ICHTHYS ONSHORE LNG FACILITIES CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

Plan

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This CEMP was collated by INPEX inclusive of information provided by Contractor's Construction Environmental Management Plan (L290-AH-PLN-0059), Revisions 17, 18 and 19, prepared, checked and approved by Contractor as per signature block below.

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Definitions

Term	Meaning
Active discharge	Where water is pumped or otherwise removed from an area of the Site for construction purposes and discharged to the environment outside of the Site boundary. This may be active pumping, or the modification of berms or other containment features that allow water to flow out of the package battery limits or offsite. This includes removal of water from a system (pipework, vessels and tanks) for drying after flushing, cleaning, hydrotesting and commissioning.
All Site personnel	This refers to all personnel working on the Site, inclusive of Company, Contractor, Subcontractors and visitors to Site, as applicable.
Basis of design	Basis of design is a term used in engineering, which typically consists of statements that form the basis of inspection and test acceptance criteria, preliminary drawings, equipment lists, etc.. The basis of design documentation and the specification identify how the design provides the performance and operational requirements of the Project and its systems.
BOG	Boil-off gas (BOG) is produced whenever heat penetrates the insulation of the cryogenic LNG and LPG storage tanks (on land and aboard ships). Generally, LNG BOG is used as fuel gas in Operations. LPG (propane and butane) BOG is re-liquefied and recombined with liquid product during operations.
Commissioning	This refers to all works required for plant verification activities which occur before operation of any systems or introduction of hydrocarbons to processing facilities. The commissioning process ensures that all equipment is installed and will operate as per design and meet the functional intent. These verification activities include the last critical review of the design before achieving a state of Ready for Start-up (RFSU).
Company	INPEX Operations Australia Pty Ltd acting as agent for Ichthys LNG Pty Ltd.
Construction	This refers to all works required prior to start-up of the LNG plant, Bladin Point, inclusive of commissioning and Contractor demobilisation activities.
Contractor	JKC Australia LNG Pty Ltd—the Joint Venture between JGC Corporation, KBR (Kellogg Brown & Root Pty Ltd) and Chiyoda Corporation.
daylight hours	The hours between dawn and dusk.
dry season	Annual period from 1st May to 30th September.
EIS	This refers to both the Ichthys Gas Field Development Project: draft environmental impact statement and Supplement to the draft

Term	Meaning
	environmental impact statement prepared by INPEX Browse, Ltd. Perth, WA.
EPA7 (as amended)	This refers to Environment Protection Approval 7 issued by the Northern Territory Government under the *Waste Management and Pollution Control Act* (WMPC Act) on 19 April 2012, and includes all subsequent approved variations to the approval, as amended.
Good International Industry Practice (GIIP)	GIIP is defined as the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally. The outcome of such exercise should be that the project employs the most appropriate technologies in the project-specific circumstances (The International Finance Corporation Performance Standard 3: Resource Efficiency and Pollution Prevention (2012)).
heritage protection zone	The designated area for protection of a heritage site, including for 'exclusion', 'declared' and 'controlled' zones as they relate to heritage protection.
marine megafauna	Cetaceans (whales and dolphins), dugongs, marine turtles and saltwater crocodiles.
NCW	The non-contaminated water (NCW) system drains to the perimeter regulating drain. The NCW system captures water within the plant boundaries which is considered non-contaminated (free from oil/chemicals). During the Construction phase, installed erosion and sediment control structures prevent highly turbid (and otherwise non-contaminated) stormwater from entering the NCW system, as per the approved erosion and sediment control plans prepared in advance of each wet season.
nearshore development area	The nearshore development area encompasses the waters in the immediate vicinity of Bladin Point, including areas for the product loading jetty, the module offloading facility and the temporary sewage treatment plant (STP) outfall.
onshore development area	The onshore development area includes the site proposed for the onshore processing plant at Bladin Point and the onshore gas pipeline corridor.
Passive discharge	Natural flow of water through erosion and sedimentation controls in accordance with the CPESC-endorsed ESCP and IECA Guidelines.
Precommissioning	Precommissioning is a subset activity of the commissioning process. This refers to all works required for checking, cleaning and testing of the installed permanent plant and equipment prior to the introduction of process fluids and hydrocarbon feed during commissioning and start-up. Activities may include (but not be limited to) cleaning, lube

Term	Meaning
	oil flushing and first fill of fuel and lubrication systems, charging of catalysts, operational tests of emergency utilities including fire water pumps and emergency diesel generators and associated systems and other utilities including air compressors and demineralised water systems.
Project	The Ichthys Gas Field Development Project.
Project vessel	A vessel engaged directly for undertaking works within the nearshore development area for the Project or as part of, or to support, works undertaken within the Site. A Project vessel does not include international vessels delivering cargo to the module offloading facility (MOF).
Regulating drain	A concrete drainage structure around the perimeter of the LNG plant area that regulates the flow and distribution of stormwater through outfall pipes to the surrounding environment.
RFSU	Ready for start-up certifies that all necessary dynamic testing, competency training and familiarisation has been accomplished as per the requirements of the Contract and that the plant section satisfies the applicable statutory codes and Company procedures for introduction of process hydrocarbons.
Site	The boundary of Contractor's scope of work, as defined in Figure 1-2.
Subcontractor	Any company to whom Contractor has subcontracted any part of the works.
Wet season	Annual period from 1st October to 30th April.

Abbreviations And Units Of Measurement

Item	Meaning
$\%SO_x$	percentage of oxidised sulfur
AAPA	Aboriginal Areas Protection Authority (NT)
AASS	actual acid sulfate soils
ADG Code	Australian Code for the Transport of Dangerous Goods by Rail and Road
AHD	Australian height datum
AEMR	annual environmental monitoring report
AGRU	acid gas removal unit
AIP	Australian industry participation
ALARP	as low as reasonably practicable
AMSA	Australian Maritime Safety Authority (Cwlth)
ANZECC	Australian and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AOC	accidentally oil-contaminated (system)
AS	Australian standard
ASS	acid sulfate soils
ATSI	Aboriginal and Torres Strait Islander
°C	degree(s) Celsius
BGL	below ground level
BOG	boil-off gas
CBD	central business district
CCNT	Chamber of Commerce Northern Territory
CCPP	combined cycle power plant
CEMP	Construction Environmental Management Plan

Item	Meaning
cfu/100 mL	colony-forming unit(s) per 100 millilitres
cm	centimetre(s)
CMT	crisis management team
CO_2-e	carbon dioxide equivalent
COC	continuously oil-contaminated (system)
CPESC	Certified Professional in Erosion and Sediment Control
CPF	central processing facility
CRM	Community Relations Manager
CRS	chromium reducible sulfur
CRWG	Community Relations Working Group
DA	Department of Agriculture (now DAWR)
DAWR	Department of Agriculture and Water Resources (Cwlth)
dB(A)	decibel ("A" weighting)
DHWQO	Darwin Harbour water quality objectives
DLPE	Department of Lands, Planning and the Environment (NT)
DLRM	Department of Land Resource Management (NT)
DoE	Department of the Environment (Cwlth)
DoH	Department of Health (NT)
DGPS	differential global positioning system
EA Act	Environmental Assessment Act (NT)
EAW	East Arm Wharf
EDG	emergency diesel generator
EHS	environment, health and safety

Item	Meaning
EIMP	environmental impact monitoring program
EIS	environmental impact statement (see Definitions)
EMA	extractive materials area
EMS	environmental management system
ENVID	environmental hazard identification
EOO	Emergency Operations Officer
EPA7	Environment Protection Approval 7 (see Definitions)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)
EPC	engineering, procurement and construction
EPO	environment protection objective
ERC	emergency response coordinator
ERT	emergency response team
ESCP	Erosion and Sediment Control Plan(s)
FGP	fuel gas pipeline
FPSO	floating production and storage offtake facility
g/m^2/month	gram(s) per square metre per month
GEP	gas export pipeline
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GIIP	good international industry practice (see Definitions)
GPS	global positioning system
GTG	gas turbine generator
h	hour(s)
ha	hectare

Item	Meaning
HAT	highest astronomical tide
HDPE	high density polyethylene
HMP	Heritage Management Plan (Company document C025-AG-PLN-0010)
HRSG	heat recovery steam generator
HSE	health, safety and environment
HSE-MS	health, safety and environment management system
HSEQ	health, safety, environment and quality
HSEQ-MS	health, safety, environment and quality management system
HSES	health, safety, environment and security
HVAC	heating, ventilation and air conditioning
ICNNT	Industry Capability Network Northern Territory
IECA	International Erosion Control Association
IFC	International Finance Corporation
IFD	(rainfall) intensity frequency duration
IMS	integrated management system
IMT	incident management team
ISQG	interim sediment quality guideline
JHA	job hazard analysis
JKC	JKC Australia LNG Pty Ltd
JUB	jack-up barge
kg/dry tonne	kilogram(s) per dry tonne
km	kilometre(s)
KPI	key performance indicator(s)

Item	Meaning
LA_{10}	noise level exceeded 10% of the time
LA_{90}	noise level exceeded 90% of the time
LDC	Larrakia Development Corporation
LDMP	Liquid Discharge Management Plan
LER	local electrical room
LHMEC	Larrakia Heritage Management Executive Committee
LIR	local instrument room
LNG	liquefied natural gas
LOLO	load-on/load off
LPG	liquefied petroleum gas
µg N/L	microgram(s) of nitrogen per litre
µg P/L	microgram(s) of phosphorous per litre
µg/L	microgram(s) per litre
$\mu g/m^3$	microgram(s) per cubic metre
µm	micrometre(s)
m	metre(s)
m^2	square metre(s)
m^3	cubic metre(s)
mg/kg	milligram(s) per kilogram
mg/L	milligram(s) per litre
min	minute(s)
mm	millimetre(s)
mm/a	millimetres per annum

Item	Meaning
mm/h	millimetres per hour
mm/s	millimetres per second
MCHE	main cryogenic heat exchanger
MMO	marine mammal observe
MOF	module offloading facility
MOFTP	MOF transition pontoon
mol H^+/tonne	moles of hydrogen ions per tonne
Mt	megatonne(s)
Mt/a	megatonne(s) per annum
MW	megawatt
NAQS	North Australian Quarantine Strategy
NATA	National Association of Testing Authorities Australia
NCW	non-contaminated water (system)
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measures
NHMP	Non-Aboriginal Heritage Management Plan: Nearshore Development Area and Darwin Harbour (Company document C025-AG-PLN-0029)
NOHSC	National Occupational Health and Safety Commission
NO_x	nitrogen oxides
NRETAS	Department of Natural Resources, Environment, the Arts and Sport (has since been restructured to form the Department of Lands, Planning and the Environment, the NT EPA and the Department of Land Resource Management) (NT)
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority (NT)
NTFRS	Northern Territory Fire and Rescue Service (NT)

Item	Meaning
NTIBN	Northern Territory Indigenous Business Network
NTQS	Northern Territory Quarantine Service
NTU	nephelometric turbidity unit(s)
OSC	on-scene commander
PASS	potential acid sulfate soils
PCB	polychlorinated biphenyl
PDCA	plan, do, check, act
PEAR	people environment assets reputation
PTS	permanent threshold shift
PTW	permit to work
pH	logarithmic index for the hydrogen ion concentration in an aqueous solution as a measure of acidity or alkalinity
PM_{10}	particulate matter with diameter less than 10 µm
PPE	personal protective equipment
ppt	parts per thousand
PWC	Power Water Corporation (NT)
RFSU	ready for start-up
RORO	roll on/roll off
QASSIT	Queensland Acid Sulfate Soils Investigation Team
QA	quality assurance
QAP	quarantine approved premises
QC	quality control
RTMP	Road Transport Management Plan
RWA	restricted work area

Item	Meaning
SO_x	sulfur oxides
SDS	safety data sheet(s)
SEMP	Subcontractor Environmental Management Plan
SEP	site environmental plan(s)
SIMP	Social Impact Management Plan (Company document C075-AH-PLN-0053)
SPMT	self-propelled modular transporter
STP	sewage treatment plant
SWMS	safe work method statement
t	tonne(s)
TAA	total actual acidity
TEOM	tapered element oscillating microbalance
TPA	total potential acidity
TPA/TAA	ratio of TPA to TAA
TPWC Act	Territory Parks and Wildlife Conservation Act (NT)
TRH	total recoverable hydrocarbons
TRT	tactical response team
TSS	total suspended solids
UV	ultra-violet
UXO	unexploded ordnance
VMS	variable message signs
WDL	waste discharge licence
WHS (NUL) Act	Work Health and Safety (National Uniform Legislation) Act (NT)
WMPC Act	Waste Management and Pollution Control Act (NT)

Item	Meaning
WMPC Regulations	Waste Management and Pollution Control Regulations (NT)
VWP	vibrating wire piezometers
WMS	work method statement(s)
WWTP	wastewater treatment plant (part of the Drainage and Effluent System)

1 Introduction

1.1 Ichthys Gas Field Development Project

The Ichthys LNG Project (the Project) is a joint venture between INPEX group companies (the Operator), major partner Total, CPC Corporation Taiwan and the Australian subsidiaries of Tokyo Gas, Osaka Gas, Kansai Electric Power, Chubu Electric Power and Toho Gas. Drawing on the hydrocarbon resources of the Ichthys gas and condensate field in the Browse Basin at the western edge of the Timor Sea offshore Western Australia, the Project is expected to produce 8.4 Mt of liquefied natural gas (LNG) and 1.6 Mt of liquefied petroleum gases (LPGs) per annum, along with approximately 100 000 barrels of condensate per day at peak.

The Project has an expected operational life of at least 40 years.

The Ichthys Field covers an area of around 800 km^2 and drilling studies suggest that its hydrocarbon resources are 12.8 trillion cubic feet of sales gas and around 527 million barrels of condensate.

The extraction of natural gas and condensate will be carried out via a floating semi-submersible central processing facility (CPF) at the Ichthys Field. This will remove water and most of the condensate from the reservoir fluids and the separated condensate will be transferred to a floating production, storage and offloading (FPSO) facility moored approximately 3.5 km from the CPF. After further processing on the FPSO, the condensate will be exported directly from the field at an average rate of up to 85 000 barrels per day (at the start of LNG production).

The dehydrated gas and the remainder of the condensate will be compressed and exported through an approximately 890 km long gas export pipeline (GEP) to the Project's onshore processing plant at Bladin Point in Darwin Harbour in the Northern Territory (Figure 1-1).

1.2 Purpose

JKC Australia LNG Pty Ltd (Contractor)—the joint venture between JGC Corporation, KBR (Kellogg Brown & Root Pty Ltd) and Chiyoda Corporation—has been appointed by INPEX Operations Australia Pty Ltd (Company) as the engineering, procurement and construction (EPC) Contractor for the Ichthys Onshore LNG Facilities and its supporting infrastructure, located on Bladin Point, approximately 16 km south-east of Darwin. Contractor will execute this work using a variety of subcontractors.

This Construction Environmental Management Plan (CEMP) details the environmental protection management measures and controls with the intent to avoid, reduce or mitigate the environmental impacts during the construction (including commissioning) of the Ichthys Onshore LNG facilities. It describes the systems and tools that will be used by Contractor to manage subcontractors and the environmental management responsibilities of Company, Contractor and Subcontractors during construction.

The construction period of the Project will take place from the initial mobilisation until the final handover of the second LNG train, approximately five years later.

This CEMP meets the various legal requirements as detailed in Section 3 and Appendix A.

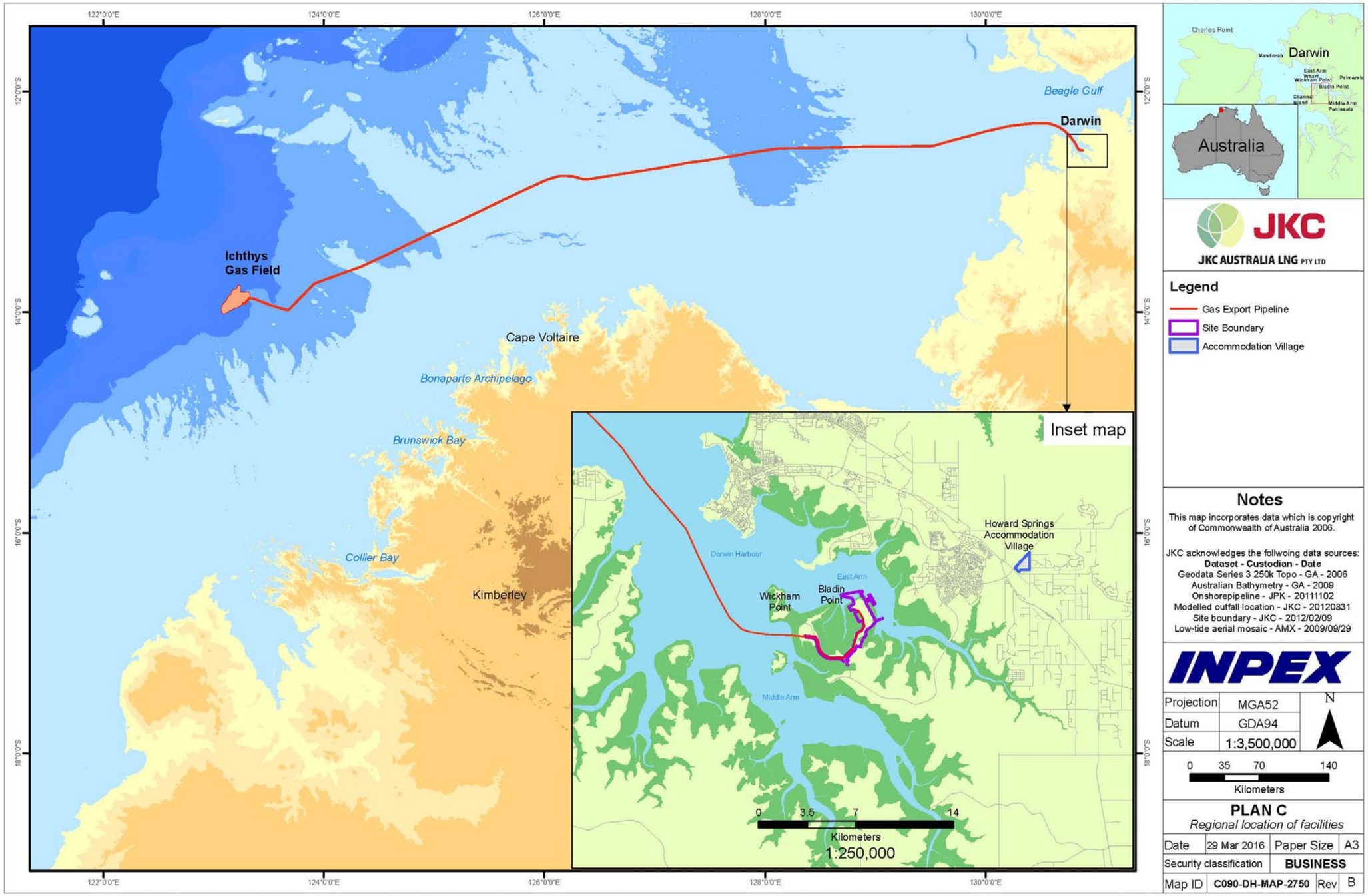

Figure 1-1: Location of Ichthys Field and Bladin Point

1.3 Extent of works and exclusions

This CEMP addresses the potential environmental impacts and identified mitigation measures related to the construction (including commissioning) of the onshore LNG facilities and its associated infrastructure confined to the Site, as shown in Figure 1-2. This CEMP also addresses demobilisation from Site by Contractor, and all remaining works under the EPC Contract, as described in Section 2.2, including any remediation of defects as may be required under the EPC Contract.

This CEMP is not applicable to:

- the accommodation village
- Section 1888 (remote laydown area)
- dredging in Darwin Harbour
- offshore construction
- overseas fabrication yards
- domestic Australian Vendors' workplaces
- transport of equipment, fill and rock material (prior to arrival on Site)
- the extractive minerals area (EMA)
- start-up of the Onshore plant and commencement of operations when hydrocarbons from the Ichthys field are introduced (which will be the subject of an Operations Environmental Management Plan and Environment Protection Licence application).

Section 1888 and the EMA are support areas for the construction activities on Site and have separate environmental management plans as per the requirements of the relevant approvals to occupy and operate the areas.

Company will make available this Company CEMP to all Company personnel on Site and issue it to Contractor. Contractor will issue its Contractor CEMP, which is fully aligned with this Company CEMP, to all Subcontractors (including where there are multiple layers of Subcontractors) and all personnel employed by Contractor. Subcontractors are required to comply with the Contractor CEMP. Contractor and Subcontractor plans and procedures will be aligned with this Company CEMP, and together with environmental systems and documentation will form the basis of the implementation of this Company CEMP. Where plans and procedures are referenced in this Company CEMP, refer to the latest approved version of the document.

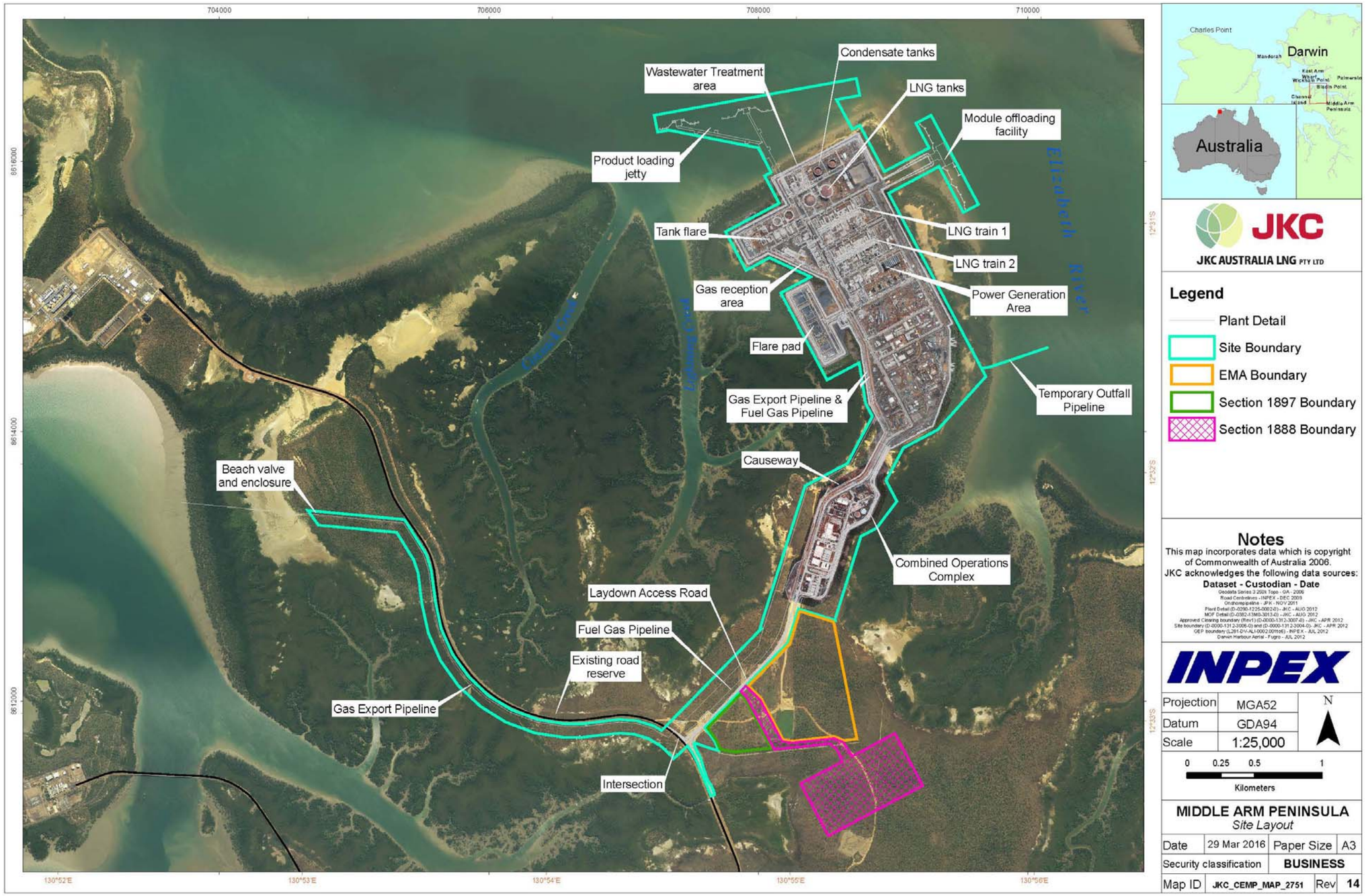

Figure 1-2: Site layout

1.4 Document review and revision

In accordance with Environment Protection Approval 7 (EPA7, as amended) the CEMP must be revised and approved by the Northern Territory Environment Protection Authority (NT EPA) prior to commencing any works that are not addressed in an approved CEMP and will or may cause or increase the potential for environmental harm, such as by any increase of emissions or discharges.

For any proposed new or changed site activities that are not already addressed in this CEMP, an environmental risk assessment will be completed in accordance with Section 5, and approved by Contractor and Company. Where the risk assessment demonstrates that the proposed activity will not cause or increase the potential for environmental harm, and Company agrees with this, the activity may commence ahead of revising the CEMP to include the new or changed activity. Further information on management of change in relation to this CEMP, and any resulting required revisions, is provided in Section 5.4.

If the risk assessment indicates that the proposed activity will, or may, cause or increase the potential for environmental harm, then that activity will not be approved to commence until the revised CEMP (or an Addendum to the CEMP) has been approved by the NT EPA.

Revisions to the CEMP will be submitted in accordance with EPA7 (as amended) requirements whereby:

- All CEMP revisions will be submitted to the NT EPA for approval, other than minor revisions involving changes such as typographical changes or revisions to formatting and referencing to other documents;
- Each revision of the CEMP must address all works that will be conducted prior to approval of the next revision of the CEMP, be reviewed and endorsed by a qualified person prior to submission to NT EPA; and be submitted to the NT EPA for review (with a copy of the qualified[1] person's certified review) at least 30 business days prior to implementation.

The CEMP will be reviewed as required, in response to outcomes from management audits and environmental events to identify opportunities for improved environmental performance for the Project. Although this revision of the CEMP is intended to be the final revision for the remainder of the construction scope of work, inclusive of commissioning, demobilisation and site restoration to final design, revisions will be made to the CEMP, if identified as required. Depending on the scope of the revision, this may be in the form of an Addendum.

1.5 Related documentation

A number of specific management plans and procedures have been prepared to satisfy the requirements of the Northern Territory Government Development Permits DP12/0065 and DP13/0501, Environment Protection Approval 7 (EPA7, as amended) and the Commonwealth Government Approval Decision EPBC 2008/4208. The relationship of these plans to the CEMP is illustrated in Figure 1-3.

Company, Contractor and Subcontractor shall comply with the requirements of these plans. Subcontractor shall consider these plans when preparing their own to ensure compliance. These plans will be provided by the Project Environmental Manager where

[1] A qualified person means an auditor who is accredited under either the New South Wales Site Auditor Scheme or the Victorian Environmental Auditor Scheme as a class of persons suitable to undertake environmental audits in the Northern Territory in accordance with Part 6 of the Northern Territory's *Waste Management and Pollution Control Act*.

relevant.

Waste discharge licence (WDL) 192 has been issued for the discharge of treated effluent from the temporary sewage treatment plant (STP) into Darwin Harbour. WDL 192 is publicly available to view at: http://www.ntepa.nt.gov.au/waste-pollution/approvals-licences/wd-licences.

WDL 211 has been issued for the discharge of spent hydrotest water into Darwin Harbour. WDL 211 is publicly available to view at: http://www.ntepa.nt.gov.au/waste-pollution/approvals-licences/wd-licences.

Specific environmental procedures for dewatering (Water Discharge Procedure L290-AB-PRC-10265) and waste management (Waste Management Procedure L290-AH-PRC-10295) have also been prepared to assist the implementation of this CEMP.

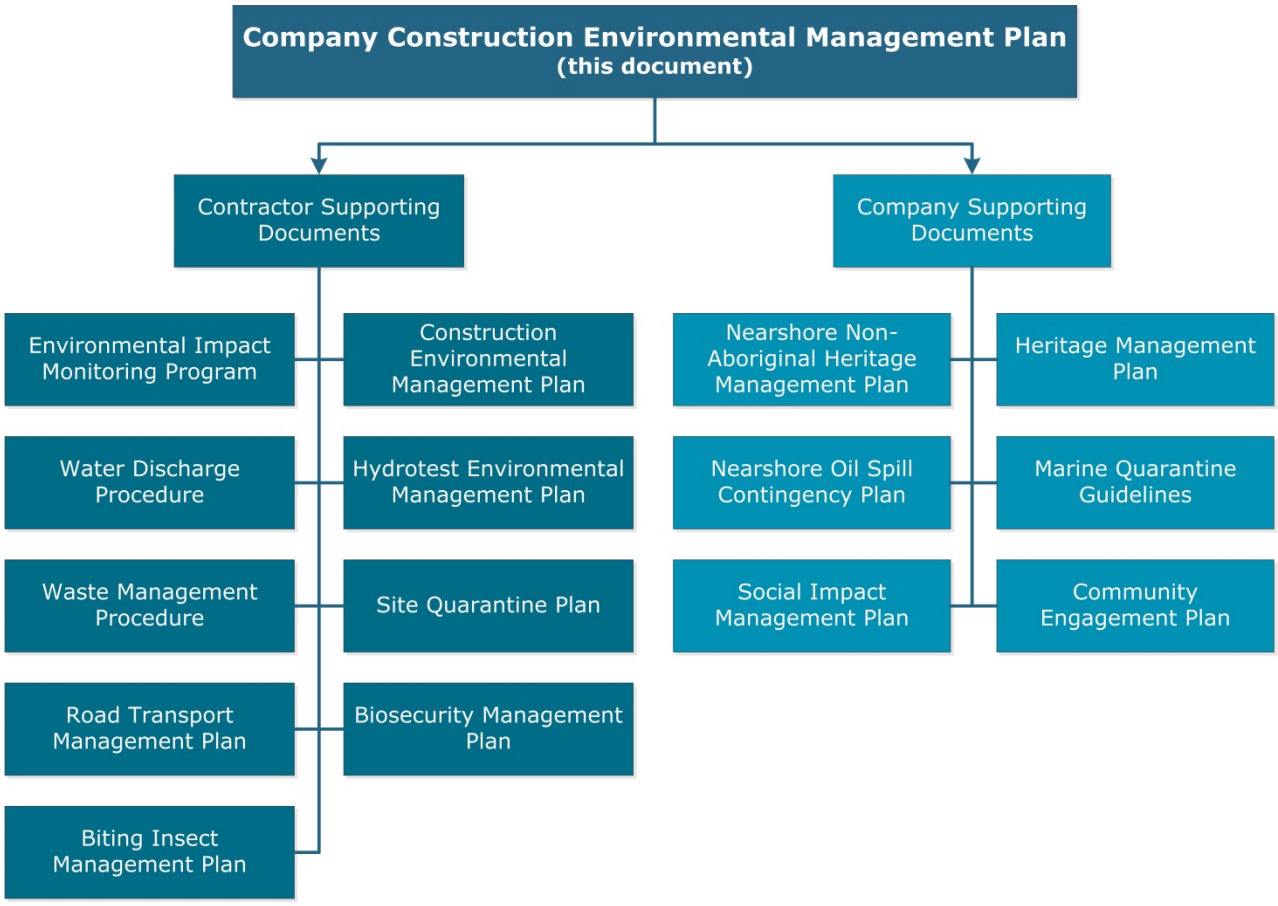

Figure 1-3: Onshore CEMP and related management plans

1.5.1 Environmental Impact Monitoring Program

Contractor undertakes environmental impact monitoring in accordance with the Environmental Impact Monitoring Program (EIMP; L290-AH-PLN-10013), to assess the potential impacts of Project construction activities on the receiving environment. Preparation, approval by the NT EPA and implementation of the EIMP is a condition of EPA7 (as amended).

The EIMP monitoring network has been progressively implemented to align with the construction schedule, and the EIMP allows for optimisation of the network once

construction is completed within discrete areas. If needed, the EIMP is updated and provided to the NT EPA for approval, as required under EPA7 (as amended).

The EIMP includes monitoring of:

- mangrove community health
- weeds
- surface water
- groundwater
- sediment and bio-indicators
- dust
- airborne noise.

Table 1-1 summarises the key components of the EIMP (Rev 6[2]). Preparation of the EIMP and the design of the monitoring programs take into account the activities on Site at different stages of the Construction process to ensure receiving environment monitoring is commensurate with potential sources of contaminants or pollution of the receiving environment. Monitoring associated with (Contractor held) waste discharges licences is not included in the scope of the EIMP, which is specific to the CEMP. These additional monitoring programs are agreed and provided to the NT EPA, if required, through alternative processes.

Table 1-1: Summary of EIMP Rev 6

Program	Monitoring Rationale and Methodology	Frequency
Surface water	Determination of impacts of surface water discharge on the receiving environment. In-situ analysis will be undertaken using telemetered water quality meters attached to navigation buoys.	Continuous (15 minute intervals)
	In-situ analysis to be undertaken using pre-calibrated water quality meters. Auto samplers to collect water samples during basin and drainage structure overtopping events. Samples will be collected for laboratory analysis.	During each discharge at, or in proximity to, the onsite basins
	Determination of impacts of surface water discharge on the receiving environment through sampling locations upstream, downstream, at the point of discharge and reference sites[3]. Samples will be collected for laboratory analysis to supplement in-situ analysis of key parameters.	Monthly
	In-situ analysis to be undertaken using pre-	Monthly before

[2] EIMP Revision 6 is the approved version at the time of preparation of this CEMP.

[3] A reference site is defined in the ANZECC (2000a) Guidelines (Section 3.1.4) as a location nearby that is uninfluenced or not as influenced by the disturbance being assessed.

Program	Monitoring Rationale and Methodology	Frequency
	calibrated water quality meters. Basins will be retained as sentinel monitoring locations, which may be sampled on an as needed basis, dependent upon how the basin is used, to focus on specific events.	discharge
Groundwater and acid sulfate soils[4]	In-situ analysis of groundwater pH and conductivity using data loggers across the bore network. Groundwater elevations will also be monitored.	Continuous
Groundwater quality	Groundwater sampling will be undertaken using low-flow sampling techniques and (where practical) using dedicated or disposable equipment. In-situ analysis will also be undertaken using calibrated water quality meters.	Monthly
Mangrove community health, sediment quality, sedimentation and erosion and bioindicators	An assessment will be made of the vitality of mangrove communities through comparison of baseline and reference site[2] data on parameters including canopy cover, tree condition and benthic community health. Photographs of mangrove condition will be taken from standard reference points at monitoring sites. Cores will be taken to investigate the presence and thickness of veneers of different material overlying the mangrove substrates. Elevation of marker stakes will also be measured to determine the effects, if any, on ground surface. Sediment samples will be collected from the top 1 to 5 cm of sediment within intertidal areas using a sterile scoop. If potential impacts are observed (e.g. discoloured surface sediments might indicate acid leachate is occurring), a sample may be collected for determination of pore water quality, acid soluble metals and/or acid volatile sulfides to determine the level of risk posed by the sediment.	Quarterly
	Telescopium telescopium will be collected and	Biannually

[4] Disturbance of potential or actual acid sulfate soils is no longer likely as all site excavations and ground preparation works into natural ground have been completed. Any excavations that may be required will be into the top 5 m, which has been replaced with NASS soils during the major earthworks stage of the Project in 2013/14. In the event that excavation into natural soils is required, assessment, monitoring and treatment will occur in accordance with QASSIT guidelines.

Program	Monitoring Rationale and Methodology	Frequency
	analysed for bioaccumulation of heavy metals. Data will be assessed for trends and against reference sites[2]. Mud whelk distribution along transects will be recorded with GPS coordinates.	
	Sediment depth will be monitored by relative elevation of sediments measured by surveyed benchmarks.	Annually
Air quality (dust)	Dust will be collected in dust deposition gauges. PM_{10} and $PM_{2.5}$ particulate measurement through near-forward light scattering samplers (E-Samplers). Dust mass determination will be undertaken.	Continuous sampling and gravimetric determination
Airborne noise	Assessment of sound levels dB (A) and comparison to baseline data. Permanent sound monitors have been deployed; these will also continuously record sound. These recordings will be referenced if Project noise limits are exceeded or complaints are received.	Continuously throughout the construction program
Flora and fauna	Visual assessment of clearance against the clearance permit. Clearing limits will be collected using DGPS.	As required
	Documentation of all native fauna injuries and deaths in incident registers.	Daily
Weed monitoring	Visual survey to review onsite weed management efficacy. Weed locations will be captured by GPS and newly identified weed locations will be incorporated into the weed inventory.	Quarterly
Weather monitoring	Monitoring will occur at a weather station located within the Project area which will collect rainfall, temperature, humidity and wind speed/direction data.	Continuously throughout the construction program

2 Scope of Work

2.1 Company scope of work

Company Operations Division will move onto Site during commissioning and will provide support and guidance to Company and Contractor discipline groups to ensure the facilities can be efficiently and safely operated and maintained as per the intent of the basis of design. The commissioning scope is divided into separable portions, and Contractor will progressively 'handover' separable portions, or parts of separable portions (individual subsystems), to Company who will undertake 'pre-operations' activities. This includes running of some of the utilities to support commissioning activities. Key Company activities during this phase are included in Table 2-3.

2.2 Contractor scope

This section lists the total scope of work to be undertaken by Contractor, as the EPC Contractor for the onshore LNG facilities and its supporting infrastructure. The total scope of works will be executed within the Site.

The scope of work relevant to this CEMP is described in Section 1.3.

The total scope of work to be undertaken by Contractor includes the following:

- an 8-km 42" onshore GEP from the beach valve and enclosure to the Bladin Point gas processing plant site
- a 4-km 12" fuel gas pipeline (FGP) located within the LNG facilities boundary that supplies gas during commissioning and emergency gas export during permanent operations
- a gas reception area
- two gas liquefaction trains, each producing approximately 4.2 Mt/a, including:
  - gas treatment facilities (acid gas removal, dehydration, mercury removal)
  - a fractionation system
- a condensate stabilisation system
- utilities distribution and storage (power generation, fuel, water, nitrogen, compressed air, heating medium)
- two LNG tanks with a net working volume of 165 000 m^3 each
- two condensate tanks with a net working volume of 66 000 m^3 each
- a condensate buffer tank with a net working volume of 6 500 m^3
- a propane storage tank with a net working volume of 85 000 m^3
- a butane storage tank with a net working volume of 60 000 m^3
- propane refrigerant sphere volume of 2500 m^3
- LNG and LPG recovery units for boil-off gas (BOG)
- a product loading jetty on the north-western end of Bladin point with one berth for LNG export and one for propane, butane and condensate export
- a gas flaring system consisting of a ground flare and enclosed tankage flares
- a permanent wastewater treatment plant (WWTP)

- access road and operation complex consisting of gatehouse, operation office, central control building, main workshop, laboratory, hazardous goods store, radio communications building, hazardous materials warehouse, warehouse, warehouse laydown and shutdown village
- utilities annex consisting of local electrical room (LER), diesel tank, service and drinking water storage tank, freshwater tank and fire water tank
- other temporary infrastructure required to support the construction of the onshore LNG facilities.

