearing works: - The vegetation clearing permit, including clearing area plans - The ESCP (refer C1 ESC Strategy), ASSMP (refer C3 ASS Strategy) and WMP (refer C5 Weeds and Pests Strategy). Vegetation clearing activities must adhere to the requirements of the above strategies. No lay down areas or materials storage will be located within areas of retained vegetation. Vegetation clearing and earthworks will be conducted during the dry season, with areas stabilised as much as practicable prior to wet season rains. Clearing activities must avoid damage to the roots, trunks and canopy of adjacent retained vegetation. Cleared vegetation will be pushed into a series of windrows within the disturbed area and either chipped for reuse in rehabilitation areas or burnt. Burning will only occur after receipt of a Permit to Burn. **Operation** Maintain rehabilitated areas of the site, with endemic species where possible.
Monitoring	Undertake pre-construction flora and vegetation surveys of the Project area (by a suitably qualified botanist) prior to any clearing or earthmoving activities for the presence of *Cycas Armstrongii* or *Monochoria Hastata* (Arrowleaf Monochorea). Prepare or update the project vegetation map to show the locations of these species if found. Regular inspections will be undertaken of cleared area extents to ensure retained vegetation is not being directly or indirectly impacted by construction activities. Weekly monitoring shall be conducted of retained vegetation to detect any damage or decline in the health and condition of retained vegetation within the construction site and adjacent sites. Weed mapping will be completed as identified in *C5 Weeds and Pests Strategy*.
Reporting	Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up. Any clearing of vegetation outside approved clearing areas shall be reported to the approving authority.
Corrective Actions	Corrective Action Triggers: - Clearing has occurred outside of the approved and marked clearing areas - Vegetation die-back or deterioration is found in areas outside of the clearing footprint - Changes to threatened or near threatened species list at the Commonwealth, Northern Territory or local level - Poor vegetation health in rehabilitation / replanted areas. Corrective Actions: - Notify the approving authority of clearing outside approved boundaries - Rectify training, ground truth marking, reinstate controls, review vegetation clearing plans and this Vegetation Management Strategy - Investigate the potential cause of vegetation die-back and rectify. This may be related to a number of causes including but not limited to soil related (fertility, salinity/sodicity, acid sulfate soils, loss of topsoil); surface water runoff (toxicants, salinity, waterlogging, or lack of water through changed runoff paths) - Review site operations and Vegetation Management Strategy to determine whether changes can be made to lessen or avoid impacts to significant species.

Element	Detail
References	DNREAS (2010) Land Clearing Guidelines, Department of Natural Resources, Environment, The Arts and Sport, Darwin. Northern Territory.

C5 Weeds and Pests Strategy

REF: EN02-PR4511, REV. D

TABLE C5.1 - WEEDS AND PESTS STRATEGY

Element	Detail
Applicable site activities	Construction activities, particularly: ▪ transport of equipment, vehicles and materials to site ▪ clearing, stockpiling and movement of topsoil on the site, particularly from where weed species were present Operational phase of the Project, for natural or other (vehicles, etc.) spread and movement of weeds on the site Waste handling including changes to landuse and management (relating to pest fauna species)
Aim	To maintain the conservation status, abundance, diversity, geographic distribution and productivity of flora and fauna at species and ecosystem levels through the avoidance or management of adverse impacts on the Project area and on adjacent areas that may be impacted. To minimise the risk of the spread of weeds and pests.

Objectives	Targets	Key Performance Indicators
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - Minimise weed and pest introduction or spread on the site	T3.8 No increase in weed or pest distribution or number in the Weed Control Area	Maps showing location and extent and area/number calculations: - Location and distribution of each weed and pest species identified on the site

Responsibility	**Construction**: Construction Manager **Operations**: Site Manager
Actions / Mitigation Measures	**Weed Management Plan** A weed management plan (WMP) is to be developed prior to the commencement of works. The WMP will be submitted to the Consent Authority for assessment and approval. The WMP must detail methods and treatments and other reasonable measures to: ▪ manage existing declared weeds on the land ▪ prevent the land being infested with any declared weed ▪ prevent any declared weed on, or likely to be on the land, spreading to other land. Weeds are to be controlled as per the requirements of the approved WMP. **Pest Control** Implement an on-going, rodent baiting program around built facilities. Minimise available food sources for pest animals around buildings and kitchen / accommodation areas. **Marine Pests** All vessels to be used shall be of local origin or otherwise free of marine fouling from other locations to prevent spread of marine pests. Where foreign vessels are required, consult with the Aquatic Biosecurity Unit (DPIR Fisheries) to determine controls required for the vessel.

Element	Detail
Monitoring	**Pre-Construction** Comply with pre-construction monitoring requirements in the Weed Management Plan. **Construction and Operation** Comply with the construction and operational monitoring requirements in the Weed Management Plan.
Reporting	Comply with reporting requirements in the Weed Management Plan. Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up. Updates to the Weed Management Plan and this strategy, will be undertaken in consultation with the Weed Management Branch of the Department of Environment and Natural Resources.
Corrective Actions	Initiate control measures as outlined in the WMP.
References Weeds DLRM (2014). Northern Territory Weed Management Handbook. Weed Management Branch, Northern Territory Department of Land Resource Management. NT Government (2016). Weed Management Plans - https://nt.gov.au/environment/weeds/weeds-and-the-law Pest Fauna NT Government (2016) Controlling wild dogs and pest animals with 1080 poison. Last updated 19 April 2016. Available from: https://nt.gov.au/industry/agriculture/farm-management/controlling-pest-animals-wild-dogs-with-1080-poison	

C6 Fauna Management Strategy

REF: EN02-PR4550, REV. E

TABLE C6.1 - FAUNA MANAGEMENT STRATEGY

Element	Detail
Applicable site activities	Site Establishment Vegetation Clearing and Earthworks, Construction Operation
Aim	To maintain the conservation status, abundance, diversity, geographic distribution and productivity of flora and fauna at species and ecosystem levels through the avoidance or management of adverse impacts on the Project area and on adjacent areas that may be impacted. To minimise the risk of Significant Impacts to threatened species and communities, and migratory species listed under the EPBC Act, and species listed under the TPWC Act.

Objectives	Targets	Key Performance Indicators
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - Minimise impacts on flora and fauna communities	Comply with C4 Vegetation Management Strategy T3.4.1 No clearing of vegetation outside of approved clearing areas T3.4.2 Minimise impacts on fauna and vegetation, particularly listed threatened species and sensitive/significant habitats	# of incidents: - Number of fauna incidents or mortalities Maps showing location and extent and area/number calculations: - # and/or area of rare or important fauna and habitat areas cleared/damaged

Responsibility	**Construction**: Construction Manager **Operations**: Site Manager
Actions / Mitigation Measures	**Vegetation Clearing** Comply with *C4 Vegetation Management Strategy*, in particular to minimise vegetation clearing, and clearing only within the approved bounds. In addition: - Undertake vegetation clearing sequentially so as to encourage fauna to disperse towards adjacent habitats that will remain intact - A fauna spotter-catcher is to be in attendance during clearing operations to implement fauna relocation and protocols for injured wildlife. The fauna spotter-catcher will provide site specific fauna management protocols suitable for use on the site - Where possible, retain large trees with hollows and hollow logs on the ground to provide nesting opportunities for native species. - Where practical, temporary fencing will be erected around excavations to exclude mobile animals from vegetation clearing areas. - Work areas will be checked before work commences each day for fauna that may have become trapped. If any pits/trenches are to remain open after daily site works have been completed and are not in fenced areas, they will be securely covered by an impenetrable barrier, if possible, or fauna ramps (e.g. log ramps or wooden planks) will be put in place to provide a potential means of escape for trapped fauna. - Site inductions are to include education regarding the local fauna of the site and protocols to be undertaken if fauna are encountered. **Traffic**

Element	Detail
	Vehicles will be required to stay on pre-determined routes and must comply with speed limits. Speed limits will be clearly signposted so as to minimise the potential for road kill. This will also apply to vessels operating on estuarine/marine waters. Where there is a fauna-vehicle interaction which results in a mortality, the animal will be relocated to the edge of the road immediately, and subsequently removed as quickly as practicable to reduce potential for scavengers to be subsequently struck. **Hydrology and Aquatic Ecology** Comply with *C7 Surface Water Management Strategy*, in particular to avoid changes to hydrology in receiving waters. Comply with *C1 Erosion and Sediment Control Strategy* to protect water quality during construction, and the Surface Water and Hazardous Materials Management Strategies during operation. Implement the Effluent Management Strategy on-site. **Boat Strike** To reduce the likelihood of injury or mortality to aquatic fauna as a result of boat strike, the following procedures will be observed: ▪ A speed limit of 5 knots will be enforced for all vessels working in the Project area during construction ▪ Boat crew to maintain a look out for aquatic fauna (large fish, schools of fish, marine mammals and turtles) during all operations. ▪ If a boat approaches aquatic fauna (or vice versa), the vessel will take all care to avoid collisions, including stopping, slowing down and/or steering away. ▪ Site inductions for all vessel crew covering identification of marine fauna and procedures to minimise disturbance. ▪ In the unlikely event of an impact, contact the Marine Wildwatch hotline to determine the next steps. **Waterway Barriers** Comply with *C1 Erosion and Sediment Control Strategy* for In-stream Works and Waterway Crossings during construction. For the operational stage, all waterway crossings are to contain suitable flood and low flow passage to avoid creating barriers to fish passage. **Impingement and Entrainment of Aquatic Fauna at Intake Structure** Comply with *C7 Surface Water Management Strategy* **Noise and Light Disturbance** Direct lighting away from the marine environment where practicable. Comply with *C10 Air and Noise Management Strategy*. **Increased site access leading to increased take of important species** Increased site access will be mitigated via the installation of gates on the access road and signs to discourage off road access.
Monitoring	**Construction** Implement *C4 Vegetation Management Strategy* and *C5 Weeds and Pests Strategy* monitoring, particularly in relation to inspection of clearing limits and potential damage to retained vegetation, and presence of weeds and pests on the site. Monitor all work areas before work commences each day for fauna that may have become trapped. **Operation** Regular inspections of the intake structure and storage ponds will be undertaken for signs of fauna being drawn into the system. In particular, the presence of threatened or near threatened species is to be noted and actions taken to return these to the wild. **Increased Site Access**

Element	Detail
	Implement monitoring to detect changes in use of the site by employees or the community, and apply rectification measures where required, in accordance with *C15 Social Impact Management Strategy* and *C16 Cultural Heritage Management Strategy*.
Reporting	Record all incidents and complaints related to fauna on the incident-complaint form in Appendix F (or similar) and enter into the incident-complaint register for rectification and follow up.
Corrective Actions	Corrective Action Triggers: ▪ Clearing outside of approved areas, or clearing where a spotter-catcher has not inspected or was not present ▪ Flooding changes due to the works, or blockages to waterways ▪ Aquatic fauna found trapped or entrained in the intake structure or storage ponds ▪ Noise or light disturbance occurs in proximity to turtle nesting sites, due to the Project ▪ Boat strike or other injury to marine megafauna Corrective Actions: ▪ Engage fauna spotter catcher to inspect site as soon as possible to identify any injured fauna or fauna in distress to relocate or manage ▪ Implement drainage controls and construct or rectify fish passages ▪ Remove fauna from intake structures and return to the wild, although only if safe to do so ▪ Alter lighting and restrict noisy activities (refer C*10 Air & Noise Management Strategy*) to avoid impacts to nesting sites ▪ If marine fauna are injured, contact the Marine Wildwatch hotline to determine the most appropriate actions. Do not approach crocodiles or enter the water where crocodiles are present without expert advice and assistance ▪ Address complaints through the *C15 Social Impact Management Strategy* and *C16 Cultural Heritage Management Strategy*.
References ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy	

C7 Surface Water Management Strategy

REF: EN02-PR4301, REV. E

TABLE C7.1 - SURFACE WATER MANAGEMENT STRATEGY

Element	Detail
Applicable site activities	Intake of seawater Management of waters within the site Earthworks Discharge of water to Wheatley Creek Activities with the potential for spills, leaks or other discharges to surface waters
Aim	Ensure surface waters, including estuarine and marine waters, wetlands and floodplains, are protected both now and in the future, such that the ecological health, and the health, welfare and amenity of people are maintained. Ensure a safe and sustainable saltwater supply for the Project.

Objectives	Targets	Key Performance Indicators
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - Protection of marine, estuarine and freshwater aquatic ecosystems - Maintenance of the recreational, cultural and spiritual values of marine, estuarine and freshwaters, including ecosystems, biota and hydrology - Protection of human consumers, primarily for fish species, crabs, etc. - Maintenance of existing public recreation and aesthetics, in relation to hydrology, water quality and fisheries resources	T3.2.1 No significant releases of chemicals or spills T3.2.2 No unplanned or unauthorised releases off-site T3.3 No Complaints **Design and Development** T3.6.1 Minimise changes between pre- and post-development hydrology **Construction and Operation** T3.6.3 Minimise bank scour and erosion As per *Water Quality Monitoring and Management Plan* (WQMMP): T3.1.1 Comply with the discharge criteria in the WQMMP T3.1.2 EIMP program shows no significant impact on receiving waters	# of non-compliances # of complaints # of incidents: - spills, leaks or unplanned/unauthorised releases - flood incidents from altered hydrology Maps showing location and extent and area/number calculations: - Hydrology, bathymetry, bank erosion changes compared to reference sites

Responsibility	Construction: Construction Manager Operations: Site Manager
Actions / Mitigation Measures	Implement the WQMMP. In addition: - Avoid construction in major drainage lines to the greatest extent practical. Where not avoidable determine whether fish passage is required, and design crossings and culverts to allow for fish passage. - No seawater extraction other than via the licensed intake infrastructure point. - Direct all aquaculture washdown waters to the discharge drainage system. Any contaminated waters (e.g. with oil, fuel, etc.) to be managed as per *C12 Hazardous Materials Management Strategy*.

Element	Detail
	▪ Maintain armouring and scour protection as required to minimize erosion and scour as a result of the Project. ▪ Undertake inspection and maintenance of pond liners when ponds are emptied for cleaning.
Monitoring	Implement WQMMP. In addition: ▪ Visual monitoring to include pegging of banks to provide a baseline for further erosion and scour monitoring and protection works at the inlet and outlet. ▪ Regular site inspections along with erosion and sediment control inspections to include rock armouring, scour and erosion protection associated with banks and structures. ▪ Routine visual monitoring and inspections of the intake and outlet structures and banks for signs of erosion, fouling, injury to marine organisms, etc.
Reporting	Implement the WQMMP. Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up.
Corrective Actions	Refer to the WQMMP

References

WQMMP - Seafarms / CO2 (2018). Water Quality Monitoring and Management Plan. Seafarms Ltd and CO2 Australia Pty Ltd. Ref: EN-02-MP-EM4201.

ANZECC & ARMCANZ 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy, Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand

DERM 2010. Monitoring and Sampling Manual 2009 Environmental Protection (Water) Policy 2009 Version 2 September 2010. Department of Environment and Heritage Protection, Brisbane.

Simpson, S. L., Batley, G. E., Chariton, A. A., Stauber, J. L., King, C. K., Chapman, J. C., Hyne, R. V., Gale, S. A., Roach, A. C. & Maher, W. A. 2005. Handbook for Sediment Quality Assessment, CSIRO, Lucas Heights, NSW.

Simpson, S. L., Batley, G. B. & Chariton, A. A. 2013. Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines. CSIRO Land and Water Science Report 08/07. CSIRO Land and Water.