2.3 Transition of Site from Contractor to Company prior to commencement of Operations

Transition of Site from Contractor to Company, prior to the commencement of Operations, will be managed as follows:

- Company has delegated control to Contractor for all construction (and commissioning) areas related to the Site up until separable portion handover.
- When precommissioning is complete in a specific area, that area will be delineated to indicate that commissioning activities are underway. Control of that area will remain with Contractor.
- At the point of introduction of PWC commissioning gas, Company will increase its oversight of safety management on the entire site in order to establish the integrity of the safety management system. The Company Health, Safety, Environment and Quality (HSEQ-MS) Management System and Company Permit to Work System may be progressively applied (refer to Section 4.2 for information on the Company HSEQ-MS).

2.4 Indicative schedule

An indicative construction (including commissioning) schedule, and the responsible organisation conducting the works, is provided in Table 2-1.

Table 2-1: Indicative construction schedule for remaining scope of work

Activity	Start	Finish	Responsible Organisation
Site Development Civils Work (complete)	May 2012	Feb-15	Contractor
Civil and Concrete Works	Jan 2013	Q2 2017	Contractor
Installation of Contractor Temporary Facilities Works (complete)	Mar 2013	Dec-14	Contractor
Construction of Product Loading Jetty	Apr 2013	Q4 2016	Contractor
Installation of Cryogenic Storage Tanks	May 2013	Q4 2016	Contractor
Installation of LNG Train 2	May 2013	Q3 2017	Contractor
Installation of LNG Train 1	May 2013	Q3 2017	Contractor

Activity	Start	Finish	Responsible Organisation
Construction of Module Offloading Facility (MOF) (complete)	Jun 2013	Aug-14	Contractor
Installation of Common Utilities	Jun 2013	Q3 2016	Contractor
Installation of Power Generation Area, including the Combined Cycle Power Plant (CCPP)	Jun 2013	Q2 2017	Contractor
Construction of Operations Complex	Jul 2013	Q3 2016	Contractor
Installation of Non-Cryogenic Storage Tanks	Feb 2014	Q1 2017	Contractor
Construction of MOF Transition Pontoon (MOFTP) (complete)	Mar 2014	Aug-14	Contractor
Heavy Hauling and Erection	Apr 2014	Q3 2016	Contractor
Hydrotesting and precommissioning of tanks, pipes and pumps	Oct 2015	Q4 2016	Contractor
Commissioning of common utilities	Jun 2016	Q3 2016	Contractor
Commissioning of the Operations Complex	Jun 2016	Q3 2016	Contractor
Commissioning of the CCPP	Jun 2016	Q2 2017	Contractor
Commissioning of LNG trains	Jun 2016	Q3 2017	Contractor
Running of CCPP on PWC gas (simple cycle and combined cycle) to support commissioning activities	Q2 2017	Q3 2017	Contractor with Company support
Running of the permanent WWTP	Handover of WWTP to Company	Q3 2017	Company
Import of propane via truck to fill sphere (trigger for Major Hazard Facility Status, subject to acceptance of Safety Case by NT WorkSafe)	Q4 2016	Q1 2017	Contractor
Running of utilities (demineralisation plant, nitrogen, instrument air) to support commissioning activities	Q3 2016	Q2 2017	Company
Importation of LPG and LNG via ship and	Q2 2017	Q2 2017	Company

Activity	Start	Finish	Responsible Organisation
bringing into service associated tanks and piping			
Site rehabilitation to final landform design	Progressively implemented until EPC scope completed		Contractor
Demobilisation	Progressively implemented until EPC scope completed		Contractor

Commissioning of the Onshore plant will be progressive, starting with the facilities required for:

- Water supply: Potable water, supplied from PWC and distributed throughout the site for various consumers, is used to produce the demineralised water, critical for the commissioning of the CCPP and other units such as the acid gas removal unit (AGRU). Potable water is also used for the firefighting system that has to be in place prior to starting any potentially flammable commissioning activities.
- Power supply: Power is initially supplied by the temporary diesel engine generators, followed by the use of the emergency diesel generators (EDGs), prior to progressively bringing on line gas turbine generators (GTGs) at the CCPP. The GTGs will be using PWC gas.
- Air supply: Air is used throughout the site for air compressors and various instruments. Temporary dry air will be produced by portable oil-free air compressors, and used as temporary instrument air sources and for cleaning of various systems. Permanent air systems will be commissioned with EDG power.

Commissioning of the other facilities will follow, divided into separable portions. Figure 2-1 provides a schematic of the location of each separable portion for commissioning purposes. Some of the systems, such as the drainage and effluent system, are commissioned in several components, reflecting their integration into various other systems which are commissioned at different times and at different areas throughout the site. Table 2-2 provides an overview of the systems to be commissioned in each separable portion.

Table 2-2: Staged completion of various systems Ichthys Onshore Plant

Area No	Description	Separable Portion
710	Service and drinking water	1
780	Power generation and distribution - I	
680 720	Compressed air LNG trains – I Demineralised water LNG trains	
790	Firefighting	
750	Drainage and effluent treatment – I	

Area No	Description	Separable Portion
690 700	Nitrogen LNG trains Relief flare and vents LNG trains	
450 660 750	Solvent storage Fuel – I Drainage and effluent treatment - II	
750	Drainage and effluent treatment - II	2
680 410 420	Compressed air LNG trains – II LNG storage and loading LPG storage and loading	
430 440	Condensate storage and loading Refrigerant storage	
780	Power generation and distribution – II (CCPP)	3
510	Onshore arrival inlet facilities	4
520	Condensate stabilisation	
530	Condensate mercury removal	
750	Drainage and Effluent Treatment - III	5
680	Compressed air LNG trains - III	5,6
660	Fuel - II	
540	Mercury removal LNG trains	
550	Acid gas removal	
560 580	Dehydration LPG recovery	
590 600	Liquefaction/refrigeration Refrigeration	
610	Fractionation LNG trains	
640 650	Heating medium LNG trains Cooling medium LNG trains	

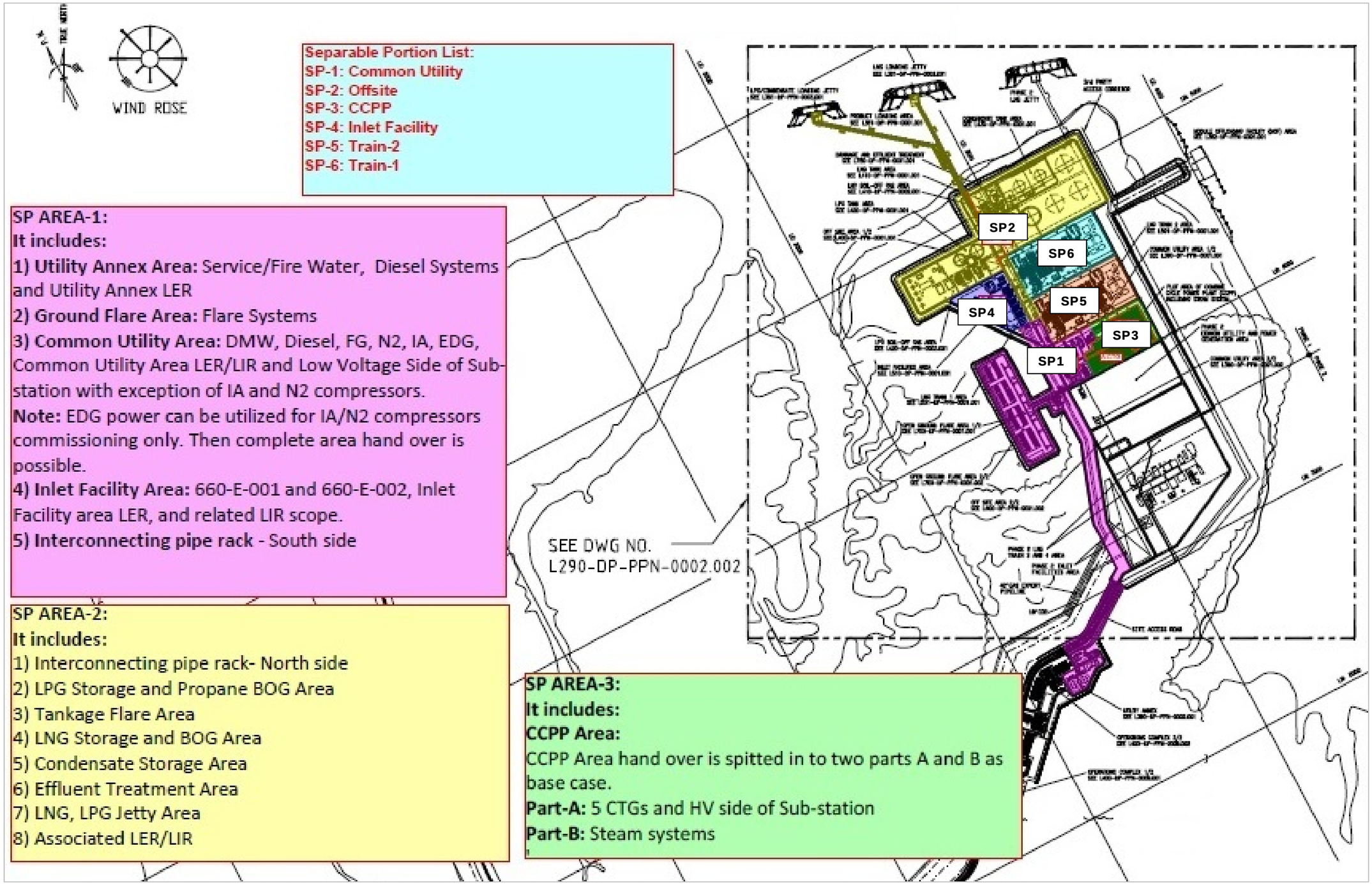

Figure 2-1: Separable portion locations on Site

2.5 Relevant construction activities

A detailed description of each of the key construction activities and facilities applicable to this CEMP is listed in Table 2-3. For activities that are indicated as complete in Table 2-3, mitigation measures will not be detailed in Section 6.

Table 2-3: Key construction activities

Activity	Description
Activities previously approved	
Clearing of vegetation	Clearing activities primarily consist of the following: • surveying and pegging-out of the areas to be cleared and those to be protected • pushing over vegetation and grubbing up roots • mulching vegetation • removing and stockpiling topsoil. The machinery/equipment required for clearing includes bulldozers, excavators, backhoes and water carts. Planned vegetation clearing within the Project approved clearing boundary has been undertaken across the Site with majority of vegetation removed. Other clearing at various localised pockets across the Site and within the Project approved clearing boundary will be undertaken as required e.g. geotechnical works.
Geotechnical investigations	Onshore geotechnical investigations involves the following: • drilling of onshore boreholes using a crawler or truck-mounted drill rig then installation of bore casing for the purpose of sampling and obtaining the required geotechnical information • depending on borehole location, localised vegetation clearing for access and drilling purposes • trenching and test pitting. Planned onshore geotechnical investigations are complete; however further geotechnical investigations may be undertaken as required.
Bulk earthworks	Bulk earthworks are required across the Site to meet the required ground-surface design levels and grades prior to the construction of subsequent facilities. Bulk earthworks involves cutting and filling with suitable cut material or imported/borrow material. Conventional cut and fill methodology is to cut high areas and use the resultant material to fill in low areas. Alternatively, cut and fill may apply to cutting out of unsuitable material and replacing with engineered fill or other suitable material. Borrow material will be preferentially sourced from the EMA directly adjacent to the

Activity	Description
	Site though some fill will be sourced from external commercial suppliers and quarries (refer to 'Transportation of fill and rock materials' in this table). Unsuitable cut material will be managed on Site where possible. The machinery/equipment required for bulk earthworks includes excavators, bulldozers, scrapers, water trucks, compressor and generators, compactors, tipper trucks and trailers, fuel and lube trucks, and flat-bed trucks. The majority of bulk earthworks are now completed for the Site, with any remaining earthworks to be done within the Site boundary, as required.
Ground improvement	Due to existing unsuitable ground conditions within the Site ground improvement is required to achieve the strength and to limit settlement to meet loading criteria. The individual work areas to be targeted are based on pre-treatment soil investigations. A number of ground improvement methods are used, including but not limited to dynamic replacement, dynamic consolidation, stone columns, controlled modulus columns, deep soil mixing and remove and replace, and other similar methods. The deep soil mixing and remove and replace methods are summarised below. **Deep Soil Mixing** This methodology improves ground conditions by introducing a binder and mixing to stabilise soil profiles. An example where deep soil mixing could be used is along the GEP corridor where cement and/or lime will be injected into the unsuitable soil/soft areas and mixed using a rotary mixing head attached to an excavator treat (in situ) any identified acid sulfate soils (ASS) or potential acid sulfate soils (PASS) as required. The cement and/or lime act as the binder for ground improvement and neutralising agent for ASS. Each area to be improved/treated will be completely mixed to design depth including initial mixing across the soil profiles and mixing during and after injection of the binder/neutralising agent to ensure homogenous conditions are achieved. Ground improvement is typically undertaken in cells of nominally 5 m x 5 m x 3 m deep with overlap until all areas are treated. The key machinery and equipment required for these works includes excavators with rotary mixing heads, self-propelled binder pressure units, tipper trucks, road tankers and prime movers, compactors and water cart. **Remove and Replace** This ground improvement method involves excavation of unsuitable material in soft areas, including intertidal and wet areas, to a nominated depth and replace this material with engineered fill including compacted

Activity	Description
	crushed rock and other suitable materials. Remove and replace is a modified version of cut and fill methodology where unsuitable material is removed and replaced with a suitable rock fill for ground improvement purposes. Examples of where this method could be used are under the foundations of permanent facilities where required such as the foundations for the cryogenic (LNG and propane) tanks and flare pads, and construction of the MOF causeway. The key machinery required for these works includes excavators, front-end loaders, rollers, graders, tip trucks and water trucks. All planned ground improvement works are now complete, however additional ground improvement may be undertaken if required.
Civil works	Following bulk earthworks and ground improvement activities, further civil works are conducted across the Site including for temporary and permanent foundations, slabs and above and below grade features and installation of underground services such as cabling and piping. These works involve detailed earthworks and site grading, trenching, excavation, dewatering and backfilling, surface protection, installation of formwork and reinforcements and concrete works. Civil works also include construction of roads, paving and surface sealing, erection of fencing and gates, installation of shore protection measures using rock armour around the Site perimeter, construction of laydowns, installation of perimeter drains, stormwater pipes and drainage ditches. Road construction includes: • the Site access road including the intersection with Wickham Point Road to allow ingress and egress of all vehicles to Site with additional access points to be constructed for the GEP works • access and haul roads within Site for heavy vehicle movements and to accommodate the significant volume of traffic movements. The construction of roads is phased, with different road-surface standards being applied at different stages. The construction of the roads require cut and fill activities with borrow material being used for pavement and embankment construction. Elevations of civil works including foundations vary across Site depending on locations. Work may encounter ASS and/or PASS and/or extend below the groundwater table. The key machinery required for these works includes excavators, front-end loaders, backhoes, bulldozers,

Activity	Description
	rollers, graders, cranes, concrete trucks, pumps, concrete placing booms, tip trucks, side-tippers, prime movers, trucks, water trucks, tele handler and fork lifts. Civil works are ongoing across the site and will continue through to the demobilisation and removal of temporary construction facilities, rehabilitation and final landscaping to basis of design.
Transportation of materials, plant and equipment	Transport of a range of materials, supplies, plant and equipment via public road to the Site are to be expected. Transport of materials and goods is an ongoing activity. Fill material for bulk earthworks and road construction are preferentially sourced from the EMA directly adjacent to the Site. However, some fill, aggregates, road bases, sand, rock material (for use at the LNG plant, flare pad and its causeway, the operation complex and Site access road), pavement materials and rock armour are sourced from external commercial suppliers and quarries and transported to the Site using road trains and haul trucks. Materials including supplies, plant and equipment are also being transported to Site from multiple origins overland and from East Arm Wharf following delivery by vessel. Transportation of materials, plant and equipment is an ongoing activity. Environmental impacts and mitigation measures relating to activities within the EMA are addressed in Contractor's Mine Management Plan (L290-AH-PLN-10009). Impacts and mitigation measures for activities which interface between the Site and EMA such as transport of fill material to and from the EMA are addressed in this CEMP. Offsite environmental impacts and mitigation measures relating to these activities are addressed in the Contractor Road Transport Management Plan (L290-AB-PLN-0147).
Mobilisation and installation of temporary construction facilities	Mobilisation of plant, equipment and materials is expected to occur for the commencement of any construction activities. A range of temporary construction facilities have been installed to facilitate/support the construction of any permanent facilities. The temporary facilities include cyclone-rated office buildings, crib huts, ablutions, shelters, power generation (generator sets), car parks, workshops, warehouses, diesel storage and fixed refuelling facilities, mobile refuelling equipment, other dangerous goods and hazardous chemicals storage areas, abrasive blasting and painting shop, waste storage areas, washdown bays, wheel washes, washout pits, hardstand areas, laydown areas, fencing, gates and turkey's nests. . Other temporary construction facilities include a STP, treated effluent discharge outfall pipeline, fuel station, quarantine facilities, mobile and stationary concrete batch plants, crushing and screening plants, hazardous

Activity	Description
	waste and controlled waste storage facilities, HSE and induction training centre, first aid and fire station facility, general warehouse and workshop, security guard houses, car parks, vehicle washdown bays, ASS treatment pads, storage and laydown areas and a temporary discharge outfall at the MOF for management of compliant wastewater discharges. Key facilities are described in more detail below (refer to 'Operation and maintenance of temporary construction facilities and site support' in this table). Temporary construction also includes erosion and sediment control structures and devices for the management of stormwater and associated impacts and risks after vegetation clearing activities for the individual work areas. Erosion controls include stabilisation of exposed soil and drains, and sediment controls include devices such as temporary sedimentation ponds, perimeter drains, rock check dams, sediment traps, rock-lined drains and silt fences. Temporary buildings are generally of modular prefabricated type and fitted out as far as practicable prior to mobilisation. Localised excavation for footings and pads is being/has been undertaken to install the temporary buildings. Cyclone blocks are utilised. Construction of temporary infrastructure also includes utilities and services such as power, water, sewer, ablution blocks, telecommunications, waste disposal and area lighting around the Site; as well as connection to the various temporary facilities. The key machinery required for these works includes excavators, front-end loaders, cranes, tip trucks, fork lifts, bob cats and semi-trailers for delivery of prefabricated buildings to Site. Mobilisation and installation of temporary construction facilities is an ongoing activity.
Operation and maintenance of temporary construction facilities and site support	Operation and maintenance of a range of temporary facilities occur throughout construction. Relevant facilities and activities are described below. **Concrete Batch Plants** Concrete is supplied on Site by mobile and stationary concrete batch plants: A typical mobile concrete batch plant has a nominal capacity of 50 m^3 of concrete per hour and be built onto a trailer chassis as one or two units consisting of an agitator, aggregate silos, loader, engine, water chillers and tanks, and system controls. A typical small stationary concrete batch plant is typically installed within an area of 5000 m^2 and includes two mixing plants, each with a rated capacity of 50 m^3 of concrete per hour. The mixing plants are operated in

Activity	Description
	duty/standby mode during normal operations while both operate in peak demand periods. The layout also includes office, crib hut, ablutions, agitators, aggregate bins, cement silos, loaders, generator sets, water chillers and tanks and system controls. A large stationary concrete batch plant is supplying the majority of concrete required for the Site construction activities. The plant is on an area of 24,000 m^2 and includes two mixing plants, each with rated capacity of 120 m^3 of concrete per hour. The plant layout also incorporates offices, crib hut, ablutions, agitators, aggregate bins, cement silos, control room, generator sets, water chillers, ice plants and water storage tanks. Admixtures are stored in bunded chemical storage areas, cement in closed silos and sand and aggregates stockpiled in bunded areas and covered as appropriate. Potentially contaminated runoff and process wastewater including water from bunded process hardstands in dedicated plants is collected and fully recycled including for washing equipment such as transit mixers/agitator trucks and dust suppression within the hardstand areas. Solids settling in the washout systems and waste concrete is dried and recycled as an alternative for aggregate in hardstands or fill where possible. Transit mixers/agitator trucks delivers concrete from the batch plants to the end users as required. The majority of the concrete shall be placed into position using high-pressure concrete pump equipment and placing booms. Operation and maintenance of a range of temporary construction facilities is an ongoing activity. **Vehicle Washdown / Wash Facilities** Vehicle washdowns/wash facilities are operated for vehicle hygiene management requirements of the Site and to facilitate all weather movement of vehicles. The washdowns are self-contained, and water is retained for reuse or disposal offsite by a licensed waste contractor. Water to be reused is treated (i.e. oil water separator). The vehicle washdown bays will be operated generally in accordance with the Guidance note for washdown facilities using recycled water (DEH 2011). Currently there is one operational wheel wash located on the site access road. During the wet season a number of additional wheel wash facilities may also be installed on site in individual areas and managed as per the above. **Fuel Supply** Multiple diesel storage tanks of a range of capacities are installed on Site for storage of diesel for refuelling of vehicles and mobile fuel trailers at fixed and temporary refuelling facilities. The Site currently has two

Activity	Description
	refuelling facilities onsite which each includes one 60 m^3 diesel storage container and one 20 m^3 diesel storage container. All other fuel is diesel delivered using approximately 10 m^3 capacity fuel trucks. During commissioning, permanent diesel tanks will be commissioned, which consist of one 171 m^3 tank in the common utility area, and a 35 m^3 tank and a 50 m^3 tank in the operations complex. Fixed refuelling facilities contain an impervious pad and means to contain spills and treatment (i.e. oil water separator) for potentially contaminated water. For temporary refuelling facilities, drip trays or portable bunds are used during refuelling. The majority of diesel is delivered to Site by external licensed fuel suppliers. **Waste Management** There are a number of waste storage areas including for hazardous/controlled waste. Several licensed waste operators provide waste management for the Site, including a Site-wide waste management service implemented to offer coordinated waste management. This service comprises: • the provision, maintenance and replacement of all appropriate storage facilities such as bins, drums and receptacles at nominated waste storage/collection areas throughout the Site for the storage of waste including hazardous and controlled wastes, and sludge cake from the temporary STP operation • collection and treatment of all types of waste from these designated storage/collection areas, to transport and dispose of these wastes to approved and licensed waste treatment facilities and landfill sites • auditing and monitoring at waste storage/collection areas to ensure correct segregation of waste streams. Waste management requires operation of appropriate plant/equipment for the storage, collection, transport and disposal of wastes offsite. A main hazardous/controlled waste facility is utilised as a bin transition and holding area to accept, segregate and appropriately hold hazardous and controlled waste generated during construction. Waste from this facility is managed as per the Site-wide waste management, as described above. The facility is fitted with spill response equipment suitable for the wastes being stored. Potentially contaminated runoff from this facility is contained by an interceptor tank while uncontaminated runoff is treated to remove hydrocarbons prior to discharge to the site drainage network. All other waste operators other than Site-wide waste management

Activity	Description
	operator, collect and transport hazardous/controlled waste directly (i.e. no holding) offsite for disposal. Refer to 'Quarantine premises' below for management of quarantine waste. **Warehousing and On-site Laydown Areas** Containers are utilised for warehousing purposes. Activities in the warehouse and laydown areas include inspection, receiving and issuing of material and equipment, preservation and maintenance of material and equipment and maintenance of appropriate records for these actions. **Maintenance of Roads** Activities related to the maintenance of roads (temporary access and haul roads), parking lots and hard-stand areas include repair of damaged pavement, temporary grading, repair and maintenance of fencing and gates, traffic control and temporary signage. The activities also include maintenance of site drainage, including the removal of siltation material and pumping out of stagnant water in temporary and permanent drainage ditches. **Sanitary Facilities** The sanitary facilities include a number of ablution blocks located around Site, a temporary STP (as described below) and associated collection network with pumping stations. The majority of ablution blocks are connected to the network; however, several satellite ablution blocks remain unconnected with regular pump out and disposal of sewage to the temporary STP via trucks. Prior to operation of the temporary STP, ablutions were connected to holding tanks with regular pump out and disposal offsite by local licensed waste services. The key aspects of the sewage collection, treatment and disposal system during operation are: • Sewerage collection system captures sewage from two main sources, ablution blocks and crib rooms. The sewage is transferred via gravity and pumping stations to the temporary STP. There is no industrial effluent entering the plant. • The sewage influent is treated in the temporary STP which includes screening, biological nutrient removal, nitrogen and phosphorous removal, membrane filtration and UV disinfection. The temporary STP is a modular design where treatment tanks can be commissioned/decommissioned as required to service the varying construction workforce and variable levels of incoming flow while continuously meeting the required discharge specification. • Treated effluent is then collected in a holding tank and pumped out for discharge into Darwin Harbour by

Activity	Description
	an outfall system consisting of a pipeline connected to a multiport diffuser. WDL 192 has been issued for the discharge of treated effluent from the STP into Darwin Harbour. • Dried sludge cake and screenings removed at the inlet are the waste by-products of the treatment process. These wastes are collected and disposed of at an approved offsite facility. **Quarantine Premises** Modules and equipment being delivered via the MOF are being quarantine inspected at the quarantine premises, on board vessels at the MOF or on the MOF. Quarantine inspection takes place under the direction of Department of Agriculture and Water Resources (DAWR) personnel. All modules and equipment will need to comply with the DAWR quarantine requirements prior to being cleared. The quarantine premises contains a dedicated concrete pad for inspection and washdown. Any required quarantine washdown is undertaken on the dedicated pad. Washing facilities include high pressure water jets and lifting equipment. The pad drains to controlled outlets for discharge of clean water into the drainage system. In the event of a washdown, the controlled outlets are closed and all water drains to a sump within the quarantine premises. The sump has a wet well pump station arrangement and washdown wastewater is pumped out into an above ground collector tank for containment and temporary storage. Any quarantine or biosecurity waste or washdown wastewater are contained in appropriate storage (e.g. tank, designated biosecurity bins), collected and transported by a DAWR-approved biosecurity waste operator to a facility approved by DAWR. The quarantine premises is being maintained as required including ensuring the area and surrounds remains clean of waste, debris and weeds. **Module Offloading Facility (MOF)** The MOF is operated to receive modules and equipment from delivery vessels, at hours and time as required to receive vessels and as dictated by weather, tide condition and arrival of delivery vessels. Temporary lighting is provided for any night time works. Appropriate construction equipment, and other necessary tools and/or devices are made available as required to achieve efficient work at the MOF. The MOF is a restricted zone and with perimeter fencing and one access point from onshore under guard control. **Acid Sulfate Soils (ASS) Treatment Pads** A number of ASS treatment pads are operated simultaneously on Site at any one time to manage ASS. ASS are excavated and transported to the pads for treatment (ex situ) with neutralisation agent. Stormwater runoff from the pads is captured for treatment. The development/installation of ASS pads is staged with the

Activity	Description
	volume of treatment required. Treatment of ASS materials also occur in appropriately contained facilities (e.g. drums, portable bunds) for small volume, in accordance with the appropriate guidelines. Pre-excavation neutralisation (in situ treatment) of ASS will also occur within the gas export pipeline corridor.
Nearshore infrastructure construction	Construction activities in the nearshore development area include the module offloading facility (MOF), product loading jetty (Jetty), discharge outfalls for the STP, permanent WWTP and hydrotest water. Note: No dredging is being undertaken by Contractor. **Module Offloading Facility (MOF)** The MOF consists of a cellular cofferdam structure comprising 14 cells and 13 interconnecting arcs. The cells and enclosed areas are filled with quarried rock. The toes of the cells and arcs are stabilised by mattresses and grouting. The MOF deck structure consists of a combination of precast and in-situ concrete slabs, finished with a pavement layer, monopile dolphins and large-span catwalks. Key construction activities for the MOF will involve installation of sheet piles onto the seabed which form the walls of the cofferdam cells and interlinking arcs. The equipment required for these construction activities includes barges, jack-up barges (JUB), crane, conveyor, piling template, genset, hydraulic impact hammer, vibrohammer, pontoon, tug boats, personnel launch and safety vessels, and fuel transfer tanks. Construction of the MOF is now complete. **MOF Causeway** The construction of the MOF causeway involves bulk earthworks where rock fill is tipped onto areas stabilised using a number of ground improvement methods (refer to 'Ground improvement') to address unsuitable material, particularly at the edge of the dredge pocket. Construction is land-based and progresses from onshore into the nearshore environment of Darwin Harbour. Construction of the MOF causeway is now complete. **Product Loading Jetty** The Jetty comprises two separate berths, one for LNG carriers and one for LPG and condensate carriers. Access to the berths from the onshore facility is provided by a Y-shaped approach trestle. The Jetty consists of

Activity	Description
	the trestle, two loading platforms, eight breasting dolphins, twelve mooring dolphins and interconnecting catwalks between the dolphins. The trestle comprises a precast concrete deck on steel tubular piles. Loading platforms consists of a space-frame steel deck structure grouted onto nine vertical piles and a deck finished with an in-situ concrete slab. Dolphins consist of a space-frame steel jacket structure grouted onto four large-diameter vertical piles. The catwalks consist of steel trusses spanning between dolphins with no intermediate supports. The approach trestle is constructed using a cantilevered bridge so that the trestle is built from onshore out to the nearshore, with each component of the trestle cantilevers out over the edge of the previously installed component. The LER and Local Instrument Room (LER/LIR) platform is located approximately halfway along the approach trestle and is constructed using a JUB and/or a floating crane barge. The vertical piles of the loading platforms is also installed using a JUB and/or a floating crane barge and the space-frame steel deck structure will be delivered to Site on a heavy-lift vessel. Construction of the product loading jetty is now complete. **Impact Piledriving** Marine piledriving was required for construction of the MOF and Jetty. Potential underwater noise impacts associated with marine pile driving were managed in accordance with the Underwater Noise Management Plan (L290-AH-PLN-10015). Jetty construction involves piledriving tubular piles into the seabed to support the Jetty structure. MOF construction involves tubular piles for the dolphins, navigational aids and fender piles. A total of approximately 450 tubular piles are required. A range of hydrohammers are likely to be used for piledriving including, but not limited to, the S-150, S-200, S-280, S-500 and S-600 (150 kJ, 200 kJ, 280 kJ, 500 kJ and 600 kJ, respectively) and operating at approximately 50 strikes per minute and at a range of strike energies, up to the maximum rated energy with transfer efficiency of 95%. The hydrohammers are operated within the noise thresholds as approved under the Underwater Noise Management Plan (L290-AH-PLN-10015). Typically, each pile will be driven to the required depth in a single continuous piling session. Test piling and pile re-strikes are also conducted. Test piling involves static test loading and dynamic test loading on test piles to validate the pile design before construction and to check compliance with the design specification during construction. A number of piles are likely to undergo a re-strike test after installation, which involves striking the pile several times at full hammer energy to establish the depth of penetration into the ground per blow. It is expected that less than 1% of the total piles to be driven require a re-strike to be

Activity	Description
	performed. Upon completion of the test program, the test piles are cut off at seabed level and any permanent piles from the reference frame remain in position. Some drilling and cutting are required for marine piledriving at locations with challenging geotechnical conditions. Seawater is used as a lubricant for drilling. Impact piledriving activity is now complete. **Sheet Piling** MOF construction involves the vibration of sheet piles into the seabed to form the walls of the cofferdam cells and interlinking arcs. Sheet piles are pitched and vibrated into place using an MS32 vibrohammer or HPH2400 top hammer, with the guidance of a template and frame. Sheet piles forming the circular cells and interlinking arcs are installed with the use of a template and frame that will be positioned in place using the barge and tugs, and held in place by four spud piles. The spud legs are rested on the seabed. Each circular cell is pitched as one operation. Once the first zipper piles are in place, the remaining sheet piles are connected to its adjacent neighbour until it hits the seabed. Some of the sheet piles are left intentionally higher to allow flow of water through the cell. Sheet piles are held in their pitched position with help from the zipper piles and the outer guide frame. Pitching of the sheet piles into the seabed are done using the vibrohammer or Dawson remote-type shackles or a combination of both. The vibrohammer may also be required to assist with the removal of the spud piles. A total of approximately 2700 sheet piles are expected to be driven. Sheet piling is now complete. **Discharge Outfall for Temporary Sewage Treatment Plan** Installation of the treated effluent discharge outfall pipeline used the "float and sink" method in the nearshore development area, to lay the pipe directly onto the seabed avoiding trenching and secured with concrete collars. In the onshore area, installation of the pipeline consisted of a combination of trenching and above-ground installation, requiring localised clearing of mangroves. The equipment required for these construction activities included a cantilever bridge; JUB; floating crane barge, hydrohammers; heavy-lift vessel; fuel transfer tanks; tug boats; personnel launch; and safety vessels. Installation of the discharge outfall for temporary STP is now complete and WDL 192 has been issued for discharge of treated effluent.

Activity	Description
	Discharge Outfall for the Drainage and Effluent Treatment System Combined treated water from several process streams, which is the main product of the Drainage and Effluent Treatment System, is discharged to the Darwin Harbour via the Product Loading Jetty (Jetty) outfall. The wastewater outfall discharge pipe is fixed to the supporting structure (legs) of the Jetty and anchored to the seabed; it is fitted with diffusers as endpoints of wastewater discharge. The depth of the outfall diffusers is 12 metres below Lowest Astronomical Tide. Installation of the wastewater outfall discharge pipe is now complete. An amendment to EPA7-4 for use of the jetty outfall will be obtained prior to commencing discharge from this system.
Marine and vessel operations	A range of marine vessels associated with construction are used in the nearshore development area including barges, JUBs, cranes, conveyors, gensets, drilling rig, piledriving templates, hydraulic impact hammers, vibrohammers, pontoons, tug boats, personnel launch and safety vessels, fuel transfer tanks, cantilever bridge, floating crane barge, hydrohammers, heavy-lift vessel. Other vessels operating in the nearshore development area include international transportation vessels making deliveries to the MOF including roll-on roll-off (RORO) (using the MOF Transition Pontoon (MOFTP) as described below) and lift-on lift-off (LOLO) operations (using cranes on board the transportation vessels to offload to the MOF), and other vessels such those associated with environmental impact monitoring and spill prevention and response, as required. **MOF Transition Pontoon (MOFTP)** Modules and large and heavy equipment for the onshore LNG Facilities are transported to Site by sea, and offloaded from the transportation vessel to the MOF to be moved to their final locations on Site (refer to 'heavy hauling and erection works'). The significant tidal range at Bladin Point limits the direct offloading of modules from the vessel to the MOF, consequently, the MOFTP is required. The transportation vessel offloads the modules to the MOFTP (with both vessels afloat and moored end to end), then the modules are offloaded from the MOFTP to the MOF. The MOFTP has been custom designed for the Project and in consideration of the environmental conditions and tidal range at Darwin. The MOFTP is designed to have the capability to work over a 24 hour time period, independent of the tidal cycles, by utilising an air and hydraulic (water) ballast system. Loading and offloading of modules from the vessel to the MOFTP to the MOF are performed using hydraulic ramps. The capacity of the ballast tank is sufficient to maintain even keel during any module loading/offloading sequence with the water ballast system capacity ranging from 0 to 24,000 m^3/hour. The system includes both

Activity	Description
	pumping and free flow (gravitation) of sea water to/and from the ballast tanks and is arranged for filling and emptying through multiple ballast pumps, across two pump room spaces. The rate of ballast exchange can be adjusted with overboard valves and/or the number of pumps running. The ballast tanks remain free of potential pollutants or contaminants, so that only sea water is discharged from the tanks back into the marine environment. A sea chest is provided in each pump room to serve the water ballast system and a grate system is incorporated on ballast intakes. The ballast water is taken from the sea chest via a strainer, with the grates having an opening size of 1000 x 50 mm, so that large marine life, including marine megafauna will not be impacted by the ballast operations. Ablution facilities are incorporated in the hold of the MOFTP. All wastewater is to be pumped to and contained in a black water holding tank. Liquid waste disposal is performed via a liquid waste removal truck. The waste removal pump hose is connected to a sealed coupling which is located within a bunded chest. Liquid waste is transferred onshore via the waste removal truck for disposal via a suitably licensed facility. General waste (if any) is stored on the MOFTP and the waste collected and transferred onshore for appropriate handling and disposal. MOFTP is fitted with a bunker station (fuel storage). The refuelling hose is connected to sealed couplings and the refill connection point is contained within a bunded chest. The bunker station has an above deck emergency shut off valve and pressure gauge. The MOFTP is refuelled from onshore by refuelling trucks on the MOF. Operation of the MOFTP is an ongoing activity.
Heavy lift and transportation	Works include loading, transportation and installation of modules, equipment and structures onshore and in the nearshore development area. Onshore works includes offloading of modules (pre-assembled modules/pipe racks, modularised equipment and modularised electrical and instrument rooms (LERs/LIRs)) and large equipment (e.g. gas turbine compressors, pre-dressed extra-heavy/tall equipment and vessels) from transportation vessels at the MOF with transportation via the quarantine premises to the erection location for installation on Site. In some cases, modules and equipment may be transported to/from the Contractor's material lay-down area or the pre-assembling area on Site. The works involve coordination with the vessel, MOF and MOFTP including mooring/unmooring for RORO offloading from the vessels to the MOF or vessels via the MOFTP to the MOF, management of ramps and

Activity	Description
	gangways, and removal of sea fastenings and grillage. The work also includes offloading of some large equipment items such as columns, which will be delivered by others onto the self-propelled modular transporters (SPMTs) on the MOF by LOLO operations using cranage equipped on the vessels. All transportation of modules and equipment from the MOF are by SPMTs on the engineered access roads for heavy hauling. The majority of large and heavy modules (the weight of the modules range from 50 to 6,500 t) are installed by SPMT direct onto foundations by using the SPMT hydraulic systems. The smaller, lighter modules, equipment and vessels up to approximately 750 t are installed onto the foundations from SPMTs by heavy lift cranes. The key machinery and equipment required for these works includes various cranes ranging up to 1,600 t, SPMTs, lifting gear, rigging equipment, spreader beams, crane mats and steel plates, ramps and gangways. Nearshore works involves installation of modules and structural components of the Jetty including loading arms, pipe racks, gangway tower structures and firewater monitor towers by a heavy lift vessel. The modules and structures are transported from an offsite fabrication yard/storage area to Site either via the MOF for loading onto the heavy lift vessel or by loading at East Arm Wharf. Heavy lift and transportation activities are ongoing.
Mechanical/major equipment installations	Temporary mechanical installations include a range of mechanical equipment, pumps, piping systems and facilities. Permanent mechanical installations for the LNG Facilities include LNG trains and other process modules including equipment and vessels such as pumps, pressure vessels, heat exchangers, fans and blowers, boilers, furnaces, ducts and stacks, flare and combustion equipment, rotating equipment including turbines, compressors, and generators, columns and condensers, drums, tank components and loading equipment. Activities include installation and setting of equipment and modules on foundations, erection, installation and connection of components and equipment by welding, grinding, cutting, machining, fixing, sealing, concreting and grouting. The key machinery and equipment required for these works includes a range of fixed and mobile lifting equipment including cranes, SPMTs and heavy lift vessel (refer to 'Heavy lift and transportation'), scaffolding, elevated work platforms, forklifts, fuel trailers, compressors, generators, pumps, trucks, water truck, welding equipment and lighting towers. Mechanical and major equipment construction and installation is ongoing.

Activity	Description
Pipeline/Piping	A range of pipework assemblies are to be installed above and underground during construction including for temporary works and the permanent LNG Facilities. The pipes carry/convey a range of aqueous and organic media including water, hydrocarbons and other process fluids, waste streams and gaseous substances including steam, air and nitrogen. The piping to be constructed are made of a number of different materials ranging in sizes according to design conditions and maintenance programs. Activities include installing and connecting piping and process and pneumatic tubing including excavation, trenching, stringing, bending, pipe preparation, welding, grinding, cutting, machining, fixing, testing, laying of piping, backfilling, compaction, installation of above ground pipe racks and supports, construction of foundations. **Gas Export Pipeline and Fuel Gas Pipeline** The works include installation of the GEP from the beach valve to inlet facilities and the FGP from a PWC connection at the Site boundary at Wickham Point Road to the inlet facilities. The pipelines are constructed conventionally and by a push pull method in unsuitable soil/soft areas below the highest astronomical tide (HAT) in the intertidal zone, including those where ground improvement has occurred. The works entail the following activities: • benching and levelling and stringing of pipe for preparation, bending and welding • DSM ground improvement for unsuitable soil/soft areas (refer to 'Ground improvement') • trench excavation and installation of bedding as required • pipe and utilities cabling installation • reinstatement including installation of padding and protective material, backfilling of trench, compaction and stabilisation of the disturbed surface. Dewatering of trenches are undertaken as required for the conventional method prior to lowering in of pipe. The push pull method involves flooding of the trench in sections with Darwin Harbour water to allow for the pipeline to be floated in. Once in position, the pipeline is placed at the trench floor either by filling the pipe with potable water for sinking or dewatering the trench to lower the pipeline. Key equipment includes cranes, pipe layer, pipe trucks and trailers, excavators, benders, welding equipment, pipe facing machines, induction heating rigs, water pumps and compactors. Pipeline construction and pipework installation activities are ongoing.

Activity	Description
Electrical, instrumentation and communications	Temporary above and underground service installations connect temporary facilities using the utilities corridor around Site. Temporary telecommunication services include fibre optic cables, data network, telephone system, video conference system, siren system, closed circuit television, and radio (land and marine) systems. Activities include pulling cables through conduits, fitting out temporary buildings and erecting telecommunication towers. Construction also includes installation and connection of electrical, instrumentation and telecommunication cables for the permanent LNG Facilities including for pipelines, pipe rack modules, equipment modules, main substation modules and LERs/LIRs. Telecommunication and security systems include fibre optic cables, microwave radio links, data network, telephone system, video conference system, siren system, security system, lighting, closed circuit television, radio (land and marine) systems and telecommunication towers. Other systems include earthing, heating, leak detection, intrusion detection and cathodic protection. Activities include installation of equipment including transformers, cabinets, control boards, above ground cable ways, laying of conduits and cable, testing and termination, foundations and grouting and erection of towers, masts and poles. Electrical and instrumentation activities are ongoing.
Construction of permanent LNG facilities	Construction of the permanent LNG Facilities involves a number of structures that are stick built and modular, single and multi-story and constructed from a range of materials. Examples include: • modular – pre-assembled modules/pipe racks and LERs/LIRs • modular and stick built – pipe racks to support various LNG train components such as equipment, vessels, piping, access floors – product loading jetty (refer to 'Nearshore infrastructure construction') – CCPP – WWTP • numerous operational buildings and facilities, equipment sheds, shelters and canopies – concrete slab, typically steel framed and clad with sheet metal • tanks – cryogenic and non-cryogenic • tall structures – stacks, vents, ducts, towers

Activity	Description
	• drainage and effluent treatment system, including permanent STP. Other permanent facilities are constructed to support the operation of the LNG plant including gate house, hazardous materials warehouse, warehouse, main workshop, operations office, central control building/fire station, radio communication building, laboratory, hazardous goods store, field workshop, ablution blocks, refuelling facility, waste management area, washdown pad, covered shelters and walkways. **Tanks** Cryogenic tanks include two LNG tanks (nett working volume of 165,000 m^3 each), a propane tank (85,000 m^3) and a butane tank (60,000 m^3) and consisting of insulated and heated metal inner tanks enclosed in pre-stressed and reinforced concrete. The concrete walls and roof are formed on Site using a non-continuous slipform system and tower-mounted concrete placing boom. A number of non-cryogenic tanks (and a sphere) are constructed across the Site, ranging in capacity up to approximately 70,000 m^3. The tanks are a combination of either Site erected or shop built (complete or modular constructed in two parts for assembly on Site). **Combined Cycle Power Plant** The CCPP is designed to deliver approximately 500 MW of dedicated electrical power to the permanent LNG Facilities. The facility includes a range of modules and stick built structures, steel framed and clad shelters, and tall structures. The construction works comprise installation and setting of structures on foundations and supports, erection and construction of structures includes transportation, lifting, fixing, welding, cutting, drilling, grouting, concreting and surface treatments including abrasive blasting and painting. Fit-out of internal buildings includes services such as heating, ventilation and air conditioning (HVAC), fire protection and alarm systems, hydraulic, and wastewater. The key machinery and equipment required for these works includes excavators, front-end loaders, rollers, graders, various cranes including heavy lift cranes and other lifting equipment including SPMTs and heavy lift vessel (refer to 'Heavy lift and transportation'), elevated working platforms, scaffolding, telehandlers, forklifts, alimaks, concrete trucks and pumps, slipform system, tower-mounted concrete placing boom, trucks, water trucks, welders, fuel trailers, compressors, generators, pumps and lighting towers. **Drainage and Effluent Treatment System** The drainage and effluent treatment facilities are required for the operation of the LNG plant and its associated

Activity	Description
	infrastructure to treat various wastewater streams to the appropriate quality for disposal via discharge. It involves the construction of a drainage collection system and treatment facilities. Construction of the drainage collection system includes a combination of open channels and surface drains with gratings, kerbs, pits, sumps and pipes, as well as larger basins and tanks. Construction and installation of the permanent LNG facilities is an ongoing activity.
Material surface treatment, testing, protection and preservation	Surface treatment and protection takes place at numerous locations across the Site including onshore and over water in the nearshore, particularly for construction of the permanent LNG Facilities. Activities including abrasive blasting, painting including spray painting and touch up, application of coatings, films and surface protection, chemical cleaning such as by hot water, caustic solutions or other cleaning agents, insulation, fireproofing, post weld heat treatment, non-destructive testing, non-destructive examination, pneumatic testing, hydrostatic testing (refer to 'Hydrostatic testing' in this table) and preservation to establish inert conditions in preparation for other pre- and commissioning activities will be undertaken at numerous locations across the Site. Painting works include surface preparation, application of protective coatings, lettering and marking for mechanical equipment, structural steel, instrument and piping. For vessels the painting works are to dress-up columns, structural steel and piping. A dedicated closed abrasive blasting and paint shop will be operated on Site. Material surface treatment, testing, protection and preservation activities are ongoing.
Site clean-up/ rehabilitation and demobilisation	Although general housekeeping activities are being conducted on an ongoing basis, at the completion of the construction activities listed above, it is necessary to re-establish initial handover conditions where relevant, including: • Remove any debris, litter and temporary stockpiles. • Remove all equipment and temporary construction infrastructure including underground services, temporary STP and outfall, and other cabling and piping as required. • Rehabilitate disturbed areas not required for subsequent construction activities or for the operational phase of the Project. This involves minor earthworks to create the required landform and manage drainage, spreading topsoil and/or mulch, and reseeding. Clean-up and remediation of any contaminated

Activity	Description
	areas, any contaminated land around areas used for storage of dangerous goods and hazardous materials including fuel tanks and facilities and waste storage areas. Equipment is demobilised from the Site in staged activities as construction within individual areas is completed. Site clean-up, rehabilitation and demobilisation activities are ongoing. Rehabilitation of the EMA is addressed in the Mine Management Plan (L290-AH-PLN-10009).
Hydrostatic testing	Hydrostatic testing (hydrotesting) involves pressure testing with water on numerous vessels, equipment, piping/pipelines and tanks across Site to verify the integrity and detect leaks. Hydrotesting also facilitates controlled settlement of foundations particularly applicable to large storage tanks. The source of water for hydrotesting on the Site is from potable water supplied by PWC. Hydrotesting can be divided into two groups, based on the volume of water needed for hydrotesting at the Project Site: • Large volume tanks/pipelines (>5000 kL of hydrotest water): – two liquefied natural gas (LNG) tanks (112,000 kL each) – two condensate tanks (64,800 kL each) – condensate buffer tanks (7241 and 8200 kL) – propane storage tank (2200 kL) – propane tank (94,200 kL) – butane tank (67,000 kL) – service water storage and fire water tanks (25,125 kL each) • Smaller volume facilities (< 5000 kL of hydrotest water): – 12” fuel gas pipeline, which supplies gas during commissioning of the Project, and emergency gas export during permanent operations – 42” gas export pipeline (onshore section only) – gas reception area pipework – two gas liquefaction trains with their gas treatment facilities (acid gas removal, dehydration, mercury removal), fractionation system and condensate stabilisation system, including interconnecting pipework – utilities distribution and storage (power generation, fuel, service water, fire water, nitrogen, compressed air,

Activity	Description
	heating medium) – propane refrigerant sphere (volume of 2500 kL) – product loading and return pipelines – gas flaring system consisting of a ground flare and enclosed tankage flares – permanent WWTP (note will be subject to an Environment Protection Licence application in due course for the operational aspects of the plant) – utilities consisting of diesel tank and drinking water storage tank. The estimated total volume of water required for the total hydrotesting scope of work on site is approximately 600,000 kL. All hydrotesting will be undertaken using potable water provided to Site by PWC. Up to 3000 kL of potable water per day will be allocated to hydrotesting activities from the Site potable water network via the existing site connection to the PWC main. Activities involved in hydrotesting include cleaning, chemical dosage as required, filling, testing, dewatering/emptying, drying, treatment and management of hydrotest water. Treatment may be required using certain hydrotest chemicals (Table 6-13) to improve the quality of the potable water supply, reducing corrosion during hydrotesting and providing improved spent hydrotesting water quality for reuse and/or discharge. The strategy for managing spent hydrotest water on the Project follows the hierarchy of: 1. reusing water onsite e.g. for multiple hydrotesting activities, for dust suppression, to the largest extent practicable (refer to Table 6-14) 2. discharge to Darwin Harbour via regulating drain or via a temporary outfall (contingency) in accordance with WDL 211 3. disposal offsite at a licensed waste facility. Key equipment/infrastructure associated with the works includes pumps, temporary piping, treatment/chemical dosing skids as required, tanks, pipeline pigs, water trucks, mobile fuel trailers, generators, compressors, air blowers, nitrogen generators, elevated work platforms. Refer also to 'Nearshore infrastructure construction' for information on the temporary outfall (contingency) to support discharge to Darwin Harbour. Hydrotesting of piping, smaller vessels and tanks is in progress. Hydrotesting of the 12" fuel gas pipeline is complete as is the hydrotesting of the 42" gas export pipeline (onshore portion) including the hydrotesting of

Activity	Description
	the beach valve. Filling of the first of the two condensate tanks has begun.
Nearshore infrastructure construction	**Discharge Outfall for Hydrotest Water** The outfall for discharge of hydrotest water will be aligned along the MOF. This outfall has been engineered to provide sufficient dilution of hydrotest waters to achieve the receiving environment criteria at the edge of the approved 50 m mixing zone. The discharge pipe will be secured to the MOF supporting structure and the pipeline and multiport outfall diffuser will be anchored by concrete anchor block to the seabed. Construction of the hydrotest water discharge outfall has been completed. WDL 211 (as amended) has been issued for discharge of hydrotest water to Darwin Harbour.
Precommissioning	Precommissioning activities include the checking, cleaning and testing of the installed permanent plant and equipment prior to the introduction of process fluids and hydrocarbon feed during commissioning and start-up. Activities may include (but not be limited to) cleaning, lube oil flushing and first fill of fuel and lubrication systems, charging of catalysts, operational tests of emergency utilities including fire water pumps and emergency diesel generators and associated systems and other utilities including air compressors and demineralised water systems. Precommissioning activities described here and above as Preservation and Protection activities have commenced.
New Activities Relevant to this Revision of the CEMP	
Commissioning	The commissioning process is a series of plant verification activities which are required before operation of any systems or introduction of hydrocarbons to processing facilities. It occurs following mechanical completion of the facility components and ensures that all equipment is installed and can be operated as per design and meets functional intent. While the commissioning encompasses a large number of well-coordinated activities across a range of systems, all of them could be grouped as follows: • Instrument loop test including valve stroking instrument function test: This is a full functional test of field instrumentation, and verification of integrated control parameters and safety system and/or package unit control panel parameters. Testing procedures have been established for valve types used on the project, combined with the acceptance criteria or performance standards that the valve is expected to meet or

Activity	Description
	exceed. • Motor solo, coupled run and hot alignment: Motor solo run refers to when an electric motor is subjected to a running/spinning test without any attachment to its own rotor shaft in order to guarantee its individual durability/functionality. This activity applies to all motors on Site. These motors will be commissioned in a way that each will be run solo first (i.e. single motor only), following which a number of (ultimately connected) motor units will be connected (coupled runs) and finally the connected equipment will be run for several hours to reach operating temperature (hot alignment). This involves verifying correct installation and integrity of motors and associated auxiliaries and to check the running performance of motors in operation under no-load conditions. • Final lube oil flushing of permanent pumps: This involves cleaning and flushing the lube oil system, as per designated boundaries, to an approved cleanliness level. Lube oil flushing boundaries are pre-determined. Multiple flushing systems are likely to be created. More than one system can be flushed in one flush run. The equipment and components to be cleaned and flushed are the refrigerant compressors and rotary pumps. Equipment and materials that are required for the flushing operations includes flushing skid, hydraulic rubber hoses, filter pots, temporary flange screens stainless steel mesh, valve and fittings. During flushing, the flushing equipment will achieve an optimum speed for good flushing, and at a pre-determined oil temperature on all oil supply lines. After flushing, all flushing oil will be drained and properly disposed of, including for reuse or recycle. Upon completion of flushing, the system is visually inspected at selected points to verify cleanliness. The system is considered clean when such foreign matter such as scale, rust, metal shavings, and sand are not visible to the eye and grittiness is not detectable to the touch and in compliance with the particle count. The flushed system is subsequently preserved. • Pump run-ins: The purpose of mechanical run-in is to check the mechanical performance of all pumps on Site, including drivers and pump auxiliaries while monitoring the operating parameters such as vibration, noise, heat generation, and flow characteristics on the pump systems. This testing enables early detection of machine problems and is intended to minimise problems during normal operation. Where practical, pumps installed for the plant (including the auxiliary pumps such as for lubrication) are mechanically run in with water. Otherwise, when the use of water could lead to an adverse impact on a particular system, alternative fluids (including air and the actual process fluid to ultimately be used in the system) will be used. The process fluids cover the range of gases e.g. air, steam, CO_2, N, and liquids such as boiler feed water, hot oil, lubricating oil and water condensate, and others. Some pumps can be

Activity	Description
	operated with water, while other pumps can only be operated with process fluids. Leaks are typically collected by the drip trays and conveyed away via the COC system. • Operational pressure leak tests: The purpose of the testing is to identify and repair leaks at flanges and other connections at near working pressure prior to the introduction of hydrocarbons. Potable water and air are used for pressure testing in first instance, unless their use may lead to an adverse impact to the equipment. If potable water or air are not suitable, process fluid is used. Typically, the test pressure is the higher value between the maximum normal operating pressure and 90% of design pressure. Upon the completion of the leak test, a list of all leaks is generated. The system is then depressurised prior to the remedial work being carried out. Once this work is completed the previous leaking joints, and any joints disturbed during the repair, are re-tested with the results again recorded. The pressure is applied gradually, allowing for early identification of leaks. For pump testing, pressure testing is undertaken using potable water or air, where this is appropriate for particular vessel/pipeline. • System drying and inerting: System drying is carried out to remove water from pipes, vessels, equipment that is required to be water free for preservation, and for operational purposes. Water is removed to prevent ice/hydrate formation, which causes mechanical damage to valves, filters and the like, decreases solid catalyst activity, and progresses corrosion. As a first step, the system will be dried by means of dry air sweeping. When the system cannot be dried anymore by dry air, the system is dried by means of dry nitrogen gas sweeping. Introduction of inert nitrogen gas allows for the air and nitrogen to mix in a pressurised condition and then depressurising the system to vent out the resulting air-nitrogen mixture. Where any combustible vapour or gas combines with air (approximately 21% oxygen) in a system, such system has the potential to form an explosive mixture. Hence, inerting is done before hydrocarbon flammables/combustibles are introduced into pipe/equipment. Inerting is also applicable to systems wherein the presence of air can cause unwanted chemical reaction, which could alter the property or function of the system's contents. At completion of the process, all temporary hose connections and fittings are removed and the system is maintained with nitrogen at a slightly positive pressure until introduction of hydrocarbon. Nitrogen does not contain any Class I or Class II ozone depleting chemicals (SDS for N_2 by Air Products 1994). • Diesel oil filling: Diesel tanks are filled with diesel oil, using the diesel distribution pump. A number of steps have to be undertaken to ensure safe execution of this process such as: ensuring the correct pressure in the tank, ensuring that the road tanker is of appropriate specification, earthing requirements have been fulfilled, implementing controlled operation of the unloading pump (on road tanker), and

Activity	Description
	monitoring of the control system during diesel filling. Diesel tanks are enclosed by bunds, sized to reflect both the volume of diesel oil within the tank and the rainfall. Any leaks, if they occur, are transferred to the treatment system via the AOC network. • Catalyst/desiccant loading: Loading activity starts with the work planning developed based upon the requirements for the particular substance as outlined in Safety Data Sheet (SDS). Commissioning Permit to Work (PTW) refines particular requirements, limitation, isolations and precautions to be taken in handling a particular catalyst/desiccant. Catalysts, desiccants and absorbents are introduced into the gas treatment facilities, the power plant and the demineralised water plants. These products are used during hydrocarbon processing to facilitate removal of mercury, acid gas and moisture from the field gas, production of demineralised water and air drying within the plant systems. • Hot oil introduction/circulation: Heating medium circulation pumps oil from the heating medium surge drum and circulates it through hot oil to a range of equipment. Heating medium filter is used to remove any suspended material from the circulating liquid. Any leaks, if they occur, are typically collected by either the AOC system or by drip trays and conveyed away via the COC system. The above commissioning activities occur across a number of subsystems as shown in Figure 2-2 and summarised below: • the onshore arrival and condensate systems, consisting of inlet facilities and the condensate stabilisation, condensate mercury removal, and condensate storage and loading systems • LNG Process Trains 1 and 2, consisting of the mercury removal, acid gas removal, dehydration, LPG recovery, gas liquefaction, refrigeration, and fractionation systems • utilities, consisting of: – the heating medium, cooling medium, fuel, instrument (compressed) air, nitrogen, service and drinking water, demineralised water, drainage and effluent treatment, HVAC, emergency diesel generator, and fire water systems – the refrigerant storage system, for which propane refrigerant is sourced externally and trucked to site with tankers for commissioning – the LNG storage (which includes the BOG compressor) and loading system, throughout which lines are dried and purged by nitrogen, and then cooled by the spray system in the tank – the LPG storage and loading system, in which the LPG storage tank and associated lines are dried and purged by nitrogen

Activity	Description
	– the relief flare and vent system – the CCPP – the fuel gas system – solvent storage system, which consists of the solvent make-up tank, wash water tank and solvent distribution and the make-up solvent used in the AGRU system is prepared and stored in the solvent make-up tank – defrost gas heater, which is planned to be commissioned using PWC commissioning gas.
Pre-operations	Following the completion of construction and commissioning (including operational testing of utilities) plant and equipment within defined separable portions will be progressively handed over to Company by Contractor. This includes LNG trains, condensate stabilisation systems and utilities, accommodation buildings, the fire station, security guard house/medical facilities, main and field workshops, the central control building and the onsite laboratory. Company will run and maintain a number of utility systems to support construction and commissioning works up until the point of introduction of Ichthys field hydrocarbons. The administration and central control buildings will be occupied and the workshops, warehousing (including waste and dangerous good storage), fire station and laboratory facilities will be in use by Company. The utilities to be run by Company to support construction and commissioning include: • the relief flare and vent system, which is the primary safety device for the facility and as such needs to be continuously available during commissioning and import of LNG/LPG • the CCPP, which will use PWC commissioning gas to produce power during commissioning • the fuel gas system, which provides fuel gas to the CCPP • permanent diesel fuel storage and distribution • the water supply systems (service and drinking water and firewater) • the demineralisation plant • the instrument (compressed) air • the nitrogen system, to provide nitrogen for commissioning activities • cooling water systems. It is currently proposed that a cargo of LNG and LPG will be imported by Company via ship to the LNG plant

Activity	Description
	approximately one month prior to start-up. The jetty/loading facilities, LNG and propane storage tank will be brought on line to receive the import cargos. The importation of cargos will initially involve several days of constant flaring from the tank flares as the cryogenic tanks and run down lines are slowly cooled down to the required operating temperatures to receive the liquid product. The main reason to import the cargos is to significantly reduce flaring during start-up and reduce the time duration of start-up. Cool-down of LNG and LPG storage tanks on Site is required to occur in a controlled manner at a defined flow rate. If undertaken through vessel importation of LNG and LPG (as proposed in the CEMP), the flow rate is able to be controlled from the vessel and therefore there is minimal wastage directed to flares for disposal. In contrast, if the same task was undertaken using gas from the Ichthys Field, the rate of flow and production rate of the process can only be turned down so much, which would result in between 60 and 80% of the gas been directed to the flares for disposal, which is unable to captured as a fuel gas or reprocessed, which would necessarily result in a much greater period of flaring. It is expected that importation of the LNG/LPG cargoes will reduce flaring by 20,000 tonnes per cryogenic tank cool-down. Following the importations, LNG BOG will be directed to the fuel gas system, while BOG from the propane tank will be chilled and re-circulated back into the tank. Operation of the demineralisation plant will be undertaken to provide demineralised water to support commissioning activities listed above (e.g. rinsing, flushing) and will result in production of reject water. The demineralisation plant will use PWC potable water. Components of the WWTP will be operational when handed over progressively to Company and Company will continue to run and maintain the WWTP for the period prior to start-up. An amendment to EPA7-4 will be obtained for use of the jetty outfall to discharge streams from the WWTP. A number of systems will also be maintained in a preservation mode (running at low rates or only periodically) until the introduction of field hydrocarbons when they will be brought online during the start-up phase (as per the future Operations Environmental Management Plan). The fuel gas pipeline will be packed with PWC commissioning gas, to support commissioning of the CCPP and subsequent running of the CCPP, but there are no discharges or emissions associated with this process. This is the first activity during commissioning for which there is a risk of fire, and Company emergency management system will be in place at this time.
Operation of CCPP to support commissioning	The CCPP will become operational at the same time as other facilities are still being commissioned and will provide power for those activities. The CCPP comprises of five gas turbines (Frame 6 power generation

Activity	Description
activities	turbines) with duct burners, three utility boilers and three steam turbines. During commissioning, the turbines run on fuel gas supplied by PWC via the fuel gas pipeline. Generally one of the three boilers associated with the plant is fired at low stand-by rates, while two turbines are in stand-by mode.

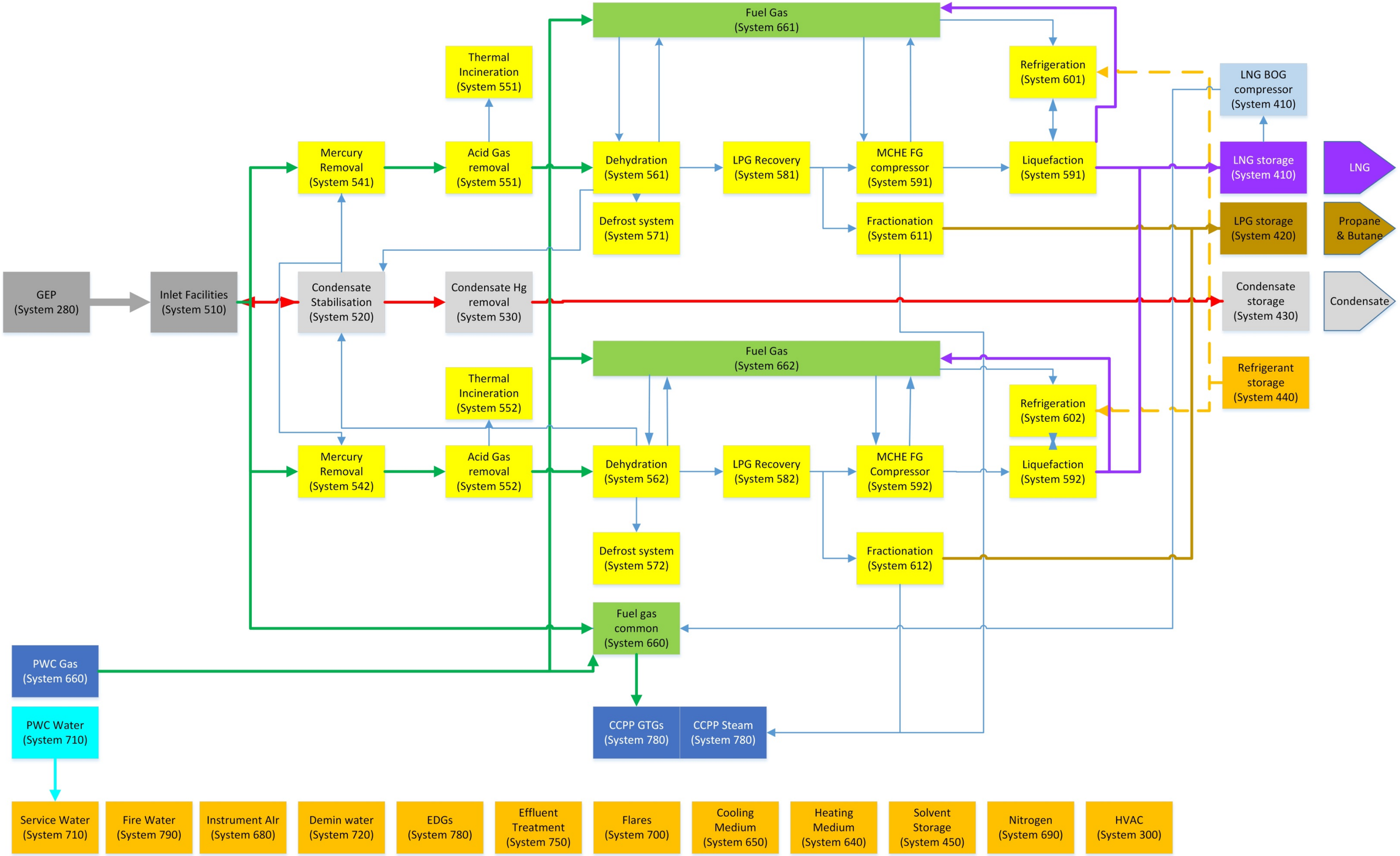

Figure 2-2: Schematic of subsystems of the Onshore facility

3 Legal and Other Requirements

3.1 Regulations and legislative requirements

INPEX's Environmental Policy sets an objective for legal compliance by requiring *compliance with applicable laws and regulations, environmental obligations and commitments*. The key environmental legislation governing the construction phase of the Project comprises the following Acts:

- *Environment Protection Authority Act* (NT)
- *Environmental Assessment Act* (EA Act) (NT)
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Cwlth)
- *Heritage Act 2011* (NT)
- *Mining Management Act* (NT)
- *Planning Act* (NT)
- *Public and Environmental Health Act* (NT)
- *Biosecurity Act 2015* (Cwlth)
- *Waste Management and Pollution Control Act* (WMPC Act) (NT)
- Waste Management and Pollution (Administration) Regulations (WMPC Regulations) (NT)
- *Water Act* (NT)
- *Work Health and Safety (National Uniform Legislation) Act* (WHS (NUL) Act) (NT)
- *Northern Territory Aboriginal Sacred Sites Act* (NT)
- *Territory Parks and Wildlife Conservation Act* (TPWC Act) (NT)
- *Marine Pollution Act* and associated Regulations.

The environmental assessments and approvals required under these Acts support the legal framework that will govern delivery of the Project. Contractor and Subcontractors are required to comply with these and other legislative requirements during construction.

A summary of the legislation, policies, guidelines and standards applicable to Contractor and Subcontractors in the management of environmental issues in the construction phase of the Project is provided in Appendix A.

3.2 Environmental approvals

A summary of the required environmental approvals and the responsibilities for each approval is provided in Appendix A. Contractor and Subcontractors are required to comply with the conditions of each approval.

The key environmental approvals and associated conditions required for the Project are described below.

3.2.1 *Environmental Assessment Act* decision

The Ichthys Gas Field Development Project: draft environmental impact statement and the Supplement to the draft environmental impact statement (EIS) was prepared by INPEX Browse, Ltd. and assessed by the Northern Territory Government under the EA Act. Assessment Report 65: Environmental Assessment Report and Recommendations was prepared by the Environment and Heritage Division of the former Department of

Natural Resources, Environment, the Arts and Sport (NRETAS) and documents the findings of the environmental assessment. Table 3-1 demonstrates how the recommendations relevant to the Site have been addressed.

The environmental commitments made by Company within the EIS have been incorporated into the management strategies of this CEMP (see Section 6). Contractor's Environmental Commitments and Conditions Register (Appendix B) will be used to track EIS and other environmental commitments during construction.

Table 3-1: Summary of responses to recommendations of Assessment Report 65

No.	Summary of recommendation	Contractor compliance
1	The proponent shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards: • identified in the Ichthys Gas Field Development Project's EIS • recommended in the Assessment Report.	Contractor has incorporated all relevant construction-related environmental commitments and safeguards into the various environmental strategies detailed in Section 6.
2	The proponent shall advise the Minister of any changes to the proposal in accordance with clause 14A of the Environmental Assessment Administrative Procedures, for determination of whether or not further assessment is required.	Contractor will construct all works according to the proposal as documented in the EIS, or as advised by Company if any amendments are made to this proposal.
3–8, 11, 13, 24	Various conditions relating to dredging activities	Not relevant to this CEMP.
9, 12, 14	Various conditions relating to ecological offsets and funding	Not relevant to this CEMP.
10	Relevant EMPs to include measures for minimising vessel interactions/collisions with large marine fauna	Measures for minimising vessel interactions/collisions with marine megafauna are included in Section 6.2.
15	Appropriate controls to mitigate risks from hydrotesting waste water must be included in the Liquid Discharges, Surface Water Runoff and Drainage Management Plan for Government approval. In preparing the plan, Company should also: • investigate options for land-based disposal where practicable • select chemical additives that have the lowest practicable risk	Controls to mitigate risks specific to hydrotesting wastewater and potential associated environmental impacts are described in Section 6.4.

No.	Summary of recommendation	Contractor compliance
	to the marine environment.	
16	Air monitoring program	Not relevant to the construction phase.
17 & 18	Greenhouse Gas Management Plan	Not relevant to this CEMP.
19	Diver surveys to detect maritime heritage	Not relevant to this CEMP.
20	Social Impact Management Plan (SIMP)	Company has prepared a SIMP in conjunction with the Northern Territory Government and is being implemented.
21	The Bladin Point Gas Facility must incorporate best practice water conservation measures into the design. The proponent must commit to continuous improvement in minimising potable water use.	Best practice water conservation measures have been incorporated into the design of the Onshore Plant. During the construction phase, water conservation measures are implemented to the largest extent practicable to minimise potable water use.
22	Notice prior to demobilising	Not relevant to this CEMP.
23	All environment management plans for the Ichthys Gas Field Development Project are to be submitted to government for approval prior to commencement of any works for which the plans apply.	Company will submit this CEMP for approval prior to commencement of any new activities described in this revision.

3.2.2 EPBC Act Approval

Commonwealth Government Approval Decision EPBC 2008/4208 issued to Company for the Ichthys Project on 27 June 2011 includes a number of conditions requiring the preparation of management plans to minimise impacts on the Commonwealth marine environment, listed threatened species and listed migratory species.

Condition 8 of Approval Decision EPBC 2008/4208 requires a Liquid Discharge Management Plan (LDMP) to be prepared, approved and implemented to protect habitat for listed species in Darwin Harbour. This CEMP has been provided to the Department of the Environment (DoE) for approval against Condition 8. Table 3-2 provides a summary of how the elements of Condition 8 have been addressed in this CEMP.

Table 3-2: Summary of requirements of Condition 8 and location in CEMP

No.	Condition Element	Location in CEMP
8.	The person taking the action must submit for the Minister's approval a Liquid Discharge Management Plan or plans to mitigate the environmental effects of any liquid discharge from the proposal, including sewerage and surface water runoff. The Liquid Discharge Management Plan(s) must be for the protection of the Commonwealth marine area and habitat for listed species in Darwin Harbour and must:	This CEMP is provided to DoE in lieu of an LDMP. The CEMP allows for *the protection of habitat for listed species in Darwin Harbour* as a result of liquid discharges; the CEMP does not include activities undertaken in *the Commonwealth marine area*.
8a)	identify all sources of liquid discharge	Table 2-3 Section 6.4 Section 6.5 Section 6.6 Section 6.7 Section 6.13 Appendix C
8b)	describe any impacts associated with the discharge of liquids, including the cumulative impacts associated with the discharge of sewerage	Section 6.4 Section 6.5 Section 6.7 Section 6.13 Appendix C Appendix D
8c)	clearly articulate the objectives of the plan and set measurable targets to demonstrate achievement of these	Section 1.2 Table 6-16 Table 6-20 Table 6-25 Table 6-28 Table 6-54
8d)	outline measures to avoid impacts	Table 6-17 Table 6-21 Table 6-26 Table 6-30 Table 6-55
8e)	where impacts are unavoidable describe why they are unavoidable and measures to minimise impacts	Table 6-17 Table 6-21 Table 6-26 Table 6-30

No.	Condition Element	Location in CEMP
		Table 6-55
8f)	demonstrate how any discharges into Darwin Harbour are consistent with the guidelines for discharges, and the water quality objectives for Darwin Harbour, developed under the National Water Quality Management Strategy	Section 1.5.1 Section 6.4.5 Table 6-14
8g)	identify all regulatory requirements relating to the discharge of liquids and how these will be met	Section 3 Appendix A Appendix B
8h)	include a monitoring regime to determine achievement of objectives and success of measures used	Section 1.5.1 Table 6-17 Table 6-21 Table 6-26 Table 6-30 Table 6-55
8i)	outline reporting and auditing arrangements	Section 7
8j)	describe how the plan will apply the principles of adaptive management	Section 5.4 Table 6-18
	The plan(s) must be submitted prior to the commencement of the relevant activity to which they apply. The relevant activity may not commence until the plan is approved. Separate Liquid Discharge Management plans can be submitted for the management of liquid discharges in the Commonwealth Marine Area and Darwin Harbour. The approved plan(s) must be implemented.	Noted

Contractor has previously prepared and Company has had approved by DoE an Underwater Noise Management Plan in accordance with Condition 9 of Approval Decision EPBC 2008/4208. The plan specifically addressed piledriving activities associated with the construction of the MOF and Jetty, and this work is complete.

None of the other plans required by the conditions are relevant for the construction (including commissioning) activities covered by this CEMP.

3.2.3 Development Permit (*Planning Act*)

The Minister for Lands and Planning issued the Ichthys Project with a development permit (DP12/0065 (as amended)) for the use and development of the land for the purpose of the LNG processing plant (applicable to the Bladin Point gas processing plant site up to

the Wickham Point Road intersection). In accordance with the conditions of the permit, Company submitted this CEMP to NT EPA for approval prior to the commencement of works. Other plans that are a condition of the permit (such as the Biting Insects Management Plan (L290-AH-PLN-0064) and Road Transport Management Plan (L290-AB-PLN-0147)) have also been prepared by Contractor and approved by the relevant government authority.

An amendment to DP12/0065 was issued in March 2013 to incorporate the temporary STP outfall pipeline.

Development permit DP13/0501 (applicable to the GEP corridor, from the Wickham Point Road intersection to the beach valve), for the use and development of the land for the purpose of the GEP, was issued in October 2013.

General conditions of these permits have been incorporated into the management strategies (Section 6) as required.

3.2.4 Environment Protection Approval (WMPC Act)

EPA7 (as amended) was issued for constructing, installing and carrying out works in relation to premises for processing hydrocarbons so as to produce, store and dispatch LNG or methanol pursuant to the WMPC Act.

Implementation of and compliance with this CEMP is a condition of this approval.

Other relevant conditions of EPA7 have been incorporated into this CEMP and the EIMP (L290-AH-PLN-10013).

3.2.5 Waste Discharge Licence (*Water Act*)

A temporary STP is required on Site during the construction phase to treat sewage to a suitable quality prior to discharge to Darwin Harbour. WDL 192 has been issued by NT EPA to Contractor for discharge of treated effluent to Darwin Harbour from the temporary STP.

WDL 211 has been issued to Contractor for the discharge of hydrotest water to Darwin Harbour.

An amendment to EPA7-4 will be obtained for discharge from the permanent WWTP as part of the Drainage and Effluent Treatment System.