C9 Waste Management Strategy

REF: EN-PR4601, REV. H

TABLE C9.1 - WASTE MANAGEMENT STRATEGY

Element	Detail
Applicable site activities	All construction and operational activities generating, managing or interacting with waste. Excludes discharges into receiving waters of aquaculture waters (refer Surface Water Management Strategy)
Aim	Ensure wastes generated by the Project, both solid and liquid, are appropriately managed in accordance with the waste management hierarchy to minimise the risks of environmental pollution and public health nuisances.

Objectives	Targets	Key Performance Criteria
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments - Protection of ecosystems, land systems and amenity - Minimise waste disposed to on or off-site landfill - Comply with waste tracking requirements	T3.2.1 No significant releases of chemicals or spills T3.5.1 No soil contamination T3.9.1 All waste stored in appropriately contained areas, including potentially contaminated waste drums or containers T3.9.2 All putrescible waste removed within 7 days either to landfill or for soil / waste conditioning on or off-site T3.9.3 Waste targets, including recycling targets, met T3.9.4 Hazardous wastes removed from site or fully contained under cover and above flood levels before the wet season T3.9.5 All listed wastes stored in appropriately contained areas on-site or removed from the site appropriately tracked	# of incidents # of breaches in site visual inspections Post-storm site condition assessment failures Assessment against waste targets # of failures to track and breaches of tracking requirements

Waste Hierarchy

Avoid and Reduce (1, 2)

This element involves effective choices and management in procurement and site practices, to limit the amount of waste actually generated.

Reuse and Recycle (3, 4)

Reuse and recycling are the next best waste management options, avoiding disposal by maintaining the material in a productive state. The preferred approach is reuse of materials without further processing, being lower energy and material intensive, followed by recycling, where materials may be turned into other materials, potentially with different uses.

Recover (5)

Recovery refers to recovery of energy or other materials from a waste stream prior to it going to disposal, or rectifying a waste so that it doesn't ultimately require disposal, such as on-site soil conditioning.

Dispose (6)

Disposal is the least preferred option, and the waste management system will seek to minimise as much as practicable disposal of waste, either in the on-site landfill, or off-site landfill sites, by using the above more preferred approaches.

Element	Detail
Responsibility	**Construction**: Construction Manager **Operations**: Site Manager

Actions / Mitigation Measures	**General**
	• All permanent and temporary storage facilities are to be designed and operated according to appropriate Australian Standards or guidelines. Store listed wastes and hazardous materials in accordance with *C12 Hazardous Materials Management Strategy*
	• Maintain products and dispose of all wastes in accordance with their safety data sheet (SDS)
	• Implement the waste hierarchy above to preference practices at the top of the hierarchy (avoid, reduce, reuse) below those lower down (recycle, recover, dispose). This to include:
	  ◦ Use care in ordering of products and materials to minimise waste
	  ◦ Provide segregation of wastes at source where practicable
	  ◦ Ensure bins containing putrescible waste are fitted with lids and closed at all times
	  ◦ Look for opportunities to reduce, reuse or recycle materials on site.
	• Comply with the additional requirements described in C9.1 – Site Waste Management Plan
	• Update the waste inventory in C9.1 – Site Waste Management Plan as required to ensure it remains current and includes all waste streams.
	• Locate waste storage and collection areas away from overland flow paths and direct stormwater away from these areas.
	• Listed Waste (defined in Schedule 2 of the *Waste Management and Pollution Control (Administration) Regulations* (NT)), shall be collected and removed from the site by a licensed contractor, to a site licensed to accept the waste, or shall otherwise be managed as conditioned under approvals, permits, licences or similar requirements for the site.
	• All litter and waste materials to be stored or transported from the site shall be covered to prevent spillage or loss of materials.
	• Prior to the start of the wet season and as part of cyclone preparedness, prepare the site by ensuring all waste materials, receptacles and storages are properly contained and stable, and will be able to withstand wet season rainfall without leaching or other loss of contaminants.
	Construction
	• Provide temporary waste collection facilities, and sort waste streams as much as practicable at source prior to removal from site.
	• Regularly remove waste from site by appropriately licensed contractors, to appropriately licensed facilities. Remove putrescible waste at least weekly.
	• Provide waste separation facilities (including recycling facilities) in areas accessible to collection vehicles.
	• Implement the operational waste controls as soon as practicable during construction.
	Operation
	Implement the waste strategy, including:
	• Waste receptacles located at source, including at source sorting into general waste, recyclables, and listed wastes.
	• Transfer of general, recyclable and other non-listed and non-hazardous wastes to a centralized Waste Transfer Facility, or temporary storage at other locations prior to transfer to this Waste Transfer Facility. This facility to be fenced and comprise an impermeable floor.
	• Transfer of listed and hazardous wastes to a centralised Hazardous Waste Facility before removal off-site by licenced transporters to licensed facilities for reuse, recycling, recovery or disposal. Store in accordance with *C12 – Hazardous Waste Management Strategy.*

Element	Detail
	▪ Drain washwaters and rainfall from bulk putrescible bin storage areas into the sewer system via appropriate trash rack screens and sumps in the floor of these areas, or otherwise treat prior to drainage to stormwater system. ▪ Disposal of general waste to landfill. Disposal of inert waste to landfill, unless it can be safely reused on-site or lawfully (and safely) reused elsewhere off-site. **Interstate Transfer** Transfer of waste interstate will require a number of authorisations from relevant authorities, either by Seafarms or the transport company. All authorisations are to be in place and a copy maintained on-site for any interstate transfer.
Monitoring	Undertake a site audit prior to each wet season with the results provided internally and acted on to ensure the site is adequately prepared. Undertake a similar process prior to forecast storms or other extreme weather events, to ensure all wastes are contained and restrained so as to avoid loss of materials during the event. Conduct an annual review, and set waste targets for the coming year. Each annual review will assess the progress against the waste targets and identify opportunities (and constraints) for continued waste minimisation and optimisation.
Reporting	Record and summarise annually the waste produced on the site and the ultimate end-point to determine opportunities for waste minimisation. Record all transfer of wastes from the site, either by the retention of a receipt from waste transporters, or in the case of listed wastes by recording the type of waste, quantity removed, transporter, destination, and treatment/disposal method (if known) in a register, along with the receipt from the transporter (if the receipt does not contain sufficient information). Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up
Corrective Actions	Correction Action Triggers: ▪ Inappropriate disposal of wastes, either into the environment, or disposal of wastes that can practicably be recycled ▪ Uncontrolled waste disposal ▪ Listed wastes removed from the site without appropriate waste tracking, and/or by an unlicensed person, and/or to an unlicensed site Corrective Actions: ▪ Implement this waste management strategy where site procedures are non-compliant. Review and revise this strategy if required ▪ Clean up and appropriately dispose of any waste as needed ▪ Ensure only licensed waste transporters are utilised to transport listed wastes.

References

LGANT (2010) Waste Management Guidelines for Small Communities in the Northern Territory. Effective from Local Government Association of the Northern Territory, 1 January 2010

NT EPA (2013) Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites In the Northern Territory. Northern Territory Environmental Protection Authority, January 2013

NT EPA (2015) Waste Management Strategy for the Northern Territory 2015 - 2022. Northern Territory Environmental Protection Authority, July 2015

NT EPA (2013). Guideline for Disposal of Waste by Incineration. Version 2.0, Northern Territory Environment Protection Authority, November 2013

NT EPA (2016). Listed Waste Company Summary
https://ntepa.nt.gov.au/__data/assets/excel_doc/0006/285720/listed_waste_company_summary.xlsx

National Environment Protection Measures (NEPM).

Element	Detail
	Australian Dangerous Goods Code, and enabling legislation Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act and Regulations Interstate Transfers: NEPM Movement of Controlled Waste between States and Territories (1998) Western Australian Environmental Protection (Controlled Waste) Regulations 2004, which requires a controlled waste tracking form and Consignment Authorisation (CA) from the Department of Environment Regulation, along with a Waste Transport Certificate (WTC) from the Northern Territory. Queensland Environmental Protection Regulation 2008, which requires a WTC from the Northern Territory and CA from the Department of Environment and Science

C9.1 Site Waste Management Plan

REF: EN02-PR4602, REV. C

TABLE C9.1.1 - SITE WASTE MANAGEMENT PLAN

Element	Detail
Abstract	This Waste Management Plan extends the C9 Waste Management Strategy to incorporate site specific elements at the Bynoe Harbour Core Breeding Centre and Broodstock Maturation Centre site.
Overview of Waste System	**Construction** Standard waste controls outlined in C9 Waste Management Strategy **Operation** Waste Transfer Station located at the Common Facilities Disposal of waste prawns via: ▪ incinerator located within the Waste Transfer Station at the Common Facilities, or ▪ frozen, for subsequent disposal off-site via a licensed contractor
Responsibility	**Construction**: Construction Manager **Operations**: Site Manager
Actions / Mitigation Measures	Implement the C9 Waste Management Strategy Implement the waste management measures for each waste stream as identified in the waste inventory in Table C9.1.2
Monitoring	Update the waste inventory in Table C9.1.2 and maintain during construction and operational phases to record all waste types, quantities produced, and management measures used for each.
Reporting	Implement the C9 Waste Management Strategy
Corrective Actions	Implement the C9 Waste Management Strategy

References

Donovan (2003). Environmental Code of Practice for Australian Prawn Farmers. Australian Prawn Farmers Association

NT EPA (2015) Waste Management Strategy for the Northern Territory 2015 - 2022. Northern Territory Environmental Protection Authority, July 2015

NT EPA (2013). Guideline for Disposal of Waste by Incineration. Version 2.0, Northern Territory Environment Protection Authority, November 2013

NTEPA (2018). Guideline for Remote Clinical Waste Incinerators in the NT. Northern Territory Environmental Protection Authority, Version 1, September 2018.

NT EPA (2016). Listed Waste Company Summary
https://ntepa.nt.gov.au/__data/assets/excel_doc/0006/285720/listed_waste_company_summary.xlsx

National Environment Protection Measures (NEPM).

Interstate Transfers:

NEPM Movement of Controlled Waste between States and Territories (1998)

Western Australian Environmental Protection (Controlled Waste) Regulations 2004, which requires a controlled waste tracking form and Consignment Authorisation (CA) from the Department of Environment Regulation, along with a Waste Transport Certificate (WTC) from the Northern Territory.

Queensland Environmental Protection Regulation 2008, which requires a WTC from the Northern Territory and CA from the Department of Environment and Heritage Protection

TABLE C9.1.2 - SUMMARY OF WASTE MANAGEMENT APPROACH FOR WASTE STREAMS

Waste Source	Waste Classification	Management	Qty*	Off-site Disposal
Construction				
Excavated soils	Inert waste	Waste soils will be minimised by adopting a cut/fill balance (1); Any topsoils remaining will be stockpiled for reuse on-site in revegetation, soil stabilisation and rehabilitation (3).		
Concrete, rock, inert waste	Inert waste	Procurement and concrete batching to be managed to reduce material wastage (1, 2); material to be reused as fill (structural or otherwise) or scour protection (3); excess material to be disposed off-site to landfill (6).		
Asbestos Containing Materials (ACM) (unexpected findings)	Listed Waste	If found, the site will be isolated and a site investigation will be initiated and site stabilisation and/or cleanup initiated. ACM will generally be double wrapped and removed by licenced operators to a licenced facility for disposal by burial (6)		
Construction and Operation				
Vegetation clearing, trimming	Green waste	Minimise vegetation clearing areas (1, 2). Mulching of woody vegetation for reuse in revegetation, soil stabilisation and rehabilitation (3), or burnt on-site (6).	Construction: 150 ha of woodland and open forest clearing Operation: minimal	
Wooden pallets	Green waste	Non-treated pallets will be stored at the Waste Transfer Facility. Those that are in good condition will be re-used on-site (3). Damaged pallets will be composted onsite (6). Treated pallets will be stored at the Waste Transfer Facility and disposed to licensed waste facilities (6).		
Plastics (non-recyclable) i.e. poly pipe, offcuts.	General waste	This material, where it cannot be reused on the site (3), will be removed to the Waste Transfer Facility for ultimate removal off-site to waste recycling facilities at Litchfield or Darwin (4).	Construction: 104m^3/y Operation: 156m^3/y	
Personal Protective equipment and small items: - Gloves - Hardhats	General waste	This material will likely be in small quantities relative to the general waste stream, and will be disposed of at a licenced off-site landfill (6).		

Waste Source	Waste Classification	Management	Qty*	Off-site Disposal
▪ Safety glasses ▪ Boots, biosecurity gear ▪ Water coolers				
Workers on-site, accommodation, including: ▪ putrescible wastes ▪ Non-class 1, 2, 5 plastics	General waste	The use of an on-site composting tumbler will be investigated, with the resulting compost being utilised on landscaping surrounding the site office or similar areas (5). Otherwise, this material will be disposed of at a licenced off-site landfill (6).		
▪ Aluminium and steel cans ▪ Class 1, 2, 5 plastics ▪ Cardboard ▪ Paper	Recyclable waste	A separate recycling bin will be provided at source, regularly removed to the Waste Transfer Facility and, where practicable, further sorted (e.g. into cans, recyclable plastics, cardboard). This material will be removed off-site for recycling (4).	Construction: 52m^3/y Operation: 78m^3/y	
Steel, metal waste, offcuts	Recyclable waste	Waste metal bins to be provided at relevant locations across the site, primarily workshops and maintenance areas. Recycling bins will also be provided next to all general waste receptacles to allow for sorting at source. All recyclable wastes removed to the Waste Transfer Facility for ultimate removal off-site to waste recycling facilities at Litchfield or Darwin (4).		
Batteries	Listed Waste	Vehicle batteries will be removed to the Hazardous Waste Facility and stored in a bunded area, before removal off-site by a licensed transporter to a licensed facility for recycling (4) and material recovery (5).		
Tyres	Listed Waste	Tyres will be stored on the site in small quantities, and sent off-site prior to representing a fire hazard for re-treading (3) or recycling (4) where possible, or disposal (6). Removal will be by a licensed transporter to a licensed facility.		
Used oil/fuel filters, waste oil, oil-water mixtures, oily rags,	Listed waste	Liquid waste of this type will be stored at various locations across the site (at source) in waste oil drums, oil-water separators or similar, and either:		

Waste Source	Waste Classification	Management	Qty*	Off-site Disposal
absorbent and oil spill cleanup products (spent)		▪ Removed periodically to the Hazardous Waste Facility, for later removal off-site by a licenced transporter, or ▪ Removed periodically from each source by a licensed transporter. Material removed from the site will be processed to recycle (4) or recover (5) oils for reuse, with residual material, including solids, disposed to licensed landfill facilities (6).		
Empty chemical and hazardous materials drums and containers	Potentially Listed Waste if containing the residue of a Listed Waste	Waste containers will be stored within bunded areas inside the Hazardous Waste Facility. Alternatively, containers double rinsed with fresh or salt water may be stored as non-hazardous materials (not in bunded or roofed areas) prior to removal off-site		
Oil contaminated soil	Listed Waste	No oil contaminated soil is anticipated to be generated on site. However, in the event of an incident, only a small amount (<20 L) may be expected. This can be removed with spent absorbent material as described in the above row for disposal off-site to a licenced facility (6). If larger quantities (> 20L) are involved, onsite soil conditioning will be used where practicable, involving laying out, turning and fertilisation (potentially with nutrients from pond waste) to allow microbes to break down hydrocarbons in the soil (5). Regular soil testing will be undertaken by Project Sea Dragon to determine when the soil can be considered 'clean' for reuse (as fill) back on the site (this is not anticipated to be required, however if it is, an approval from NT EPA would be sought prior to undertaking on the site).		
Paints and solvents	Listed Waste	These materials will be stored in sealed drums at source, and regularly removed to the Hazardous Waste Facility for later transport off-site by licenced transporter to a licenced facility. Recovery (5) or disposal (6) may then occur off-site.		
Vehicle washbays - wash waters, first flush runoff	Listed Wastes	Wash-bays will produce oil-water mixtures, and biocide containing waters for disposal. An oil-water separator will separate oily water from the treatable water that will be pumped to the onsite package waste water treatment system (5), with the oil-water residue treated as described above in 'Used oil/fuel filters, waste oil, oil-water mixtures, oily rags, absorbent and oil spill cleanup products (spent)'.		