3.2.6 Approvals compliance

A Contractor approvals responsibility matrix has been prepared to assign responsibility and to track the status of required documentation to support approval applications and monitor the timing and receipt of approvals. The matrix will also be used to track compliance with the conditions of environmental approvals via separate registers, in addition to all other Project approval requirements.

The Contractor Approvals and Regulatory Compliance Manager is responsible for monitoring and updating the matrix and registers as necessary, reporting quarterly to Company on approvals compliance and submitting monthly approvals reporting to Company as part of the monthly progress report.

The Project Environmental Manager, or delegate, will report any non-compliance on the Site to the Approvals and Regulatory Compliance Manager who, in consultation with the Site Construction Manager and Project Environmental Manager, is responsible for overseeing that the works are undertaken in compliance with the above-listed and other Project approvals.

Company also has an approvals compliance tracking system, which is used to document

evidence of environmental compliance against all Company approval requirements for activities on Site. The Company Senior Environmental Advisor (Operations) (or delegate) is responsible for tracking environmental compliance by Company for all Operations activities on Site, and the Company Lead Environmental Advisor Onshore HSE (or delegate) is responsible for tracking environmental compliance by Contractor activities on Site.

3.3 Other obligations and requirements

3.3.1 International Finance Corporation Guidelines

The project has a commitment to comply with the International Finance Corporation (IFC) performance standards and Environmental Health & Safety (EHS) Guidelines. The relevant guidelines are referenced throughout this document where applicable.

3.3.2 Sustainability initiatives and commitment to pollution prevention

A key objective of Contractor is to construct the onshore LNG facilities and its supporting infrastructure in such a way that negative impacts on the environment are avoided or kept to the levels that are as low as reasonably practicable. In pursuing this objective, Contractor is committed to assisting Company in applying sustainability initiatives, including:

- implementing a bussing strategy for the construction workforce
- pursuing water re-use opportunities
- applying the waste hierarchy in the management of construction-related waste
- incorporating best practice water conservation measures during construction of the process plant.

Consistent with Company's Environmental Policy, Contractor will also endeavour to prevent pollution during construction, in accordance with legislative requirements.

3.3.3 Subcontractor requirements

Subcontractors shall be responsible for the effective management of the environment as it relates to their activities, and shall participate in the construction planning and help identify and evaluate hazards arising from the construction activities.

Subcontractors shall have a documented and fully implemented health, safety, environment and security (HSES) management system that addresses the minimum requirements of Australian Standard AS/NZS ISO 14001:2004, Environmental management systems—Requirements with guidance for use.

Contractor requires all Subcontractors to undertake the following in the delivery of their works:

- complete an environmental hazard/risk assessment for their scope of work; this is an ongoing process as per Section 5 for the duration of the construction phase and all risk assessments will be undertaken in coordination with Contractor. Where there is a new activity proposed or an increased risk, Company approval will be required in accordance with Section 5.4.
- comply with legal requirements and other requirements associated with their scope of work
- prepare an environmental management plan or equivalent that is specific to their scope of work and is consistent with this CEMP and its approved Revisions

- nominate a Subcontractor Environmental Representative who shall be appropriately qualified and experienced to undertake environmental management of the scope of Subcontractor activities and provide required reports to Contractor
- undertake inductions and relevant environmental training
- meet with the Project Environmental Manager (or delegate) at least weekly to discuss environmental performance, including outcomes of inspections, monitoring and audits.
- advise the Project Environmental Manager immediately of all environmental incidents and hazards (as per Section 8), to allow for appropriate reporting by Company or Contractor to government and to participate in incident investigations as directed by Contractor
- undertake any monitoring required to validate the protection of the environment impacted or potentially impacted by the scope of their work
- provide a monthly environment report to the Project Environmental Manager that describes compliance with Project approvals and conditions, compliance with the CEMP, environmental incidents and hazards, environmental improvement initiatives and results of monitoring and audits, and includes environmental performance statistics including fuel usage, waste volumes.

4 Environmental Management System

4.1 Governing HSEQ Management Systems

Post introduction of PWC gas various activities will be underway including construction, pre-commissioning, cold commissioning, and commissioning with hydrocarbons within the facility. As such, Company has conducted a gap assessment between Contractor HSEQ-MS and Company standards and has decided to allow Contractor to continue to conduct work activities in accordance with aspects of its approved HSEQ-MS and the requirements contained within this plan.

Figure 4-1 outlines the HSEQ-MS application during the various phases.

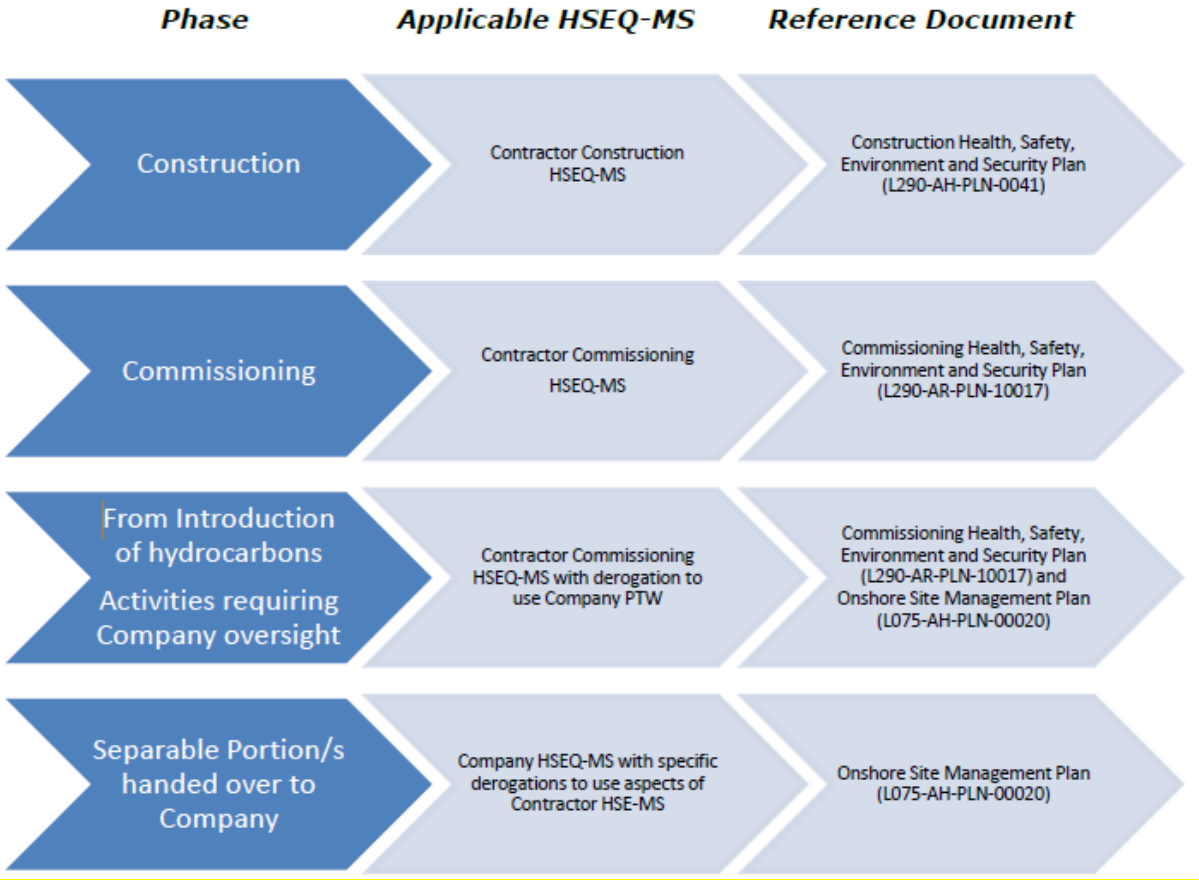

Figure 4-1: Application of Company and Contractor HSEQ-MS

4.2 Company HSEQ-MS overview

The Company HSEQ-MS is part of the INPEX's Business Management System, an integrated framework of policies, standards and procedures that describe how business activities at INPEX are governed and managed.

The INPEX Environmental Policy sets the direction and minimum expectations for environmental performance, and is implemented through the standards and procedures of the HSEQ-MS.

The HSEQ-MS includes standards and procedures from other business areas for its completeness. It is based on the principle of a "plan, do, check, act" (PDCA) continual improvement cycle, and has been developed in accordance with the following Australian

standards:

- AS/NZS 4801:2001, Occupational health and safety management systems—Specification with guidance for use
- AS/NZS ISO 14001:2004, Environmental management systems—Requirements with guidance for use.

It provides mandatory rules and processes for the systematic and consistent management of HSEQ risks, demonstration of compliance, and facilitation of continual improvement. The HSEQ MS enables INPEX to ensure that:

- environmental risks of activities are identified and communicated
- organisational structures and resources are provided to ensure that control measures remain effective in reducing environmental risks to levels that are tolerable and as low as reasonably practicable (ALARP)
- performance outcomes and standards are being met
- continual improvement is achieved through application of lessons learned.

The 13 external elements that influence the HSEQ-MS reflect key aspects of INPEX activities requiring process safety and HSEQ controls (Figure 4-2). These elements have to be managed and implemented properly in order to achieve the desired HSEQ performance and reflect a PDCA cycle, which is applied to every aspect of the 13 elements.

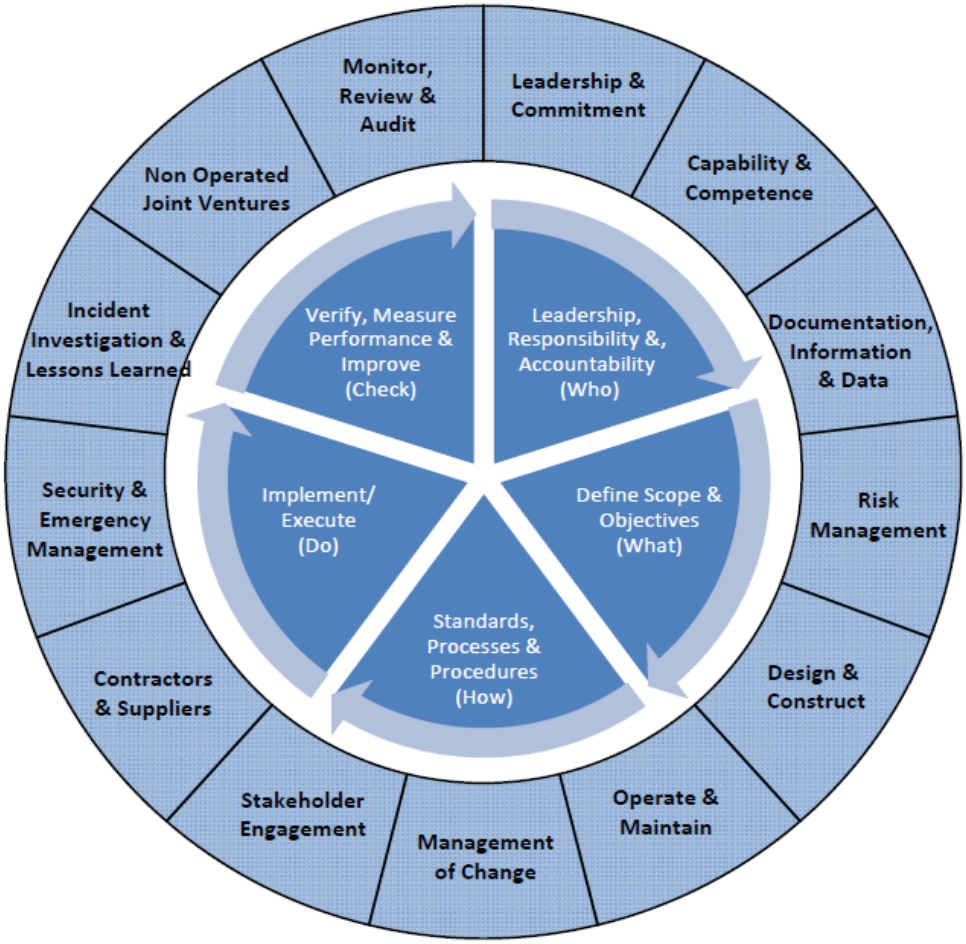

Figure 4-2: Company health, safety, environment and quality management system (HSEQ-MS)

4.3 Contractor Environmental management system overview

Contractor operates a quality and HSES Integrated Management System (IMS) which provides an authorised, documented basis to guide, direct, and instruct project team members in the execution of their work in a consistent manner and provides the framework for implementing project policies. It is designed to meet the requirements of the following:

- AS/NZS ISO 9001:2008, Quality management systems—Requirements
- UNI ISO/TS 29001:2008, Petroleum, petrochemical and natural gas industries—Sector-specific quality management systems—Requirements for product and service supply organisations
- AS/NZS ISO 14001:2004, Environmental management systems—Requirements with guidance for use
- AS/NZS 4801, Occupational health and safety management systems
- Company specifications.

Contractor has prepared a Project-specific HSES policy and is committed to adhering to the HSES policies of its parent organisations and Company.

This CEMP is one of the HSES documents that sit under the IMS and outlines the framework by which Contractor will implement its environmental policies, objectives and targets and manage the environmental impacts of its activities. Figure 4-3 shows the hierarchy of the HSES IMS documents and the relationship to Subcontractor HSES systems and documentation which form the basis of the implementation of this CEMP.

This CEMP is not intended to be an environmental management system manual. It describes broadly how Contractor will satisfy the requirements of ISO 14001. An overview of the structure of this CEMP in relation to the various elements of ISO 14001 is provided in Table 4-1.

For commissioning, activities are undertaken via carefully planned steps and activities, accounting for:

- technical objectives
- acceptance criteria
- definition of responsibilities for activities, care control and custody
- HSES
- resources (including their qualifications, training, appropriate inductions).

A large number of detailed procedures have been produced to ensure transparent execution.

The HSES planning for each activity addresses:

- specific HSES roles and responsibilities
- energy isolation (LOTO) procedures
- risk management
- environmental management.

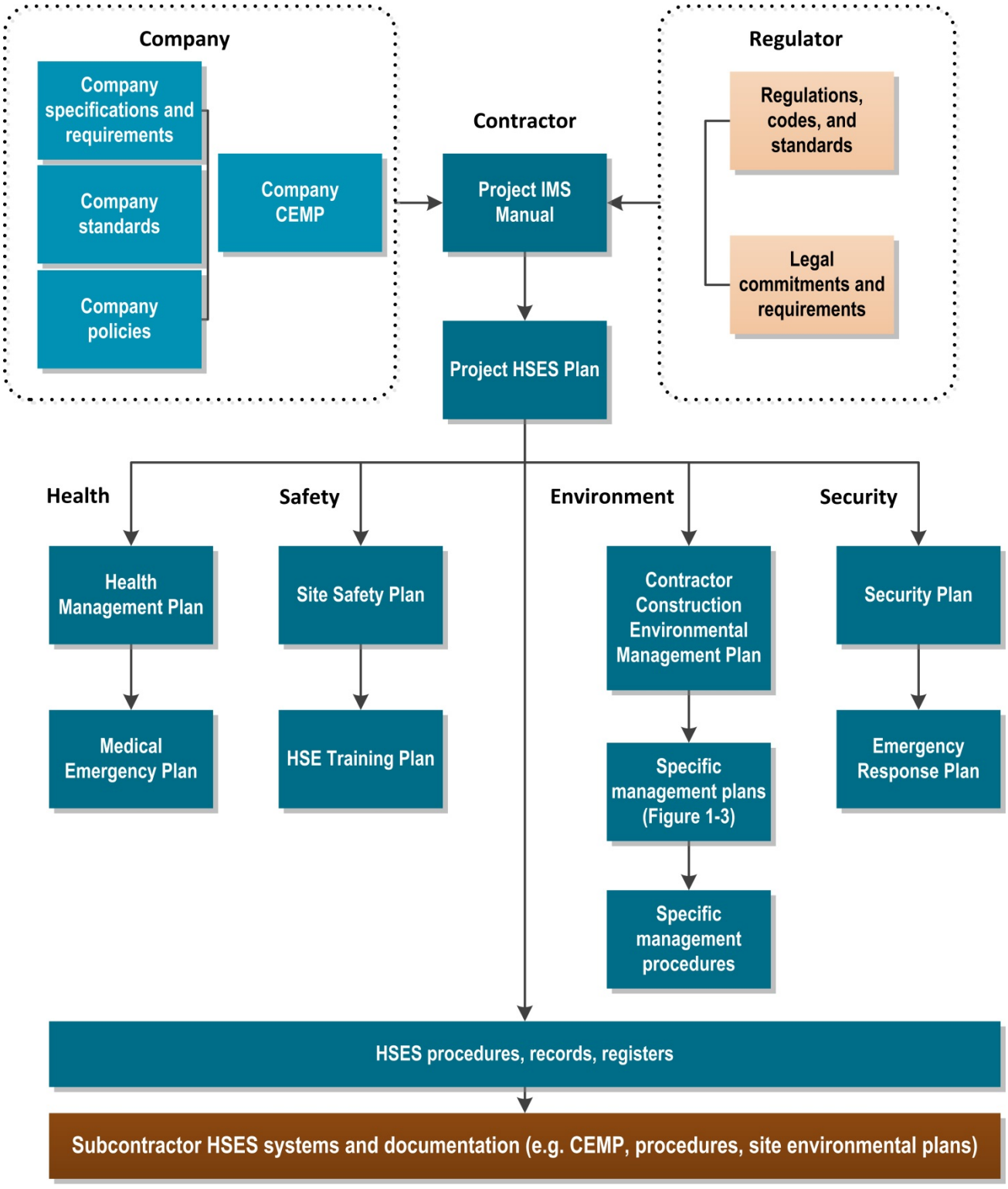

Figure 4-3: Contractor HSES Integrated Management System document hierarchy

Table 4-1: ISO 14001 requirements and CEMP reference

	ISO 14001 requirement	CEMP reference
PLAN	4.1 General requirements	Section 4 Environmental Management System
	4.2 Environmental policy	Section 4 Environmental Management System
	4.3 Planning	
	4.3.1 Environmental aspects	Section 5 Environmental Risk Identification and Assessment Section 6 Environment management strategies—under each relevant environmental aspect Appendix C
	4.3.2 Legal and other requirements	Section 3 Legal and Other Requirements Appendix A Appendix B
	4.3.3 Objectives, targets and program(s)	Section 6 Environment Management Strategies—under each relevant environmental aspect
DO	4.4 Implementation and operation	
	4.4.1 Resources, roles, responsibility and authority	Section 9.1 Roles and responsibilities
	4.4.2 Competence, training and awareness	Section 9.2 Competency, training and awareness
	4.4.3 Communication	Section 7.3 Communication
	4.4.4 Documentation	Section 1.5 Related documentation Section 4 Environmental management system
	4.4.5 Control of documents	Section 7.5 Document control, data and records management
	4.4.6 Operation control	Section 6 Environmental Management Strategies
	4.4.7 Emergency preparedness and response	Section 8.3 Emergency preparedness and response

	ISO 14001 requirement	CEMP reference
CHECK	4.5 Checking and corrective action	
	4.5.1 Monitoring and measurement	Section 7.1 Inspections Section 7.2 Auditing Section 6 Environmental Management Strategies
	4.5.2 Evaluation and compliance	Section 7.1 Inspections Section 7.2 Auditing Section 3 Legal and Other Requirements
	4.5.3 Nonconformity, corrective and preventative action	Section 8 Corrective and Preventative Action
	4.5.4 Control of records	Section 9 Responsibilities, Training and Awareness Section 7.5 Document control, data and records management
	4.5.5 Internal audits	Section 7.1 Inspections Section 7.2 Auditing
ACT	4.6 Management review	Section 4.4 Management review

4.4 Management review

A management review of this CEMP will be conducted at least annually. The Project Environmental Manager, as management representative, will facilitate the review of the suitability, adequacy and effectiveness of the system in implementing the Contractor policies and objectives and targets. The management review will include the Construction Manager, HSES Manager, Company Site HSE Manager and other relevant Contractor, Company and Subcontractor personnel. The findings of the management review will be documented, and any corrective actions will be tracked and closed out in a timely manner.

The CEMP will be updated in line with the CEMP review, revision and approval process outlined in Section 1.4.

5 Environmental Risk Identification and Assessment

5.1 Environmental risk assessment framework

A systematic risk assessment process has been adopted by the Project for environmental management, in line with INPEX's Environmental Policy which requires the identification of environmental hazards and risks associated with our business and management of these to levels that are 'as low as reasonably practicable' (ALARP). This methodology is used to identify activities that have the potential to result in adverse impacts (environmental harm) in the receiving environment. By developing mitigation measures and controls to reduce the risks identified, risks can be reduced to ALARP. The risk assessment process used has been developed in line with Australian Standard AS/NZS ISO 31000:2009, Risk management principles and guidelines (formerly AS/NZS 4360:2004). This assessment process maintains the systematic approach that was applied throughout the EIS and involves the identification of potential impacts to environmental aspects due to site activities.

A risk assessment is undertaken by assessing the likelihood and consequence of impacts on environmental aspects during the construction activities with consideration of currently planned mitigation measures. The likelihood of an impact can be described as the level of probability that, or the frequency with which, an aspect of an activity will impact upon the environment.

The likelihood levels applied range from "remote" (6) to "highly likely" (1) (refer to Table 5-1). The consequence levels applied range from "insignificant" (F) to "catastrophic" (A). The definitions of likelihood and consequences of environmental risk assessments are shown in Table 5-1.

Table 5-2 includes more detailed definitions of environmental consequences to be used for site specific assessment of environmental risk as agreed with the NT EPA.

The environmental risk matrix used to determine the risk of an impact is shown in Table 5-1. The risk matrix using four risk categories: "critical", "high", "moderate" and "low". The typical management action for each risk category is shown in Table 5-1.

Table 5-1: Environmental risk matrix

INPEX

Risk Matrix

CONSEQUENCE TABLE

		CONSEQUENCES							
		Financial		Health & Safety	Environment	Reputation	Cultural & Social Heritage	Legal	Severity
		NPV	A$						
Severity Level	A	>$1B	> $5B **Project Schedule** >24 months	>20 fatalities or permanent total disabilities	Regional scale event, permanent impact on environment. Eradication of local populations of protected species	Prolonged international multi-NGO and media and by public protests. Loss of host government support and/ or social licence to operate. Company reputation severely tarnished	Permanent, long-term impact on social structure, and destruction of highly-valued heritage, aesthetic, economic or recreational items	Criminal prosecution, potential jail sentences for directors and senior officers. Civil prosecution, class actions. Heavy fines, threat to licence to operate or future approvals	A Catastrophic
	B	$100M – $1B	$1B – $5B **Project Schedule** 12 – 24 months	2 – 20 fatalities or permanent total disabilities	Large scale event, long term impact on environment. Extensive impact on populations of protected species	International multi-NGO and media condemnation. Host government registers concerns. Prolonged large protests. Company reputation seriously impacted	Widespread disruption to a number of communities with damage to highly-valued heritage, aesthetic, economic or recreational items	Criminal prosecution for directors and senior officers. Civil prosecution and class actions. Heavy fines, threat to licence to operate	B Major
	C	$10M – $100M	$100M – $1B **Project Schedule** 6 – 12 months	Single fatality or Permanent Total Disability	Medium to large scale event, medium term impact on environment. No threat to overall population viability of protected species	Serious public or national media outcry. Damaging NGO campaign. Large protests. Company reputation impacted	Significant impact to regional communities, and to heritage, aesthetic, economic or recreational items of significant value	Significant, multiple breaches of regulation or licence conditions. Significant litigation and fines	C Significant
	D	$1M – $10M	$10M – $100M **Project Schedule** 1 - 6 months	Major injury or illness, permanent partial disability, lost time injury	Local to medium scale event with short to medium term impact on environment. No threat to overall population viability of protected species	Major adverse national media, public or NGO attention. Significant protests. Asset reputation impacted	Regional community disruption with moderate impact on heritage, aesthetic, economic or recreational values	Serious breach of regulation. Investigation by regulatory authorities. Potential litigation and moderate fines	D Moderate
	E	$100K– $1M	$1M – $10M **Project Schedule** 2 - 4 weeks	Minor injury or illness, alternative duties injury, medical treatment injury	Local scale event with short term impact on the environment. Minor and temporary impact on a small portion of the population of protected species	Attention from regional media with heightened concern with local community. Criticism by community or NGOs	Isolated community disruption with limited adverse impact on heritage, aesthetic, economic or recreational values	Minor legal issues. Report provided to regulatory authorities. Potential for minor fines	E Minor
	F	<$100K	<$1M **Project Schedule** < 2 weeks	Slight injury or illness, first aid injury	Local scale event with temporary impact on environment. Behavioural responses inconsequential ecological significance to protected species	Short term local concern or complaints. Low level media or regulatory issue	Minor impact on heritage, aesthetic, economic or recreational values	Breach of internal standards. Potential scrutiny by regulatory authorities	F Insignificant

LIKELIHOOD TABLE

Time Frame Could be experienced	100 year timeframe or less	50 year timeframe	10 - 20 year timeframe	5 year strategic planning time frame	1 -2 year budget timeframe	Once or more during the next year
Experience History of occurrence in Company or Industry	Unheard of in the industry or in Projects	Has occurred once or twice in the industry or rarely occurs in Projects	Has occurred many times in the industry but not in the company or in <1 out of 100 Projects	Has occurred once or twice in the company or in <1 out of 10 Projects	Has occurred frequently in the company or in many Projects	Has occurred frequently at the location or in every Project
Frequency Continuous Operation	Once every 10 000 – 100 000 years at location	Once every 1,000 – 10 000 years at location	Once every 100 - 1000 years at location	Once every 10 - 100 years at location	Once every 1 - 10 years at location	More than once a year at location or continuously
Probability Single activity	1 in 100 000 – 1 000 000	1 in 10 000 – 100 000	1 in 1000 – 10 000	1 in 100 - 1000	1 in 10 - 100	>1 in 10

Likelihood Level	6	5	4	3	2	1
	Remote	Highly Unlikely	Unlikely	Possible	Likely	Highly Likely
A Catastrophic	6	5	4 **Critical Risk**	3	2	1
B Major	7	6	5	4	3	2
C Significant	8	7	6 **High Risk**	5	4	3
D Moderate	9	8	7	6	5	4
E Minor	10	9	8 **Moderate Risk**	7	6	5
F Insignificant	10	10	9 **Low Risk**	8	7	6

INPEX Risk Matrix
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Applying the Risk Matrix

Application of the Risk Matrix should be a facilitated discussion, or the results peer reviewed to assure reported risks are appropriately evaluated.

Determining the Residual or Target Risk Levels

Residual Risk Level

Describe the Risk Event being analysed.

1. Selecting the Consequence Level

From the business consequences listed in the consequence table select the most credible consequences associated with the selected event with *existing* mitigating controls in place. Where more than one consequence applies, select the consequence level for the highest severity impact selected.

2. Selecting the Likelihood Level

Select likelihood level from the description that best fits the chance of the selected consequence actually occurring, considering *existing* preventative controls and mitigating controls are in place and are effective.

3. Residual Risk Level

The Residual Risk Level is the product of the Consequence Level and Likelihood Level and should be plotted on the Risk Matrix

Target Risk Level

Describe the Risk Event being analysed.

1. Selecting the Consequence Level

From the business consequences listed in the consequence table select the most credible consequences associated with the selected event with *planned and budgeted* mitigating controls in place. Where more than one consequence applies, select the consequence level for the highest severity impact selected.

2. Selecting the Likelihood Level

Select likelihood level from the description that best fits the chance of the selected consequence actually occurring, considering *planned and budgeted* preventative controls and mitigating controls are in place and are effective.

3. Target Risk Level

The Target Risk Level is the product of the Consequence Level and Likelihood Level and should be plotted on the Risk Matrix

Selected Consequence Level x **Selected Likelihood Level** = **Residual or Target Risk Level** → **Risk Response**

The Residual Risk Level is applied to define the appropriate Risk Response shall be consistent with requirements in the **Risk Response Table**.

Risk Response Table

Risk Management Response				
Residual Risk Level	Response	Escalate		Timeframe
		INPEX Australia	Project	
Critical	Detailed risk control plan to mitigate risk must be developed, implemented and reported to senior management. Senior management to monitor and ensure implementation	President Director	President Director through Project Managing Director	Immediate – 1 month
High	A risk control plan to be developed and authorised by area manager. Implementation to be reported to senior management	Director	Project Directors General Managers	1 month – 6 months
Moderate	Review controls to ensure they remain effective	General Manager	Package Managers	6 – 12 months
Low	Continue to monitor to ensure risk remains low	Team Leads	Team Leads	Annual review

Determining the Maximum Foreseeable Exposure

Describe the *credible* worst case risk event assuming all preventative and mitigating Controls fail. The MFE scenario should be described, include an estimation of the financial business impact and, where applicable, the most credible maximum number of fatalities, and the details entered into the Risk Register. Select the highest Severity Level from the Consequence table that reflects the scenario impact. The MFE shall be reported as:

- The highest Financial and Non-Finance Severity Level selected; and
- Where applicable, the maximum credible number of fatalities expected from the risk event

For more information refer to the INPEX Risk Management Standard (PER00155769)

Table 5-2: Definitions of environmental consequences

	Biodiversity and ecological processes			Environmental quality				Societal considerations			
	Protected species	Marine primary producers	Ecological diversity	Water quality	Marine sediment quality	Air quality	Soil and groundwater contamination	Protected areas	Cultural matters	Compliance	
Consequences	B1	B2	B3	E1	E2	E3	E4	S1	S2	S3	
	Eradication of local population. Loss of critical habitats or activities.	Permanent loss of primary producers on large or regional scale.	Significant and permanent effects on ecological diversity on a regional scale.	Continuous or regular contamination to water quality above background and/or national or international standards and/or known biological effect concentrations on a regional scale.	Permanent to long-term contamination above background and/or national or international quality standards and/or known biological effect concentrations on a regional scale.	Continuous exceedance over national or international air quality standards. Human fatalities possible.	Extensive off-site contamination of groundwater and/or soil on a regional scale. Cost of effective treatment not possible. Sustained damage to the environment; human health risks likely.	Significant permanent effect on one or more of protected-areas values.	Significant permanent impact on aesthetic, heritage, economic or recreational values. Overall societal benefits do not outweigh impacts.	Significant and continuous licence or regulatory or internal target exceedances. Fines and/or prosecutions incurred or expected.	A
	Extensive impact on population(s). Significant impact on critical habitats or activities.	Recoverable loss of primary producers on large scale.	Significant and permanent effects on ecological diversity on a large scale.	Continuous or regular contamination to water quality above background and/or national or international quality standards and/or known biological effect concentrations on a large scale.	Permanent to long-term contamination above background and/or national or international quality standards and/or known biological effect concentrations on a large scale.	Frequent and sustained exceedance over national or international air quality standards. Human fatalities possible.	Extensive off-site contamination of groundwater and/or soil at medium scale. Treatment difficult and/or expensive. Damage to the environment and risk to human health possible.	Significant long-term effect on one or more of protected-areas values.	Significant long-term impact on aesthetic, heritage, economic or recreational values. Overall societal benefits do not outweigh impacts.	Frequent and significant licence or regulatory or internal target exceedances. Fines or prosecutions likely.	B
	Minor disruptions to a significant portion of the population. Minor impacts on critical habitats or activities. No threat to overall population viability.	Permanent loss of primary producers on a medium scale.	Significant and permanent effects on ecological diversity on a medium scale.	Continuous or regular discharge with contamination above background and/or national or international quality standards and/or known biological effect concentrations on a medium scale.	Permanent to long-term contamination above background and/or national or international quality standards and/or known biological effect concentrations on a medium scale.	Frequent, short-term exceedances over national or international air quality standards. Human illness and effects on the environment possible.	Extensive contamination of groundwater and/or soil, off-site contamination probable and treatment difficult and/or expensive. Limited threat to the environment or human health.	Moderate long-term or permanent effect on one or more of protected-areas values.	Moderate impact on aesthetic, economic, heritage or recreational values. Overall societal benefits do not outweigh impacts.	Frequent, minor to moderate licence or regulatory or internal target exceedances. Fines or prosecutions possible.	C
	Minor disruptions or impact on a small portion of the population. Minor and temporary impact on critical habitat or activity. No threat to overall population viability.	Recoverable loss of primary producers on a medium scale.	Loss of ecological diversity on a medium scale. Community or habitat maintains ecological integrity though some change in species composition or abundance may occur. Community, habitats and species well represented regionally.	Continuous or regular discharge with contamination above background and/or national or international quality standards and/or known biological effect concentrations on a local to medium scale.	Short- to medium-term contamination above background and/or national or international quality standards and/or known biological effect concentrations on a medium scale.	Frequent temporary exceedances over national or international air quality standards. Human illness and effects on the environment possible.	Moderate contamination to groundwater or soil, contained within site boundary and readily treated. No significant threat to the environment or human health.	Moderate medium-term effect on one or more of protected-areas values. Full recovery expected.	Moderate impact on aesthetic, heritage, economic or recreational values. Overall societal benefits outweigh impacts.	Occasional significant licence or regulatory or internal target exceedances. Fines or prosecutions possible.	D
	Minor and temporary disruption to small portion of the population. No impact on critical habitat or activity.	Permanent loss of small proportion of primary producers on a localised scale.	Loss of ecological diversity on a localised scale. Community or habitat maintains ecological integrity though some change in species composition or abundance may occur. Community, habitats and species well represented regionally.	Continuous or regular discharge, with contaminants reduced to below background and/or national or international quality standards and/or known biological effect concentrations within a small mixing zone.	Short- to medium-term contamination above background and/or national or international quality standards and/or known biological effect concentrations on a localised scale.	Occasional and temporary exceedance over national or international air quality standards. No effect on human health or the environment.	Minor contamination of soil and/or groundwater, contained within site boundary and readily treated. No threat to the environment or human health.	Minor medium-term effect on one or more of protected-areas values. Full recovery expected.	Minor impact on aesthetic, heritage, economic or recreational values.	Occasional minor licence or regulatory or internal target exceedances. No fines or prosecutions.	E
	Behavioural responses of inconsequential ecological significance.	Recoverable loss of small portion of primary producers on a localised scale.	Minor loss of ecological diversity on a localised scale. Communities, habitats and species well represented on medium scale.	Occasional discharge with contaminants reduced to below background and/or national or international quality standards and/or known biological effect concentrations within a small mixing zone.	Short -term contamination above background and/or national or international quality standards and/or known biological effect concentrations over a very small area (<1 km²).	Very infrequent and temporary exceedance over national or international air quality standards. No effect on human health or the environment.	Minor contamination of soil within site boundary and readily treated. No effect on groundwater. No threat to the environment or human health.	Negligible impact on protected-areas values.	Negligible impact on aesthetic heritage, economic or recreational values.	Very infrequent minor licence or regulatory or internal target exceedances.	F

5.2 Environmental risk assessment process

The potential for environmental harm from Contractor and Company scopes of work is assessed during environmental hazard identification (ENVID) workshops in accordance with Contractor's EPC ENVID Study Procedure (L290-AH-PRC-10033) prior to the commencement of new activities. ENVID workshops are conducted with Company, Contractor and Subcontractor representation and the purpose of these workshops is to identify and assess the risks associated with the construction, precommissioning and commissioning activities relevant to specific work and activities.

The systematic risk assessment process is initially applied at the ENVID workshops for each activity before it is completed. Revisions of the ENVID workshops are triggered where major changes in control measures are proposed, or when new scope is added, or changes in the way the scope is implemented. This ensures that the key risks and impacts are identified and control measures nominated to reduce the residual risk to ALARP.

The outcomes of the ENVIDs represent an evaluation of environmental risk at a given point in time; consequently, the environmental risk profile of construction will be assessed by Contractor and Subcontractor as construction progresses. The environmental risk profile of construction will continue to be assessed throughout construction as Site conditions change as part of continual improvement in the environmental management process. All environmental risks as identified through ENVIDs are incorporated into Contractor's Environmental Risk Register (L290-AH-LIS-0005) provided in Appendix C. Section 6 identifies appropriate controls and mitigation measures relevant to environmental risks.

Where ENVID workshops and the ongoing risk assessments result in identification of new hazards, or a higher risk ranking for existing hazards, these changes are incorporated into Contractor's environmental risk register. For each hazard identified, the risk register describes the level of risk relevant to the activity and potential impacts and mitigations.

The risk register is reviewed and updated following every ENVID workshop including new activities not already covered in the existing risk register. To date this has been approximately every 6 months. The risk register is maintained by Contractor and is appended to each revision of the CEMP.

The risk rating for an activity will change when the likelihood of its occurrence changes from the implementation of controls. This is the focus of the ENVIDs to reduce the risk rating to ALARP.

The consequence of an activity typically will not change.

ENVID workshops conducted to date have included site preparation activities, onshore temporary facilities, nearshore infrastructure, concrete batch plant, detailed civil works and permanent LNG facilities such as LNG and non-cryogenic tanks, CCPP, GEP and FGP, operation complex and nearshore module transportation including operation of support facilities such as MOFTP and heavy hauling and erection works, hydrotest activities, precommissioning activities, commissioning activities and a reassessment of any potential remaining activities to be performed within the Contractor work scope as well as a reassessment of potential changes related to emissions or discharges. No critical or high residual risks have been identified during risk assessments completed to date.

The risk register is maintained on Site and is reviewed and assessed by key Company, Contractor and Subcontractor personnel prior to commencement of new works and/or when revisions occur. The risk register is also used as a basis for future risk assessments including Subcontractor ENVIDs, to provide alignment and consistency in the assessment of risks and application of mitigation measures across the Project. In addition, the risk register is also reviewed when major environmental incidents occur, after an incident

investigation is completed, when environmental non-conformances are identified and when there is an unanticipated or unidentified environmental hazard.

5.3 Conceptual site model for commissioning activities

The risk assessment process described above was used to develop a conceptual site model for commissioning activities. Figure 5-1 shows the key sources of identified hazards, and potential impact pathways. The conceptual site model represents potential pathways with no controls in place.