Waste Source	Waste Classification	Management	Qty*	Off-site Disposal
Sewage Sludge and Grease Trap waste	Listed waste	This material will be stored at and accumulate at various locations across the site (at source) and will be removed periodically from each source by a licensed operator, and transported off-site to a licensed facility for soil conditioning and recovery (5) or disposal (6).	Construction: 160kL/y Operation: 120kL/y	
Sewage effluent	Sewage Effluent	Effluent will be treated by on-site wastewater treatment plants and disposed of by land disposal systems. This is nominally number (6) in the hierarchy, although effective treatment and disposal will be much more benign than would be waste disposal to landfill.	Construction: 750kL/y Operation: 359kL/y	
Defunct and damaged vehicles and equipment (pumps, motors, aerators, electrical equipment, computers, etc.)	General or Recyclable waste	These will be either transported off-site for recycling (4), reuse (3) or for disposal (6) at appropriately licensed facilities		
Operation				
Feed bags	General or Recyclable waste	Feed bags will generally be a woven polypropylene bulka bag. This will be either reused by filling with sand/cement mix and using as armour for scour protection (3), removed from site for recycling where possible (4), or disposed of to a licenced off-site landfill (6). Reduction of this waste stream (1, 2) is achieved through improving the Feed Conversion Ratio in ponds, related to pond management, and will be an ongoing refinement process for economic and environmental reasons.		
Waste (spoiled) feed	General waste	In small quantities, this material might be used as fertiliser to assist with the growth of vegetation (landscape or stabilising vegetation) under cover to avoid attracting pests, or disposed of to a licenced off-site landfill with general waste (6). In larger quantities (an unlikely and emergency type situation), this material can be conditioned with farm/settlement pond waste (soil composting). This would be undertaken in windrows adjacent to the landfill site until the material is suitably benign to use as topsoil dressing or fertiliser on the site (5).		

Waste Source	Waste Classification	Management	Qty*	Off-site Disposal
Laboratory waste	General waste Listed Waste	General waste will be disposed of to landfill (6). Clinical waste would be expected to be minimal (if any), and if required will be appropriately packaged, stored within the hazardous waste facility, and transported off-site by licenced transporter to a licenced site for disposal (6).	Included above 50L/y	
Seawater settling pond sediments	Inert Waste	This material can be stockpiled for reuse on-site in revegetation, soil stabilisation and rehabilitation (3), including in soil improvement for higher organic load material such as farm pond spoil, and in soil conditioning or windrowing activities	31t/y	
Discharge water pond sediments	Listed Waste	Sediments from ponds, tanks and discharge settlement ponds that contain aquaculture water are to be placed in a dedicated sediment drying area in accordance with the Environmental Code of Practice for Australian Prawn Farmers (Donovan, 2003). The drying area will have a bund wall constructed around it and an internal perimeter drain will divert all rainwater that falls in this area back into the ponds so to prevent any influence on surrounding waterways. This material is initially anoxic, but upon drying and stabilisation is an inert waste, although high in nutrients. The material is likely to be useful for topdressing berms and embankments for revegetation and may represent a useful and valuable resource (3). It may also be mixed with other organic wastes to improve soil conditioning if undertaken on the site (5). Where not able to be used on the site, the material will be stockpiled and compacted into a low stable landform (6).	73t/y	
Dead prawns	Listed Waste	Prawn mortalities will be either: - incinerated onsite via a dual-chamber diesel-fired marine waste incinerator, with the ash (also a listed waste) disposed of by a licensed contractor to a licensed facility (6), or - frozen, for subsequent disposal via a licensed contractor (6) Where major quantities arise as part of a notifiable disease outbreak, this will be handled by the official regulatory process, involving development of a plan by DPIR Fisheries and the proponent, covering shutdown of parts or all of the facility, agreed treatment and disposal of prawns. Disposal would be via a method guaranteed to avoid spread of disease / prawn remains, odour, etc.	Prawn mortalities: 53.4t/y Ash for disposal: 1.1-3.4 kg/week	

Table notes: (1) Avoid; (2) reduce; (3) reuse; (4) recycle; (5) recover; (6) dispose
* Estimate if not known

C10 Air and Noise Management Strategy

REF: EN02-PR4101, REV. D

TABLE C10.1 - AIR AND NOISE MANAGEMENT STRATEGY

Element	Detail
Applicable site activities	Primarily construction, particularly, earthmoving machinery, dust generation from vegetation clearing and earthworks Operational phase power generation, odour from sewage treatment plants and sediment/sludge disposal
Aim	Protect the health, welfare and amenity of people due to noise and air quality impacts.

Objectives	Targets	Key Performance Indicators
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - No dust, odour or air quality impacts to sensitive receptors - No noise impacts to sensitive receptors	T3.3 No Complaints	# of complaints

Responsibility	**Construction**: Construction Manager **Operations**: Site Manager
Actions / Mitigation Measures	**Dust** Water will be applied periodically to unsealed road and construction area surfaces used for mobile plant and vehicle traffic. Speed limits will be enforced for all vehicles on unsealed roads. Vegetation clearing will be limited and exposed areas revegetated, where possible. Weather reports will be checked daily to enable action to be taken immediately if conditions change. Control measures will be implemented in a way that also controls for dust while the site is unattended, e.g. at night or on weekends. A site 'shut down and cover up' policy will be implemented during periods of extreme weather conditions. Additional dust control methods that can be employed where required to control impacts include: - Physical barriers around dust generating activities (dust fences – note: wind fencing is generally suitable for a distance downwind of 15 times their height) - Dust suppressants on stockpiles or berms / slopes. **Odour** Sediments that are likely to be odorous will not be disturbed when conditions are likely to disperse the odour toward any sensitive receptors (i.e. not on poor dispersion, light wind days). On-site sewage treatment plants will be operated efficiently so as to minimise or eliminate odour (well-run plants typically do not produce excessive odour). Implement *C11 Effluent Management Strategy*.

Element	Detail
	Noise Undertake works with the potential to affect noise sensitive areas only between the hours of: - 7 am to 7 pm Monday to Saturday - 9 am to 6 pm Sunday or Public Holidays All equipment will be selected to minimise noise emissions. Equipment will be fitted with appropriate silencers and be in good working order. All engine covers will be kept closed while equipment is operating. The height at which material is dropped into or out of trucks will be minimised as far as practicable. Vehicles should be kept properly serviced and fitted with appropriate mufflers. The use of exhaust brakes will be minimised, where practicable. Machines found to produce excessive noise compared to industry best practice will be removed from the site or stood down until repairs or modifications can be made. To reduce the annoyance associated with reversing alarms, broadband reversing alarms (audible movement alarms) will be used for site equipment where working near sensitive areas.
Monitoring	As part of regular site inspections (weekly during construction and operation), observations will be made of dust, odour, air quality and noise from site works. Any unacceptable noise will be recorded in the Site Manager's logbook for follow up and rectification. Monitoring will be conducted at sensitive receptors where a complaint (non-vexatious) has been made, where evidence is required against air quality criteria, with the monitoring selected as follows: - Dust: PM_{10} and dust deposition - Odour: H_2S monitoring as an indicator, or odour unit sampling if required - Noise: According to AS 1055.1 - 3: Acoustics
Reporting	Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up. Any monitoring results will be retained and summarised into annual monitoring / environmental performance reporting.
Corrective Actions	Corrective Action Triggers: - Noise, dust or odour complaint - Observed excessive noise, dust or odour emissions - Odours in proximity to sewage treatment plants. Corrective Actions: - Respond to the complaint on the same day if possible and determine the time, location and possible source - Rectify any problems identified if practicable, and if non-vexatious, consider monitoring to determine whether air or noise quality criteria are being exceeded - Follow up on complaints after rectification works to determine if they have been successful - For sewage treatment plants, inspect the plant, and determine if system needs maintenance, such as sludge pumping or other works to ensure efficient operation. Additional odour control systems may be required to be retrofit.
References NT EPA (2014) Noise Guidelines for Development Sites in the Northern Territory. Northern Territory Environment Protection Authority, May 2014 New South Wales (NSW) Industrial Noise Policy	

Element	Detail
	DEC (2005). The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales. NSW Department of Environment and Conservation EPA Victoria (2013) Recommended Separation Distances for Industrial Residual Air Emissions. EPA Victoria, Publication Number 1518, March 2013. AS 1055.1-1997: Acoustics – Description and measurement of environmental noise, Part 1 General procedures AS 1055.2-1997 Acoustics – Description and measurement of environmental noise, Part 2 Application to specific situations AS 1055.3-1997 Acoustics – Description and measurement of environmental noise, Part 3 Acquisition of data pertinent to land use

C11 Effluent Management Strategy

REF: EN02-PR4602, REV. E

TABLE C11.1 - EFFLUENT MANAGEMENT STRATEGY

Element	Detail
Applicable site activities Construction and Operation activities producing sewage effluent	
Aim Ensure sewage effluent generated by the Project is appropriately managed, treated and disposed so as to minimise the risks of environmental pollution, human health impacts, and public health nuisances.	
Objectives	**Targets** / **Key Performance Indicators**
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions **Key Performance Indicators:** # of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - Protection of ecosystems, land systems and amenity - Sustainable long-term domestic effluent land disposal schemes operated at the site	T3.1.3 Sewage treatment plant effluent quality is suitable for land disposal T3.2.2 No unplanned or unauthorised releases off-site - no overflows T3.4.2 No damage to flora or vegetation communities due to irrigation scheme T3.5.4 No soil quality or structural decline due to land disposal scheme T3.7.1 No negative changes to groundwater quality due to land disposal areas **Key Performance Indicators:** Compliance with Hazardous Materials Management Strategy Compliance with relevant guideline levels Degree of change over time - to groundwater quality in proximity to disposal areas, particularly for salinity, nutrients, pathogens (E.Coli indicator) - to soil quality, particularly for salinity, nutrients, heavy metals, pathogens (E.Coli indicator) - to disposal area vegetation health
Responsibility	**Construction**: Construction Manager **Operations**: Site Manager In both cases, nominate a person with responsibility for managing and maintaining the sewerage scheme.
Actions / Mitigation Measures	**Source Control** Only effluent suitable for treatment in the sewage treatment plant to drain into the sewer. Quality dependant on STP type and manufacturers / suppliers recommendations. Provide warning signs in kitchens, toilets, etc. warning of what not to flush to avoid overloading or destabilising the treatment plants. **Treatment Plant and Irrigation Area** Wastewater treatment plants and Land Application Areas (LAAs) will be sized appropriate to the hydraulic load and the soils to avoid overwatering as per the requirements of the *Code of Practice for small on-site sewage and sullage treatment systems and the disposal or reuse of sewage effluent* (THS, 2014), specifically by: - matching hydraulic load to the hydraulic capacity of the soils - matching nutrient application rates to the nutrient assimilation capacity of the soil/vegetation system, and - managing salinity buildup by using a salt leaching fraction (if required). Flow meters will be installed to measure the daily amount of treated water applied to each separate LAA, recorded on a daily basis to ensure that the scheduled volume is not exceeded.

Element	Detail
	Adopt suitable buffers between LAAs and sensitive receptors, as outlined in THS (2014). Review buffer distances at detailed design to ensure no odour nuisance will occur. Erect appropriate signage complying with *AS 1319 Safety signs for the occupational environment* indicating that treated water is not suitable for drinking at every outlet from the treated effluent distribution system. Signs shall be easily visible and maintained regularly. Signage shall also be provided and maintained at the irrigation area informing of the use of treated effluent for land irrigation. Piping and fittings shall be installed and colour coded in accordance with *AS/NZS 1547:2012 On-site domestic wastewater management*, *AS 3500 National Plumbing and Drainage Code*, and *AS 1345-1995 Identification of the contents of pipes*. Any fittings/valves accessible by public must be appropriately secured to restrict access. **Alarms and Contingency** An alarm system shall be installed on the treatment plant to warn of system malfunctions, high level alerts and potential overflows before they occur (strobe light or similar). All pump stations to be similarly alarmed. **Maintenance** Do not drive or park vehicles, build structures or create shade on land application areas. Maintain diversion bunding to keep overland flow water from running across land application areas. Regularly mow and remove excess grass from LAAs. Do not allow trees or large vegetation to grow in this area where roots may disrupt subsurface irrigation systems. Ensure system is maintained in accordance with manufacturer's instructions, including routine flushing of irrigation pipework, and cleaning of filters.
Monitoring	Systems are to be routinely visually inspected to ensure they are not overflowing, that LAAs are not being overloaded, no excessive odours are being generated, and that treatment plants are operating efficiently and effectively. Regular visual monitoring of LAAs for signs of: - Soggy ground with or without ponding evident on the land application area - Patchy vegetation growth (or limited growth) indicating blockages or preferential flow pathways to deeper soils - Drains and toilets running slowly, which may indicate a blockage in the pipework or treatment system - Excessive effluent odour (both land application and sewage treatment systems) which may indicate the system is not performing adequately. Quarterly sampling of water quality including E.coli, BOD_5, turbidity/total suspended solids, nutrients (Total nitrogen and phosphorous) and major cations (Ca, Mg, K, Na). After 2 years, if levels are stable, reduce to 6 monthly sampling.
Reporting	All monitoring results are to be maintained on-site, and inspected by a person with sufficient knowledge of on-site sewerage treatment plants. Compile all results into an annual monitoring report for internal dissemination, and provision to authorised government officers, on request. Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up.
Corrective Actions	Corrective Action Triggers: - Excessive odour generated from the treatment plant (whether complaints are received or not) - High level alarm is triggered - Water quality exceedances

Element	Detail
	▪ Evidence of decline of disposal area soils Corrective Actions: ▪ Inspect and undertake repair or maintenance of treatment plant ▪ Check for blockages or pump failures. If required, pump out to temporary holding tank before reintroduction back to plant before the material can go septic, or organise for a licenced contractor to pump out system and remove off-site ▪ Investigate source of issue with plant and undertake repair or mitigation. If necessary, additional plant or equipment may be required ▪ Where irrigation soils are showing signs of decline, improve water quality from the plant (better process control, additional equipment), reduce irrigation rates), or allow irrigation area to rest (irrigate alternative location).
References THS (2014). Code of Practice for Small On-Site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent. Environmental Health Program Directorate, Territory Health Services, July 2014	

C12 Hazardous Materials Management Strategy

REF: EN-PR4051, REV. J

TABLE C12.1 - HAZARDOUS MATERIALS MANAGEMENT STRATEGY

Element	Detail
Applicable site activities	All activities involving storage of listed wastes, potentially hazardous chemicals, substances or waste. May include storage, handling or transport of: ▪ fuels in minor quantities and in bulk tanks ▪ hydrogen peroxide in bulk tanks (up to 10,000L) ▪ pesticides and herbicides (minor quantities) ▪ waste oils/water, hydrocarbons/water mixtures, emulsions ▪ lead acid batteries, paints and solvents ▪ grease trap waste and sewage sludge ▪ clinical and laboratory waste ▪ concreting works producing concrete washout waste ▪ wastes of any of the above. Storage will generally involve minor storage quantities across the site, other than some bulk stores at the farms/farm services, and a central chemical storage facility at the Central Facilities.
Aim	Ensure hazardous substances are appropriately managed to minimise the risks of environmental pollution and that land and soil, surface and groundwater resources are protected both now and in the future, such that the ecological health and land uses, and the health, welfare and amenity of people are maintained.
Hazardous Substances	Hazardous goods are substances that have the potential to cause harm to people, property and the environment. For the purposes of this strategy, *hazardous substances* include: ▪ Dangerous goods, classified as having the potential to cause immediate harm to people, property or the environment due to their explosive, corrosive, toxic, oxidising or flammable nature. ▪ Chemicals if they are listed on the national Hazardous Substances Information System and are above the concentration level which is harmful to human health. ▪ Listed wastes, if they are listed in Schedule 2 to the *Waste Management and Pollution Control (Administration) Regulations 1998* (NT), but excluding pond sludge and pond / aquaculture waters The above applies to whether the substances are products to be used or wastes to be stored and disposed.