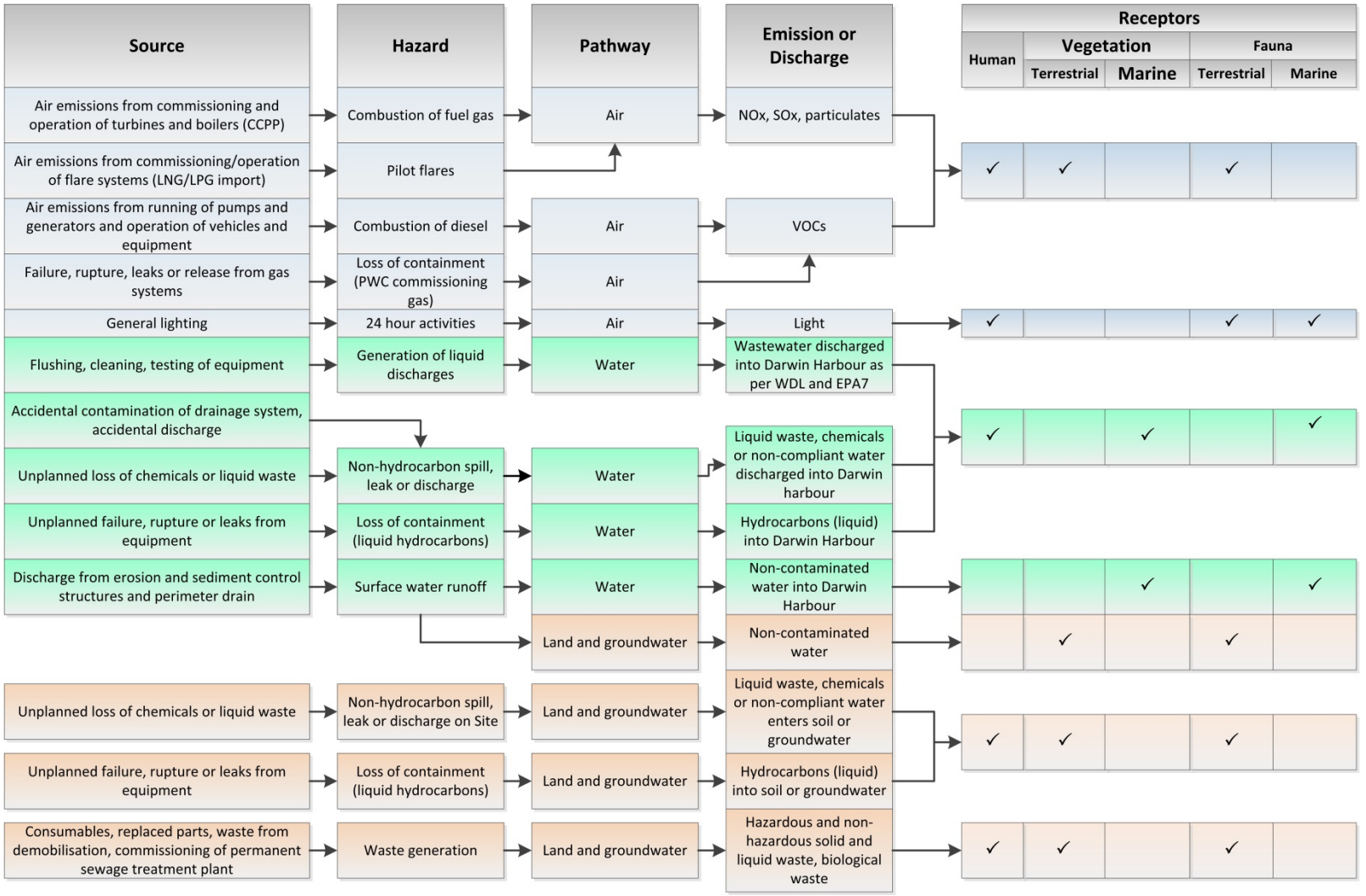

Figure 5-1: Conceptual site model for commissioning activities, potential impact pathways and receptors

5.4 Management of change

INPEX's Environmental Policy requires the Project to set, measure and review environmental performance objectives and targets and ensure appropriate management of change processes are followed.

In the event that works are proposed to be undertaken on Site which are not addressed in this CEMP, the management of change process illustrated in Figure 5-2 will be followed to determine whether the works will or may cause, or increase, the potential for environmental harm, such as by any increase of emissions or discharges, or increase in impacts to habitat of listed species in Darwin Harbour.

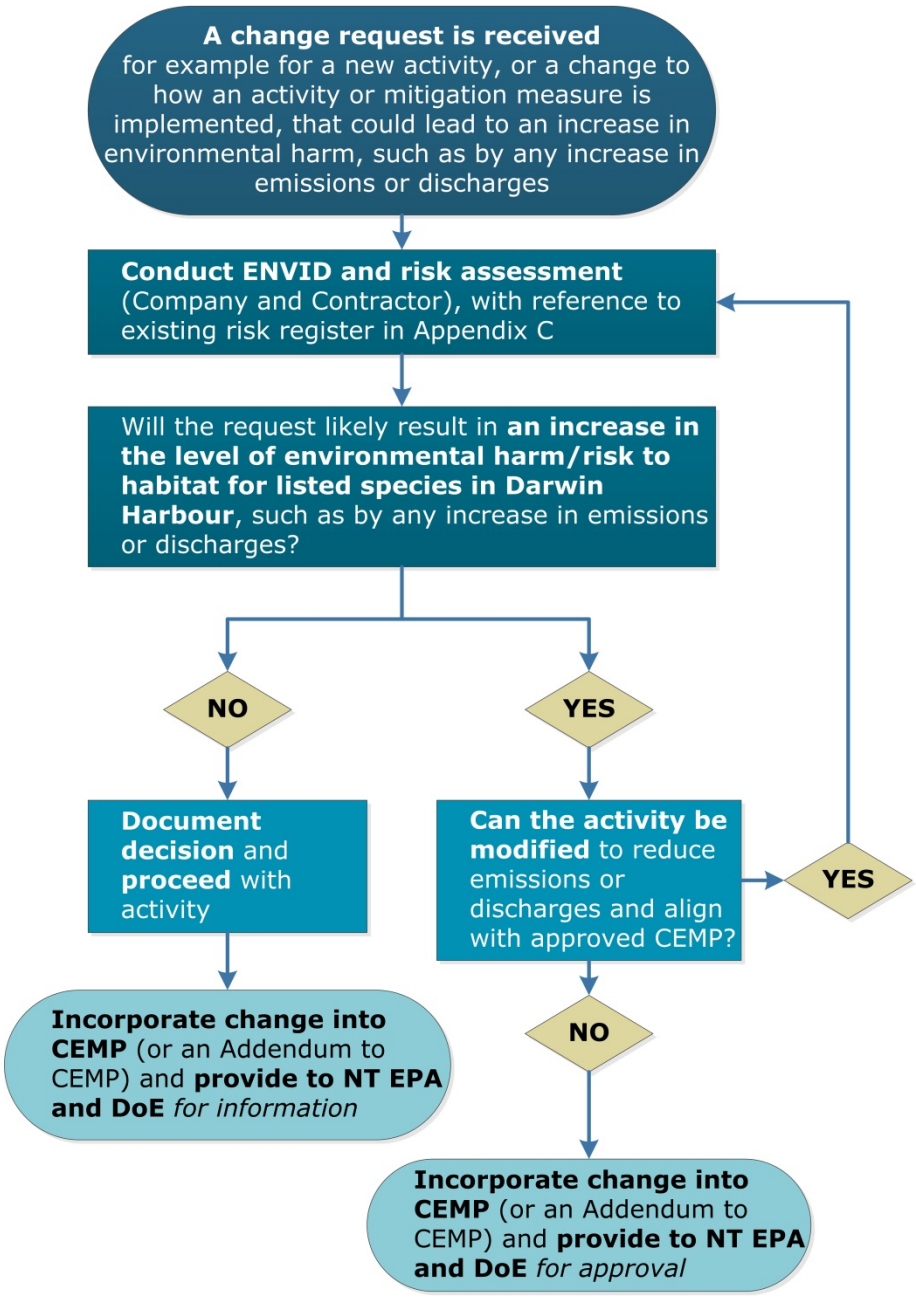

Figure 5-2: Management of change process

Company monitors Project changes over time to confirm the risk profile for the approved activity has not changed, in line with Company Environmental Policy, which endeavours to *prevent pollution and seek continual improvement with respect to emissions, discharges, wastes, energy efficiency and resource consumption*.

6 Environmental Management Strategies

6.1 Cultural heritage management

The Project works are contained within the traditional land of the Larrakia people. Company is responsible for engagement with the Larrakia people for any matters associated with Aboriginal heritage.

Contractor will direct any queries and requests related to Aboriginal heritage (such as site meeting requests) with the Larrakia people to Company to communicate with the Larrakia people through the Larrakia Heritage Management Executive Committee (LHMEC).

Company has prepared the following management plans:

- Heritage Management Plan: Heritage Sites (Non-Aboriginal and Aboriginal) in the Onshore Development Area and Sacred Sites in Darwin Harbour (C025-AG-PLN-0010) (HMP)
- Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029) (NHMP).

6.1.1 Current conditions

Onshore heritage

All Aboriginal heritage sites (known or unknown) are afforded protection under the *Heritage Act 2011* (NT).

During archaeological surveys, a number of known Aboriginal heritage sites were identified in and just outside the onshore development area. Following consultation with the LHMEC and NT Heritage Branch, some sites and objects were removed or relocated and others have been protected using measures such as the implementation of conservation zones. All removed items are either stored at the Heritage Hill storage site (see Figure 6-1 Inset B for location) or at a location determined by the LHMEC.

The Heritage Hill storage site and Site 3 are the only remaining known heritage sites within the onshore development area boundary. Both are fenced and have signage preventing entry.

See Figure 6-1 for map detailing known Aboriginal sites which are to be protected during site works.

Maritime Heritage

Several maritime heritage sites are located within the nearshore development area for which heritage protection zones have been established. Table 6-1 details the locations of the identified sites and heritage protection zones as well as the location of Catalina wrecks and historical shipwrecks. Details of the coordinates, heritage protection zones and heritage status for sites in the nearshore development area are summarised in Table 6-1 and shown in Figure 6-2.

Vessels are prohibited from anchoring within the heritage protection zones identified in Figure 6-2 and Table 6-1 without approval from the relevant regulatory authority via Company but most Project vessels are permitted to traverse over these areas. However, no Project vessel is permitted to traverse or anchor within the Catalina 6 heritage protection zone. Permission must be obtained from the relevant regulatory authority via Company prior to entering the Catalina 6 heritage protection zone.

Sacred sites

The Aboriginal Area Protection Authority (AAPA) has issued the project with several authority certificates which define restricted work areas (RWA) in relation to sacred sites located both in Darwin Harbour and near the onshore project works.

These AAPA Authority certificates provide for the conduct of limited project activities within the defined RWA. Project activities must be conducted in accordance with the conditions of the certificate.

Contractor will distribute the content of AAPA Authority certificates to Subcontractors as and when required, when it affects the scope of works (e.g. where a vessel requires access to a RWA).

Subcontractors should be aware of the existence of AAPA Authority certificates and seek advice from Contractor during planning, design and execution of their works.

The information contained in this map is confidential and for the use of INPEX and those with whom it contracts directly and must not be communicated to other persons without the prior written consent of INPEX. Any unauthorised use of such information may expose the user and the provider of that information to legal action. While every effort has been made to ensure accuracy and completeness of the information presented, no guarantee is given nor responsibility taken by INPEX for any errors or omission. INPEX accepts no liability for any use of the said information or reliance on it.

Figure 6-1: Location of heritage sites

The information contained in this map is confidential and for the use of INPEX and those with whom it contracts directly and must not be communicated to other persons without the prior written consent of INPEX. Any unauthorised use of such information may expose the user and the provider of that information to legal action. While every effort has been made to ensure accuracy and completeness of the information presented, no guarantee is given nor responsibility taken by INPEX for any errors or omission. INPEX accepts no liability for any use of the said information or reliance on it.

Figure 6-2: Location of maritime heritage wrecks and protection zones

Table 6-1: Maritime heritage sites and protection zones within the nearshore development area

Site name	Centroid location of protection zone	Heritage protection zone radius	Remarks	Approximate distance from work area	Approved activities	Current heritage status
Catalina 1 (A24-1, PBY-5)	709631 E 8615276 N	100 m (project requirement)	Beached RAAF aircraft (Catalina)	Located 800 m south of MOF area	Most Project vessels permitted to traverse; no anchoring without prior approval	Declared heritage under the Heritage Act 2011 (NT).
Catalina 2 (A24-69)	706047 E 8617662 N	100 m (project requirement)	Sunken RAAF aircraft	Located 2.3 km north-west of the nearshore development area	Most Project vessels permitted to traverse; no anchoring without prior approval	Not declared.
Catalina 3 (A24-206)	707418 E 8617803 N	100 m (project requirement)	Sunken RAAF aircraft	Located 1.8 km north of the nearshore development area	Most Project vessels permitted to traverse; no anchoring without prior approval	Not declared.
Catalina 4 (PBY-5)	706282 E 8616273 N	100 m (project requirement)	Sunken US aircraft	Located 1.1 km west of the nearshore development area	Most Project vessels permitted to traverse; no anchoring without prior approval	Declared heritage under the *Heritage Act 2011* (NT). Protected under the *Sunken Military Craft Act* (US).
Catalina 5 (PBY-4)	706776 E 8616231 N	100 m (project requirement)	Sunken US aircraft	Located 500 m west of the Jetty work area	Most Project vessels permitted to traverse; no anchoring without prior approval	Declared heritage under the *Heritage Act 2011* (NT). Protected

Site name	Centroid location of protection zone	Heritage protection zone radius	Remarks	Approximate distance from work area	Approved activities	Current heritage status
						under the *Sunken Military Craft Act* (US).
Catalina 6 (PBY-4)	704752 E 8616782 N	100 m (project requirement)	Sunken US aircraft	Located 2.5 km west of the nearshore development area	None – no traversing or anchoring without prior approval	Declared heritage under the *Heritage Act 2011* (NT). Protected under the *Sunken Military Craft Act* (US).
Kelat	704067 E 8617577 N	150 m (legislated requirement)	Sunken coal barge	Located 4.2 km north-west of the nearshore development area	Most Project vessels permitted to traverse; no anchoring without prior approval	Declared heritage under the *Heritage Act 2011* (NT). Will automatically be declared as a historic shipwreck in 2017 under the *Historic Shipwrecks Act 1976* (Cwlth) as the wreck will be 75 years old.
SS Ellengowan	703015 E 8613248 N	100 m (legislated	Sunken ship	Located 7 km from the nearshore	Most Project vessels permitted to traverse; no anchoring without	Declared as a historic shipwreck under the *Historic*

Site name	Centroid location of protection zone	Heritage protection zone radius	Remarks	Approximate distance from work area	Approved activities	Current heritage status
		requirement)		development area	prior approval	*Shipwrecks Act 1976* (Cwlth) as the wreck is more than 75 years old. Declared heritage under the *Heritage Act 2011* (NT).
Catalina tail section	705926 E 8616317 N	50 m (project requirement)	A tail section associated with a Catalina	Located 1.1 km west of the nearshore development area	Most Project vessels permitted to traverse; no anchoring without prior approval	Not declared

6.1.2 Key activities, potential impacts and residual risk levels

The key activities and potential environmental impacts identified for cultural heritage are listed in Table 6-2. The residual risk levels after the implementation of the mitigation measures contained in Table 6-4 are also identified.

Table 6-2: Key activities, potential environmental impacts and residual risk levels for cultural heritage management

Activity	Potential environmental impact	Residual risk level
General onshore construction activities, including clearing and grubbing, earthworks and vehicle movement	• Damage, disturbance or loss of Aboriginal heritage sites retained on Site	Low
	• Potential risk for damage, disturbance or loss of previously unidentified non-Aboriginal and Aboriginal heritage sites	Low
Vessel movement and operations for construction or construction support activities in the nearshore area	• Damage or disturbance to maritime heritage sites listed under the *Heritage Act 2011* (NT) or *Historic Shipwrecks Act 1976* (Cwlth)	Low
	• Damage or disturbance to known Catalina flying-boat wrecks	Low
	• Potential risk for damage, disturbance or loss of previously unidentified maritime heritage sites	Low

6.1.3 Objectives, targets and indicators

The objectives, targets and indicators for heritage management that have been established are outlined in Table 6-3.

Table 6-3: Cultural heritage objectives, targets and indicators

Objective	Target	Indicator
The ongoing protection and preservation of maritime heritage sites and Aboriginal heritage sites	• Zero occurrences of unapproved activities within maritime heritage protection zones. • Zero occurrences of disturbances to retained Aboriginal heritage sites	• Number of incidents of unapproved activities within maritime heritage protection zones. • Baseline data and photography of retained Aboriginal heritage sites • Number of incidents of unapproved activities contravening AAPA

Objective	Target	Indicator
		Authority certificates

6.1.4 Mitigation measures

The mitigation measures that will be implemented to minimise impacts to cultural heritage and to achieve the established objectives and targets are described in Table 6-4.

Note: The NT Heritage Branch endorsed HMP and NHMP incorporate and/or supersede commitments made in the EIS.

Table 6-4: Cultural heritage mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.1.01	Site inductions will include the following specific components for cultural heritage: • cultural values in the Project area, and the importance of protecting and preserving these values • information on mitigation measures such as the location of designated conservation areas (Aboriginal heritage) and heritage protection zones (maritime) • the requirements of the Heritage Management Plan (HMP) and Non-Aboriginal Heritage Management Plan: Nearshore Development Area (NHMP), as relevant to the Project scope • the procedure in the event of the discovery of a new heritage site or a heritage site being damaged.	Company Environmental Policy Contractor HSES Policy CEMP Section 9 Heritage Management Plan (C025-AG-PLN-0010_3) Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029)	Before entering Site	Contractor Company
6.1.02	Vessel masters will also be trained in maritime heritage protection zones and restricted work areas defined by AAPA Authority certificates as necessary, and incident reporting related to marine heritage as per Section 9.	CEMP Section 9	Before entering Site	Subcontractor
			Prior to any Company-controlled vessel activity	Company
	Aboriginal Heritage			

Number	Mitigation measure	Reference	Timing	Responsibility
6.1.03	Company HMP will be implemented and complied with when undertaking works within the Site boundary.	Heritage Management Plan (C025-AG-PLN-0010_3)	At all times	All Site personnel
	Contractor will distribute the HMP to relevant Subcontractors scope of work.		On an as required basis	Contractor
6.1.04	The construction-related elements of the current issued HMP shall be implemented and complied with including the following: • chance find procedure for Aboriginal heritage • procedure if skeletal remains are detected • chance find procedure for WWII heritage • procedure for breach of authority certificate conditions • procedure if a known heritage site is damaged.	Heritage Management Plan (C025-AG-PLN-0010_3) IFC Performance Standard 8: Cultural heritage	At all times	All Site personnel
6.1.05	Contractor will attend a LHMEC meeting prior to the commencement of construction to provide a briefing on construction timelines and to meet relevant LHMEC personnel.	Heritage Management Plan (C025-AG-PLN-0010_3) Environmental Commitments Register Item 28.01	Prior to commencement of works	Construction Manager Project Environmental Manager
6.1.06	The boundary of the two conservation zones that are within the Site i.e. around Site Number 3 and Heritage Hill, will be clearly defined.	Environmental Commitments Register Item 28.03, 28.05 & 28.16	Prior to construction activities adjacent to the conservation areas	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Monthly inspections will be conducted to preserve the integrity of the storage location.		Monthly	Contractor Company (periodically)
	Weeding and fence maintenance will be conducted.		As required	Contractor
6.1.07	Site access will be facilitated for the LHMEC or its representative to inspect sites close to construction activities prior to, during and after the activity. Photographic records of inspections are to be made and kept by LHMEC or its representative only.	Heritage Management Plan (C025-AG-PLN-0010_3) Environmental Commitments Register Item 28.08	At all times	Construction Manager Company
6.1.08	Larrakia heritage monitors shall be engaged to monitor all ground disturbing activities, and to assess and advise on the potential for the discovery of heritage objects. Where ground disturbing activity involving machinery is proposed to occur within 100 m of the external boundary of a heritage site or heritage conservation zone, LDC representatives will be invited to supervise the construction activity, with due regard to safety requirements. Should safety considerations not permit heritage observers to be present during construction, the LHMEC will meet with Contractor to agree on a mutually acceptable alternative action. This action is to be completed before the construction activity near the site is scheduled to occur - where possible a minimum of two weeks before the scheduled commencement of ground disturbing work.	Heritage Management Plan (C025-AG-PLN-0010_3) Environmental Commitments Register Item 28.03	At least two weeks prior to construction activities near the site	Construction Manager Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.1.09	A permit-to-clear system shall be followed prior to commencing vegetation clearance in order to clearly define permitted work areas and to avoid accidental disturbance of heritage sites.	Environmental Commitments Register Item 28.06	Prior to and during clearing of vegetation	Subcontractor
6.1.10	Consideration of heritage risks will be included in job hazard analyses (JHAs) and toolbox talks or prestart meetings as relevant to the scope of works being undertaken at the time. This will be undertaken so that work areas are clearly identified before works commence to avoid accidental disturbance to heritage sites.	Environmental Commitments Register Item 28.06	At all times	Subcontractor
	Non-Aboriginal Heritage			
6.1.11	If previously undetected archaeological material is uncovered during construction, work will cease in the immediate area of the find and the site supervisor shall advise the Project Environmental Manager.	Good International Industry Practice (GIIP) Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029)	At all times	All Site personnel
	DLPE's Heritage Branch will be contacted by Company as soon as practicable.		If previously undetected archaeological material is uncovered during construction	Company

Number	Mitigation measure	Reference	Timing	Responsibility
	Maritime Heritage			
6.1.12	Company NHMP will be implemented and complied with when undertaking works in the nearshore environment.	Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029)	At all times	All Site personnel
	Contractor will distribute the NHMP to relevant Subcontractors.		On an as required basis	Contractor
6.1.13	Anchor management plans will be developed consistent with the requirements of the NHMP for the safe anchoring of vessels. In accordance with the NHMP, anchor management plans require Company approval. At a minimum, plans should include the following: • a description of anchoring and mooring requirements relevant to the activities being undertaken • a description of the anchor types to be used • a list of nominated mooring locations (if required), approved by the Darwin Port • a description of the areas where anchoring is controlled or restricted as outlined within the plan • a requirement that navigation systems be used to delineate controlled or restricted areas.	Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029) Environmental Commitments Register Item 28.07	Prior to commencement of nearshore construction	Subcontractor
6.1.14	Vessels may only moor in areas approved by Darwin Port.	Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029)	At all times	Subcontractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
6.1.15	All Project vessels (excluding small craft such as dinghies) will be fitted with accurate differential GPS (dGPS) equipment. The maritime heritage site locations, heritage protection zones and AAPA RWAs (as required) will be uploaded onto the GPS devices prior to the vessel commencing work on the project to ensure vessel captains/masters/operators are aware of the locations. An audible alarm will be used to signal entry to a heritage protection zone. The vessel master (or delegate) will download and check vessel track plots and GPS information on a daily basis for evidence of compliance with protection zones and record status on a register. This is to be reported monthly to Contractor Project Environmental Manager.	Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029)	At all times	Subcontractor
6.1.16	To minimise disturbance, a 100 m radius protection zone will be adhered to around all known Catalina 1–6 flying-boat wrecks and a 50-m radius protection zone for the Catalina tail section as listed in Table 6-1.	Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029) Heritage Act 2011 (NT) Darwin Port Corporation Act (NT) Sunken Military Craft Act (US) Environmental Commitments Register Item 28.09	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.1.17	To minimise disturbance, a 100-m-radius protection zone for the wreck of the SS Ellengowan will apply as listed in Table 6-1	Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029) Environmental Commitments Register Item 28.10	At all times	Subcontractor
6.1.18	To minimise disturbance, a 150-m-radius protection zone for the wreck of the coal hulk Kelat will apply as listed in Table 6-1.	Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029) Environmental Commitments Register Item 28.11	At all times	Subcontractor
6.1.19	Project activities must be conducted in accordance with the conditions of the AAPA Authority certificate for the defined RWA.	Heritage Management Plan (C025-AG-PLN-0010_3)	At all times	Subcontractor Contractor Company
6.1.20	Project vessels are prohibited from anchoring within a heritage protection zone but may traverse over it with the exception of the heritage protection zone for Catalina 6 which must not be traversed by any vessel without prior approval from the regulatory authority and Company.	Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029)	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.1.21	If anchoring or works are required within a protection zone, the following will apply: • Subcontractor must demonstrate how the wreck will be avoided. • A risk-based assessment will be undertaken in conjunction with the relevant government authorities. Based on the outcomes of this assessment, specific management controls will be applied. • Written authority must be obtained from Company and the relevant government authority (including DLPE and Darwin Port) before any works commence or any anchoring is permitted within an exclusion zone.	Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029)	At all times	Subcontractor
6.1.22	In the event of the following occurring: • damage to a known maritime heritage wreck • traversing or anchoring within the Catalina 6 heritage protection zone without prior permission from the relevant regulatory authority and Company. • performing non-prescribed works within the RWAs under the AAPA Authority certificates, the activities in the vicinity must cease, and the requirements of Section 8 are to be implemented.	Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029) CEMP Section 8 Northern Territory Aboriginal Sacred Sites Act (NT)	At all times	Subcontractor
	Monitoring and Inspection			
6.1.23	Prior to clearing, extents shall be inspected to confirm that works are consistent with any permit to clear and that there is no unauthorised clearing, including within the heritage conservation zones or the heritage site buffer areas.	GIIP	Prior to and during clearing activities	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.1.24	Where works are occurring adjacent to an Aboriginal heritage site or heritage conservation zone, the integrity of the boundary markers shall be inspected.	GIIP	Weekly, where works are occurring adjacent to an Aboriginal heritage site or heritage conservation zone	Subcontractor
6.1.25	Inspections of the integrity of heritage boundaries shall be undertaken for any visible evidence of disturbance.	GIIP	Weekly	Environmental Advisor— Land and Ecology
6.1.26	Implement heritage monitoring requirements by Larrakia Development Corporation (LDC) representatives during ground disturbing activities and any activities involving machinery within 100 m buffer of a heritage zone/site, where it is safe to do so.	Heritage Management Plan (C025-AG-PLN-0010_3)	During ground disturbing activities and where machinery is operating within 100 m of a heritage zone/site.	Subcontractor Contractor
6.1.27	LDC representatives will be invited to perform heritage monitoring for any new clearing prior to the works being undertaken.	Heritage Management Plan (C025-AG-PLN-0010_3)	Prior to new clearing activities	Subcontractor LDC representatives Company
6.1.28	Cultural heritage events which require reporting in accordance with Section 8 include, but are not limited to: • any cultural heritage non-compliance with this CEMP, the Company HMP, Company NHMP, AAPA Authority certificate conditions, the *Heritage Act 2011*, or	CEMP Section 8 Heritage Management Plan (C025-AG-PLN-0010_3)	At all times	Subcontractor Contractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	Northern Territory Aboriginal Sacred Sites Act • potential heritage site or object chance find • damage to a site • traversing or anchoring within a heritage protection zone without prior regulatory and Company permission • performing non-prescribed works within the RWAs under the AAPA Authority certificates.	Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029) Heritage Act 2011 (NT) Northern Territory Aboriginal Sacred Sites Act (NT)		
	Report the event to the relevant regulator, as required, as per Section 8.		If an event occurs	Company

6.2 Flora and fauna management

6.2.1 Existing environment

Pre-construction conditions - Onshore flora and fauna

Flora and vegetation surveys of the Site were undertaken prior to site clearing. The area of native vegetation comprised of *Eucalyptus* woodland, *Melaleuca* communities and closed monsoon vine forest above the intertidal zone and dominated by mangrove communities in the intertidal zone.

One species of cycad (*Cycas armstrongii*) listed as "vulnerable" under the *Territory Parks and Wildlife Conservation Act* (NT) (TPWC Act) and the EPBC Act was found within the Site. No vegetation communities found within the Site are listed as threatened ecological communities under the EPBC Act.

Surveys of terrestrial vertebrate fauna were also undertaken. Terrestrial fauna species were predominantly recorded within the eucalypt communities and savannah woodlands. The mangrove communities were seen to provide habitat for mangrove-specialist bird species such as honeyeaters, raptors and lower species richness of specialist reptiles. The low-ground-level vegetation within the intertidal areas acts as foraging habitat for migratory birds and some amphibians.

No significant protected fauna species were recorded at the Site during the field surveys. The DLPE and EPBC databases suggest that there are a number of protected native fauna species that could potentially occur in and around the Site, including the northern quoll (*Dasyurus hallucatus*) and several migratory bird species listed as endangered under the EPBC Act.

Current conditions — Onshore flora and fauna

All planned vegetation clearing for the Site has been carried out, however there may be minor additional clearing required within the site boundary.

Mangrove community health monitoring as part of the EIMP (L290-AH-PLN-10013) has shown that mangroves surrounding the Site are in good health with no sediment changes or detrimental health effects observed at monitoring sites. All monitoring sites contain at least 90% healthy trees with no stressed trees evident.

No terrestrial threatened species have been recorded on Site to date.

Marine flora / fauna

The seabed in Darwin Harbour varies from exposed pavement, through sand-veneered pavement, to beds of sediment which vary from gravel to fine sands and silt. The Harbour supports a number of taxonomic groups and marine communities which are well represented throughout coastal environments. The seabed habitats in the nearshore area of the Site (MOF and Jetty locations) consist of soft-bottom benthos and rock pavement communities. These communities occur throughout Darwin Harbour. In addition, the MOF is constructed in an area which has been dredged by others prior to its construction; hence, the majority of the original benthic species are not present in the immediate MOF construction area. The end of the Jetty also extends into a dredged area in the middle of East Arm, where navigational aids are installed.

Surveys of the sub-tidal marine benthic habitats in the nearshore area of Site undertaken in 2008, 2012 and 2015 (URS 2008, Cardno 2013, Cardno 2015) reported overall low biotic abundance and diversity. Similar taxa were numerically abundant in both the Darwin Harbour Inner and Darwin Offshore surveys, including tanaid and amphipod

crustaceans, several polychaete families, nematodes and nemerteans.

All of the numerically abundant species recorded in the Darwin Harbour Inner and Darwin Offshore surveys are ubiquitous to most marine habitats and commonly found to occur in large numbers. Overall, the composition and relative abundance of infaunal assemblages in intertidal mudflats at sites in Darwin Harbour Inner, in terms of major taxonomic groups, has been similar throughout the monitoring program.

Macro-algae–dominated communities in Darwin Harbour are located on platform crests and in the intertidal–subtidal interface zone, generally one metre either side of the low-water mark and often in association with coral- or sponge-dominated communities.

Darwin Harbour supports an abundance of both resident benthic and transient pelagic fish species. The most diverse groups in the Harbour area are the gobies (~70 species), cardinal fish (20 species) and the pipefishes (19 species) (Larson 2003). Barramundi is a particularly important commercial and recreational species in the Northern Territory.

Protected marine fauna species

Cetaceans (whales and dolphins), dugongs, marine turtles and saltwater crocodiles, collectively referred to as marine megafauna, are protected in the Northern Territory.

Protected marine species that may be present in the nearshore development area include the ray-finned fishes and cartilaginous fish. Other protected species such as marine megafauna and sea snakes may potentially occur in the vicinity of the Site; however, as indicated in the EIS, this area is unlikely to provide nesting or significant habitat for these species. It is considered unlikely that whales would be observed in the immediate vicinity of the Site.

6.2.2 Key activities, potential impacts and residual risk levels

The key activities and potential environmental impacts identified for flora and fauna management are listed in Table 6-5. The residual risk levels after the implementation of the mitigation measures contained in Table 6-7 are also identified.

Note that the impacts on marine megafauna associated with the construction activities of the MOF and Jetty in the nearshore area from marine pile driving are addressed under Section 6.11.

Table 6-5: Key activities, potential environmental impacts and residual risk levels for flora and fauna management

Activity	Potential environmental impact	Residual risk level
Clearing of vegetation	• Unapproved clearing of vegetation (including mangroves) beyond maximum permitted • Localised reduction in biodiversity due to loss of mangrove, monsoon vine forest, Eucalypt woodland and *Melaleuca* communities and habitat • Localised reduction in biodiversity due to removal of *Cycas armstrongii* (cycads), which are classed as "vulnerable" under the TPWC Act • Death or injury of threatened/protected fauna species (e.g. crocodiles, migratory birds) • Reduction in habitat corridors for flora and fauna	Low

Activity	Potential environmental impact	Residual risk level
	• Potential loss of unidentified threatened/protected species of lower abundance and restricted to more-specialised habitats	
Bulk earthworks, ground improvement including for MOF causeway	• Underwater noise leading to physiological damage (injury) and/or death of marine megafauna • Turbidity and sedimentation impacts on benthic communities • Erosion and sedimentation impacts on retained vegetation • Airborne noise and vibration impacts temporarily displacing terrestrial fauna • Soil erosion due to the removal of vegetation, leading to soil instability and declined health of vegetation • Dust deposition smothering surrounding vegetation and reducing growth	Low
Vessel movements	• Injury to, or death of, marine megafauna • Disturbance to benthic communities and marine fauna • Anchoring of vessel anchors or placement of JUB spud legs causing disturbance to benthic communities and marine fauna in the near shore area • Temporary, localised disruption of natural behaviour or displacement of marine megafauna • Contamination of Darwin Harbour and associated marine fauna habitats as a result of vessel collision (i.e. spill of liquid waste or hydrocarbons)	Low
General near shore construction activities (e.g. due to JUB spud leg placement, operation of the MOFTP and temporary STP outfall, MOF, MOF causeway and Jetty construction)	• Temporary, localised disruption of natural behaviour or displacement of marine megafauna • Underwater noise or vibration leading to adverse behavioural impact, physiological damage (injury) and/or death of marine megafauna • Disturbance to benthic communities and marine fauna in the nearshore area • Turbidity and sedimentation impacts on benthic communities e.g. due to disposal of drill cuttings and displacement of water with fill material, bulk fill and excavations • Light emissions attracting marine fauna during night-time work on the cells causing temporary,	Low

Activity	Potential environmental impact	Residual risk level
	localised disruption of natural behaviour or displacement of marine megafauna • Deterioration of aquatic environmental health, including decline in water quality and seabed impacts • Entrainment of small (not protected) species by MOFTP ballast operations • Potential acidification and heavy-metal contamination of surrounding soil, surface water and groundwater due to the disturbance/displacement/dewatering of ASS or PASS, leading to potentially reduced plant growth and health	
Storage, transport or disposal of waste	• Attraction of fauna and insects to uncovered waste-storage areas	Low
Clearing of vegetation/general construction activities	• Disruption/displacement of fauna species • Fauna injury or death/entanglement on Site	Moderate
Bulk earthworks, ground improvement including for MOF causeway	• Potential acidification and heavy-metal contamination of surrounding soil, surface water and groundwater due to the disturbance/displacement/dewatering of ASS or PASS, leading to potentially reduced plant growth and health • Excessive alkalinity from deep soil mixing ground improvement or management of wastewater from concrete production process to soils, surface water, groundwater, and the marine environment • Uncontrolled release of sediment (e.g. from severe weather) leading to decreased water quality and impacts on marine life • Compaction causing modified soil permeability leading to increased surface water runoff, decreased infiltration/recharge and altered groundwater flows, alteration of groundwater table due to compaction of soil pore spaces and localised lowering of water table and potential for seawater intrusion • Reduced health or mortality of hinterland mangrove community because of reduced flow through of fresh groundwater • Disturbance of soil (including the generation of mud waves) during ground improvement	Moderate

Activity	Potential environmental impact	Residual risk level
	activities has the potential to change elevations and consequently cause mangrove damage or mortality as a result of changed groundwater levels and erosion impacts.	
General onshore construction activities (including onshore piledriving)	• Bushfire leading to loss of flora and fauna • Erosion and sedimentation impacts on retained and/or surrounding vegetation • Disruption/displacement, injury to, or death of fauna (e.g. entrapment) • Injury to, or death of fauna (e.g. vehicle/fauna interaction to/from Site) • Airborne noise and vibration impacts temporarily displacing terrestrial fauna • Dust deposition smothering surrounding vegetation • Excavation/dewatering/displacement of ASS impacting growth and health of vegetation and aquatic environments • Unauthorised destruction of and damage to mangroves leading to non-compliance • Uncontrolled release of hazardous substances including from refuelling incidents (e.g. from truck rollover) resulting in loss of flora and fauna • Uncontrolled release of sediment (e.g. from severe weather) leading to decreased water quality and impacts on marine life	Moderate
General nearshore construction activities (e.g. due to JUB spud leg placement, operation of the MOFTP and temporary STP outfall, MOF, MOF causeway and Jetty construction)	• Contamination of Darwin Harbour and associated marine fauna habitats as a result of uncontrolled release/spills of dangerous goods and hazardous materials, hydrocarbons and other chemicals and waste	Moderate
Marine piledriving	• Underwater noise leading to adverse behavioural impact, physiological damage (injury) and/or death of marine megafauna	Moderate

Note: Risk and impacts to marine habitats associated with operation of the temporary STP are discussed in Section 6.4.

6.2.3 Objectives, targets and indicators

The objectives, targets and indicators for flora and fauna management that have been established are outlined in Table 6-6.

Table 6-6: Flora and fauna management objectives, targets and indicators

Objective	Target	Indicator
To minimise disturbance to flora and alteration of mangrove communities outside the Site boundary due to project activity	• Vegetation clearing within the approved clearing boundary. • No detected impact to mangroves outside the Site boundary attributable to the works (acceptable change in mangrove canopy cover is <30% reduction in canopy cover and in tree condition (including pneumatophores))	• Clearing permits • Results from mangrove community health monitoring program
To avoid injury or death to native terrestrial fauna attributable to project activities	• Zero incidents of death or injury to native fauna attributable to project activities	• Reported incidents of native fauna injuries/deaths attributable to project activity
To avoid injury or death to marine megafauna attributable to project activities	• Zero incidents of death or injury to marine megafauna due to Site activities	• Reported incidents of marine megafauna injuries/deaths

6.2.4 Mitigation measures

The mitigation measures that will be implemented to minimise impacts to flora and fauna, and to achieve the established objectives and targets, are described in Table 6-7.