Objectives	Targets	Key Performance Criteria
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - No release of hazardous substances causing or having the potential to cause environmental harm or impacts to human health and wellbeing	T3.2.1 No releases of hazardous substances outside of containment areas or off-site T3.2.3 All rags, absorbents, soils, or containers containing hazardous substances contained on the site T3.5.1 No soil contamination	# of incidents # of failures recorded in site inspections

Element	Detail
Responsibility	**Construction**: Construction Manager **Operations**: Site Manager

Actions / Mitigation Measures	**Compliance with relevant statutory requirements**
	
	Comply with the requirements of the *Work Health and Safety (National Uniform) Act* (NT) and Regulation (WH&S Act, WH&S Regulation) particularly in regards to hazardous chemicals. This includes:
	
	▪ Maintenance of a hazardous chemical register
	▪ Notification to NT Worksafe and provision of manifest where hazardous chemicals in excess of the manifest quantity in Schedule 11 of the WH&S Regulation are stored on-site
	▪ Notification to NT Worksafe where hazardous chemicals exceed the threshold quantity detailed in Schedule 15 of the WHS Regulations by 10%. A licence may also be required.
	
	General
	
	All staff to be trained in the safe handling, storage, use and disposal of hazardous substances.
	
	All plant, containers or other equipment used for the storage, handling, or transporting of hazardous substances to be maintained in a safe condition.
	
	Disposal of potentially hazardous substances to be undertaken in accordance with the requirements in the safety data sheet (SDS). This includes any spill absorbent material, rags, containers (empty or otherwise), soil, etc. contaminated with the material.
	
	All hazardous substances shall be stored, used and handled in accordance with the requirements of the SDS and the approved label for the substance.
	
	A substance may be used other than in accordance with the labelling requirements, where a veterinary surgeon has prescribed the use of the substance to avoid imminent loss of prawns, and prior written approval has been obtained from the Australian Pesticides and Veterinary Medicine Authority.
	
	All substance containers to be correctly labelled.
	
	Site storage and containment requirements
	
	Store all hazardous substances (including their wastes) in designated storage areas designed to appropriate Australian Standards (refer end of table for examples). These require as a minimum:
	
	<u>Construction</u>
	
	▪ Internally bunded fuel tanks, with spill kits on hand. Permanent installations will be externally bunded around fuel dispensing areas. Chemicals and other hazardous substances to be stored in temporary (or permanent once built) hazardous storage facilities, including a containment system in accordance with the relevant Australian Standard. Where no relevant Australian Standard exists, the containment system must be sized to contain at least 110% of the volume of the largest container within the area.
	▪ Concrete batching and concreting to contain all liquid concrete waste, including by recycling, to minimise any discharge, with the residual after drying dug out and disposed as a listed waste (licensed transporter to a licensed facility), or reused in batching or construction on-site. A designated area or areas are to be defined for washout of equipment that is able to fully contain the washwaters
	▪ Paints must not be washed onto the site or into waters.
	  ▪ Water based painting equipment may be wiped clean, with washwaters left to settle and the residual (after decanting out clean water over pervious vegetated areas) disposed of to general waste. A designated area or areas are to be defined for washout of equipment that is able to fully contain the washwaters.
	  ▪ Oil based painting equipment should be washed with the solvent retained, settled or filtered for reuse of the solvent, and the waste residue and solvent kept in a sealed container for off-site disposal to a licensed site via a licensed transporter.

Element	Detail
	Operation - An impermeable base (concrete typically) - A containment system so that the total bunded storage meets the bunding requirements of relevant Australian Standards (see references below for some examples). Where no relevant Australian Standard exists, the containment system must be sized to contain at least 110% of the volume of the largest container within the area - Roofed, or provision to remove or treat all stormwater as contaminated water through oil water separators - Sumps and pipework to allow the area inside the bund to be completely drained - No breaks through the bund - all pipes to go over the bund wall, trafficable sections to go over the height of any bund - Specific storage containers or sections for specific items, ensuring separation of incompatible chemicals (refer to SDS, AS1940, etc.) - A detailed site plan to be prepared for each storage location to include layout plan, location of spill kit, emergency exit, any emergency/contingency measures (emergency stops etc.), location of PPE, and location and direction of any overflow discharges (if they were to occur) and receiving environment for these discharges - An overall site plan including the location of above storage locations - SDS for all substances stored at the storage location to be included with the above plan **Fuel transfer and refuelling operations** Construction - Adopt operational controls when they have been constructed - Small or day tanks to be double lined and/or stored in suitable containers to mitigate the risks of spills or leaks - Store all other quantities and bulk hazardous substances within suitably bunded areas - Spill control equipment is to be deployed prior to the transfer of fuel or oil within 30m of a drainage line or the pond, and refuelling is to be attended at all times Operation All bulk transfer and regular re-topping or refuelling points to be bunded to contain the largest likely spill Refuelling locations to also contain: - Automatic wet weather diversion, to capture all flows while refuelling, plus the first flush (typically 15mm) after refuelling stops, triggered by the refuelling hose - Emergency stops in prominent locations to close off all valves and pipes to tanks - Auto shut off valves Fuel will be stored within impermeable and bunded areas (and double skinned storage tanks where required), with refuelling areas being either a built for purpose bunded, concreted refuelling area (larger central storage), or smaller bunded refuelling location (permanent or temporary). Chemicals and waste chemicals, fuel and oil, oil-water mixtures, and waste drums or containers, will be stored within designated roofed and bunded chemical and waste storage facilities. Water within bunds will be treated as contaminated water through oil water (or similar) separators prior to discharge. Water captured within refuelling stations will be preferentially reused within the system with the residual removed from site as contaminated water (licensed transporters to licensed sites). **Spill Response** Ensure spill response equipment of a suitable type and capacity is located on-site in easily accessible locations. These are to include material for spill clean-up within waterways where waterways could be affected.

Element	Detail
	Spills of hazardous materials must not be hosed. Dry cleanup procedures shall be employed as appropriate to the substance. Spill Response Procedures are located in the Contingency Response Plan (Appendix E). **Health and Safety** Comply with the site Health and Safety Plan. In particular, ensure that workers and others are not exposed to risks to health or safety arising from the Project, based on risk assessment and management of risks.
Monitoring	Weekly visual inspections shall be conducted of refuelling/servicing areas and hazardous material containment areas to detect leakages or spills. Inspect spill kits monthly and following each use of a spill kit to ensure they are appropriately stocked. Monthly inspections of containment bunds to ensure bund integrity, and rectify any issues found. Annual tank integrity testing for all bulk hazardous or dangerous goods storage tanks.
Reporting	Details of all regulated waste transfers onto and off the site are to be recorded, including the date, quantity, type, name of transporter, source and intended treatment or disposal destination. Records are to be maintained of the quantity of waste material removed from the site, and chemicals stored on the site that are dangerous goods, hazardous materials, or those with the potential to cause environmental harm. All actual or potentially hazardous substances (products or waste) to be stored on the site to be subject to a risk assessment to identify the level of risk, and thereafter appropriate controls if required (e.g. using Chemalert or similar). Any new chemicals purchased for use to be subject to this risk assessment prior to use. Implement a chemical storage register, to identify types and quantities of chemicals, storage details and location on site, etc. The above risk assessment is to be included with or form part of the register. Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up.
Corrective Actions	Correction Action Triggers: - Hazardous substance located outside of containment facility - Leaks or spills of any substance (hazardous or otherwise, assuming at first it is hazardous) - Structures found to be in need of repair, or potential for spill, leak or breach of containment identified Corrective Actions: - Initiate spill response (refer Spill Response in the Contingency Response Plan - Appendix E) - Rectify leaks, defects or potential for leaks or spills, ensuring first it is safe to do so, and appropriate personnel and PPE are utilised
References Work Health and Safety (National Uniform Legislation) Act (NT) Work Health and Safety (National Uniform Legislation) Regulation (NT) AS 1940 The storage and handling of flammable and combustible liquids AS 3780 The storage and handling of corrosive substances AS 4326 The storage and handling of oxidizing agents AS 3961 Liquefied natural gas—Storage and handling AS 4332 The storage and handling of gases in cylinders	

Element	Detail
	AS/NZS 1596 The storage and handling of LP Gas AS/NZS 3833 - The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers National Standard for the Storage and Handling of Workplace Dangerous Goods. http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/ns200103storageandhandling Australian Dangerous Goods Code. http://www.ntc.gov.au/heavy-vehicles/safety/australian-dangerous-goods-code/ Hazardous Substances Information System (HSIS). http://hsis.safeworkaustralia.gov.au/ NT Work Safe (2016). Dangerous Goods Laws. http://www.worksafe.nt.gov.au/LawsAndCompliance/Pages/Dangerous-Goods-Laws.aspx NT EPA (2015). Guidelines to Prevent Pollution from Building Sites. Northern Territory Environment Protection Authority, Version 1, November 2015. General environmental duty: Code of practice for the concrete batching industry. Accessed from https://www.ehp.qld.gov.au/management/planning-guidelines/codes-of-practise/industry_environmental_codes.html

C13 Bushfire Management Strategy

REF: EN-PR4052, REV. G

TABLE C13.1 - BUSHFIRE MANAGEMENT STRATEGY

Element	Detail
Applicable site activities Construction and Operation, Land management	
Aim To minimise the risk of adverse impact from bushfire on life, property and the environment.	

Objectives	Targets	Key Performance Criteria
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - Reduce the number of human-induced bushfire ignitions that cause loss of life, property and/or environmental harm - Manage fuel loads to reduce the rate of spread and intensity of bushfires, while minimising environmental/ecological impacts. - Reduce the community's vulnerability to bushfires by improving its preparedness	T3.13.1 No human-induced bushfire ignitions that cause loss of life, property and/or environmental harm associated with the Project site T3.13.2 Maintain fuel management zones including low fuel loads in asset protection zones (e.g. assets, fire access trails and property boundary) T3.13.3 Maintain adequate separation distances between hazardous vegetation and Class 1-3 and 10a buildings in accordance with AS 3959-2009 T3.13.4 Manage fuel loads taking into consideration ecological impacts on listed species known to be fire-sensitive T3.13.5 Prepare, maintain and review a detailed Bushfire Management Plan	# of human-induced bushfire ignitions that cause loss of life, and/or damage to property and the environment Measured fuel loads within identified fuel management zones, including asset protection zones # of confirmed losses of listed fire-sensitive species attributable to fuel management activities Availability and familiarity of Bushfire Management Plan to all employees and contractors Review of Bushfire Management Plan annually and after every bushfire event

Responsibility	**Construction**: Construction Manager **Operations**: Site Manager
Actions / Mitigation Measures	A Bushfire Management Plan for the site will be prepared in consultation with Bushfires NT. This will include preparation of risk-based maps to prioritise and evaluate fuel management zones and mitigation activities, including those within asset protection zones. The Bushfire Management Plan will incorporate fire management guidelines recommended to maintain and/or enhance ecological values of the vegetation communities on site. Burning of cleared vegetation, if required, will be undertaken in consultation with Bushfire NT with approval under the Bushfires Management Act (NT). Undertake ongoing liaison with Bushfires NT and nearby volunteer bushfire brigades as necessary. All staff and contractors will be briefed about the impacts of bushfires and burning in asset protection zones and other sensitive areas. Fire-fighting equipment will be made available during construction and operation to prevent fires spreading, with all vehicles to be fitted with fire extinguishers The site manager will be responsible for liaison with the local authorities (e.g. Bushfires NT, Northern Territory Bushfires Council) on severe bushfire hazard days.

Element	Detail
Monitoring	Site inspections will be undertaken of fuel management zones. This will include annual assessment of fuel loads prior to the fire season, especially within asset protection zones. The confirmed location of fire-sensitive species will be identified on fuel management maps in order to minimise impacts (or loss) of fuel management activities on those species.
Reporting	A report will be prepared following all bushfires on the property, including details of location, source and management actions (if any). Annual reports will be prepared outlining implementation of the bushfire management activities identified in the Bushfire Management Plan. Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up
Corrective Actions	Correction Action Triggers: - Bushfire deemed to have ignited as a result of human action - Bushfire encroaching into asset protection zones - Elevated fuel loads within asset protection zones - Confirmed losses of fire-sensitive species as a result of fuel management activities Corrective Actions: - Review Bushfire Management Plan to ensure no breaches of management strategies including monitoring of fuel loads - Ensure Bushfire Management Plan is made available and familiar to all employees and contractors - Survey and identify location of fire-sensitive species within fuel management zones
References *AS 3959-2009 Construction of buildings in bushfire-prone areas.*	

C14 Traffic Management Strategy

REF: EN-PR4701, REV. H

TABLE C14.1 - TRAFFIC MANAGEMENT STRATEGY

Element	Detail
Applicable site activities	Construction and Operation, vehicles on public roads, and on-site roads
Aim	To minimise risks of accidents on-site and off-site, and reduce the impacts of traffic on site receptors (environmental and social). To minimise impacts and maintain productive use of site and off-site roads

Objectives	Targets	Key Performance Indicators
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - Minimise impacts from traffic on and off-site	T3.3 No Complaints T3.12 No increase in traffic incidents during construction and operation compared to baseline including normal growth) at start of construction No accidents on-site	# of complaints # of accidents on-site (by severity) and off-site involving site vehicles or staff

Responsibility	**Construction**: Construction Manager **Operations**: Site Manager
Actions / Mitigation Measures	**Traffic and Access Planning** Develop and implement a Project wide and site-specific traffic management plan, in a format and including details suitable to the risk, such as related to access, proposed haulage routes, vehicle types, protection of existing assets, protection of public access and a risk assessment, and other elements as required. Liaise with relevant agencies, including Transport and Civil Services Division, NT DIPL to ensure traffic arrangements are suitable for the proposed works prior to works commencing. Obtain approvals from relevant agencies where required. **General Controls** Reduce total vehicle travel where practicable, by developing logistics to reduce overall travel distance / time on-site, and for workers travelling to and from the site. Implement fatigue management procedures, to include driving time (as part of the Health and Safety Plan). Monitor site roads for signs of failure and undertake pre-emptive repair works to avoid accidents or delays. Observations from drivers recorded and communicated to NT government on the state of external roads. Liaison to be undertaken to maintain trafficability on these roads. Implement speed limits on site to: - Reduce dust generation - Reduce the potential for fauna injury or death, and consequent vehicle damage and human injury (or death) - Ensure safe vehicle operation on the site.

Element	Detail
Monitoring	All accidents and near misses on-site to be recorded in the incidents-complaints register. All off-site accidents involving Project drivers, employees and/or vehicles to be recorded in the incidents-complaints register. Encourage reporting of near misses. Monitor road pavement condition on-site, and undertake visual observations of external haulage routes.
Reporting	Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up. In the case of a vehicle accident, an incident form will be required under the site Health and Safety Plan. Undertake an investigation to determine whether future accidents of this type can be reasonably avoided, and implement measures to do so.

C15 Social Impact Management Strategy

REF: EN02-PR4801, REV. C

TABLE C15.1 - SOCIAL IMPACT MANAGEMENT STRATEGY

Element	Detail
Applicable site activities Construction and Operation	
Aim The overall aim is to monitor and manage the intended and unintended social and economic consequences, both positive and negative, of the Project.	

Objectives	Targets	Key Performance Indicators
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - Minimise negative social impacts on the surrounding area during construction and operations	T3.3 No Complaints T3.12 No increase in traffic incidents during construction and operation compared to baseline (baseline + normal growth) at start of construction	Compliance with *C14 Traffic Management Strategy* # of Complaints # and growth in traffic incidents (infringements and accidents) compared to baseline + projected growth
O5. Maintain positive stakeholder, community and workforce relations	T5.2 Local communities provided with information relevant to their needs T5.3 Set, review and implement regular community and stakeholder communication schedule	# of complaints # of negative media reports # of stakeholder meetings per year
O6. Maximise local recruitment and training and local businesses participation, and enable indigenous training, employment and advancement opportunities in the project	T6.1 Targets for local workforce and for indigenous employment set and reviewed periodically T6.2 Implement indigenous employment, training and advancement program within the organisation T6.3 Maximise opportunities for local sourcing T6.4 No workforce disputes	% of workforce that is local or domiciled locally % of workforce that is indigenous % of supply from local sources # of complaints or disputes

Responsibility	**Construction**: Construction Manager **Operations**: Site Manager
Actions / Mitigation Measures	Establish and work towards achieving targets for Indigenous employment, training and skills development, including Cross-Cultural Awareness Training (CCAT) to improve cultural understanding and communication between Indigenous and non-Indigenous team members. Open and use an Industry Capability Network. Establish Project Sea Dragon Local Community Reference Group (PSDLCRG) for annual review of Project Sea Dragon social impacts and progress against targets and management actions. Implement a short-term accommodation strategy to manage the capacity of local hotels and likely project demand, including monitoring of potential displacement of rooms usually utilised by the tourist industry, and measures to manage the impacts on local services.

Element	Detail
	Establish the following policies and targets: - Indigenous Employment, Training and Business Policy. - Targets for contracting and sub-contracting of Indigenous businesses. - Community Grievance Policy incorporating public complaints register - Local Employment Policy and targets - Local Content Policy and targets. - Traineeships, apprenticeships and other employee development opportunities. - Private property Recreational Fishery Access Policy, balancing public access with biosecurity and other farm management concerns - Driver Safety and Fatigue Management Policy for employees and contractors. - OHS policies as required under law - Implement the Traffic Management Strategy - Implement the EMS Communication requirements and C15.1 Site Communications Plan. Refine the social impact management strategy and implement the above in consultation with the Department of the Chief Minister Social Policy workgroup to ensure the social impact management strategy is appropriate for the Project and site.
Monitoring	The monitoring associated with the social and community aspects of the Project will involve: - Project Sea Dragon Local Community Reference Group (PSDLCRG) annual review of social impacts and progress against targets and management actions - Internal social impact reviews - Maintenance and follow up on complaints register, and annual review.
Reporting	Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up. Provide an annual summary report of community and workforce relations, complaints and any incidents.

C15.1 COMMUNICATIONS PLAN

TABLE C15.1.1. KEY CONTACTS

Contact	Contact Details
Proponent	Project Sea Dragon Pty Ltd Address: Level 11, 225 St Georges Terrace, Perth WA 6000 Australia Postal Address: PO Box 7312 Cloisters Square, Perth WA 6850 Australia Phone: +61 8 9321 4117 Fax: +61 8 9321 4411 Website: http://seafarmsgroup.com.au/project-sea-dragon/ Primary Contact: Chris Mitchell, Executive Director – Seafarms Group Limited Postal Address: U6 Ground Floor, 31-47 Joseph St Blackburn North VIC 3130 Phone: +61 3 9928 5111 Fax: +61 3 9928 5199 Email: chris.mitchell@seafarms.com.au
Construction Manager	Warren Harries Phone: 0477 774 901 Email: warren.harries@seafarms.com.au
Site Manager, OH&S contact	Warren Harries Phone: 0477 774 901 Email: warren.harries@seafarms.com.au *Note: Site specific manager and OH&S personnel will be appointed as Project develops*
Environmental Manager	Kate McBean Phone: 07 3248 0211 Email: kate.mcbean@co2australia.com.au *Note: Site specific environmental personnel will be appointed as Project develops*
Community / Communications Manager	Chris Mitchell Phone: +61 3 9928 5111 Email: chris.mitchell@seafarms.com.au *Note: Site specific communications personnel will be appointed as Project develops*
Seafarms Ltd	Refer Proponent above
24-hour emergency contact (within Seafarms)	Rod Dyer Phone: 0477 774 901 Email: rod.dyer@seafarms.com.au
Pollution Incidents	NT EPA pollution hotline: 1800 064 567 (urgent) OR pollution@nt.gov.au | GPO Box 3675, Darwin NT 0801 (non-urgent)
Boat Strike or other Marine Fauna Incident	Marine Wildwatch hotline: 1800 453 941

Contact	Contact Details
Cultural Heritage	Heritage Branch, Department of Tourism and Culture: 08 8999 5039 OR heritage@nt.gov.au | GPO Box 1680, Darwin NT 0801 Level 1 Arnhemica House, 16 Parap Road, Parap, Darwin NT
Environmental Information	CO2 Australia Ltd
Bushfires, medical and other emergencies	000 (or 112 from a mobile phone) Dundee Volunteer Bushfire Brigade
Reporting for WDL242	NT DENR (WDL Licence reporting): waste@nt.gov.au
Reporting for Vegetation Clearing (Development Permit DP17/0371)	NT DENR (Vegetation Clearing reporting): landclearing.DENR@nt.gov.au

TABLE C15.1.2. INTERNAL COMMUNICATIONS

Communication Type (What)	By (Who)	Frequency (When)	To (Who)		
Incidents, complaints, potential impacts (environmental harm or nuisance)	Site Staff, Sub-contractors	ASAP	Site Manager		
	(as identified in the Contingency Response Plan)				
	Site Manager	As identified in the Contingency Response Plan			

TABLE C15.1.3. STAKEHOLDER IDENTIFICATION

Organisation	Contact Name, Role and Details	Communication	Comments
Dundee Volunteer Bushfire Brigade	TBA Dundee Rd, Dundee Downs NT 0840 (08) 8977 7166	Consult and liaise on bushfire management and issues as required	
Paspaley oyster leases in Bynoe Harbour	TBA	Liaise with as the project progresses to maintain good relations, and ensure no unacceptable impacts occur	

TABLE C15.1.4. EXTERNAL COMMUNICATIONS

Communication Type (What)	Frequency (When)	Objective (Why)	Medium (How)	Audience (Who)	Owner	Deliverable
Project Sea Dragon Local Community Reference Group (PSDLCRG)	Annual	Review of Project social impacts and progress against targets and management actions	Face to Face meeting		Project Manager	Agenda Meeting Minutes Action Plan (if required)
Kick-off Meeting	Prior to works starting on-site	Site familiarization, communication of key issues and constraints, understanding of EMP requirements	Face to face meeting	Site personnel	Site Manager / Construction Manager	Record of attendance
Community Information Sessions	Twice yearly for first 2 years (including construction) – revise as necessary after	To understand community concerns and provide information	Fact Sheets Web site Face to face meetings	Local community Other interested parties	Project Manager	Agenda, meeting minutes Summarised issues and suggestions Maintain complaints / grievance log
Landholder Consultation	Prior to Key Project Stages	To provide information on the project, potential effects and proposed management measures	Mailout Face to face meetings (group and/or one-on-one)	Nearby landholders	Project Manager	Key issues and suggestions from each meeting Summarised issues and suggestions Action plan as required (including timing)

C15.1 COMMUNICATION PLAN PROCEDURES

C15.1.1 Purpose and Scope

This Communications Plan outlines the Key Contacts, Internal and External Communications and Stakeholders for the Project Sea Dragon Core Breeding Centre and Broodstock Maturation Centre, Bynoe Harbour, Northern Territory.

Tables 1 (Key Contacts), 2 (Internal Communications), 3 (Stakeholder Identification) and 4 (External Communications) are detailed above.

C15.1.2 Key Contacts

This should contain all contacts required for the ongoing management of the Project, including site manager, environmental manager, government reporting contacts and departments, etc., and be updated as required to ensure it remains up to date at all times.

C15.1.3 Training and Awareness

This communications plan shall be retained on-site such that all staff have ready access. Training of staff will include reference to this plan and its location, and the communications relevant to their role.

C15.1.4 Records

All deliverables listed in the communications plan (Table 3 above) shall be retained either on-site or electronically so as to be readily accessed as required.

C15.1.5 Review

This plan is to be reviewed and updated prior to works starting on the site, and periodically thereafter, at a minimum annually.

C15.1.6 Definitions

Nil

C16 Cultural Heritage Strategy

REF: EN02-PR4850, REV. E

TABLE C16.1 - CULTURAL HERITAGE STRATEGY

Element	Detail
Applicable site activities	Construction, particularly excavation and vegetation clearing Operation, associated with sacred sites and possible unexpected finds
Aim	To identify and protect items or places which have historic and/or cultural heritage values, and to minimise impacts on cultural heritage values, places and practices.

Objectives	Targets	Key Performance Indicators
O2. Undertake and complete works in compliance with statutory environmental requirements	T2.1 Zero statutory infringements T2.2 No breaches of licence/approval conditions	# of infringements # of non-compliances identified in audits and reviews
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - Minimise impacts on sites or objects of cultural significance - Minimise restrictions on traditional owner access to sites of cultural significance	T3.3 No Complaints T3.10 No damage or disturbance to objects or sites of cultural significance T3.11 Maintain existing access to sites of cultural significance	# of incidents of damage or trespass to areas of cultural significance # of complaints

Responsibility	**Construction**: Construction Manager **Operations**: Site Manager
Actions / Mitigation Measures	Obtain AAPA certification for the proposed project area prior to construction works commencing and comply with the conditions of the certification. Include the conditions of the AAPA Certificate in any contract or tender documents for the works. Ensure that all persons operating on the site as part of the Project are aware of the conditions of the AAPA Certificate and the obligations of all persons who enter on or carry out works or use land on which there is a sacred site under Part IV of the *Northern Territory Aboriginal Sacred Sites Act 1989*. Essentially this requires avoiding sacred sites and limiting recording or communication in relation to the sacred sites, unless in accordance with the Act. Maintain a cultural heritage register on the site for any heritage areas or items requiring protection or avoidance, and where necessary fence off or clearly identify such areas as 'no go' zones. Implement the Unexpected Findings Protocol in the Contingency Response Plan (Appendix E) for cultural heritage finds (indigenous and non-indigenous). Continue to engage with Traditional Owners in the management of potential heritage impacts, and to ensure access is not an issue.
Monitoring	Complaints and any other issues raised in relation to cultural heritage issues will be recorded on the incidents-complaints form and entered into the incidents-complaints register.
Reporting	Any non-conformance, incident or potential incident will be recorded on the incident-complaint form in Appendix F (or similar) and entered into the incident-complaint register for rectification and follow up. The Heritage Branch will be notified in the event that previously unidentified archaeological / cultural heritage sites or objects are encountered, or there is an incident involving cultural heritage sites or objects. Any advice provided by the Heritage Branch will form part of the corrective action.

Element	Detail
	Provide an annual summary report of cultural heritage interactions, relations, finds, and sites. Prepare a heritage register, to be updated with any new finds, and any changes to sites, artefacts or heritage requirements.
Corrective Actions	Corrective Action Triggers: - Cultural heritage artefact or site found during construction works - Complaint received regarding cultural heritage values or access Corrective Actions: - Implement the Unexpected Findings Protocol in the Contingency Response Plan (Appendix E). Record the location of the find on the heritage register
References ICOMOS (2000). The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance. The Australian National Committee of International Council on Monuments and Sites. Available at: http://australia.icomos.org/publications/charters/	

C17 Biting Insect Management Strategy

REF: EN-PR4551, REV. F

TABLE C17.1 - BITING INSECT MANAGEMENT STRATEGY

Element	Detail
Applicable site activities Site establishment Operations Site rehabilitation	
Aim Ensure that mosquito breeding sites are not created or exacerbated through the development of the Project.	

Objectives	Targets	Key Performance Indicators
O3. Minimise pollution and the potential for environmental harm or nuisance on the natural, social and cultural environments: - No biting insect impacts to staff or adjacent landowners	T3.3 No Complaints No biting insect nuisance problems from the Project site	Nuisance levels onsite attributed to biting insects
	No occurrences of biting insect transmitted diseases in Project workforce	Number of biting insect transmitted diseases

Responsibility	**Construction**: Construction Manager **Operations**: Site Manager
Actions / Mitigation Measures	▪ Standing water (such as in ponds and tanks) will be aerated, and completely drained when not in use. The settlement / raw seawater storage ponds will not be aerated, but the water within them is constantly moving, so does not provide optimal habitat for biting insects. Rainwater tanks will be appropriately screened at the inlet and outlet. ▪ Culverts and drains will be installed where required along roads to prevent the shallow impoundment of water. ▪ Inspection of equipment such as tanks, drums, buckets, machinery items and other receptacles sourced from North Queensland for water ponding or evidence of previous water ponding (water stains) to prevent the potential introduction of the dengue mosquito, *Aedes aegypti*, from North Queensland as larvae or desiccation resistant eggs. ▪ Low intensity yellow lighting will be installed in outside areas, where possible, to minimise attracting insects. ▪ Artificial receptacles will be stored undercover away from rain where possible or stored in a manner that prevents the ponding of water and creation of mosquito breeding habitat. ▪ The Project will comply with the Guidelines for Preventing Mosquito Breeding Associated with Construction Practice near Tidal Areas in the NT (Department of Health 2011) and the Guidelines for Preventing Mosquito Breeding Sites Associated with Aquaculture Developments in the NT (Department of Health and Families 2006).
Monitoring	Regular surveys for potential mosquito breeding sites within 5 days of rain occurring twice in the wet season and as required during the dry season.
Reporting	Occurrences of biting insect transmitted diseases are to be reported to the Construction Manager and/or Site Manager and the Department of Health - Centre for Disease Control.
Corrective Actions	Consultation with relevant authorities (i.e. Department of Health - Medical Entomology and Department of Health - Centre for Disease Control).