Table 6-7: Flora and fauna mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.2.01	Site inductions will include the following specific components for flora and fauna management: • the flora, fauna and ecological values within and in the vicinity of the Site, and the Project commitments • how flora and fauna are protected during the works • the procedures in the event that fauna are encountered within the Site • the requirement that all clearing/earthworks/construction activities are to be confined within the Site boundary.	Company Environmental Policy Contractor HSES Policy CEMP Section 9	Before entering Site	HSES Manager Subcontractor Company
6.2.02	Vessel (excluding international vessels) masters will be trained in the appropriate vessel stand-off distances and other vessel–marine megafauna interaction management requirements; specifically, the undertaking of no-wash speed within 50-150 m of marine megafauna. Personnel routinely involved in marine vessel operations will be trained in basic cetacean observation and how to record cetacean sightings.	Environmental Commitments Register items 9.01 & 36.01 CEMP Section 9 CEMP Section 8 EPBC Act Policy Statement 2.1	Before entering Site	Subcontractor
	Clearing			

Number	Mitigation measure	Reference	Timing	Responsibility
6.2.03	Large-scale vegetation clearing and earthworks will be planned to be undertaken in dry-season conditions where practicable. If further clearing is required during the wet-season, it will be undertaken in accordance with the mitigation measures outlined in Section 6.5.	Land Clearing Guidelines (NT) (NRETAS 2010) Environmental Commitments Register Item 11.06 CEMP Section 6.5	Prior to clearing of vegetation	Subcontractor
6.2.04	A vegetation clearing permit will be obtained so that appropriate mitigation measures are in place to minimise disturbance to flora and fauna inside the Site and to prevent clearing outside the approved clearing boundary for the area.	Land Clearing Guidelines (NT) (NRETAS 2010) Environmental Commitments Register Items 14.02 and 14.03 IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources Approved Clearing Permit CEMP Section 8	Prior to clearing activity and then a follow-up inspection of the cleared area once completed.	Subcontractor
	Clearing of vegetation is not permitted outside of the approved clearing boundary on the clearing permit. In the event this occurs, the requirements in Section 8 are to be implemented.		During clearing	
6.2.05	Areas to be cleared will be clearly marked on appropriate plans/figures containing appropriate level of information such that the areas allowed for clearing can be easily interpreted on the ground. These plans will be	Land Clearing Guidelines (NT) (NRETAS 2010) Environmental	Prior to clearing of vegetation	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	readily available to personnel. Prior to the commencement of any clearing, the area to be cleared will be surveyed and the extent of the area will be clearly marked out with survey pegs. All personnel involved in the clearing activities will be made aware of the clearing boundary and documented on the vegetation clearing permit form.	Commitments Register Item 14.02 and 14.03		
6.2.06	Once clearing of an area is complete, the cleared area will be surveyed and the cleared area survey files will be used to verify compliance with the clearing permit application area. The cleared area will be recorded in the clearing permit register. Survey files of cleared areas will be provided to Contractor and incorporated into the overall site clearing map.	Land Clearing Guidelines (NT) (NRETAS 2010)	After clearing	Subcontractor
	Overall site clearing maps will be progressively updated and provided to Company upon request.		On request by Company	Contractor
6.2.07	Cleared vegetation will be stored for the purpose of rehabilitation and/or soil stabilising as described in Section 6.9.	Land Clearing Guidelines (NT) (NRETAS 2010)	Prior to clearing vegetation	Subcontractor
6.2.08	Topsoil will be stripped to a depth dependent on the location, and as determined on site, and will be stored in various temporary topsoil stockpiles. These will be relocated to designated stockpiles (once identified) for future rehabilitation as described in Section 6.9.	Environmental Commitments Register Item 14.06 Land Clearing Guidelines (NT)	Following clearing and prior to commencement of performing earthworks	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
		(NRETAS 2010)		
6.2.09	Burning vegetation for the purpose of clearing is not permitted.	GIIP Environmental Commitments Register Item 14.07	At all times unless in accordance with NTFRS requirements under the *Fire and Emergency Act* and Regulations	All Site personnel
	Burning of vegetation on Site is not permitted after the introduction of PWC commissioning gas	GIIP	When burning is proposed after introduction of PWC commissioning gas to Site	Company Contractor
6.2.10	All land disturbance, including from personnel and vehicle movement, will be contained within the Site to avoid impacts to surrounding vegetation, with the only exception being clearing for firebreaks up to 4 m outside the site perimeter boundary where permission from DLPE has been granted, and the firebreak is verified to be inside the EIS clearing limit, development permit boundary and Project Development Agreement boundary. Vehicles will be parked in approved areas to avoid unnecessary disturbance.	Environmental Commitments Register Item 14.04 Bushfires Act (NT)	At all times	All Site personnel
6.2.11	A pre-clearing survey is to be conducted to identify potential fauna and recorded on the permit to work as a permit condition. Should the pre-clearing survey detect	Environmental Commitments Register	Prior to and during clearing	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	potential fauna in the vicinity then the accredited fauna spotters will monitor the vegetation clearing works in order to relocate native fauna species away from the Site. The accredited fauna spotter will be present during clearing to salvage and relocate fauna, as required.	Item 15.02		
	Other			
6.2.12	The impact of dust on surrounding vegetation will be managed in accordance with Section 6.10.	CEMP Section 6.10	Refer to CEMP Section 6.10	Subcontractor
6.2.13	The impact of erosion and sedimentation on terrestrial and marine flora and fauna will be managed in accordance with Section 6.5.	CEMP Section 6.5	Refer to CEMP Section 6.5	Subcontractor
6.2.14	The potential impacts to vegetation as a result of changes to groundwater quality and levels will be managed in accordance with Section 6.7.	CEMP Section 6.7	Refer to CEMP Section 6.7	Subcontractor
	Terrestrial Fauna Management			
6.2.15	The following measures will be implemented to prevent animals being attracted to Site: • The "Eliminate, reduce, re-use, recycle" disposal waste management principles will be applied. • Food waste will be disposed of at a designated facility. • Putrescible wastes will be stored in secure bins	GIIP	At all times	All Site personnel

Number	Mitigation measure	Reference	Timing	Responsibility
	with lids or transported offsite daily for disposal.			
6.2.16	A variety of management measures will be used for areas that could potentially trap fauna, such as excavations: • Excavations will exclude fauna entry or allow for fauna egress. • Pipe string ends will either be covered at both ends or left open at both ends. • All excavations left open overnight will be inspected each morning. Records (either field records or electronic records) of daily fauna excavation inspections shall be maintained on site as an auditable record, and made available to Contractor as required.	Environmental Commitments Register Item 15.03 GIIP	At all times	Subcontractor
6.2.17	Personnel will record fauna sightings/encounters during construction activities using a fauna register. In the event animal injuries or deaths occur that are attributable to project activities, the requirements in Section 8 will be implemented.	IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources CEMP Section 8	At all times	All Site personnel
	The following fauna management practices will be observed on the Site: • Fauna egress will be provided in excavations left open overnight e.g. ramped ends. Where it is not practical to provide fauna egress, fauna refuges will be installed and checked daily. • Where trench excavations (>100 m) are left open with no fauna egress provided, fauna refuges will		At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	be installed at 100 m intervals as required and inspected daily. • Uninjured trapped fauna will be released to a nearby area of suitable habitat away from the Site. • Dead native animals that are found on the Site will be recorded using a fauna register, reported, collected and disposed of either in adjacent bush or at the Shoal Bay Waste Disposal Site so as not to attract predators or scavengers. • Injured native animals will be collected and taken to nearby veterinary facilities for treatment, as required or contact Wildcare NT 8988 6121 / 0408 885 341 for assistance as required.			
6.2.18	Appropriate speed limits for both earthmoving equipment and light vehicles will be implemented, sign-posted and enforced on all roads throughout the Site to minimise the risk of animals being hit.	GIIP	At all times	All Site personnel
6.2.19	Company and Contractor will enforce the following policies: • Catching or feeding of native or feral animals is prohibited, and site personnel will be banned from harming or intentionally killing any wildlife. • No pets are permitted on the Site. • No guns are permitted on the Site. • Discarding food wastes on the Site is strictly prohibited.	TPWC Act CEMP Section 6.3	At all times	Construction Manager Company

Number	Mitigation measure	Reference	Timing	Responsibility
6.2.20	In the event that a crocodile is observed in the onshore development area, a licensed company or Parks and Wildlife Crocodile Management Team may be engaged to manage (e.g. trap and relocate) the animal, in accordance with DLRM Wildlife Approved Programs, and dependent upon the safety hazard that the crocodile poses to personnel. The Crocodile Management Team in Darwin can be contacted at 08 8999 4691 or 0419 822 859.	DLRM native and introduced species management	At all times	Subcontractor Company
	Marine Fauna Management			
6.2.21	All vessels (i.e. dinghy or runabouts) used for Site works will be equipped with a propeller guard (where propeller extends below keel of vessel) and spill kits. The vessels will also comply with the controlled speed limits within Darwin Harbour to avoid collision with marine megafauna. Any collisions with marine megafauna shall be reported in accordance with Section 8.	Environmental Commitments Register Item 37.16	At all times	Subcontractor Contractor Company
6.2.22	The no-approach and caution zones established for whales, dolphins, dugongs, marine turtles and crocodiles, as indicated in Table 6-8 will be adhered to.	Environmental Commitments Register items 9.01 & 36.01 Australian national guidelines for whale and dolphin watching 2005 (DEH 2006) IFC Performance Standard 6:	At all times	Subcontractor Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
		Biodiversity Conservation and Sustainable Management of Living Natural Resources		
6.2.23	All project personnel shall adhere to the following: • Where megafauna observations or interactions are identified from a vessel, inform the vessel master/pilot immediately, record and provide records to Contractor. Where land based observations are made, record and provide records to Contractor. • Do not feed and/or touch marine megafauna. • Avoid making loud or sudden noises near marine megafauna. • Do not intentionally make any noise to attract marine megafauna towards a vessel or platform.	Environmental Commitment Register item 9.01 Australian national guidelines for whale and dolphin watching 2005 (DEH 2006) EPBC Act Policy Statement 2.1	At all times	All Site personnel
6.2.24	Procedures for avoiding interactions between marine megafauna and vessels will be implemented and will include the following: • Vessels shall not enter the no-approach zone and shall not wait in front of the direction of travel of an animal or pod of animals. • Vessels within the caution zone of any animal shall not operate at a speed greater than 6 knots. • No more than three vessels are allowed within the caution zone at any one time.	Environmental Commitment Register items 9.02 & 37.16 Australian national guidelines for whale and dolphin watching 2005 (DEH 2006) Australian Maritime Safety Authority (AMSA) requirements	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	• If a whale shows signs of being disturbed, vessels shall leave the caution zone at a constant speed of less than 6 knots. • Within the caution zone, if there is more than one person on board the vessel, a lookout shall be posted. • If a cetacean surfaces in the vicinity of a vessel, all precautions should be taken to avoid collisions. Possible actions include stopping, slowing down and/or steering away from the cetacean. • A vessel shall not enter the caution zone of a calf. If a calf appears within the caution zone of a vessel, then the vessel Master shall immediately stop the vessel; and shall turn off the engines, or disengage the gears, or withdraw from the caution zone at a speed of less than 6 knots. • Bow-riding shall not be deliberately encouraged. When animals are bow-riding, vessels should not change speed suddenly or alter course. If there is a need to stop, speed should be reduced gradually. • Project vessel movements will be limited to routes and areas required for work. Where the above are requirements are not complied with, the requirements in Section 8 will be implemented.	CEMP Section 8 EPBC Act Policy Statement 2.1		
	Marine Fauna Habitat			
6.2.25	All anchoring will be undertaken in accordance with the applicable anchor management plan and will minimise	CEMP Section 6.1	Prior to the commencement of	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	impacts on benthic communities and avoid plume generation.	Environmental Commitments Register Item 28.07 IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	anchoring	Contractor Company
	Other			
6.2.26	The impact of airborne and underwater noise and vibration on fauna will be managed in accordance with Section 6.11.	CEMP Section 6.11	CEMP Section 6.11	Subcontractor
	Fauna Handling			
6.2.27	Persons authorised to relocate animals on Site will hold a Permit to Take or Interfere with Wildlife issued by Parks and Wildlife Commission NT.	TPWC Act	As required	Subcontractor
6.2.28	Any stranded marine megafauna or any other suspicious sightings including of injured or dead marine animals will be reported in accordance with Section 8.	Australian national guidelines for whale and dolphin watching 2005 (DEH 2006) EPBC Act Policy Statement 2.1	As required	Subcontractor Contractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	Flora Monitoring and Inspection			
6.2.29	A mangrove community health monitoring program will be undertaken as per the details in the EIMP to assess the potential effects of construction activities within the Site on mangrove community health for compliance with the acceptable change of <30%. In the event mangrove health deteriorates beyond acceptable limits, the requirements in Section 8 are to be implemented. This program will integrate the monitoring of mangrove community health with the monitoring of change to mangrove habitat condition factors that may potentially occur as a result of the Project works (i.e. sediment quality/deposition, ground level change, groundwater conditions and dust), so the potential for mangrove impacts outside of the Site boundary is minimised.	Environmental Commitments Register Item 2.17 EIMP (L290-AH-PLN-10013) CEMP Section 8	Once prior to construction and quarterly to the completion of construction. Or in response to specific incidents e.g. hydrocarbon spills or uncontrolled discharge from site.	Contractor
6.2.30	Inspection and reconciliation of disturbed areas will take place to confirm clearing has occurred within the approved clearing boundary.	GIIP	As required and at completion of works	Subcontractor Contractor
	Fauna Monitoring and Inspection			
6.2.31	A wildlife handler will survey the area to be cleared prior to clearing to relocate native animals.	GIIP	Prior to clearing and grubbing	Subcontractor
6.2.32	The wildlife handler will observe the clearing process and will relocate animals during clearing as required.	GIIP	During clearing	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.2.33	All project vessels will have at least one crew member who is responsible for looking out for marine megafauna, including dolphins, whales, turtles, dugongs and crocodiles. The trained observer(s) will record any marine megafauna forward completed sighting forms to Company via <sightingreports-marine@inpex.com.au> on a monthly basis. The following information, and any other relevant information, will be recorded where possible: • time of sighting • observations regarding megafauna movement and behaviour • approximate location • species, if known.	Australian national guidelines for whale and dolphin watching 2005 (DEH 2006) EPBC Act Policy Statement 2.1	During operation of vessels and during nearshore construction activities	Subcontractor Contractor Company
6.2.34	During marine geotechnical investigation works, there will be an observation zone of 500 m radius. All marine megafauna observations within this zone will be recorded in a fauna observation register.	GIIP	At all times	Subcontractor
6.2.35	Flora and fauna related events which require reporting in accordance with Section 8 include, but are not limited to: • impact to vegetation outside the approved clearing boundary or Project boundary • deterioration of surrounding mangrove health or bio-indicator quality that exceed EIMP trigger criteria or unplanned impact for retained	CEMP Section 8 EIMP (L290-AH-PLN-10013) Australian national guidelines for whale and dolphin watching 2005 (DEH 2006) EPBC Act Policy	At all times	Subcontractor Contractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	mangroves; or • native animals (not 'protected' species) are injured or killed on site • breach of marine fauna "no-approach" and/or "caution zone" requirements • death of surrounding mangroves or unplanned death of retained mangroves; or • marine megafauna are struck by vessel or equipment; or • injured or stranded marine megafauna sighted in the nearshore development area or any suspicious marine animal death sightings.	Statement 2.1		

The "no-approach" zones for marine megafauna and vessel interaction are summarised in Table 6-8.

Table 6-8: Vessel and marine megafauna interaction restrictions

Marine megafauna	No-approach zone	Caution zone	Avoiding encounters
Dolphins and dugongs	Within 50 m, including area directly in front or behind out to 150 m	• Within 150 m, vessels must operate at no wash speeds of <6 knots • No more than three vessels within the caution zone • Vessels will not enter the 150 m caution zone of a calf	If an animal shows signs of being disturbed, vessels shall leave the caution zone at a constant speed of less than 6 knots.
Whales	Within 100 m, including area directly in front or behind out to 300 m	• Within 300 m, vessels must operate at speeds less than 6 knots • No more than three vessels within the caution zone • Vessels will not enter the 300 m caution zone of a calf	If in the vicinity of a cetacean, possible actions include steering away from the cetacean at a constant speed, slowing down and/or stopping gradually.
Marine turtles and crocodiles	Within 50 m	• Within 100 m, vessels must operate at speeds <6 knots	If an animal shows signs of being disturbed, vessels shall leave the caution zone at a constant speed of less than 6 knots.

Note: A calf (for whales and dolphins) is defined under the EPBC Regulations as an animal that is not more than half the length of an adult of the species.

6.3 Weed and pest management

6.3.1 Current conditions

Weeds are broadly defined as introduced plant species which have the potential to become invasive. The Northern Territory's *Weeds Management Act* applies to all land users in the Northern Territory. As per the Act, once a weed is "declared" all land users are required to comply with the declaration classification.

There are three classification types in the Northern Territory:

- Class A: to be eradicated
- Class B: growth and spread to be controlled

- Class C: not to be introduced to the Territory.

All Class A and Class B weeds are also considered Class C weeds.

The Site has been surveyed yearly for weeds since 2008. During the recent survey conducted in February 2015, a total of eight introduced species were recorded. Of these, three weed species—*Hyptis suaveolens* (horehound), *Andropogon gayanus* (gamba grass) and *Pennisetum polystachion* (perennial mission grass)—are listed as declared Class B noxious weeds under the Act. Gamba grass is also a weed of national significance (WONS) listed under the Commonwealth legislation.

A weed survey was conducted in March 2015 of the GEP and FGP corridors. This identified three weed species, *Passiflora foetida* (stinking passionfruit), *Hyptis suaveolens* (horehound) and *Sida cordifolia* (flannel weed).

There are no persistent or critical weed areas that currently pose an ongoing management issue on the Site. Cleared vegetation identified to contain weeds has been sprayed and all weed-affected topsoil has been stored separately, prior to disposal or burial and capping in the EMA.

Several introduced fauna species have been recorded within the survey area. The cane toad (*Rhinella marina*) was the most widely occurring pest species recorded and was observed in most habitats and areas throughout the Site. The biological effects caused by cane toads, including lethal toxic ingestion, are listed as a key threatening process under the EPBC Act.

Feral pigs (*Sus scrofa*) were recorded within the mangroves in the intertidal zone. Predation, habitat destruction, competition and disease transmission by feral pigs is also listed as a key threatening process under the EPBC Act. A single black rat (*Rattus rattus*) was also captured within the interface between the mangroves and monsoon vine forest. Black rats have been associated with declines in the populations of many bird species as a result of predation on their eggs. This pest also often preys on birds, invertebrates and lizards, and may consume seeds that would otherwise be eaten by native animals. Biting insects in the Northern Territory consist of biting midges and mosquitoes, both of which are known to be present at the Site.

Pests observed at the Site included rodents and insects. There are currently no persistent pest management issues on Site.

6.3.2 Key activities, potential impacts and residual risk levels

The key activities and potential environmental impacts identified for weed and pest management are listed in Table 6-9. The residual risk levels after the implementation of the mitigation measures contained in Table 6-11 are also identified.

Table 6-9: Key activities, potential environmental impacts and residual risk levels for weed and pest management

Activity	Potential environmental impact	Residual risk level
Vehicles, machinery and equipment entering the Site from elsewhere in the Northern Territory and Australia (overland) Import of fill and/or gravel from a number of quarries in	• Accidental introduction of pest and/or weed species as a result of vehicle movement, to the Site, with potential for spread to Bladin Point and Middle Arm Peninsula, displacing native species, altering ecosystem function and leading to non-compliance	Low

Activity	Potential environmental impact	Residual risk level
the region		
Marine vessels entering Darwin Harbour from outside Australian waters	• Accidental introduction of terrestrial and marine invasive species from infested vessel, plant and equipment or packaging to Bladin Point and Middle Arm Peninsula, displacing native species and altering and degrading habitats and ecosystem function (refer to Section 6.15)	Low
Vegetation clearing	• Spread of weeds, pests and diseases • Improper stockpiling of cleared vegetation resulting in spread of weeds.	Low
Disposal of food waste	• Attraction of pests to uncovered waste-storage areas	Low
Vegetation clearing	• Creation of areas of pooling water and mosquito breeding sites. This is a health issue and will not be addressed further in this CEMP. Refer to the Biting Insect Management Plan (L290-AH-PLN-0064).	Moderate

6.3.3 Objectives, targets and indicators

The objectives, targets and indicators for weed and pest management that have been established are outlined in Table 6-10.

Table 6-10: Weed and pest management objectives, targets and indicators

Objective	Target	Indicator
To prevent the introduction of new weed species to the Site and the spread of "declared" weed species and WONS within the Site	• Zero introduction and spread of new weeds to Site • Effective and strategic control of weeds	• Weed register developed from weed surveys for the Site • Weed control programs
To prevent the introduction and increase in populations of terrestrial and marine invasive species to the Bladin Point and Middle Arm Peninsula	• Effective and strategic control with no reported increase in abundance or distribution of pest species as compared to the baseline data	• Number of incidents relating to introductions of marine pests or terrestrial invasive species attributable to the Works

6.3.4 Mitigation measures

The mitigation measures that will be implemented to minimise the spread of weeds and pests from human activities and construction activities, and the potential introduction of weeds and pests to the Site to achieve the established objectives and targets are described in Table 6-11.

See Section 6.15 for mitigation measures for the mobilisation of machinery and equipment from outside Australian waters to the Site via East Arm Wharf or the MOF.

Table 6-11: Weed and pest mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.3.01	Site inductions will include the following specific components for weed and pest management: • identification of weed and pest species in the Site and in the vicinity • ecological impacts associated with invasive weeds and pests • mitigation and hygiene measures for controlling weeds and pests • awareness of human vectors in the introduction of weeds and pests.	Company Environmental Policy Contractor HSES Policy CEMP Section 9	Before entering Site	HSES Manager Subcontractor Company
6.3.02	Weed and pest control activities will generally be conducted by specialist contractors, however if site personnel are directly involved in weed or pest control activities, appropriate and practical training will be provided.	GIIP	Prior to undertaking weed control	HSES Manager Subcontractor
	Weed and Pest Hygiene			
6.3.03	Prior to site mobilisation, all vehicles, plant and equipment require a plant and equipment inspection report which verifies it is clean and free from weed and seed material. Once vehicles, plant and equipment have arrived on site, they must be kept weed free. If a vehicle passes through a suspected weed infestation	Environmental Commitments Register Item 17.05 Weeds Management Act (NT) Northern Territory Weed	As required	Subcontractor Contractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	area, it is the driver's responsibility to ensure a clean-down is completed.	Management Handbook (NRETAS 2009) IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources		
6.3.04	A fully integrated washdown bay has been built. Washdown shall occur for all vehicles leaving the Site that may have been exposed to weeds or weed seed.	Environmental Commitments Register Item 17.06	At all times	Subcontractor Contractor Company
6.3.05	Washdown of vehicles, plant and equipment for seeds will be implemented based upon a risk evaluation, including visual inspection, based upon the activities being conducted on the Project. Vehicles, plant and equipment cannot leave the Site without being clean and free from weed and seed material. Washdown will be undertaken at Site as required for vehicles, plant and equipment leaving the Site. Vehicles entering the Site and requiring washdown will be washed at Site where possible, else at appropriate offsite facilities.	Environmental Commitments Register Item 17.06 IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	At all times	Subcontractor Contractor Company
6.3.06	Infestations of declared weeds will be controlled onsite and along the access road from Wickham Point Road to avoid contamination to vehicles and machinery during roadwork and grading activities.	Environmental Commitments Register Item 17.04	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Weed Identification and Control			
6.3.07	A weed control program has been developed and implemented to identify where weed species occur and where weed control is required. Timing and methods for weed control will be consistent with the NT Weed Management Handbook.	Environmental Commitments Register Item 17.4 and 2.15 Northern Territory Weed Management Handbook (NRETAS 2009) IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Annually or as required	Contractor
6.3.08	In the event a new weed species is introduced to a weed-free area or existing weeds spread, the requirements in Section 8 will be implemented.	CEMP Section 8	At all times	Subcontractor
6.3.09	General planning of weed-control activities will commence before the start of the wet season, with implementation during the early months of the wet season.	GIIP Northern Territory Weed Management Handbook (NRETAS 2009)	Before the start of the wet season	Subcontractor
6.3.10	A weed report will outline species, details of location, distribution, abundance, relevant biological information, and a history of control methods and their relative success.	GIIP	Quarterly	Subcontractor Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.3.11	Burning of weeds may occur if a Permit to Burn has been obtained from the NT Fire and Rescue Service (NTFRS) Hazard Abatement Officer.	GIIP Northern Territory Weed Management Handbook (NRETAS 2009)	When weeds are identified, prior to introduction of PWC commissioning gas	Subcontractor
	Burning of vegetation on Site is not permitted after the introduction of PWC commissioning gas.	GIIP	When weeds are identified, after introduction of PWC commissioning gas	Company Contractor
6.3.12	The DLRM list of declared weeds will be reviewed prior to each weed survey being conducted.	DLRM, "Declared Weeds", <http://www.lrm.nt.gov.au/weeds/declared>	Annually	Environmental Advisor—Land and Ecology
6.3.13	Topsoil stripped from areas containing high densities of weed will be treated, buried and capped to at least 2 m depth or disposed of. Weed surveys undertaken throughout construction including of topsoil stockpiles will identify the likely density of weed seeds expected to be in topsoil. Survey results will be recorded in a weed register and will be used to avoid topsoil potentially containing high densities of weed seeds and/or weeds (unless they have been treated) being used in rehabilitation.	Environmental Commitments Register Item 17.03	After clearing	Subcontractor
6.3.14	Any topsoil from cleared areas where the vegetation was recorded as having been infested by a "declared" weed and where weed control has not been applied will be used	Environmental Commitments Register Item 17.03	After clearing	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	as fill at a designated location and capped to at least 2 m depth to prevent the emergence of vegetative shoots or seedlings.			
6.3.15	A declaration from applicable vendors will be required to attest that the materials are free from declared/prohibited weeds and pest animals. This relates to vendors associated with quarries and bulk deliveries of items that have been stored outside for periods of time prior to arrival to the Site.	Environmental Commitments Register Item 17.01	Prior to entering Site	Subcontractor
6.3.16	Where practicable, previously disturbed areas that have large infestations of listed (potential and declared) weed species will be cleared separately from undisturbed areas to avoid spreading weeds and their seeds to the weed-free areas and to minimise the amount of vehicle washdown required.	Northern Territory Weed Management Handbook (NRETAS 2009)	During clearing	Subcontractor
6.3.17	Vegetation stockpiled after clearing will be managed to ensure the control of weeds. Areas identified as being weed infested will be managed to prevent the spread of weeds to other areas.	Environmental Commitments Register Item 17.04	At all times	Subcontractor
6.3.18	Vegetation debris, mulch or topsoil will not be stockpiled in areas where declared weeds are known to exist.	GIIP	At all times	Subcontractor
6.3.19	Vegetation, sediment and other waste containing weeds and seeds will be disposed of by deep burial on Site or used as fill at a designated location and capped to at least 2 m depth to prevent the emergence of vegetative shoots	GIIP CEMP Section 6.9 CEMP Section 6.12 Weeds Management Act	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	or seedlings.	(NT)		
	Pest Identification and Control			
6.3.20	Pest control will be undertaken by an appropriately licensed pest control contractor. Pest control will be undertaken in a manner that is target-specific and does not impact native animals including for use of baits, traps and other control methods.	NRETAS 1080 Management of Pest Animals IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	As required	Subcontractor
6.3.21	In the event pest species increase in population or spread in area or a new pest species is introduced to Site, the requirements in Section 8 will be implemented.	CEMP Section 8	At all times	Subcontractor
	Monitoring and Inspection			
6.3.22	A weed monitoring program has been developed and implemented to monitor the distribution and abundance of declared weeds species on Site. Weed surveys will be conducted quarterly, and will include surveys of the Site and the clearing fringes beyond the Site that are visible from the Site boundary. The weed register will be updated quarterly following completion of the weed surveys.	Environmental Commitments Register Item 2.15	Quarterly	Contractor
6.3.23	Earthmoving vehicles will be inspected for weed and seed material prior to leaving and entering the Site.	Environmental Commitments Register	Prior to leaving and entering the	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
		Item 17.05	Site	
6.3.24	Weed and pest related events which require reporting in accordance with Section 8 include but are not limited to: • any non-compliance with this CEMP or the *Weeds Management Act* (NT) • introduction of a 'declared' weed species or 'weeds of national significance' or spread of existing weeds, or introduction of new pest species.	CEMP Section 8 Weeds Management Act (NT) EIMP (L290-AH-PLN-10013)	At all times	Subcontractor Contractor
6.3.25	The NT Weed Management Branch shall be notified by Contractor, on behalf of Company (within 14 days) of the presence of any weeds found on site that were not previously known to be present as per Part 3, Section 9 (c) of the *Weeds Management Act*.	Weeds Management Act (NT)	Within 14 days of identifying weeds not previously known to be present	Contractor

6.4 Surface water management

6.4.1 Current conditions

Bladin Point is located in a tropical monsoonal bioregion with high rainfall in the wet season which occurs from 1st October to 30th April. Dry season climate conditions prevail from 1st May to 30th September. Darwin (Darwin International Airport) has a mean annual rainfall of 1711 mm with rain falling on an average of 111 days, mainly in the wet season.

The Site is bound by Lightning Creek on the western side, by East Arm (part of Darwin Harbour) to the north, and by the mouth of the Elizabeth River on the eastern side.

Construction has significantly changed the topography and surface characteristics of the Site, becoming almost entirely clear of vegetation, flatter and compacted in some areas. The variation in pre-construction topography of approximately 10 m across the Site has been decreased to 1.5 m through cut and fill works to meet design levels. In addition, the ground improvement works have led to significant decreases in the water absorption properties of the soil, decreasing the water infiltration in affected areas. Site runoff from rainfall will be directed by erosion and sediment controls installed prior to each wet season to manage surface-water flows.

Water quality in Darwin Harbour is generally of a high quality although naturally turbid. Water quality parameters vary greatly spatially and temporally due to the tide (spring versus neap), sampling location and the wet and dry season. The Darwin Harbour Water Quality Objectives (DHWQO) have adopted the ANZECC (2000a) approach for physico-chemical indicators for slightly to moderately disturbed systems (NRETAS 2010).

Surface water monitoring of the Darwin Harbour has been undertaken monthly since June 2012 under the approved EIMP (L290-AH-PLN-10013). The surface water monitoring objectives for the Site are to detect changes in receiving water quality resulting from the Site activities and discharges offsite of water potentially containing nutrients, dissolved metals, hydrocarbons or other contaminants. Ongoing monitoring is undertaken to assess potential impacts resulting from surface water discharges on the receiving environment.

EIMP monitoring results indicate that overall, the in situ measurements of physico-chemical parameters generally compare well between impact and reference sites for corresponding sampling events and resemble an estuarine environment. Temporal trends between parameters have been observed. Surface water monitoring results and trends are summarised and discussed in the Annual Environmental Monitoring Report submitted to the NT EPA annually and placed on INPEX's website.

6.4.2 Drainage and effluent treatment system overview

The drainage and effluent treatment system is integral to management of surface water on Site and its layout on Site is shown on Figure 6-3. The drainage and effluent treatment system design philosophy ensures potentially contaminated stormwater is not able to comingle with non-contaminated stormwater runoff, through a series of kerbed and bunded areas, which isolate AOC/COC areas from the non-contaminated water (NCW) system. The catchment areas of the AOC/COC are designed such that water in these zones are captured from kerbed and bunded areas and directed to treatment or wastewater storage options. Areas outside of the kerbed and bunded areas are defined as the NCW catchment. The plant design also aims to minimise creation of potentially contaminated stormwater by directing rain from roofed areas, as much as possible, to the NCW system, and by keeping, as much as possible, AOC/COC and chemical sewer catchment areas completely underneath roofed areas to prevent rainfall into these zones.

The drainage and effluent treatment system consists of a series of subsystems which will be progressively brought on line during the commissioning phase and then be available to manage surface water potentially contaminated with hydrocarbons or chemicals. An overview of these sub-systems is as follows:

- Non-contaminated water (NCW): During the construction phase, the NCW system is isolated to prevent potentially contaminated water from leaving Site. The NCW drainage network has been designed to ensure potentially contaminated stormwater is not able to comingle with non-contaminated stormwater runoff, which goes to the NCW system. This includes the swales and perimeter regulating drain. Once fully commissioned, the NCW system captures water within the plant boundaries which is considered non-contaminated (free from oil/chemicals). The NCW system allows non-contaminated water to be discharged without treatment to multiple outfall facilities around the perimeter of the site via the perimeter regulating drain. The NCW system consists of surface drainage, open channels, piping and pits which collect the following:
  - surface and rainwater runoff that have no potential for hydrocarbon or chemical contamination, including rainwater from tank bunded areas that (following testing) has been classified as free from oil and chemicals
  - overflow and drains from pits and ponds which have no potential for hydrocarbon/chemical contamination
  - non-contaminated water from the utility annex area.

  During the construction phase, the NCW system is isolated to prevent potentially contaminated water from leaving Site. Once commissioned the NCW system will be utilised.
- AOC/COC system: Once commissioned, the AOC system collects rainwater runoff from kerbed and tank bunded areas in the plant which could be potentially contaminated with hydrocarbons. It also collects water which could potentially be contaminated with hydrocarbons due to unplanned events such as oil spill/leakage from equipment. The AOC system is piped, not connected to the other systems and drains to the holding basin. During commissioning works, the filling activities will be bunded and relevant drains will be blocked using inflatable line plugs. The COC system is designed to contain surface water which is likely to be contaminated with hydrocarbons from runoff from areas where hydrocarbons leaks and drips can be expected during commissioning, and from planned discharges into the system which will be known to contain hydrocarbons. The COC system is piped, not connected to the other systems and drains to sumps. The AOC collection system is designed to store the first flush of a defined rainfall event (based on 20 minutes time concentration and 1-year ARI (87.1 mm/hr). Generally overflow diversion devices are installed upstream of the AOC pits. Overflow weirs are equipped with an underflow weir, prior to the overflow, to separate out and contain oil contamination entering the NCW system. Note any overflow from the COC is directed to the AOC system. Both systems consist of a series of concrete bunds connected to a header that drains via gravity. The AOC system drains to the drainage and effluent treatment area. From here the captured liquids flow into the inlet channel, which overflows adjustable weirs to the holding basin, or to the NCW system during peak rainfall periods. The holding basin is constructed of reinforced concrete, and has a holding capacity of 2, 200 m^3. The holding basin has been designed with three chambers. Each chamber has a special configuration to collect first flush of rain and AOC contaminated water (maximum oil and suspended solid contaminated water). A weir or adjustable stop log at different heights is provided for each chamber to collect overflow from the inlet channel at different levels. When all the chambers are full, contents of the inlet channel overflow to the NCW system through an outfall pit. An underflow weir sits between the inlet channel and the

outfall pit to prevent traces of oil going to the NCW system. Having three chambers, allows a chamber to be taken offline for maintenance if required. The design also allows for the removal of oil from the overflow weir structure. Drainage areas that are located below the gravity header are fitted with pits and pumps which discharge into the AOC gravity header at the nearest location to the pit. The COC system drains to the corrugated plate interceptor pit located in the drainage and effluent treatment area. Drainage areas that are located below the gravity header are fitted with pits and pumps which discharge into the COC gravity header at the nearest location to the pit. Drains from the closed cooling water system can be sent to the AOC treatment system if the water quality permits. If the drain from the cooling water system exceeds the water quality parameters for treatment in the AOC or discharge form the jetty outfall it can be sent to the evaporation basin or offsite for disposal at a licenced facility.

- Oily water treatment package: The oily water treatment package has three different sections which will be progressively commissioned and utilised during commissioning:
  - Primary Treatment - Corrugated plate interceptor where COC water (water and oil) are separated over a series of corrugated plates, the oil is then skimmed off the top and the water flows towards the bottom of the pack to the outlet compartment
  - Secondary Treatment – Dissolved air flotation where any remaining oil that is entrained within COC water from the corrugated plate interceptor and any contaminated water sent from the AOC effluent stream is removed.
  - Tertiary Treatment - (Filter Package) treated effluent is then treated in nutshell filters to remove any remaining oil and solids to provide a water quality that is satisfactory to be discharged at the permanent jetty outfall.
- Chemical sewer and evaporation basin: "Chemical sewer" refers to a number of vessels, tanks and pits, that have been/will be installed and commissioned , which are designed to collect waste water streams from areas where chemical contamination could occur, these includes solvent tanks, specific areas of the AGRU units, hazardous chemical warehouse, equipment wash-down bays and fin-fan washes, etc.. Chemical sewers, collection pits, vessel and pipes are constructed using impervious materials (e.g. glass-reinforced epoxy, fibreglass reinforced plastic and reinforced concrete), appropriate to the nature of the material they are designed to collect to ensure no corrosion or breakdown of the structural integrity of the sewer occurs. During operations, the chemical-contaminated water is stored in the pits and vessels and then transported to the evaporation basin via a vacuum truck or disposed of offsite to a licenced facility if not suitable for the evaporation basin. During commissioning, it is expected chemically contaminated water would be disposed of offsite via licensed subcontractors, if unable to be sent to the evaporation basin, or treated or discharged. The evaporation basin has a capacity of 425 m^3 and is equipped with a removable roof to prevent wet season rainfall from entering the basin, and constructed of reinforced concrete with a removable liner to allow for removal of solids that remain after evaporation (for offsite disposal) and to maintain an impervious barrier.
- Sewage treatment plant: Once fully constructed, the sewage treatment plant will consist of a series of pumped pits, which feed raw sewage from individual collection points to the sewage equalisation pit. It is then pumped to the anoxic tank followed by the aeration tanks and membrane bioreactor tank. After the membrane bioreactor, the treated effluent is disinfected by ultraviolet light and stored in a holding tank. Discharge from the holding tank is by pump to the permanent jetty outfall or truck connection. Once the sewage treatment plant is commissioned, it will be operated for the remainder of the commissioning phase, and discharge to the permanent jetty outfall during this period would be subject to EPA7-4 amendment.