References

Guidelines for Preventing Mosquito Breeding Associated with Construction Practice near Tidal Areas in the NT (Department of Health 2011)

Guidelines for Preventing Mosquito Breeding Sites Associated with Aquaculture Developments in the NT (Department of Health and Families 2006)

APPENDIX D MONITORING AND REVIEW REGISTER

D1 MONITORING, REVIEW AND REPORTING REGISTER

Description	Details	Responsible Persons	Frequency	Reporting
Audits, reviews, statutory reporting				
EMP Audit / Review	Internal review of EMP to include: ▪ performance against objectives and targets, including from individual sites ▪ review of new or updated legislation and standards ▪ Documents and Records	Environmental Manager	Annual	Report in PSD annual internal report. Store written results of audit in records system.
	Review of relevant parts of EMP on any changes to Project, operations, potential impacts, etc.	Environmental Manager	On changes to Project, operations, potential impacts	Refer to *Document Control*; *Project reports and Licences* below Conduct training on updates as required
	EMP Review and update, to include: ▪ A Review of project operations and potential impacts, identifying any changes and requirements for update ▪ A review of new or updated legislation and standards and requirements for update ▪ Updating the EMP based on the independent third party audit results (see below)	Environmental Manager	1 Feb 2023 On the expiry date of the licence (30 Nov 2027)	Submit by 5pm on the reporting date to DIPR Fisheries for approval.
	Review Decommissioning and rehabilitation plan and submit new copy for approval	Environmental Manager	By 5pm on: ▪ 1 Nov 2022 ▪ 1 Nov 2027	DPIR Fisheries
Project Audit/review	Internal audit of Project to include: ▪ Performance against objectives and targets ▪ General site walkover and assessment of issues and opportunities ▪ Compliance with conditions of approval and licencing / permits	Environmental Manager	Annual	Report in PSD annual internal report. Store written results of audit in records system

Description	Details	Responsible Persons	Frequency	Reporting
	▪ Assessment of social impacts Independent third-party audit of compliance with Project EMP. As well as being suitably qualified and experienced, the auditor must be registered in a register established under S68 of the *Waste Management and Pollution Control Act* (NT).		5-yearly, starting on ▪ 1 Nov 2022 ▪ 1 Nov 2027	Submit auditor's report to NT EPA and DPIR Submit by 5pm on the day of reporting
Energy Audits	Annual accounting of energy use against energy and energy intensity targets. Review annual accounts and identify opportunities for improvement	Site Manager	Annual 5-yearly	Include in site internal annual reports
Waste and Recycling Audits	Annual accounting of waste production against waste and recycling targets Review annual accounts and identify opportunities for improvement	Site Manager	Annual 2-yearly	Include in site internal annual reports
Social – Community Reference Group	Project Sea Dragon Local Community Reference Group (PSDLCRG) review of social impacts and progress against targets and management actions	Project Manager PSDLCRG	Annual	Include in site internal annual reports Public reporting as per PSDLCRG requirements
Training Needs Analysis	Annual review of personnel and training needs, training conducted. Conducted at corporate level and site specific	Environmental Manager Site Manager	Ongoing Annual review	Ongoing as needed Included as part of annual audits / reviews
Document Control	Document register to be updated for all new documents and revisions of existing documents. Annual review / audits to include review of available documentation, ensuring new documents or revisions are captured, and available documents (print and electronic copies) are up to date.	Environmental Manager Site Manager Document Author(s)	Ongoing Annual review	Included as part of annual audits / reviews

Description	Details	Responsible Persons	Frequency	Reporting
Project reports and Licences	Responsible Person: Environmental Manager Publish and maintain updated versions of the following on the Project website: ▪ Environmental Management Plan and subplans ▪ Auditor's reports of compliance against the EMP ▪ WDL licence Maintain the following on the site in hardcopy format: ▪ WDL Licence Provide the following: ▪ NT DENR: WQMMP, Emergency Response Plan (ERP), EMP once completed in the 2020 Annual Return; Annual returns, annual monitoring reports ▪ NT DPIR: Decommissioning and rehabilitation plan (DRP) – Submit draft DRP for approval within 12 months of the date of commencement ▪ Consent Authority : If required, Acid Sulfate Soil Management Plan (ASSMP) (to landclearing.DENR@nt.gov.au) ▪ Consent Authority: Erosion and Sediment Control Plans (ESCP) – certified plans (by Auditor CPESC) prior to works commencing on-site Changes to reports: ▪ Obtain prior written approval for any changes to the following plans from the Consent Authority (DENR, landclearing.DENR@nt.gov.au): ▪ ESCP, ASSMP, WMP			
Agency notification and advice requirements	Notify NT DENR to advise the estimated start date for the clearing and contact details for the person who will be undertaking the clearing (notify again if any of the above details change)	Project Manager Site Manager	Prior to any vegetation clearing on the site or if the details change	Advice provided to Department in writing DENR Land clearing: landclearing.DENR@nt.gov.au
	Notify NT DENR of the identity of the CPESCs to be used to prepare the ESCPs and to audit the ESCPs and their implementation.			NT DENR
	Notify NT DENR when discharges commence and when discharges cease. Provide monitoring data relating to the discharge.		As soon as practicable after	NT DENR
	Advise the NT EPA, NT DENR and any other responsible agency if the Project is altered such that the environmental significance of the Project may have changed, including any actual or potential increase in the potential for environmental harm.		Prior to implementing the change	NT EPA, NT DENR

Description	Details	Responsible Persons	Frequency	Reporting
	Notify NT DPIR Fisheries at least 12 months prior to undertaking any action under the Decommissioning and rehabilitation plan		At least 12 months prior to the activity	NT DPIR Fisheries
	Notify the Department of Health - Centre for Disease Control of any occurrences of biting insect transmitted diseases		As soon as practicable after	Department of Health - Centre for Disease Control
	Reports, monitoring data, etc. required under a licence, permit or condition		Within 10 days of request (unless otherwise stipulated)	
	Update contact details with Agencies in relation to licenses held		On any change	
	Notify DPIR of activities or actions that indicate the business or activity may no longer function or operate, in accordance with Aquaculture Licence C1/554 condition #7.2		Within 5 days of the noted activities or actions occurring	DPIR
Annual Reporting	Annual return for WDL	Environmental Manager Site Manager	Annually ≤20 business days of anniversary date (by 6-Mar)	Submit to administering authority
	Monitoring Report for previous 12 months		Annually ≤10 days of anniversary date (by 21-Feb)	Provide to DENR
National Greenhouse and Energy Reporting Act 2007 (Cwth) Reporting	Undertake an initial assessment (year 1). Should the Project trigger the NGER thresholds, reporting will be required under the Act. Determine if the thresholds may be triggered in the future, and schedule another review before that time.			
Project signage	Install signage (in English) in a prominent location at each public entrance to the premises that includes the WDL licence number and 24 hour emergency contact details.	Project / Site Manager	20 days prior to commencement	Record photographic evidence of installation and retain in record system

Description	Details	Responsible Persons	Frequency	Reporting
Pre-Construction				
Pre-construction soil sampling and characterisation	Representative sampling of soil profiles for fertility characterisation, salinity and sodicity	Project Manager	Prior to construction	Maintained in site records Map of results prepared
Pre-construction site reconnaissance inspection	For all construction areas to identify: - Unstable, shallow or otherwise problematic soils, or evidence of soil contamination - Drainage lines and watercourses, and other prominent site features - Excavation test pits or bores (after vegetation clearing) to the depth of excavation + 0.5m to confirm soil depths and types to be encountered.	Project Manager	Prior to construction	Maintained in site records Map of results prepared
Pre-construction Acid Sulfate Soils (ASS) assessment	Pre-construction monitoring for ASS presence and management requirements for all construction areas with potential to intersect ASS, in accordance with Qld ASS guidelines, as varied by C3 Acid Sulfate Soil Management Strategy. Involve testing to the depth of disturbance + 1.0m in accordance with Ahern *et al* (1998) (field and oxidised pH at 0.25m intervals, chromium reducible sulfur suite analysis at 0.5m intervals).	Project Manager	Prior to construction commencing	Maintained in site records Map of results prepared ASSMP prepared by CPSS
Pre-construction vegetation survey	Undertake flora and vegetation surveys of the Project area (by a suitably qualified botanist) prior to any clearing or earthmoving activities for the presence of *Cycas Armstrongii* or *Monochoria Hastata* (Arrowleaf Monochorea). Identify any fire-sensitive species found during the survey in order to minimise impacts of fuel management activities on those species.	Project Manager	Prior to construction commencing	Results collated into a Significant Flora Species Survey report and the site vegetation map updated as necessary. Update site vegetation map to include the location and type of fire-sensitive species or communities

Description	Details	Responsible Persons	Frequency	Reporting
Pre-construction Weed survey	Conducted within the Project footprint + 200m buffer to determine the location and extent of weeds	Project Manager	Prior to construction commencing	Data used to prepare a spatial map of weeds and pests presence on the site, and a register of pertinent information in relation to weed and pest distribution, numbers and control requirements Include results in annual monitoring report
Implement Water Quality Monitoring Program	Implement the program outlined in the Water Quality Management and Management Plan (WQMMP)	Project Manager	Prior to construction commencing	Maintain records Reporting requirements outlined in WQMMP
Pre-clearance survey trigger areas	Identify areas where pre-clearance surveys required prior to clearing commencing	Project Manager	Prior to clearing	Prepare map of identified areas and maintain. Provide to Construction Manager
Pre-construction geotechnical assessment	Additional geotechnical assessment as required to properly inform design and construction.	Project Manager	Prior to construction	Maintain record of assessment and reports. Provide to design team.
Construction Phase				
	Obtain ownership or landowners consent (and notify to DENR).	Project Manager	Prior to any clearing	Forward written landowners consent to DENR (landclearing.DENR@nt.gov.au)
Site Inspections	Inspections of site controls and for any rectification requirements, signs of spills, leaks or other potential pollution issues, dust, odour, air quality and noise from site works Check diversion structures and other areas for trapped or injured wildlife or fish. Monitor all work areas before work commences each day for fauna that may have become trapped Cleared area extents to ensure retained vegetation not impacted, or for damage or decline in retained vegetation	Construction Manager	Weekly and after any rain event Daily Monthly	Results recorded in site manager's logbook Any issues recorded in incident-complaint form and register and actions assigned

Description	Details	Responsible Persons	Frequency	Reporting
Erosion and Sediment Control Audits	Audits of the implementation of Erosion and Sediment Controls based on the certified ESCPs	Construction Manager CPESC engaged to review and certify ESCPs and implementation	As identified in ESCPs Reporting ≤7 days after each inspection	Provide confirmation to DENR of compliance with the detailed ESCPs after each inspection Any issues recorded in incident-complaint form and register and actions assigned
Geotechnical inspection of works	As required for structural elements – to confirm subgrade conditions and construction quality and requirements	Construction Manager	As needed during construction	Maintained in site records
Implement Unexpected Findings Protocol	Unexpected Findings Protocol requires observation and diligence to identify potential heritage items, contamination, etc. during construction	Construction Manager	At all times	Any unexpected finding to be recorded in incident-complaint form and register and actions assigned
Acid Sulfate Soils (ASS)	Test and manage in accordance with C3 Acid Sulfate Soil Management Strategy. Identified ASS to be tested before and after any liming / neutralisation treatment, such that no net acidity remains and no chance of oxidation can occur in-situ	Construction Manager	As required – all ASS	Maintain ASS register to record: • Location of all ASS testing and identified ASS • Results from all testing including location • Location of all ASS material before and after any movement, details of treatment including source, time of exposure, treatment results and destination for each batch
Topsoil tracking	All topsoil will be tracked unless used locally in the course of cut to fill earthworks, to ensure that the source and fate of all topsoils across the site are known – where topsoil is removed from weed infested areas, this will not be spread across the site, to limit spread of weed seeds	Construction Manager	As required – all topsoil movement	Register of topsoil movement – source, quantity, movement location

Description	Details	Responsible Persons	Frequency	Reporting
Weed monitoring	Monitor in accordance with the requirements of the Weed Management Plan	Environmental Manager	Annually between April-June (inclusive) for up to one year after construction is finished	Update weeds and pests plan and register Notify the Weed Management Branch of the NT DLRM of presence of any new Class A – C weed
Implement Water Quality Monitoring Program	Implement the program outlined in the Water Quality Management and Management Plan (WQMMP)	Project Manager	During construction	Maintain records Reporting requirements outlined in WQMMP
Bank stabilisation and scour monitoring	Install pegs on banks in proximity to infrastructure to provide a baseline for further erosion and scour monitoring and protection works, particularly at the inlet and outlet Monitor bank location during works	Construction Manager	At start of construction Monthly	Results recorded in site manager's logbook
Waste monitoring	Update the waste inventory contained in C9.1 Site Waste Management Plan to record all waste types, quantities produced, and management measures used for each Record details of all listed wastes removed from the site, including the type of waste, quantity removed, transporter, destination, and treatment/disposal method (if known)	Construction Manager	As required – all waste	Maintain records Update Waste Inventory
Dust, odour and noise	Monitoring will be conducted at sensitive receptors where a complaint (non-vexatious) has been made, where evidence is required against air quality criteria, with the monitoring selected as follows: - Dust: PM10 and dust deposition - Odour: H2S monitoring as an indicator, or odour unit sampling if required - Noise: According to AS 1055.1 - 3: Acoustics	Construction Manager	If required	Maintain records

Description	Details	Responsible Persons	Frequency	Reporting
On-site effluent treatment systems and disposal areas	Baseline soil monitoring in any new disposal areas (prior to operation of plant), to include monitoring for nutrients, major anions and cations, pH, salinity, and heavy metals. Monitoring of any operating plant / disposal systems in accordance with operational phase requirements.	Project Manager	Once prior to operation of plant	Retain soil monitoring data for comparison with post-operation data
Fuel, waste/chemical storages	Visual inspections of refuelling/servicing areas and hazardous material containment areas to detect leakages or spills Inspect spill kits to ensure they are appropriately stocked Inspections of containment bunds to ensure bund integrity, and rectify any issues found Tank integrity testing for all bulk hazardous or dangerous goods storage tanks	Construction Manager	Weekly Monthly and following each use of a spill kit Weekly Annual	Retain records Any issues recorded in incident-complaint form and register and actions assigned
Bushfire	See operational phase			
Traffic	Monitor and record any traffic incidents	Construction Manager	At all times	All accidents and near misses on-site and all accidents off-site involving Project drivers, employees and/or vehicles to be recorded in the incidents-complaints register. Encourage reporting of near misses.
Cultural heritage	Visual inspection of exclusion zones around cultural heritage sites to confirm no impacts from site works	Construction Manager	Weekly where works in proximity to sites Quarterly otherwise	Update Cultural heritage register if required.

Description	Details	Responsible Persons	Frequency	Reporting
Pre-operations				
Facility Certification	Obtain certification from NT DPIR that the facility has been constructed according to the commitments made in the EIS and aquaculture licence application	Project Manager Construction Manager	ASAP after construction finishes	Notify DPIR in writing. Receive written certification from DPIR
Operational Phase				
Site Inspections	Visual inspections of the site for signs of erosion, scour, weeds, pests, leaks and spills, dust, odour, air quality and noise from site works – any indication of potential or actual pollution or environmental harm. Potential issues identified and entered into the corrective action system for rectification Routine visual monitoring and inspections of the intake and outlet structures (visible structures on land only) and banks for signs of erosion, fouling, injury to marine organisms, etc.	Site Manager	Weekly of high traffic areas Monthly otherwise Monthly	Results recorded in site manager's logbook Any issues recorded in incident-complaint form and register and actions assigned
Annual weed survey	Weed monitoring in accordance with the Weed Management Plan	Site Manager	Annually between April-June (inclusive) for the first two years of the Project's operational stage,	Update site register and site mapping as needed

Description	Details	Responsible Persons	Frequency	Reporting
			and biennially thereafter	
Biting insects survey	Regular surveys for potential mosquito breeding sites within 5 days of rain occurring twice in the wet season and as required during the dry season	Site Manager	Within 5 days of rainfall in the wet season Twice in the wet season Review based on results after 2 years	Internal reporting of results (log book or similar).
Implement Water Quality Monitoring Program	Implement the program outlined in the Water Quality Management and Management Plan (WQMMP)	Site Manager	During operations	Maintain records Reporting requirements outlined in WQMMP
Waste monitoring	Update the waste inventory contained in C9.1 Site Waste Management Plan to record all waste types, quantities produced, and management measures used for each Record details of all listed wastes removed from the site, including the type of waste, quantity removed, transporter, destination, and treatment/disposal method (if known)	Site Manager	As required – all waste	Maintain records Update Waste Inventory Record movement of all wastes, particularly listed wastes, off-site Include results in annual monitoring report
	Undertake a site audit prior to each wet season and to forecast extreme weather events to ensure all wastes are contained and restrained so as to avoid loss of materials during the event	Site Manager	Prior to wet season Prior to extreme weather events	Maintain record of review and actions required
Dust, odour and noise	Monitoring will be conducted at sensitive receptors where a complaint (non-vexatious) has been made, where evidence is required against air quality criteria, with the monitoring selected as follows: ▪ Dust: PM10 and dust deposition ▪ Odour: H_2S monitoring as an indicator, or odour unit sampling if required	Site Manager	If required	Include results in annual monitoring report Any issues recorded in incident-complaint form and register and actions assigned

Description	Details	Responsible Persons	Frequency	Reporting
	▪ Noise: According to AS 1055.1 - 3: Acoustics			
On-site effluent treatment systems and disposal areas	Visual monitoring of land irrigation areas for signs of: ▪ Soggy ground with or without ponding evident on the land application area ▪ Patchy vegetation growth (or limited growth) indicating blockages or preferential flow pathways to deeper soils ▪ Drains and toilets running slowly, which may indicate a blockage in the pipework or treatment system ▪ Excessive effluent odour (both land application and sewage treatment systems) which may indicate the system is not performing adequately.	Site Manager	Monthly	Include visual monitoring in site manager's logbook. Include results in annual reporting Any issues recorded in incident-complaint form and register and actions assigned
	Soil monitoring in disposal areas, to include monitoring for nutrients, major anions and cations, pH, salinity, and heavy metals.		5-yearly	
	Sampling for water quality: pH, electrical conductivity, BOD_5, total nitrogen, total phosphorous, E.Coli		Quarterly If results stable after 2 years (and full site ramp up has occurred), reduce to 6-monthly	
Fuel, waste/chemical storages	Visual inspections of refuelling/servicing areas and hazardous material containment areas to detect leakages or spills	Site Manager	Weekly	Retain records Any issues recorded in incident-complaint form and register and actions assigned
	Inspect spill kits to ensure they are appropriately stocked		Monthly and following each use of a spill kit	
	Inspections of containment bunds to ensure bund integrity, and rectify any issues found		Monthly Annual	

Description	Details	Responsible Persons	Frequency	Reporting
	Tank integrity testing for all bulk hazardous or dangerous goods storage tanks			
Bushfire	Site inspections will be undertaken of fuel management zones to include assessment of fuel loads prior to the fire season, especially within asset protection zones		Annually prior to the fire season	Prepare report following all bushfires on the property including details of location, source and management actions (if any). Prepare annual report outlining implementation of the bushfire management activities.
Traffic	Monitor road pavement condition on-site, and undertake visual observations of external haulage routes Monitor and record any traffic incidents	Site Manager	At all times Road condition during each trip (by site manager or delegated staff)	All accidents and near misses on-site and all accidents off-site involving Project drivers, employees and/or vehicles to be recorded in the incidents-complaints register. Encourage reporting of near misses. Road pavement conditions to be recorded in site manager's logbook, and Any issues recorded in incident-complaint form and register and actions assigned

APPENDIX E ENVIRONMENTAL CONTINGENCY RESPONSE PLAN

E1 Contingency Response Plan

REF: EN02-PR2002, REV. F

E1 CONTINGENCY RESPONSE PLAN

E1.1 Purpose and Scope

This contingency response plan aims to outline a basic set of actions to follow when responding to an environmental incident to ensure the correct containment, cleanup / rectification and reporting is undertaken for incidents occurring on-site (or otherwise associated with the Project).

E1.2 Health and Safety

Health and Safety concerns will always take precedence when managing an incident. If the incident involves a health and safety incident, the Safety Incident Procedures will be initiated and followed until the area is made safe.

If a situation is not safe, personnel will not enter the area unless they are:

- Properly fitted with Personal Protective Equipment (PPE) and trained in its use;
- Sufficiently experienced to deal with the situation; and
- Acting under an approved Safety Management Plan or Procedure.

The site health and safety management procedures will take precedence in the case where danger to human health and safety exists.

E1.3 Environmental Incident Response

The general category of incident should be rapidly assessed to determine the correct course of action. The categories are outlined in Table E1.1, along with the minimum responses to be undertaken.

Generally, the control methods should follow the **Control → Contain → Clean-up** hierarchy of approaches, whereby the source of the incident is (safely) controlled, the incident itself contained so as to minimise or avoid its movement into or impact on the environment, and clean-up / rectification undertaken.

An unexpected findings protocol is included in Table E1.2, and general contingency response procedures in Table E1.3.

E1.4 Notification

The Site Manager must be notified of all incidents as soon as possible. Following this, notification will follow that outlined in Table E1.1. The written notification in Table E1.1 should include the following information:

- the location, date and time of the event that caused the incident, and the time site staff and the Site Manager became aware of the event / incident
- the suspected cause and a description of the resulting effects of the event, including an assessment of the level of risk
- actions taken to mitigate any further incidents caused by the event, and proposed actions that will be taken, including to prevent a recurrence of the event, and
- if no actions were taken, the reason why.

TABLE E1.1 ENVIRONMENTAL INCIDENT RESPONSE – MINIMUM RESPONSE RECOMMENDED

Impact Category	
Impact Category	Category applies to any one or more of the following:
High	▪ Serious environmental harm caused or threatened – includes costs of actions to stop or clean-up of $50,000 or more (see E1.9 Definitions) ▪ May include non-conformance with licence or approval conditions ▪ Where there is an immediate threat to human life and property ▪ Creates an immediate observable and significant harm to the environment, flora and/or fauna ▪ Where it occurs in water catchments for supply of the Project or other site (or off-site) uses, or ▪ Where the incident has the potential to seriously contaminate soil or water resources. ▪ Where significant mortalities of licenced species in the facility occur
Moderate	▪ Material environmental harm caused or threatened – includes costs of actions to stop or clean up up to $50,000 (see E1.9 Definitions) ▪ Any exceedance of specific discharge conditions or non-conformance with licence or approval conditions ▪ Where there is significant (but not immediate) threat to human life and property ▪ May have a long term (but not immediate) observable impact on the environment, flora and/or fauna ▪ Release of licenced species from the facility to the environment
Low	▪ Where there is no perceived threat to human life or property ▪ Where the incident is outside sensitive environments ▪ Where the incident poses no immediate or long-term threat to environmental receptors

Incident Response					
Impact class	Rectification / Clean up	Initial Notification	Written notification	Review EMP / Site procedures?	Further monitoring
High	Immediate	ASAP	Within 14 days	Yes	Yes
Moderate	Immediate	24 hours	Within 14 days	Yes	Decide based on effectiveness of clean-up
Low	Within 4 hours	None	None	No unless improvement opportunity identified	No

Notification	
Licence or approval non-compliance, or breach of relevant Act or Regulation provision in relation to the works	Waste Discharge Licence, Water Act: NT DENR Aquaculture Licence, Fisheries Act: NT DPIR Fisheries Vegetation Clearing Permit, Planning Act: NT Development Consent Authority Surface Water Extraction Licence, Water Act: NT DENR Environment protection approvals and licences, Waste Management and Pollution Control Act: NT EPA Note: reporting department noted in EN-02-RG-EM1101c Monitoring and Review register). Conditions and EMP reference noted in EMP Compliance Register

E1.5 Training

Training of staff will include spill response specific to the types of spills that may occur - oil and liquid waste spills, larger spills to land and to water, including use of absorbents, floating booms and skimmers, and notification procedures.

E1.6 Wet Season and Extreme Weather

Prior to the start of the wet season, the site will be prepared by ensuring all waste materials, receptacles and storages are properly contained and stable, and will be able to withstand wet season rainfall without leaching or other loss of contaminants. A site audit will be conducted prior to each wet season with the results provided internally in written form.

A similar process will occur prior to forecast storms or other extreme weather events, whereby all wastes are contained and restrained so as to avoid loss of materials during the event. The landfill will have the day's cover applied and compacted, if sufficient time allows (for safety), with any loose materials secured.

E1.7 Records

All incidents shall be recorded on the incident / complaints or similar and maintained as a register of incidents on the site.

E1.8 Review

This contingency plan is to be reviewed and updated prior to works starting on the site, and periodically thereafter, at a minimum annually.

E1.9 Definitions

Environmental harm means any harm to or adverse effect on the environment, or any potential harm (including the risk of harm and future harm) to or potential adverse effect on the environment, of any degree or duration and includes environmental nuisance.

Material environmental harm means environmental harm that is not trivial or negligible in nature; consists of an environmental nuisance of a high impact or on a wide scale; results, or is likely to result, in not more than $50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment; or results in actual or potential loss or damage to the value of not more than $50,000 or the prescribed amount (whichever is greater).

Serious environmental harm means environmental harm that is more serious than material environmental harm and includes environmental harm that is irreversible or otherwise of a high impact or on a wide scale; damages an aspect of the environment that is of a high conservation value, high cultural value or high community value or is of special significance; results or is likely to result in more than $50,000 or the prescribed amount (whichever is greater) being spent in taking appropriate action to prevent or minimise the environmental harm or rehabilitate the environment; or results in actual or potential loss or damage to the value of more than $50,000 or the prescribed amount (whichever is greater).

Environmental nuisance means an adverse effect on the amenity of an area that is caused by noise, smoke, dust, fumes or odour; and unreasonably interferes with or is likely to unreasonably interfere with the enjoyment of the area by persons who occupy a place within the area or are otherwise lawfully in the area; or an unsightly or offensive condition caused by contaminants or waste.

TABLE E1.2 – UNEXPECTED FINDINGS PROTOCOL

UNEXPECTED FINDINGS PROTOCOL (UFP)

General

- Implementation of the UFP includes observation of excavation works, excavated material and fill material being brought to the site, and activation of the UFP should a suspect observation be made.
- If the unexpected findings present an immediate hazard, then the Safety Incident Procedures will take precedence over the UFP.

Contaminated Soil

- If contaminated or potentially contaminated material is found, actions should include, but not be limited to, the following:
  - immediately stop work in the area of concern
  - contact the Project Manager or their designated authority
  - erect temporary barricading to prevent access, and warning signs as required
  - provide cover or suitable suppressant if odorous
  - provide erosion and sediment control measures as required, and
  - contact appropriate organisations to provide specialist advice/support – Contaminated Land consultant, Heritage Branch of the NT Department of Tourism and Culture, Council.

Heritage Finds

- If any cultural heritage items are found, a similar process will occur as for contaminated soil:
  - immediately stop work in the area of concern
  - contact the Project Manager or their designated authority
  - erect temporary barricading to prevent access, and warning signs as required
  - If the find relates to indigenous heritage:
    - notify the Aboriginal Party for the area
  - If the find relates to non-indigenous heritage:
    - Contact the Heritage Branch of the NT Department of Tourism and Culture on 08 8999 5039 (or email heritage@nt.gov.au) and provide details about the find.
    - The find shall not be interfered with for at least 20 days, or where the department provides written consent
  - If human remains are discovered:
    - Contact Northern Territory Police (it is an offence to interfere with human remains, buried or not).
    - Northern Territory Police will determine if the remains are related to a criminal investigation.
    - If the remains are heritage related, action the above as required (indigenous heritage, non-indigenous heritage)

UNEXPECTED FINDINGS PROTOCOL (UFP)

Unexploded Ordinance (UXO)

- immediately stop work in the area of concern and evacuate the area
- contact the Site Manager or their designated authority and contact the police for further directions (police will contact defence)
- erect temporary barricading to prevent access, and warning signs as required
- Do not disturb the UXO and allow defence personnel to remove or otherwise rectify

The UFP should be integrated with a site-specific emergency response plan. If the unexpected findings present an immediate hazard, then the emergency response plan should take precedence over the UFP

Indications of contamination include (but are not limited to):

- staining or discolouration
- excessive odour
- waste materials such as ash or slag, construction or demolition wastes (brick, concrete, tile, timber, steel, carpet, etc.)
- asbestos cement sheeting, pipe or fragments
- bottles, chemical containers, broken glass, plastic, etc. in non-C&D or GPT waste
- white goods, garbage, etc.

Indigenous cultural heritage items or places may include (but are not limited to):

- Ceremonial places
- Scarred or carved trees
- Burials
- Rock art
- Fish traps and weirs
- Occupation sites
- Quarries and artefact scatters
- Grinding grooves
- Contact Sites
- Wells

TABLE E1. 3 - CONTINGENCY RESPONSE

Element	Detail
Receipt of Complaint	Record details of the complaint in the incidents-complaints register Investigate and determine whether the complaint is vexatious or not Further investigate the cause and possible rectification for non-vexatious complaints
Spill or leak	1. Implement spill response procedures (refer below) 2. Define the spill's severity by type and scale of the incident (major, moderate, minor) (Table E1.1) 3. If the spill is too large to contain in a short period of time, request outside assistance. This may include external contractors, NT EPA, Council or others 4. Refer to Notification Procedures above 5. Undertake sampling of receiving waterway if spill is not minor or insignificant in nature Spill Response: 1. Assess: determine if the spill can be safely controlled, or if other or external help is required (if so seek this help as soon as safely possible) 2. Control: if safe to do so, stop the spill, for example by turning off supply, righting barrels, etc. 3. Contain: apply containment measures, such as spill booms, absorbent material, or by scooping small spills by shovel, etc. 4. Clean-up: clean up the spill by sweeping, shovelling, scooping or otherwise cleaning up the spill. Dry methods are preferred over washing 5. Notify: the spill will be recorded and appropriate persons notified 6. Review: an incident will be logged, and opportunities for improvement identified where practicable.
Noise issues	1. Investigate the source of the noise 2. If excessive, utilise controls to reduce noise, depending on the cause: - Complete the activity at more suitable times - Fix noisy plant/machinery (tighten covers, general maintenance, run correctly, etc.) - Reposition noise sources to take advantage of natural screening factors, and/or install screening between the source and receptors - Install or repair acoustic enclosures

Element	Detail
	▪ Replace noisy plant/machinery
Declared Weeds found on site	Implement the Weed Management Plan
Intake filtrate impacts	Depending on the cause and issue: ▪ Investigate the filtration system to confirm it is operating correctly, or rectify any issues ▪ Change the residue release timing ▪ Release more intake waters with the residue (dilute the residue) ▪ Direct residue to settlement ponds for settlement prior to release (seawater, discharge settlement ponds or new pond/tanks)
Facility controls to improve Discharge Water Quality	Depending on the cause and the issue: ▪ Recirculation within the release ponds to increase biological assimilation potential and settlement of biosolids ▪ Filtration ▪ Disinfection (ozonation/chlorination) coupled with interim storage and de-chlorination (aeration) pre-release ▪ Improving the feed conversion ratio (FCR) - using improved and refined feeding regimes, or using feeds that have improved formulations, to reduce generation of wastes
Other contingencies	Refer to the relevant Management Strategy, or the site Health and Safety Plan

APPENDIX F ENVIRONMENTAL FORMS

NC-	Incident / Complaint / Improvement Form

Date:.....

Name:.....

(Person filling out form)

☐ Incident ☐ Complaint ☐ Improvement

Nature of Incident / Complaint (tick one): ☐ water ☐ air ☐ land

☐ other .....