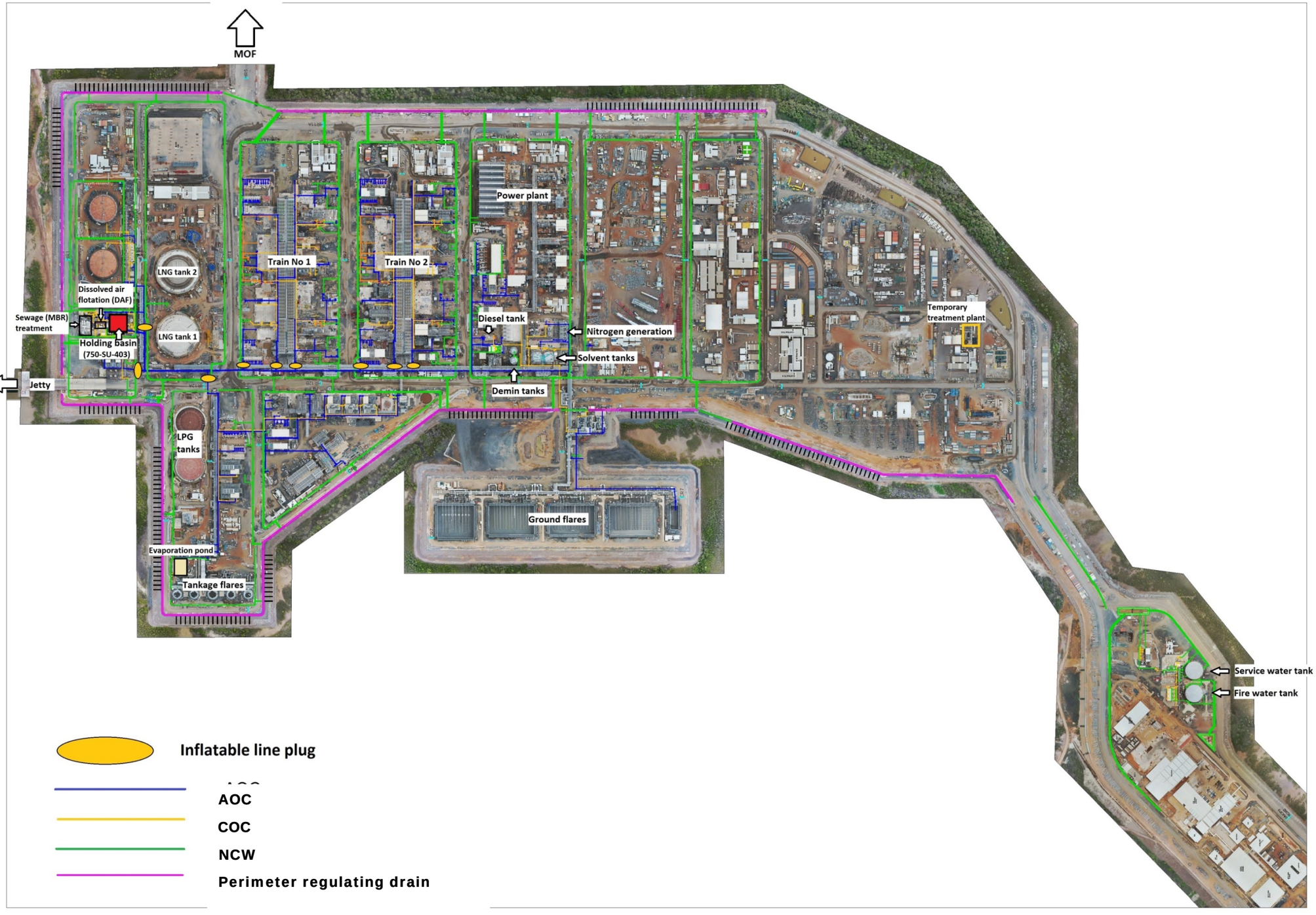

Figure 6-3: Layout of permanent drainage system

6.4.3 Types of surface water on Site and sources

Surface water is generated on Site from construction (including precommissioning and commissioning) activities and rainfall. The different types of surface water generated on Site and their sources are summarised in Table 6-12. Further detail on sources of Site surface water is provided below Table 6-12.

Table 6-12: Summary of types of surface water on Site

Type	Definition
Stormwater	• runoff from rain events that has not contacted potentially contaminated areas on Site or has been collected in a detention basin, excavation, trench, sump or other low points that has **not** had opportunity to become contaminated
Non-contaminated potable water	• potable water that has not been contaminated by Site activities that will form runoff through non-contaminated areas on Site, or will drain directly to Darwin Harbour
Construction water	• water that is generated as a result of construction (including precommissioning and commissioning) activities on Site, that may/may not have become contaminated prior to the need to discharge • stormwater runoff collected in a detention basin, excavation, trench, sump or other low points that may have had opportunity to become contaminated with hydrocarbons, chemicals or other contaminants
Spent hydrotest water	• potable water that is potentially contaminated from hydrotesting activities, including cleaning, flushing and hydrotesting

Stormwater

Stormwater is a key type of surface water on Site primarily during the wet season each year. The permanent drainage system on Site has been designed to ensure potentially contaminated sources of stormwater are not able to drain directly into Darwin Harbour. During the construction, stormwater and other types of surface water on Site with the potential to be affected by construction activities are isolated via an 'internal' drainage system and isolation points to prevent potentially contaminated water from leaving Site. Figure 6-3 illustrates the layout of the AOC, COC and NCW drainage network on Site and the isolations (shown as 'inflatable line plugs' in Figure 6-3) which prevent potentially contaminated stormwater from mingling with non-contaminated stormwater. This system is integral to managing surface water on Site. Implementation of sediment and erosion control plans, and diversion of drainage to detention basins aims to achieve the same outcome.

Sources of stormwater include:

- sheet flow or rainfall directly into the outfalls via the perimeter regulating drain (refer to Figure 6-3)

- sheet flow from the Site boundary where there is no perimeter regulating drain (refer to Figure 6-3)
- stormwater collected in detention basins, excavations, trenches, sumps, bunds or other low points where there is not any evidence of contamination (i.e. there have been no spills/other sources of potential contamination)
- general stormwater runoff from the quarantine premises
- overflow from detention basins after rainfall above the design rainfall event
- runoff from hardstands and cement plants once the first flush (25 mm) has been captured.

Stormwater management is described in full in Section 6.5.

Non-contaminated potable water

During precommissioning and commissioning there will be sources of non-contaminated potable water that will be either be passively or actively discharged. Key sources of non-contaminated potable water are:

- Condensed water: This is generated from running of the HVAC systems. The HVAC systems cool the air and moisture condenses on the coils and forms water droplets. There will be a number of minor HVAC systems across the site. There is also a HVAC system on the jetty from which condensed water forming on the HVAC will passively drain to Darwin Harbour.
- Biofouling of the seawater intake for the emergency firewater system: The seawater intake line and pumps must be maintained free of biofouling as it is critical for water supply to the deluge firewater system, in the event of an extreme worst case scenario (12 hour) tank fire on Site (during operations). Treatment with potable water or brine is routinely required to keep the biofouling to a minimum within the intake pipe and released into the harbour (mechanical cleaning may also be undertaken). The pumps will release fresh water or brine out of the intake casing of the seawater pumps and clear any immediate growth that has occurred.
- Firewater system flushing, deluge spray, and hydrant, fire monitor and hose reel tests: Firewater system flushing is expected to generate 12 KL of water and testing is estimated to generate 15,000 KL of water. Potable water will be used for flushing and testing of the firewater system and will occur successively within discrete areas on Site. The test is to demonstrate that the fire suppression system is functioning correctly, which is also a requirement of the NT Fire and Emergency Services, who will participate in the testing. No foam products will be added for this test. Based on the process undertaken, the flushing and testing water is not expected to contain contaminants. Due to the short duration of the flushing and testing activities (estimated <1 hour per location), no metal leaching is expected.
- Other potable water applications with a very low risk of contamination: Some precommissioning activities include an initial flushing stage to clean the equipment and then further potable/deionised water rinse stages to ensure the equipment meets the engineering precommissioning specifications. Once flushed, the pipework is rinsed with potable/deionised water and this rinse water is not expected to contain contaminants.

Construction Water

Construction water is the term used to describe all other sources of water not included above under stormwater that is generated as a result of construction (including precommissioning and commissioning) activities.

Sources of construction water include:

- runoff from rain events collected in a detention basin
- runoff that is potentially contaminated with chemicals, contaminants or waste (such as runoff that has been impacted by a spill)
- runoff from ASS treatment pads or intercepting ASS from excavations or stockpiles
- groundwater (intercepted, dewatered or abstracted)
- Darwin Harbour surface water (intercepted, dewatered)
- wastewater generated by washdown facilities including the quarantine premises (general runoff from the quarantine premises shall be deemed 'stormwater runoff' as per the Quarantine Pad Management Procedure), concrete washouts and vehicle washdown, concrete batch plants
- wastewaters such as grey and black waters including water treated via the temporary STP or the permanent STP (once commissioned): Effluent is currently generated on Site and treated via the temporary STP to achieve the effluent quality at the end of the treatment plant (i.e. at the outlet of the holding tank) in accordance with WDL 192 (as amended). Treated effluent is discharged via a multiport diffuser outfall. The diffuser provides appropriate dilutions, even at low tide, for the discharge such that at the edge of the 50 m regulatory mixing zone the receiving environment monitoring criteria in Table 6-14 are met for 90% of the time. During commissioning of the permanent STP, prior to the entire drainage and effluent treatment system being commissioned, treated effluent will either be transferred to the temporary STP for treatment and discharge via the temporary outfall in accordance with WDL 192 (as amended), or disposed of offsite via a licensed facility. Once the permanent jetty outfall is operational and an amendment to EPA7-4 is obtained, it is expected that treated effluent from the permanent STP will also be discharged via the jetty outfall.
- untreated sewage wastewater and other listed liquid wastes: This includes untreated sewage from temporary holding tanks on site, quarantine premises wastewater (when used for washdown of quarantines equipment that has not been cleared for biosecurity purposes) and any wastewater generated during commissioning that contains listed liquid wastes. These are treated as listed waste and transferred from Site by a licensed waste subcontractor for offsite disposal in accordance with their EPL.
- AGRU degreasing and rinsing wastewater: This is expected to produce approximately 4,000 KL of degreasing wastewater and 12,000 KL of rinse water (for two LNG trains). The AGRUs will be degreased with potable water with 3% caustic solution. This solution is removed and disposed of appropriately and the units are then rinsed three times with fresh batches of potable water and a final rinse with demineralised water. During degreasing, some metal leaching may be expected because of the caustic solution (pH 14); however only trace levels of metals are expected in the degreasing wastewater due to the short duration of the degreasing activity. Some residual hydrocarbon is anticipated in the degreasing wastewater. In contrast, the rinse waters will be neutral pH and only contain trace amounts of hydrocarbons. The spent water collected from the degreasing process will be treated to reduce pH and discharged according to the discharge trigger values for different disposal options. Where this is not feasible or discharge quality cannot be met, licensed offsite disposal will be pursued.
- AOC/COC water streams: AOC water will comprise two distinct streams – potentially contaminated and non-contaminated. During rainfall events this drainage network will capture surface water and direct it to the holding basin. This water typically will not have any evidence of contamination. In the event of a spill, the AOC system will capture the spill and direct it to the holding basin. This water is associated with the various systems described above and may contain metals,

nutrients and hydrocarbons. COC is the drainage system that captures water from discrete portions of the inlet facilities, trains systems and common utilities area and directs spill water to multiple sumps located throughout the Site as per the permanent drainage and effluent system design (refer to the COC system in Figure 6-3 and Figure 6-5). The water may contain hydrocarbons.

- Cooling system initial flushing and rinsing water: This is estimated to be 550 KL and originates from the initial flushing stage where demineralised water is circulated through the system to flush out any residual hydrocarbons, metal shavings and sediment. Then a rinse is undertaken using demineralised water. Based on the process undertaken, the flushing water is expected to contain only trace levels of metals and hydrocarbons. Due to the short duration of the flushing, no additional metal leaching is expected. Reuse will be pursued in the first instance. Where constraints prevent this, Contractor anticipates from relevant vendor information and experience that concentration of metals and hydrocarbons will allow for active discharge from Site via the perimeter regulating drain and/or the temporary MOF outfall.
- Passivation water: Passivation is a CCPP specific activity which occurs within the cooling system of the CCPP. Passivation is undertaken after the flushing and rinsing of the cooling system have been completed. Demineralised water is circulated through the cooling system with added water passivation chemicals (caustic and an oxygen scavenger) to prevent any further corrosion within in the system. Following removal of the passivation water, the final demineralised water fill is undertaken and anti-corrosives and biocides are added (which stays inside the cooling system).
- CCPP lines and vessels flushing and rinsing: It is estimated that 850 KL of wastewater will be produced during this process. During initial flushing, potable water is circulated through the lines and vessels to remove any residual hydrocarbons, metal shavings and sediment. The lines and vessels are then hydrostatically tested with a fresh round of potable water and finally rinsed with potable water. Based on the process undertaken, the flushing water is expected to contain trace levels of metals and hydrocarbons. Due to the short duration of the flushing, hydrostatic testing and rinsing, no additional metal leaching is expected. Reuse will be pursued in the first instance. Where constraints prevent this, it is expected that concentrations of metals and hydrocarbons will allow for active discharge from Site via the perimeter regulating drain and/or the temporary MOF outfall.
- Heat recovery steam generator (HRSG) and utility boiler hydrostatic testing: The total volume of water expected to be generated is 750 KL. The HRSG and utility boiler lines and vessels are hydrostatically tested with potable water. Ammonia will be added to this water for pH adjustment with a backup option of using phosphate for the same purpose. Based on the process undertaken and concentrations required, the flushing water is expected to contain ammonia, potentially phosphate and only trace levels of metals and hydrocarbons. Due to the short duration of the flushing and hydrostatic testing, no additional metal leaching is expected. The spent water collected from this process will be pH adjusted prior to discharge. Where constraints prevent reuse, water quality will be assessed against discharge trigger values for active discharge from Site via the perimeter regulating drain and/or the temporary MOF outfall. Where discharge is not feasible, it will be disposed of offsite at a licensed facility.
- Steam blow-down wastewater: Once operational, the CCPP generates steam to drive the three steam turbines. The steam is produced by five heat recovery steam generators and three utility boilers, and condensation recovered from this equipment is termed “steam blowdown water”. The CCPP steam blowdown water will contain very low levels of impurities or minerals such as silicates, and nutrients.

- Reject water generated by the demineralised water plant: The demineralisation plant will use PWC potable water during commissioning and operation to produce demineralised water for commissioning activities. In addition, periodically the demineralisation plant will be backflushed. The demineralisation plant may also be used for treatment of other types of Site surface water to improve water quality prior to discharge. Approximately 100 KL of salt-concentrated reject water will be produced. The demineralisation process will remove metals, nutrients and (should they be present) hydrocarbons from the subject water stream, with these by-products comprising the expected analytes that will be concentrated in the brine solution. Due to the anticipated salinity of the brine, onsite reuse is not recommended. The spent water collected from the demineralised water process will be tested to determine the concentrations of analytes prior to choosing a disposal option. It is anticipated that water quality will allow for active discharge from Site via the perimeter regulating drain and/or the temporary MOF outfall. Once the permanent jetty outfall is operational and an amendment to EPA7-4 is in place, it is expected that demineralisation plant water will also be discharged via the jetty outfall.

Commissioning occurs after each system is verified to be clean and there is no further potential for scale, rust, metal shavings, and sand to be present. Flushing activities undertaken during precommissioning are undertaken on new equipment and there is only minor amount of scale, rust, metal shavings, and sand expected. The scale, rust, metal shavings, and sand (if present) will be flushed out and will quickly settle out of the wastewater in the base of the storage vessel. The system is considered clean when such foreign matter such as scale, rust, metal shavings, and sand are not visible to the eye and grittiness is not detectable to the touch and in compliance with the particle count. Collected solids will be disposed of in accordance with Section 6.12 Waste management of this CEMP.

Spent hydrotest water

Spent hydrotest water is generated by hydrotesting of tanks and pipes on Site using potable water, with addition of basic chemicals as shown in Table 6-13.

During hydrotesting, chemicals may be added to assist in preserving the integrity of pipes and tanks. Table 6-13 lists the chemicals identified for use during hydrotesting activities. Any deviation from the list provided in Table 6-13 can only be undertaken with approval from the NT EPA and in compliance with WDL 211.

Table 6-13: Potential hydrotest chemicals

Treatment chemical	Uses
Aluminium sulfate (alum)	Coagulation
Calcium carbonate (ag-lime)	pH correction
Calcium chloride	Corrosion control
Calcium oxide (quick lime)	pH correction Softening Corrosion control
Calcium sulfate (gypsum)	Coagulation

Treatment chemical	Uses
Chlorine	Disinfection
Citric acid	pH correction
Hydrochloric acid	pH correction
Polyacrylamides	Coagulation aid Flocculation aid
Sodium bicarbonate	pH correction Softening Corrosion control
Sodium hydroxide	pH correction Softening Corrosion control
Sodium hypochlorite	Disinfection
Sodium thiosulfate, sodium bisulfite, sodium metabisulfite, sodium nitrite	Chlorine removal

Notes:

1. Any chemicals proposed to be added to this list would be required to be approved by Contractor in accordance with the Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014) and approval by the NT EPA of amendment to WDL 211 (if required).

2. The use of aluminium based flocculants has been restricted per the Water Discharge Procedure and requires testing to demonstrate that all residual aluminium has been removed from the water prior to discharge.

6.4.4 Surface water discharge

Currently, passively discharged surface water that is not contaminated will drain to Darwin Harbour via the erosion and sediment control systems and the Site drainage system. Additional details of surface water management for erosion and sediment control are provided in Section 6.5. Passively discharged surface water includes stormwater and potable water that has not had opportunity to become contaminated by Site activities and is not subject to discharge water quality criteria.

The perimeter regulating drain and the temporary MOF outfall are currently approved for use for discharge of spent hydrotest waters subject to Contractor WDL 211. This CEMP proposes to use the perimeter regulating drain, and the temporary MOF outfall if available and technically feasible to do so (and subject to an amendment of WDL 211), for active discharge of construction waters, inclusive of new streams from commissioning. Discharge trigger values are proposed to accommodate this in Table 6-14. It is proposed that these discharge trigger values are also applied to spent hydrotest water (subject to Contractor amending WDL 211).

Figure 6-4 summarises the disposal options and criteria to be met for different disposal options for surface water requiring active discharge. Figure 6-4 does not apply to surface

water that discharges passively from Site.

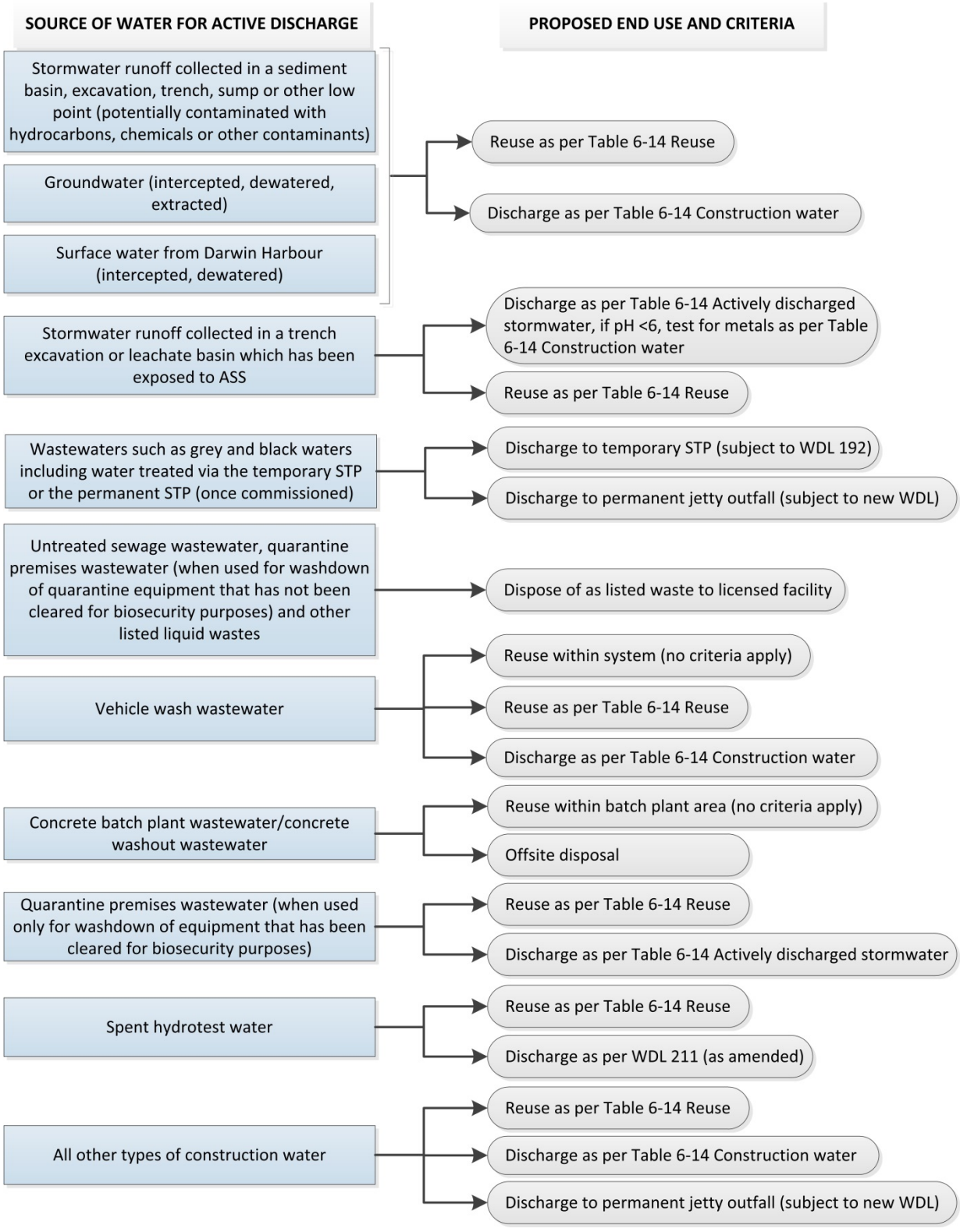

Figure 6-4: Surface water disposal options and criteria for active discharge

Reuse on Site

Reuse criteria are listed in Table 6-14. All surface water will preferentially be reused on Site if conditions allow, or it is practical to do so, as an alternative to discharge or offsite disposal. On Site reuse includes water used for dust suppression, rehabilitation, or earthworks compaction activities. Reuse must not cause ponding or erosion or otherwise adversely impact on downstream users.

Re-use of commissioning water will be implemented to the largest practical extent, where the re-use water criteria specified within Table 6-14 have been met and the weather conditions are appropriate (i.e. not during rain events or immediately prior to predicted periods of rain). If the re-use criteria cannot be achieved for key activities, alternative sources of disposal will be examined, dependent on water quality.

For reuse water quality criteria, where one or more parameters in Table 6-14 are exceeded, a case specific risk assessment may be conducted to further assess the option for reuse, subject to approval by Contractor and Company. The risk assessment shall consider the proposed method of reuse, volume of water, application rate, seasonality and forecast rainfall, and other relevant factors. Where a risk assessment determines that the potential impacts associated with reuse are not able to be reasonably mitigated, water will either be either be discharged (where the relevant discharge trigger values have been met) or collected for offsite disposal by a licensed waste contractor (where discharge trigger values are not met).

Discharge and reuse of spent hydrotest water

The strategy for managing spent hydrotest water on the Project follows the following hierarchy:

- reusing water onsite to the largest extent practicable e.g. for multiple hydrotesting activities or for dust suppression
- discharge to Darwin Harbour via the perimeter regulating drain or via the temporary MOF outfall in accordance with WDL 211 (as amended)
- disposal offsite at a licensed waste facility.

Reuse of spent hydrotest water is subject to the reuse criteria in Table 6-14. The discharge of all spent hydrotest water to Darwin harbour is subject to Contractor's WDL 211 (as amended) and Contractor's Water Discharge Procedure. Where hydrotest water exceeds criteria listed in WDL 211 (as amended), this may require offsite disposal at a licensed waste facility. For further detail on hydrotesting activities, refer to Table 2-3. For a list of potential chemicals for hydrotesting refer to Table 6-13.

Discharge and reuse of construction water

Wherever possible and practical to do so, and Site conditions allow, reuse of construction water on Site will be implemented. For active discharge of construction water from Site, the following requirements apply:

- In all cases where dewatering or discharging of construction water is required, a dewatering permit needs to be approved by Contractor before the release occurs. The dewatering permit process will assess the source of the water, ensure the water meets the appropriate discharge trigger values and further assess any risks associated with the activity. The dewatering permit is contained within Contractor's Water Discharge Procedure (L290-AB-PRC-10265).
- All construction water discharged from Site must not exceed the discharge trigger values for actively discharged stormwater listed in Table 6-14.

- After this initial assessment a risk assessment will be undertaken to determine the potential for the construction water to have been contaminated. If there is any potential for contamination, the discharge trigger values for construction water in Table 6-14 apply.
- The assessment will also consider the activity that has generated the construction water and the range of potential contaminants to be tested for. For example, if the activity has involved use of chemicals, or there has been a chemical spill that could affect water quality, but there has been no opportunity for contamination by hydrocarbons, it would need to be demonstrated in the assessment that hydrocarbons are not a contaminant of concern before this group of analytes is excluded from the discharge trigger values for construction water in Table 6-14.
- The assessment undertaken to determine potential contamination will be precautionary, i.e. if the consequence level in the INPEX Risk Matrix is determined to be more than an E (*Minor - Local scale event with short term impact on the environment; minor and temporary impact on a small portion of the population of protected species*) as a result of the discharge, the discharge to Darwin Harbour will not proceed. When determining the potential consequence, consideration will be given to:
  - the nature of any potential contaminants and their potential toxicity to the receiving environment
  - the volume, duration and frequency of the discharge, as it relates to potential toxicity in the receiving environment.
- Similarly, other relevant parameters would be considered for analysis, determined in accordance with the Water Discharge Procedure and any added chemicals as per the relevant Safety Data Sheet (SDS). The SDS of chemicals used within a water treatment process outlines the relevant compounds of interest that may be present in the wastewater. The Water Discharge Procedure includes a default screening suite of analytes which cover the major types of stressors and toxicant with trigger values at site. In the event that proprietary products are required to be used with limited analytical composition information on the SDS, specific testing is undertaken to define the analytes of concern in the product, if this information is not already available from the manufacturer or chemical supplier. Construction waters are to be handled and managed in accordance with Contractor's Water Discharge Procedure.

Additional specific requirements relating to discharge of construction water are as follows:

- Runoff actively discharged from a controlled detention basin must comply with criteria for actively discharged stormwater in Table 6-14. These criteria do not apply to the overflow discharge from a controlled detention basin where the design rainfall specification is exceeded (deemed 'stormwater runoff'), where the basin has been designed, implemented and operated in accordance with IECA (2008).
- Runoff and water accumulated in equipment bunds with no evidence of contamination must comply with the criteria for actively discharged stormwater in Table 6-14. Where there is potential or suspected contamination with hydrocarbons, chemicals or contaminants the water will be tested for relevant parameters for possible reuse or discharge as construction water in Table 6-14 prior to release, in consultation with Contractor.
- Water that intercepts ASS and is required to be discharged must comply with the discharge trigger values for actively discharged stormwater in Table 6-14. Where pH testing indicates a pH level below 6, this will trigger further laboratory testing for metals in accordance with the discharge trigger values for reuse or construction water in Table 6-14.

- Groundwater that has collected in excavations or trenches, which is proposed to be discharged will be sampled and assessed against the construction water discharge trigger values in Table 6-14. If compliant, discharge may be undertaken. If not suitable for discharge, the groundwater shall be treated and reused on site once compliant with reuse criteria in Table 6-14, or transported offsite for disposal by a licensed contractor.
- Concrete batch plants are used on Site and are designed to be operated such that, in normal operational conditions, all water from the system is fully recycled for rinsing of equipment or reused for dust suppression in accordance with reuse criteria in Table 6-14. Wastewater generated by concrete batch plants and other areas for production of cementitious materials will be recycled and reused, or if unable to be reused, taken offsite.

Water quality shall be determined through monitoring conducted by Subcontractor prior to each discharge against the relevant water quality criteria. Failure to achieve these criteria will trigger the incident reporting process as per Section 8.

Monitoring by Subcontractor will be conducted using visual assessment and calibrated hand-held instrumentation for in situ measurements (pH and turbidity; refer to criteria for actively discharged stormwater in Table 6-14), as well as water sampling and NATA accredited analytical laboratory testing as required for other parameters.

When assessing receiving environment monitoring results, a deviation from background due to impacts from surface water discharge, particularly from detention basins to the Darwin Harbour receiving environment, will be assessed through the comparison of water quality at control sites and monitoring sites. Upstream monitoring of water quality will be undertaken at each sedimentation basin for compliance with actively discharged stormwater in Table 6-14. Upon identification of impacts in the receiving environment, water samples will be collected from detention basins to assist verification of potential source(s). Impacts from diffuse discharge of potentially contaminated groundwater will be assessed through the comparison of control sites and monitoring sites adjacent to Site.

Where possible, Contractor will monitor the water quality of runoff discharged from controlled detention basins where the design rainfall specification is exceeded to determine any likely impacts in the receiving environment.

Contractor will also monitor the water quality of the catchment runoff discharged via the drainage network. This will be achieved using auto samplers to collect water samples during significant rainfall events from drop structures and culverts of the regulating drain. The autosamplers will be used to collect samples for validation of the TSS and NTU correlation for surface waters discharging from Site. Until such time as a reliable correlation can be achieved, the adopted figure of 75 NTU will continue to be used as best practice guideline.

Figure 6-5 provides a schematic of the how the permanent WWTP is proposed to be used progressively during commissioning as individual components are commissioned, specifically the AOC and COC systems. Figure 6-5 also shows the other streams the WWTP is designed to manage (CCPP steam blowdown water, demineralisation brine and treated effluent) and shows that the design intent for the AOC system to overflow into the NCW, under certain conditions. Any disposal option indicated in Figure 6-5 assumes the associated discharge trigger values are met. Use of the permanent jetty outfall, as indicated in Figure 6-5, is subject to amendment of EPA7-4.

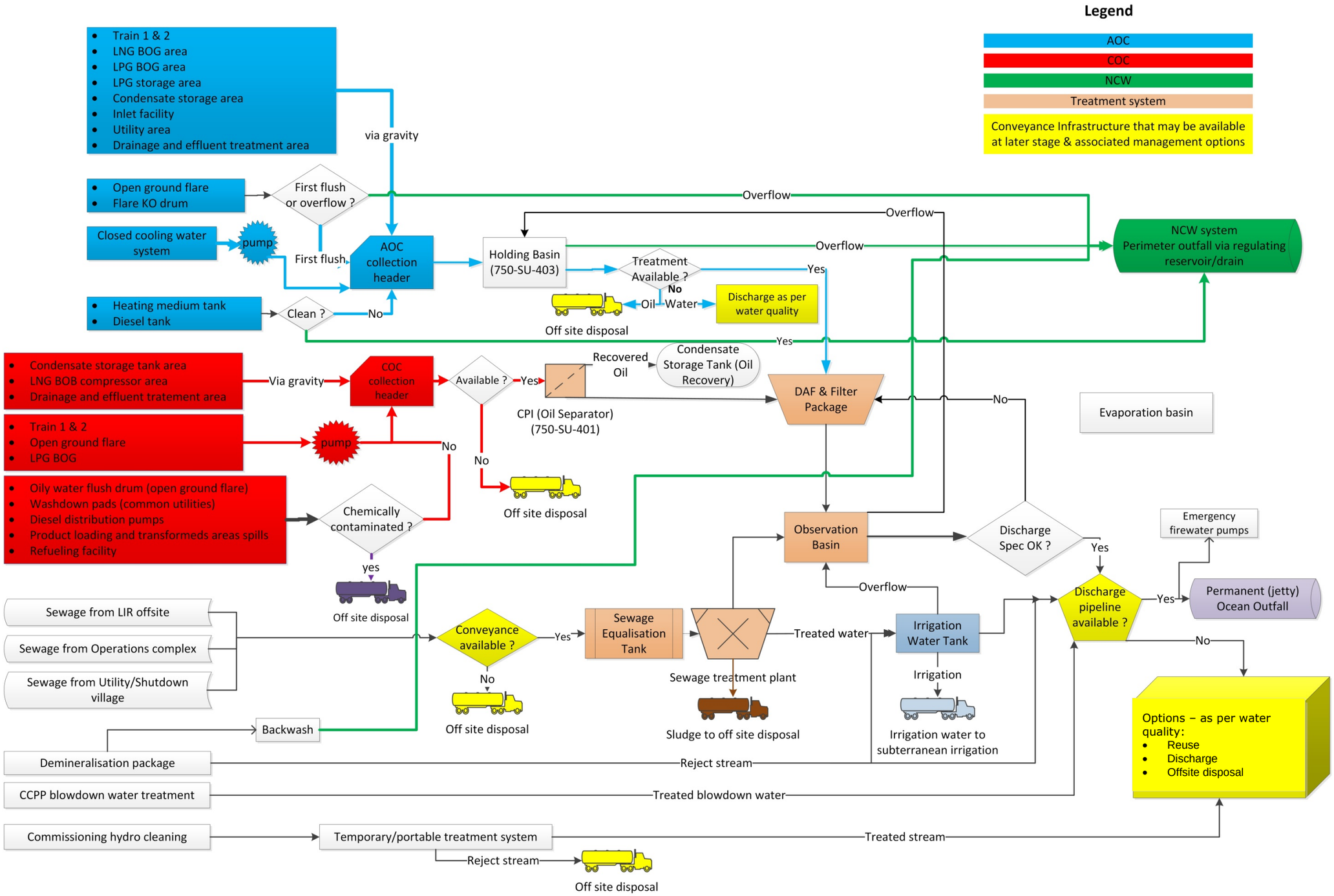

Figure 6-5: Schematic of the permanent AOC and COC system and WWTP and how it is proposed to be used as commissioning progresses

6.4.5 Discharge trigger values for different types of surface water

Following a review of available literature and completion of a risk assessment as part of the current approved EIMP, the following surface water discharge trigger values apply:

- Surface water monitoring data will initially be assessed against the trigger criteria presented in Table 6-14. These values are based upon recommended guideline values including ANZECC (2000a, 2000b) trigger concentrations for moderately disturbed environments (99% and 95% protection levels) and those in DHWQO (NRETAS 2010a), unless otherwise specified below.
- For toxicants, ANZECC (2000a) confirms that trigger values are concentrations that, if exceeded, would indicate a potential environmental problem, and so 'trigger' a management response, i.e. further investigation. The guideline trigger values were mostly derived primarily according to risk assessment principles, using data from laboratory tests in clean water. They represent the best current estimates of the concentrations of chemicals that should have no significant adverse effects on the aquatic ecosystem.
- Markich et al. (2001) confirm the conservative nature of trigger values. Metal guideline values (typically expressed as the inorganic metal concentration) may be up to an order of magnitude lower than levels that are toxic to sensitive test organisms. However, following NT EPA direction for CEMP Rev 17 to incorporate local species data, where this is available, Contractor adopted the new marine aluminium high reliability trigger value of 24 µg/L (Golding et. al, 2015) and the new manganese high reliability trigger value of 390 µg/L (J Stauber and R Van Dam, pers. comm., 23rd March 2015). Contractor also corrected the chromium III trigger value which is an errata from ANZECC (2000a).
- For stressors, ANZECC (2000a) outlines that for biological indicators, and for physical and chemical stressors where no biological or ecological effects data are available, the preferred approach to deriving guideline trigger values is from local reference data. The project has already adopted the DHWQO (NRETAS 2010), for physico-chemical class indicators based on the 80th and/or 20th percentiles of data from reference sites for the Darwin Harbour region, unless otherwise indicated (refer to Table 6-14). As such there are no other site specific trigger values that are valid for the Project.
- The Chlorine trigger level changed in revision 17 of the CEMP. The justification for this was that, although the ANZECC (2000a) trigger level for Chlorine is 3 µg/L, in practice, common standard instruments for in-situ testing of Chlorine are only capable of detecting chlorine at 20 µg/L for water that have no turbidity or TSS influence. Analysis of Chlorine at a laboratory is not considered to be reliable due to the rate of decay of Chlorine over time. Therefore, it was proposed (and approved) that the trigger level be changed to 20 µg/L, which is the detection limit of the instrument.
- Arsenic speciation undertaken for the surface water and groundwater monitoring programs will be replaced with the monitoring and analysis of total filtered arsenic. The arsenic (III) trigger value of 2.3 µg/L derived from ANZECC (2000b) will be applied to the total filtered arsenic results. The arsenic (III) trigger value is more stringent than the trigger value for arsenic (V) and as total filtered arsenic is primarily comprised of the sum of the arsenic (III) and arsenic (V) concentrations, this represents a conservative approach.
- Copper levels (filtered/bioavailable) in PWC-supplied potable water have fluctuated since measurements began in March 2014 through to February 2016, ranging from a minimum of 0.4 µg/L to a maximum of 47.2 µg/L (September 2015). The mean concentration of copper in the same period is 9.3 µg/L, with a standard deviation of

12.6 µg/L (standard error of the mean is 2.8 µg/L). Although these concentrations meet drinking water guidelines, ANZECC (2000a) recommended levels for copper are 1.3 µg/L, 3 µg/L and 8 µg/L at the 95%, 90% and 80% protection levels, respectively, and the DHWQO level is set at 1.3 µg/L. Specialist advice has been sought from an aquatic ecotoxicologist to assist in defining appropriate discharge trigger levels for construction water to be discharged to the perimeter regulating drain, impact pathways and potential for adverse impact to the receiving environment, and specific controls required to avoid adverse environmental impacts. . Appendix D summarises this information and includes the letter from the specialist. The advice received confirms that adoption of a discharge trigger value that is two standard deviations from the mean, that is 34.5 µg/L, is sufficiently conservative to avoid adverse impacts, with discharge controls in place.

- Similarly, total zinc has also been measured at elevated levels in PWC-supplied potable water tested between July 2014 and August 2015, ranging from a minimum of <5 µg/L to a maximum of 27 µg/L (August 2015). The mean concentration of total zinc in PWC water during this period is 10.9 µg/L, with a standard deviation of 6.5 µg/L (standard error of the mean is 1.6 µg/L). Again, these concentrations meet drinking water guidelines, but the ANZECC (2000a) recommended levels for copper are 7 µg/L, 15 µg/L and 23 µg/L at the 99%, 95% and 90% protection levels, respectively. The DHWQO level for zinc is set at 15 µg/L. The specialist advice received (as for copper above) confirms that adoption of a discharge trigger value that is two standard deviations from the mean, that is 23.9 µg/L, is sufficiently conservative to avoid adverse impacts, with discharge controls in place (refer also to Appendix D).

Seasonality was incorporated into the risk assessment process. The Project area is located within the monsoonal tropics of Northern Territory, which results in substantial inflows of water into Darwin Harbour and also rainwater recharge of groundwater aquifers. There are strong seasonal influences in both surface water and groundwater and it is important to include consideration of these within the risk assessment of identified exceedances in order to identify Type 2 errors (false positive results). The approved EIMP outlines the methodology used to account for seasonality in the dataset and in June 2015, the Project completed 24 months of data collection which is the minimum length dataset recommended by ANZECC (2000a) for this purpose. The 80th percentile for each analyte is calculated for each month in accordance with the approved EIMP and used within the risk assessment to determine concentrations that are within the seasonal variations normally encountered and those that are 'genuine' exceedances.