Details

Name and Address of person or company complaining / reporting incident (or anonymous)

.....

..... Phone:.....

If company, person lodging complaint / notification: .....

Time of Incident / Complaint: .....

Nature of Contact (phone, letter, personal, email, etc.): .....

Location of Incident: .....

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Description

.....

.....

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.....

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Actions Taken	Date Acted On	Signed
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

RESPONSIBILITY AND TRAINING NEEDS ANALYSIS FORM

For persons identified within the EMS, identify responsibilities, determine their competency, identify training needs, and plan for training. Examples given in red

Role / Position Title/Position no.	Name	Responsibilities	Qualifications/ competency	Training needs	Planned dates	Training details
Chief Operating Officer		*Participate in Management review* *Set Policy* *Review Objective & Targets* *Resource allocation*		*EMS awareness (in house)*		
Chief Environmental Manager		*Over-all responsibility for system implementation* *Participate in Management review* *Monitoring and measurement of environmental performance* *Corporate level training*		*EMS awareness (in house)*		
Internal Auditor		*Develop internal audit program* *Conduct internal audits*	*Certified (RABQSA) lead auditor*			
Site Managers		*Site management, comply with EMS and site specific plans where relevant* *Provide resources to Environmental Manager*		*EMS awareness (in house)*		

Role / Position Title/Position no.	Name	Responsibilities	Qualifications/ competency	Training needs	Planned dates	Training details
Site Environmental Manager		Implement EMS on site Develop and update site specific plans Training of new staff, environmental performance of the site				
General Staff		*Awareness of EMS and environmental policy* *Spill and contingency response*	*N/A*	*EMS awareness (in house)* *Spill response training (2 yearly)*		

Site		Inspection Date
Inspector		

PART A: GENERAL SITE ASSESSMENT	Outcome	Action Required[1]
GENERAL SITE		
Site generally tidy and well-kept? Adequate waste bins, no loose waste or litter on site?	☐ OK	
Clearing limits and work boundaries established and well defined? Retained vegetation clearly marked along drip line as 'no go' area?	☐ OK	
Clearing minimised as much as practicable for the stage of works?	☐ OK	
Site meetings (toolbox, etc.) include environmental controls?	☐ OK	
Site is adequately prepared for imminent storms?	☐ OK	
All loads of potentially dusty materials covered/watered prior to leaving site?	☐ OK	
No dust clouds moving off-site?	☐ OK	
Fuel/chemicals stored in bunded areas?[2]	☐ OK	
All liquid waste fully contained on-site or behind bunds?	☐ OK	
No fuel/oil/chemical spills or leaks on-site?		
Spill kit(s) on-site, fully stocked, in easily accessible location(s)?	☐ OK	
No excessive noise, or suitable noise barriers are in place?	☐ OK	
Adequate emergency materials available on short notice?[3]	☐ OK	
EROSION AND SEDIMENT CONTROL		
General:		
Erosion and Sediment Control Plan (ESCP) on site?	☐ OK	
All ESCP controls implemented and in good working order, installed prior to new areas being disturbed? [4]	☐ OK	
Public roads clear of sediment (where relevant)?[5]	☐ OK ☐ n/a	
Designated haulage routes and access points being used?	☐ OK	

[1] Identify timeframe: 1 = close out on day of inspection; 2 = within 24h; 3 = within 3 days; 4 = within 1 week
[2] Generally, enclosed volume large enough to contain 110% of the largest drum or tank
[3] Straw bales, wire, stakes, sediment fence fabric, filter cloth, clean aggregate, lime if required, etc.
[4] If required markup plan by hand. Original plan to be updated and reissued as needed.
[5] Where works may impact on public roads. Generally, dry sweeping is preferred. Washing/flushing only where sweeping has failed to remove sufficient material and remaining material represents a safety risk. All reasonable and practicable sediment control measures must be used to prevent, or at least minimise, the release of sediment into receiving waters

PART A: GENERAL SITE ASSESSMENT	Outcome	Action Required[1]
Drainage:		
All drains and outlets stable – no scour, slumping, etc.?	☐ OK	
Up-slope runoff diverted around/through the site in non-erosive manner?	☐ OK	
Erosion Controls:		
No exposed areas able to be stabilised?	☐ OK	
Long-term soil stockpiles protected?	☐ OK	
Earth batters free of 'rill' erosion?	☐ OK	
Sediment Controls:		
All disturbed areas drain through suitable sediment controls?	☐ OK	
Sediment fences free from damage, sediment <⅓ height of fence?	☐ OK	
Stormwater inlets, kerb inlets protected from sediment ingress?	☐ OK	
Sediment NOT just flowing around sediment devices?	☐ OK	
No visible sediment plumes off-site?	☐ OK	
All reasonable and practicable measures are being taken to control sediment runoff from the site?	☐ OK	
Site Stabilisation / Rehabilitation:		
Disturbed areas no longer being worked are stabilised as soon as practicable?	☐ OK	
Subsoils adequately scarified prior to topsoil placement?	☐ OK	
Topsoil replaced at an adequate depth?	☐ OK	
Stabilised surfaces have a minimum 70% soil coverage?	☐ OK	
Sediment basins: ☐ N/A		
Appropriately designed and sized?	☐ OK	
Records of chemical dosing, inspections, maintenance, monitoring being kept?	☐ OK	
Top layer (supernatant) visibly clear prior to discharge?	☐ OK	
Sediment basin volume markers intact and clearly visible?	☐ OK	
Capacity remaining in sediment storage zone?	☐ OK	
Basin emptied since the last rain event and restored to design capacity?	☐ OK	
Works in waterways: ☐ N/A		
Are permits / approvals in place for works?	☐ OK	
Are temporary flow diversions in place?	☐ OK	

PART A: GENERAL SITE ASSESSMENT	Outcome	Action Required[1]
Works scheduled to minimise exposure to storm and/or stream flows?	☐ OK	
Vehicles crossings minimised?	☐ OK	
No unnecessary disturbance of instream or riparian vegetation?	☐ OK	
Appropriate temporary erosion control measures are being applied to disturbed areas?	☐ OK	
Site stabilisation and rehabilitation undertaken as soon as practicable?	☐ OK	

Refer to next page for detailed controls assessment, if required, or to guide the above assessment.

PART B: Detailed assessment of ESC controls (as required)	Outcome	Requirements
Drainage controls:		
Catch Drains: (a) Adequate depth/width	☐ OK	
(b) Adequate flow capacity is being maintained	☐ OK	
(c) Stabilised against soil scour	☐ OK	
(d) Clear of sediment deposition	☐ OK	
(e) Appropriate grass length is being maintained	☐ OK	
(f) Water discharges via a stable outlet	☐ OK	
Channel Linings (mats): (a) Lining is well anchored	☐ OK	
(b) Mats overlap in direction of flow	☐ OK	
(c) Lining is appropriate for flow conditions	☐ OK	
(d) No damage to the mat by lateral inflows	☐ OK	
Check Dams: (a) Flow is passing over the dams and not around them	☐ OK	
(b) Check Dams are not causing excessive channel restriction	☐ OK	
(c) Rock Check Dams are not used in shallow drains	☐ OK	
(d) Check Dams are appropriately spaced down the drain	☐ OK	
Chutes (rock): (a) Geotextile filter cloth is installed under the rock	☐ OK	
(b) Rock placement has not reduced chute flow capacity	☐ OK	
(c) Rock size appears adequate for expected flow velocity	☐ OK	
(d) Water discharges via a stable outlet	☐ OK	
Chutes (geotextile): (a) Lining is well anchored	☐ OK	
(b) Mats overlap in direction of flow	☐ OK	
(c) Lining is appropriate for flow conditions	☐ OK	
(d) Water discharges through a stable outlet	☐ OK	
Level Spreaders: (a) Outlet weir is level and undamaged	☐ OK	
(b) No sediment deposition within Level Spreader	☐ OK	
(c) Discharges “sheet” flow to a stable, well-grassed outlet	☐ OK	

PART B: Detailed assessment of ESC controls (as required)	Outcome	Requirements
Slope Drains: (a) Adequate erosion/sediment controls at pipe inlet	☐ OK	
(b) Pipes are well anchored	☐ OK	
(c) No obvious water leaks	☐ OK	
(d) Water discharges via a stable outlet	☐ OK	
Stormwater Outlets: (a) Energy dissipation is appropriate for the conditions	☐ OK	
(b) Rock size is greater than 200mm	☐ OK	
(c) Soil erosion is being controlled	☐ OK	
Temporary Watercourse Crossings: (a) Crossing type is appropriate for the stream conditions	☐ OK	
(b) Sediment runoff from the approach roads is controlled	☐ OK	
(c) Likely damage to the crossing and the stream caused by possible overtopping flows is considered acceptable	☐ OK	
Erosion controls:		
Erosion Control Blankets: (a) Blankets are well anchored	☐ OK	
(b) Blankets overlap in direction of stormwater flow	☐ OK	
(c) Blanket strength is appropriate for site conditions	☐ OK	
(d) Synthetic blanket reinforcing will not endanger wildlife	☐ OK	
(e) Blankets not damaged by lateral inflows	☐ OK	
(f) Blankets protected against movement by wind	☐ OK	
Mulching (light): (a) Minimum 70% coverage of soil surface.	☐ OK	
(b) Suitable tackifier used on steep slopes.	☐ OK	
(c) Drainage controls preventing mulch displacement	☐ OK	
Mulch (heavy): (a) Minimum 100% coverage of soil	☐ OK	
(b) Minimum depth adequate to control weeds.	☐ OK	
(c) Drainage controls preventing mulch displacement	☐ OK	

PART B: Detailed assessment of ESC controls (as required)	Outcome	Requirements
Soil Binders: (a) No adverse environmental impacts observed	☐ OK	
(b) No obvious over-spray	☐ OK	
(c) Soil binders applied during appropriate weather conditions	☐ OK	
Sediment controls:		
Entry/Exit Points: (a) Control measures are appropriate for the site conditions	☐ OK	
(b) Control measures are constructed to appropriate standards	☐ OK	
(c) Excessive sediment removed from sediment traps	☐ OK	
(d) Excessive sedimentation is not evident on roadway	☐ OK	
(e) Stormwater drainage is controlled such that sediment is not being washed onto the adjacent roadway	☐ OK	
Field (Drop) Inlet Controls: (a) Inlet control measures allow adequate ponding around stormwater inlets to capture sediment	☐ OK	
(b) The sediment control measures do not simply divert sediment-laden water downstream to an uncontrolled inlet	☐ OK	
(c) Sediment control measures will not cause a safety or local flood hazard	☐ OK	
(d) Sediment traps are appropriate for site conditions	☐ OK	
(e) Excessive sediment deposition is removed from all traps	☐ OK	
Gully Inlet Controls: (a) Sediment traps are appropriate for the type of gully inlet, either “sag” or “on-grade” inlet	☐ OK	
(b) Sediment traps allow adequate ponding around or up-slope of stormwater inlets to capture sediment	☐ OK	
(c) Sediment traps do not simply divert sediment-laden water downstream to an uncontrolled inlet	☐ OK	
(d) Sediment control measures will not cause a safety, traffic or local flooding hazard	☐ OK	
(e) Excessive sediment deposition is removed from all traps	☐ OK	
Table drain sediment traps: (a) Choice of sediment trap is appropriate for flow conditions	☐ OK	
(b) Excessive sediment is removed from all traps	☐ OK	
(c) Spill-through weir is set to an appropriate elevation	☐ OK	
(d) Spill-through weir has adequate width	☐ OK	

PART B: Detailed assessment of ESC controls (as required)	Outcome	Requirements
(e) Sediment Fence traps are formed in a tight U-shape that adequately prevents water bypassing the traps	☐ OK	
Sediment Fences: (a) Choice of fabric is appropriate	☐ OK	
(b) Bottom of fabric is securely buried	☐ OK	
(c) Fabric is appropriately overlapped at joints	☐ OK	
(d) Fabric is appropriately attached to posts	☐ OK	
(e) Support posts are at correct spacing (2m or 3m with backing)	☐ OK	
(f) Sediment Fence does not cause flow diversion/bypass	☐ OK	
(g) Sediment Fence has regular returns	☐ OK	
(h) Lower end(s) of fence is/are returned up the slope	☐ OK	
(i) Sediment Fences are free of damage	☐ OK	
(j) All fences are free of excessive sediment deposition (<⅓ full)	☐ OK	
(k) Fences are adequately spaced from toe of fill banks	☐ OK	
Filter Tube Sediment Traps: (a) Geometry and layout match design details	☐ OK	
(b) Sediment-laden water cannot bypass the filtration system	☐ OK	
(c) Filter Tubes do not need replacement	☐ OK	
(d) Filter Tubes and embankment are free of damage	☐ OK	
Rock Filter Dams (Sediment Traps): (a) Geometry and layout match design details	☐ OK	
(b) Excessive sediment removed from up-slope of all traps	☐ OK	
(c) The filtration system is free from sediment blockage	☐ OK	
(d) Rock Filter Dam and spillway are free of damage	☐ OK	
Sediment Weirs: (a) Geometry and layout match design details	☐ OK	
(b) Excessive sediment removed from up-slope of all traps	☐ OK	
(c) The filtration system is free from sediment blockage	☐ OK	
(d) Sediment Weir and splash pad (if any) are free of damage	☐ OK	
Sediment Trench:	☐ OK	

PART B: Detailed assessment of ESC controls (as required)	Outcome	Requirements
(a) Trench geometry and layout match design details		
(b) Excessive sediment removed from the trench	☐ OK	
(c) Outlet structure (if any) is free from sediment blockage	☐ OK	
(d) The open trench does not represent a safety hazard	☐ OK	
Sediment Controls for Non-Storm Runoff: (a) Choice of sediment trap is appropriate for the site conditions and level of environmental risk	☐ OK	
(b) All sediment is being contained within trap	☐ OK	
Sediment Basin: (a) Basin geometry and layout match design details	☐ OK	
(b) "As constructed" plans have been prepared	☐ OK	
(c) The basin does not represent a safety risk	☐ OK	
(d) De-watering is conducted in accordance with best practice	☐ OK	
(e) Excessive sediment removed from basin	☐ OK	
(f) Sediment depth marker is installed and maintained	☐ OK	
(g) Primary outlet structure is free from sediment blockage	☐ OK	
(h) Flow conditions are not compromised across the spillway	☐ OK	
(i) Emergency spillway has adequate scour control	☐ OK	
(j) Adequate quantities of flocculant (if required) exist on-site	☐ OK	
(k) Soil erosion is adequately controlled at inlet points	☐ OK	
(l) The settled sediment layer is clearly visible through ponded water prior to discharge such water	☐ OK	
Other Sediment Trap: Type . . . . . . (a) Choice of sediment trap is appropriate for the site conditions and level of environmental risk	☐ OK	
(b) The sediment trap allows adequate ponding to capture coarse sediment (Type 2 and Type 3 Sediment Traps)	☐ OK	
(c) The sediment trap allows adequate filtration to capture fine sediment (Type 2 Sediment Traps)	☐ OK	
(d) The sediment trap does not simply divert sediment-laden water downstream to an uncontrolled outlet	☐ OK	
(e) The sediment trap does not cause a safety, traffic or local flood hazard	☐ OK	
(f) Excessive sediment deposition is removed from all traps	☐ OK	

Note: this checklist based, in part, on IECA (2008a). Best Practice Erosion and Sediment Control 2008. International Erosion Control Association. http://www.austieca.com.au/, *Model Code of Practice – Building Sites*, *Weekly Site Inspection* and *Site Inspection Checklists*