Table 6-14 provides the discharge trigger values and detection method for reuse and different types of surface water actively discharged from Site. For ease of comparison, it also includes the receiving environment monitoring criteria for Darwin Harbour from the currently approved EIMP. Each trigger value used also includes the applicable reference from which the value was derived.

Table 6-14 does not include:

- discharge trigger values for use of the permanent jetty outfall, as this would be subject to discharge trigger values in an amendment to EPA7-4
- discharge trigger values for spent hydrotest water, as this is subject to Contractor's WDL 211 (as amended).

Table 6-14: Discharge trigger values for reuse on Site and active discharge of stormwater and construction water with reference to receiving environment water quality monitoring trigger values

Analyte	Detection method	Actively Discharged Stormwater	Reuse	Construction Water		Receiving Environment Water Quality Monitoring Trigger Values
				Regulating Drain	Mixing Zone Boundary at Temporary MOF Outfall	
Physico-chemical Parameters						
pH	In situ, using calibrated field equipment	≥ 6 and ≤ 8.5 [1]	≥ 6 and ≤ 8.5 [2]	≥ 6 and ≤ 8.5 [1]	≥ 6 and ≤ 8.5 [1]	≥ 6 and ≤ 8.5 [1]
Turbidity	In situ, using calibrated field equipment	≤ 75 NTU for stormwater (Project adopted value) [3]	≤ 75 NTU (Project adopted value) [3]	≤ 20 NTU [4]	≤ 20 NTU [4]	≤ 20 NTU [4]
Total Suspended Solids (TSS)	Unfiltered, laboratory	N/A	N/A	≤ 10 mg/L [1]	≤ 10 mg/L [1]	≤ 10 mg/L [1]
Oil and grease	Visual	No visible sheen No detectable odour [5]	No visible sheen No detectable odour [5]	No visible sheen No detectable odour [5]	No visible sheen No detectable odour [5]	No visible sheen No detectable odour [5]
Iron floc and scum	Visual	No visible matter [5]	No visible matter [5]	No visible matter [5]	No visible matter [5]	No visible matter [5]
Floating matter/litter	Visual	No visible matter [5]	No visible matter [5]	No visible matter [5]	No visible matter [5]	No visible matter [5]
Dissolved oxygen	In situ, using calibrated field equipment	N/A	N/A	≥ 80 % [1]	≥ 80 % [1]	≥ 80% [1]
Temperature	In situ, using calibrated field equipment	N/A	N/A	≤ 30 °C [5]	± 3 °C from ambient at reference sites [6]	± 3 °C of ambient at reference sites [6]
Toxicants						
Aluminium	Field filtered 0.45 µm, laboratory	N/A	≤ 5000 µg/L [2]	≤ 24 µg/L [7]	≤ 24 µg/L [7]	≤ 24 µg/L [7]
Total Arsenic [16]	Field filtered 0.45 µm, laboratory	N/A	≤ 100 µg/L [2]	≤ 2.3 µg/L [8]	≤ 2.3 µg/L [8]	≤ 2.3 µg/L [8]
Cadmium	Field filtered 0.45 µm, laboratory	N/A	≤ 10 µg/L [2]	≤ 0.7 µg/L (99% protection level) [8]	≤ 0.7 µg/L (99% protection level) [8]	≤ 0.7 µg/L (99% protection level) [8]
Chlorine (free)	In situ	N/A	N/A	≤ 20 µg/L [9]	≤ 20 µg/L [9]	≤ 20 µg/L [9]
Chromium	Field filtered 0.45 µm, laboratory	N/A	≤ 100 µg/L [2]	N/A	N/A	N/A
Chromium III	Field filtered 0.45 µm, laboratory	N/A	N/A	≤ 10.0 µg/L [8]	≤ 10.0 µg/L [8]	≤ 10.0 µg/L [8]
Chromium VI	Field filtered 0.45 µm, laboratory	N/A	N/A	≤ 4.4 µg/L [8]	≤ 4.4 µg/L [8]	≤ 4.4 µg/L [8]
Cobalt	Field filtered 0.45 µm, laboratory	N/A	≤ 50 µg/L [2]	≤ 1 µg/L [4]	≤ 1 µg/L [4]	≤ 1 µg/L [4]

Analyte	Detection method	Actively Discharged	Reuse	Construction Water		Receiving Environment
Analyte	Detection method	Actively Discharged Stormwater	Reuse	Construction Water		Receiving Environment Water Quality Monitoring Trigger Values
				Regulating Drain	Mixing Zone Boundary at Temporary MOF Outfall	
Copper	Field filtered 0.45 µm, laboratory	N/A	≤ 200 µg/L [2]	≤ 34.5 µg/L [15]	≤ 1.3 µg/L (ANZECC 2000a) [4]	≤ 1.3 µg/L (ANZECC 2000a) [4]
Lead	Field filtered 0.45 µm, laboratory	N/A	≤ 2000 µg/L [2]	≤ 4.4 µg/L [4]	≤ 4.4 µg/L [4]	≤ 4.4 µg/L [4]
Manganese	Field filtered 0.45 µm, laboratory	N/A	≤ 200 µg/L [2]	≤ 390 µg/L [14]	≤ 390 µg/L [14]	≤ 390 µg/L [14]
Mercury	Field filtered 0.45 µm, laboratory	N/A	≤ 2 µg/L [2]	≤ 0.1 µg/L (99% protection level) [8]	≤ 0.1 µg/L (99% protection level) [8]	≤ 0.1 µg/L (99% protection level) [8]
Nickel	Field filtered 0.45 µm, laboratory	N/A	≤ 200 µg/L [2]	≤ 7 µg/L (99% protection level) [8]	≤ 7 µg/L (99% protection level) [8]	≤ 7 µg/L (99% protection level) [8]
Silver	Field filtered 0.45 µm, laboratory	N/A	N/A	≤ 1.4 µg/L [4]	≤ 1.4 µg/L [4]	≤ 1.4 µg/L [4]
Vanadium	Field filtered 0.45 µm, laboratory	N/A	≤ 100 µg/L [2]	≤ 100 µg/L [4]	≤ 100 µg/L [4]	≤ 100 µg/L [4]
Zinc	Field filtered 0.45 µm, laboratory	N/A	≤ 2000 µg/L [2]	≤ 23.9 µg/L [15]	≤ 15 µg/L [4]	≤ 15 µg/L [4]
Nutrients and Biological Parameters						
Total nitrogen (TN)	Unfiltered, laboratory	N/A	≤ 5000 µg/L [2]	≤ 980 µg N/L [13]	≤ 300 µg N/L [1]	≤ 300 µg N/L [1]
Ammonia	Unfiltered, laboratory	N/A	N/A	≤ 47 µg N/L [1]	≤ 20 µg N/L [1]	≤ 20 µg N/L [1]
Oxides of Nitrogen (Nitrate + Nitrite)	Unfiltered, laboratory	N/A	N/A	≤ 43 µg N/L [13]	≤ 20 µg N/L [1]	≤ 20 µg N/L [1]
Total phosphorus (TP)	Unfiltered, laboratory	N/A	≤ 50 µg P/L [2]	≤ 230 µg P/L [13]	≤ 30 µg P/L [1]	≤ 30 µg P/L [1]
Filterable Reactive Phosphorous (FRP)	Unfiltered, laboratory	N/A	N/A	< 10 µg P/L [1]	≤ 10 µg P/L [1]	≤ 10 µg P/L [1]
E. coli	Laboratory	N/A	N/A	N/A	N/A	No sample greater than 200 E. coli/100 mL [1]
Enterococci	Laboratory	N/A	N/A	N/A	N/A	50 enterococci/100 mL [1]
Chlorophyll-a	Field filter residue	N/A	N/A	N/A	< 4 µg/L [1]	< 4 µg/L [1]

Analyte	Detection method	Actively Discharged	Reuse	Construction Water		Receiving Environment
Analyte	Detection method	Actively Discharged Stormwater	Reuse	Construction Water		Receiving Environment Water Quality Monitoring Trigger Values
				Regulating Drain	Mixing Zone Boundary at Temporary MOF Outfall	
Hydrocarbons						
Benzene [10]	Unfiltered, laboratory	N/A	≤ 500 µg/L (99% protection level) [4]	≤ 500 µg/L (99% protection level) [4]	≤ 500 µg/L (99% protection level) [4]	≤ 500 µg/L (99% protection level) [4]
Ethylbenzene [10]	Unfiltered, laboratory	N/A	≤ 5 µg/L (99% protection level) (ANZECC 2000b) [8]	≤ 5 µg/L (99% protection level) (ANZECC 2000b) [8]	≤ 5 µg/L (99% protection level) (ANZECC 2000b) [8]	≤ 5 µg/L (99% protection level) (ANZECC 2000b) [8]
Naphthalene [10]	Unfiltered, laboratory	N/A	N/A	≤ 50 µg/L (99% protection level) [4]	≤ 50 µg/L 99% protection level) [4]	≤ 50 µg/L 99% protection level) [4]
Toluene [10]	Unfiltered, laboratory	N/A	≤ 180 µg/L [8]	≤ 110 µg/L [8] (99% protection level)	≤ 110 µg/L [8] (99% protection level)	≤ 110 µg/L [8] (99% protection level)
Total petroleum hydrocarbons (TPH)/Total recoverable hydrocarbons (TRH) [10]	Unfiltered, laboratory	N/A	≤ 600 µg/L [12]	≤ 600 µg/L [12]	LOR [11]	LOR [11]
Xylenes [10]	Unfiltered, laboratory	N/A	≤ 75 µg/L [8]	≤ 75 µg/L [8]	≤ 75 µg/L [8]	≤ 75 µg/L [8]

Notes:

1 Water quality objectives for the Darwin Harbour region—background document (NRETAS 2010) - upper estuary trigger values

2 Australian and New Zealand guidelines for fresh and marine water quality – Volume 1 The Guidelines (ANZECC 2000a) – Section 4.2 Water quality for irrigation and general water use, long term (up to 100 years) trigger values

3 Note that the guidelines in Best practice erosion and sediment control (IECA 2008) specify a discharge trigger value of 50 mg/L Total Suspended Solids (TSS). Given the need for a real-time measurement of suspended sediment for site management, the adopted value of 75 NTU has been used. A number of correlations have been attempted between TSS and NTU across the site and in the receiving environment with no clear correlation evident. Therefore, for site management the adopted value of 75 NTU will continue to be used as best practice guideline.

4 Australian and New Zealand guidelines for fresh and marine water quality – Volume 1 The Guidelines (ANZECC 2000a) – Section 3 Aquatic ecosystems

5 Good international industry practice

6 Environmental, Health, and Safety General Guidelines (IFC 2007)

7 Derivation of a water quality guideline for aluminium in marine waters (Golding et al. 2015)

8 Australian and New Zealand guidelines for fresh and marine water quality – Volume 2 Aquatic Ecosystems — Rationale and Background Information (ANZECC 2000b) – Section 8.3.7 Detailed descriptions of chemicals

9 Measurement of chlorine only applies when wastewater has been shock dosed with chlorine, and does not include potable water treatment; trigger value based on equipment limit of detection

10 Laboratory analysis for oil/grease/TRH and BTEX is required if visible sheen or odour is detected or in the event hydrocarbon contamination is suspected. Analytical method used is by Gas Chromatography-FID method. If TRH is detected over the prescribed limits, a silica gel clean-up to be undertaken and samples re-analysed to remove false positives from natural, normally occurring hydrocarbons.

11 Advice from analytical laboratories regarding the limit of reporting (LOR) for TPH/TRH for receiving environment surface waters outside of the Site Project boundary shows significant variability, depending on the method used and the chain length of the hydrocarbons analysed and will range between 100 to 500 µg/L.

12 Dutch groundwater intervention value for mineral oil (Ministry of Infrastructure and the Environment 2013)

13 Trigger values approved in CEMP Rev 17 and WDL 211-1

14 J. Stauber and R. Van Dam Pers. Com. 23rd March 2015

15 Revised discharge trigger values for copper and zinc are requested to allow discharge of surface water that contains elevated levels of copper and zinc from PWC-supplied potable water. The proposed trigger values are based on the mean plus two standard deviations. This means any reported value below the criteria would have a 95% change of being resulting from PWC water supply. A value above the criteria would be 5% chance of being water supply and more likely to be associated with Site activities. The maximum values recorded in PWC potable water as supplied has been 47.2 µg/L for (filtered) copper and 27 µg/L for (total) zinc.

16 Arsenic speciation undertaken for the surface water and groundwater monitoring programs will be replaced with the monitoring and analysis of total filtered arsenic. The arsenic (III) trigger value of 2.3 µg/L derived from ANZECC (2000b) will be applied to the total filtered arsenic results. The arsenic (III) trigger value is more stringent than the trigger value for arsenic (V) and as total filtered arsenic is primarily comprised of the sum of the arsenic (III) and arsenic (V) concentrations, this represents a conservative approach.

6.4.6 Key activities, potential impacts and residual risk levels

In addition to the discharge of surface water from Site described in previous sections, there are also potential impacts to receiving environment water quality that may occur as a result of working over water in the nearshore area during construction and operation of marine facilities. Key activities include:

- operation of vessels
- operation of nearshore construction equipment such as the MOFTP:
  - Ballast operations for the MOFTP will involve the intake and discharge of seawater. Ballast water tanks are only used for ballast water. No other liquid (wastewater, fuel) are ever stored in these tanks. The ballast system is completely independent of all other MOFTP systems; hence there should never be any cross contamination. When ballasting, including at or near maximum capacity, the risk of generating localised turbidity is considered low and commensurate with the operational impacts of existing project vessels.
  - The MOFTP will have a fuel supply and ablution facilities on board. These facilities are appropriately contained within the vessel; however there is a very low risk of spills that may affect surface water quality.
- vessel refuelling, ballast water and waste management
- fabrication of the marine facilities, including grouting, and painting and coating of breasting dolphins and platforms
- construction of some sections of the GEP in intertidal areas may result in the need for dewatering activities during trenching, pipe installation, pipe testing and ground improvements, which could affect surface water quality as a result of tidal movements.

The key activities, potential impacts and residual risk levels for surface-water management are outlined in Table 6-15.

Table 6-15: Key activities, potential environmental impacts and residual risk levels for surface water management

Activity	Potential environmental impact	Residual risk level
General onshore construction activities	• Introduction of contaminated fill, leading to surface-water contamination • Inappropriate handling and disposal of general waste, hazardous waste, wastewater, dewatered water and runoff, resulting in soil, surface water and groundwater contamination • Deterioration of aquatic environmental health including decline in water quality (e.g. increased nutrients or other contaminants).	Low
GEP and FGP trenching	• Introduction of contaminated fill, leading to surface-water contamination • Blockage of tidal and surface-water flows by roads, embankments and the detention basins, resulting in changes	Low

Activity	Potential environmental impact	Residual risk level
	to natural surface water flow	
Internal and external construction traffic carrying sediment around Site and onto public roads	• Deterioration of aquatic environmental health	Low
Disturbance of ASS during construction activities (ground improvement, excavation, dewatering, displacement)	• Potential acidification and heavy-metal contamination of surrounding soil, surface water and groundwater	Low
Operation of on-site vehicle washdown, refuelling facilities, dangerous goods and hazardous materials storage	• Contamination of surface waters with hydrocarbons and other chemicals • Deterioration of aquatic environmental health	Low
Temporary storage of sewage from ablution facilities	• Increased nutrient and other contaminant concentrations in receiving waters resulting from leaking wastewater storage tanks • Deterioration of aquatic environmental health including decline in water quality and seabed impacts	Low
Nearshore construction activities (e.g. geotechnical assessment, construction of MOF and causeway, Jetty, GEP and FGP and STP outfall; operation of the MOFTP including discharge of ballast water, wastewater pump out to Site)	• Exposure of soil to erosive forces during construction activities resulting in soil erosion and sediment transport and deterioration of the receiving environment • Uncontrolled discharge of sediment (e.g. from severe weather) leading to decreased water quality and impacts to marine life	Low
Hydrotesting activities	• Uncontrolled release of dangerous goods or hazardous materials, hydrocarbons and other chemicals resulting in surface water contamination and impacts to Darwin Harbour and deterioration of aquatic environmental health	Low
Discharge of treated effluent from temporary STP to the nearshore development area	• Increased nutrient, salt and other contaminant concentrations in receiving waters • Deterioration of aquatic environmental	Low

Activity	Potential environmental impact	Residual risk level
	health including decline in water quality and seabed impacts	
Vessel movement in Darwin Harbour	• Uncontrolled release of solid and liquid waste, wastewater, hydrocarbons and other chemicals contaminating Darwin Harbour with deterioration in surface water quality • Vessel collision causing spill of liquid waste, wastewater, hydrocarbons and other chemicals and contamination impacts to Darwin Harbour	Low
General onshore construction activities	• Exposure of soil to erosive forces during construction activities resulting in soil erosion and sediment transport and deterioration of the receiving environment • Uncontrolled release of sediment leading to decreased water quality and impacts to marine life • Uncontrolled release of dangerous goods or hazardous materials, hydrocarbons and other chemicals resulting in soil, surface-water and groundwater contamination and potential migration of contaminants to Darwin Harbour	Moderate
GEP and FGP trenching	• Exposure of soil to erosive forces during construction activities resulting in soil erosion and sediment transport and deterioration of the receiving environment • Uncontrolled discharge of sediment leading to decreased water quality and impacts to marine life	Moderate
Operation of concrete batch plant (non-routine/emergency response) and on-site cleaning of concrete trucks	• Discharge of wastewater leading to deterioration of aquatic environmental health	Moderate
Nearshore construction activities (e.g. geotechnical assessment, construction of MOF and causeway, Jetty, GEP and FGP and STP	• Turbidity through sediment transport resulting in decreased visual amenity and potentially increased sediment loading in the Harbour • Uncontrolled release of dangerous	Moderate

Activity	Potential environmental impact	Residual risk level
outfall; operation of the MOFTP including discharge of ballast water, wastewater pump out to Site)	goods or hazardous materials, hydrocarbons, other chemicals and waste resulting in surface water contamination and impacts to Darwin Harbour and deterioration of aquatic environmental health	
Hydrotesting activities	• Inappropriate handling and disposal of water resulting in soil, surface water and groundwater with potential migration to Darwin Harbour and deterioration of aquatic environmental health	Moderate
General commissioning activities: • commissioning and start-up of various systems which require storage, loading and transfer of chemicals • flushing and cleaning of equipment • boiler cleaning • system drying for start-up (loading of catalyst/resin/desiccant /sand etc.) • HVAC system pressurisation • transfer of other refrigerants	• Contamination of stormwater discharged to Darwin Harbour that may degrade aquatic and marine habitat and water quality • Loss of containment of chemicals which leads to uncontrolled release to environment or pollution event • Inappropriate storage, handling and use of chemicals resulting in water contamination	Low
Commissioning of Drainage and Effluent Treatment (System 750/1/2): • start-up and operation of WWTP • testing and use of outfall diffuser	• Release of contaminated discharge to Darwin Harbour that may degrade aquatic and marine habitat and water quality	Moderate
Commissioning/use of LPG Storage and Loading (System 420): • use of ship loading facilities over water • potential use of ships during transfer of	• Uncontrolled release of dangerous goods or hazardous materials, hydrocarbons and resulting in surface water contamination in Darwin Harbour and deterioration of aquatic environmental health • Release off-specification ammonia	Low

Activity	Potential environmental impact	Residual risk level
commissioning goods Commissioning and Operation of CCPP (System 780): • transfer/handling of fuels on Site • CCPP start-up	content blowdown water to environment	
Commissioning of Fire Fighting (System 790/1/2): • testing of fire water foam system • flushing of fire water system • deluge spray testing	• Release of contaminated firewater (elevated copper in PWC water) to land and surface water resulting in deterioration of aquatic environmental health	Low
• biofouling management of seawater intake pumps	• Loss of containment or uncontrolled release into the marine environment of potable water or brine resulting in deterioration of aquatic environmental health	
Commissioning of Acid Gas Removal (System 551 and 552): • degreasing and flushing	• Loss of containment resulting in release of contaminated water to land and surface water resulting in deterioration of aquatic environmental health	Low
Commissioning of Cooling medium (System 650/1/2): • charging passivation/ anti corrosive/biocide chemicals Commissioning of Demineralised Water (System 721/2): • start-up and operation of the demineralized water system • discharge of brine	• Release of contaminated water from passivation activities resulting in release of contaminated water to the environment • Loss of containment or chemical release resulting in potential for contamination of surface water on Site	Low

Cumulative effects of sewage discharge

Direct discharge of raw sewage is not proposed by Contractor during construction or commissioning. There is a very low risk of discharge of raw sewage to Darwin Harbour in

the event of an accidental spill. The volume of any potential spills is expected to be low.

Mitigation measures contained in Section 6.4.8 will be implemented to reduce the risk of any potential spills. Consequently, cumulative effects associated with the discharge of sewage on EPBC Act–listed species or their habitat is negligible.

Sewage generated on Site will be collected via reticulated pipes and treated at the temporary STP, except at selected satellite ablution blocks where sewage is pumped and transported by trucks to be disposed at approved licensed facilities or to the temporary STP. Treated wastewater from the temporary STP will be discharged into the Harbour in accordance with WDL 192, as described in Section 6.4.4.

As construction moves towards completion, the permanent STP will be commissioned. It is not expected to have high throughput, as it is designed for a permanent workforce which is significantly lower than the construction workforce. In addition, discharge from the permanent STP will be via the permanent jetty outfall (subject to amendment of EPA7-4), which has the diffuser port located to maximise mixing and dilution during operations, when this waste stream will be comingled with others from the WWTP. Once construction activities are completed, Contractor will decommission the temporary STP, thereby minimising long term effects of sewage discharge from Site.

6.4.7 Objectives, targets and indicators

The objectives, targets and indicators for surface-water management that have been established are outlined in Table 6-16.

Table 6-16: Surface water management objectives, targets and indicators

Objective	Target	Indicator
To protect surface water quality from project-related activities	• No detectable changes in surface-water quality in the receiving environment above relevant water quality parameters listed in Table 6-14 and in excess of 10% of concurrently measured background concentrations (defined as the 80 percentile of the reference site database). • Stormwater discharged from Site does not exceed the relevant discharge trigger values listed in Table 6-14. • Construction water discharged from Site does not exceed the relevant discharge trigger values listed in Table 6-14. • Treated effluent discharged from Site does not exceed the discharge trigger values listed in WDL 192 (as amended). • Surface water reused on Site is compliant with the criteria for reuse in with Table 6-14. • Spent hydrotest water discharged	• Water quality monitoring results of the receiving environment • Discharge water quality monitoring results

Objective	Target	Indicator
	from Site via the regulating drain is compliant with WDL 211 (as amended). • Spent hydrotest water discharged via the temporary MOF outfall is compliant with WDL 211 (as amended). • Treated effluent discharged from the permanent jetty outfall does not exceed water quality criteria as specified in an amended EPA7-4.	

6.4.8 Mitigation measures

The mitigation measures that will be implemented to achieve the established surface-water-quality objectives and targets are described in Table 6-17.

Table 6-17: Surface water mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.4.01	Site inductions will include the following specific components for surface-water management: • awareness of potential impacts to surface water • protocols relating to stormwater, construction water, and spent hydrotest water management, including the requirement water quality validation prior to recycling or re-use and prior to discharge from Site to the environment.	Company Environmental Policy Contractor HSES Policy CEMP Section 9	Before entering Site	HSES Manager Subcontractor Company
6.4.02	All personnel involved in discharge of surface water from Site will be appropriately trained including in monitoring, treatment and discharge requirements.	GIIP	Prior to undertaking discharge from Site	Contractor Subcontractor Company
	Surface Water Drainage			
6.4.03	All stormwater discharge will be in accordance with the approved ESCP.	Condition 8, Approval Decision EPBC 2008/4208 Best Practice in Erosion and Sediment Control Guidelines IECA 2008	At all times	Contractor Subcontractor
	Contractor shall ensure that Subcontractors are issued with the latest revision of all relevant documents.			Contractor
6.4.04	Natural drainage patterns will be maintained as much as possible. Any sheet flow will be controlled via kerbing and surface runoff control and containment.	General EHS Guideline Section 4 Construction and Decommissioning	At all times	Contractor Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Temporary drainage systems will be installed to maintain natural drainage on the Site until the permanent drainage systems are fully in place. The drainage system will be installed from the access road near the intersection with Wickham Point Road and within the Site. Temporary drains with a gradient of more than 3% will be suitably lined with appropriate control measures to manage the risk of erosion in accordance with the endorsed ESCP.	(IFC 2007)		
6.4.05	Drainage within the Site has been designed to isolate areas that could be exposed to hydrocarbon contamination. Contaminated wastewater from these areas that does not meet discharge trigger values will be treated on site to meet discharge trigger values or disposed of offsite by a licensed waste contractor.	Environmental Commitments Register Item 23.17 General EHS Guideline Section 1.3 Wastewater and Ambient Water Quality (IFC 2007)	At all times	Contractor Subcontractor
	Surface water shown to meet discharge trigger values shall be managed as surface-water runoff and non-hazardous liquid discharge, or re-used on Site where appropriate.		When discharge or reuse criteria are met	Contractor Subcontractor Company
	Surface Water Contamination			
6.4.06	All stormwater runoff from controlled detention basins (for storm events within detention basin design specifications) or equivalent control (IECA 2008) and all construction water to be discharged offsite will be by the Contractor Dewatering Permit process. Contractor	Water Discharge Procedure (L290-AB-PRC-10265) IECA 2008	At all times	Contractor Subcontractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	approval will be obtained prior to each discharge.			
6.4.07	Vehicle washdown facilities will include a concrete pad, containment, a sump to collect sediment and an oil–water separator for water treatment. Containment will prevent runoff from leaving and run-on entering the pad. Any rainfall runoff and treated wastewater from the washdown bays will be retained on site and recycled for washdown or used for dust suppression or disposed of at a licensed waste facility.	CEMP Section 6.13 General EHS Guideline Section 1.3 Wastewater and Ambient Water Quality (IFC 2007)	Monthly	Subcontractor
	Surface water will be subject to testing to assess for potential contamination prior to reuse (in accordance with Table 6-14), including reuse for dust suppression.		Prior to reuse	
6.4.08	Off-specification, excess or untreated wastewater from washdown bays will be transported and disposed of by a licensed waste contractor at a licensed facility.	GIIP	At all times	Subcontractor
6.4.09	Washdown of modules and equipment arriving via the MOF will occur only at Site quarantine premises.	CEMP Section 6.15 Biosecurity Management Plan (L290-AH-PLN-10092) Site Quarantine Plan (L290-AB-REP-0016)	At all times	Subcontractor
6.4.10	Washout of concreting vehicles, plant and equipment will occur in an impervious, dedicated washout facility with	General EHS Guideline Section 1.3 Wastewater and Ambient Water	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	collection of wastewater in an impervious washout pit.	Quality (IFC 2007)		
6.4.11	Concrete batch plants will contain impervious hardstands which drain to impervious washout pits for contaminated/process areas. Drainage systems will segregate clean stormwater runoff from contaminated areas and is used to the segregate first flush of 25 mm. Water from contaminated hardstand areas will be recycled through the concrete washout facility and reused for dust suppression within the batch plant area, or where compliance with reuse criteria in Table 6-14 permits, reused in areas outside the batch plant area. Alternatively this water may be treated to achieve the required criteria for reuse on Site, or disposed of at an appropriate licensed waste facility. Production of minor amounts of cementitious materials including concrete and grout outside of dedicated concrete batch plants will be undertaken on an impervious surface with containment of stormwater runoff from contaminated areas. Water from contaminated areas will be recycled or, if water criteria are met, reused for dust suppression on site. If water quality criteria for reuse cannot be met, it will be disposed of at an appropriate licensed waste facility.	GIIP	At all times	Subcontractor
6.4.12	Material for concrete and grout production shall be stored in pits, bunkers or other appropriate containment and appropriately covered. Storage areas shall drain to a suitable area for settling/removal of particles prior to discharge to prevent increased turbidity of stormwater.	GIIP	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.4.13	Impacts from tidal inundation will be managed while working in the intertidal zone. Examples include: • where possible, scheduling works to maximise the use of periods of low tides when tidal flows do not impact on the construction activities • minimising and staging ground disturbance • minimising exposure time of excavations/ground disturbance • where possible, containment of intercepted water and dewatering excavations in sections to allow for treatment as required prior to discharge • management of dewatering of trenches in accordance with Water Discharge Procedure L290-AB-PRC-10265 to prevent potential contamination of surface water, especially during pipe installation using the push-pull method • stockpiling of spoil on the upstream side of excavations • implementation of ESCPs and maintenance of erosion and sediment control structures • implementation of GEP-1 Acid Sulfate Soil Disturbance Permit and Protocols Procedure L280-AH-PRC-10050 • compaction and ground stabilisation upon completion of works to natural surround levels where possible. • managing equipment, plant and material to minimise contact with the tide, including limiting amounts of chemicals, plant and equipment where	Water Discharge Procedure (L290-AB-PRC-10265) GEP -1 Acid Sulfate Soil Disturbance Permit and Protocols Procedure L280-AH-PRC-10050	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	practicable at the work front.			
6.4.14	The storage of chemicals or plant and equipment will not occur below the storm surge level, defined as 5.55 m AHD, where practicable. Where storage is required below the storm surge level (e.g. within the intertidal zone) the following will be adhered to: • Approval must be obtained from Project Environmental Manager and Company prior to works/storage. • All storage will be above HAT, some plant being actively used may remain in situ overnight below HAT. • Storage of chemicals will be limited to daily storage, with minimisation of stored/working volumes. • At the completion of the work day or as dictated by weather forecasts or tidal information, all stored chemicals or plant and equipment will be removed to above the storm surge level.	GIIP	At all times	Subcontractor
	Hydrotesting			
6.4.15	A Hydrotest Environmental Management Plan and supporting documentation will be developed prior to precommissioning for approval by Company.	Environmental Commitments Register Item 23.04	Prior to hydrotesting	Contractor
	All spent hydrotest water discharge will comply with the	WDL 211	During	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	conditions of WDL 211 (as amended), and reuse will comply with criteria in Table 6-14. Investigation, sampling and reporting is to be completed as per Measure 6.4.46.		hydrotesting	Contractor
6.4.16	Equipment shall be cleaned as necessary prior to hydrotesting to remove dust, dirt, mill scale, rust, debris, preservatives, fabrication chemicals/coatings/residues to minimise the potential for contamination of hydrotest water. Methods will include sweeping and wiping, water washing, air blowing, pigging or similar. Water used in the cleaning process will be reused, discharged, or disposed of depending on the water quality in accordance with Table 6-14. For surface-water mitigation measures relating to waste management, refer to Section 6.12.	GIIP	Prior to hydrotesting	Subcontractor
6.4.17	In order to minimise the volume of potable water used and to minimise the volume of potentially contaminated water, spent hydrotest water will be transferred between equipment i.e. pipeline sections, vessels and tanks and reused for multiple pre-cleaning, flushing and hydrotesting activities to the largest extent practicable Hydrotesting of process modules will be undertaken where possible at fabrication yards prior to shipping to Site to minimise the volume of potable water required on site and production of spent hydrotest water generated on site.	*Water Act* (NT) Environmental Commitments Item 37.29 IFC Environmental, Health, and Safety Guidelines for Liquefied Natural Gas (LNG) Facilities (IFC 2007) Company Environmental Requirements for the Ichthys Gas Field	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
		Development Project (C075-AH-SPC-0001)		
6.4.18	Hot water may be used particularly in cleaning specialised equipment/systems to remove hydrocarbons (degreasing), fabrication chemicals, preservatives and contaminants.	Company Environmental Requirements for the Ichthys Gas Field Development Project (C075-AH-SPC-0001)	During initial cleaning	Subcontractor
6.4.19	All water used for hydrotesting shall be potable water supplied to Site by PWC i.e. no other water type shall be used for hydrotesting. The water quality of potable water entering the Site has been monitored regularly and these data have been used to define the supplied potable water quality.	GIIP	Prior to hydrotesting	Subcontractor
6.4.20	In the event cleaning chemicals are used in equipment, flushing with water to remove any cleaning residues will be undertaken where required prior to commencing filling with hydrotest water.	GIIP	Prior to filling with hydrotest water	Subcontractor
6.4.21	All cleaning and flushing solutions and solid and semi-solid waste shall be appropriately contained and managed as per Section 6.12. Solid and semi-solid waste will be disposed offsite at a licensed waste facility.	CEMP Section 6.12	At all times	Subcontractor
6.4.22	In order to minimise impacts associated with the discharge of contaminated spent hydrotest water, no	Water Discharge Procedure L290-AB-	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	chemicals will be added to or used in pre-cleaning, flushing or hydrotest water to be discharged from Site (with the exception of those potential hydrotest chemicals as defined in Table 6-13).	PRC-10265		
6.4.23	Methods for dewatering will avoid or minimise the risk of contamination of hydrotest water. Methods will include use of pressurised air or inert gas, gravity, pumping or vacuum or similar.	GIIP Water Discharge Procedure (L290-AB-PRC-10265)	At all times	Subcontractor
6.4.24	Dewatering will follow the Contractor permitted process and will only be commenced once Subcontractor has obtained a Dewatering Permit in accordance with the Water Discharge Procedure (L290-AB-PRC-10265).	GIIP Water Discharge Procedure (L290-AB-PRC-10265)	At all times	Subcontractor Contractor Project Environmental Manager
6.4.25	Communication will be maintained between pump/dewatering operators and observers of hydrotest equipment and dewatering pipework routes to report any problems.	GIIP Water Discharge Procedure L290-AB-PRC-10265	At all times	Subcontractor
6.4.26	Records of potable water use and spent hydrotest water generated will be maintained on site and provided to Contractor, including as part of the hydrotest Water Discharge Procedure and dewatering permit application.	GIIP Water Discharge Procedure L290-AB-PRC-10265	At all times	Subcontractor
	Records will be made available to Company upon request.		On request	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.4.27	The reuse of spent hydrotest water onsite for dust suppression will comply with NT DoH's relevant requirements based on risk assessment including, but not necessarily limited to: • there will be no surface runoff or ponding of reused water • using spray drift controls as required • adhering to minimum buffer distances as required • compliance with AS/NZS 3500.1 as required.	Guidelines for Wastewater Works Design Approval of Recycled Water Systems (NT DoH 2014)	During reuse	Subcontractor
6.4.28	All spent hydrotest water to be reused onsite will be managed by the Contractor permitted process. Contractor approval will be obtained prior to each reuse via the hydrotest Water Discharge Procedure (Water Discharge Procedure L290-AB-PRC-10265).	GIIP Water Discharge Procedure (L290-AB-PRC-10265)	Prior to reuse	Subcontractor
6.4.29	Discharge of spent hydrotest water from Site to Darwin Harbour is to be undertaken in accordance with the requirements of WDL 211 (as amended).	*Water Act* (NT)	At all times	Subcontractor Contractor
6.4.30	Hydrodynamic modelling will be undertaken once for worst case scenario discharge of spent hydrotest water to Darwin Harbour to establish the dispersion/dilution characteristics.	ANZECC & ARMCANZ 2000 Water Quality Guidelines Volume 2 Appendix 1 Mixing zones adjacent to effluent outfalls. NT EPA Guidelines on Mixing Zones, 2013, Version 1.2	Prior to discharge	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.4.31	All spent hydrotest water to be discharged offsite will be managed by the Contractor permitted dewatering process. Contractor approval will be obtained prior to each discharge via the Dewatering Permit.	GIIP Water Discharge Procedure (L290-AB-PRC-10265)	At all times	Subcontractor Contractor Project Environmental Manager
6.4.32	Spent hydrotest water that does not comply with the WDL and discharge water quality criteria will be a) treated on Site prior to reuse or discharge or b) disposed offsite. Any required treatment will avoid the addition of chemicals to hydrotest water where possible (with the exception of hydrotest chemicals listed in Table 6-13). In the event treatment requires the use of chemicals, the treatment will be effective in removal of those chemicals as well as any reaction or breakdown products as necessary to acceptable levels to comply with applicable discharge water quality criteria. The selection and management of chemicals will follow the Contractor approval process and requirements in the CEMP. The effectiveness of any treatment undertaken will be verified by monitoring to demonstrate compliance with applicable water quality criteria prior to discharge.	Water Discharge Procedure (L290-AB-PRC-10265) Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014)	At all times	Subcontractor
6.4.33	Off-specification or contaminated spent hydrotest water, including chemically treated water (with the exception of approved hydrotest water treatment chemicals in Table 6-13) will be disposed of offsite at a waste facility licensed to receive that type of waste. Handling, storage and transport will be undertaken by	CEMP Section 6.12	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	appropriately trained personnel. Disposal offsite will be via a licensed waste contractor to a suitably licensed facility.			
6.4.34	Leachate/soak testing will be conducted as necessary prior to hydrotesting of internally coated equipment i.e. with internal surface treatments, coatings, preservatives, films, linings applied to determine likely water quality of hydrotest water prior to discharge. Soak testing will also confirm the corrosion risk under hydrotesting conditions and the ability to avoid the use of chemicals in hydrotest water by minimising the time the water remains in the equipment.	GIIP	Prior to hydrotesting	Subcontractor
6.4.35	Chemicals/products (except those potential hydrotest chemicals listed in Table 6-13 and those used for water flocculation or pH correction as described in the Water Discharge Procedure (L290-AB-PRC-10265)) are not required or permitted for use in hydrotest water (pre-cleaning, flushing and hydrotesting) that is proposed to be discharged from the site. Any approval of a chemical/product will be subject to the approval process detailed in the Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014), including an environmental risk based assessment to determine the suitability of the product.	Water Discharge Procedure (L290-AB-PRC-10265 Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014)	Prior to commencement of hydrotesting activities	Subcontractor
6.4.36	A permit to commence hydrotesting activities is to be obtained via the permit to work process prior to filling. The permit to work process will include identification of	GIIP Water Discharge Procedure L290-AB-	Prior to commencement of hydrotesting	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	hydrotest activities. The permit will initiate use of the hydrotesting Water Discharge Procedure (Water Discharge Procedure L290-AB-PRC-10265).	PRC-10265)	activities	
	Operation of MOFTP			
6.4.38	The temporary STP, and associated pumping stations, will be operated and maintained, including required monitoring, recording and reporting, with regard to any conditions associated with the Approval to Operate a Recycled Water System issued by the Department of Health and WDL 192.	GIIP Approval to Operate a Recycled Water System WDL 192	At all times	Subcontractor
	Commissioning - General			
6.4.39	All cleaning and flushing solutions and solid and semi-solid waste will be appropriately contained and managed as per Section 6.12. Solid and semi-solid waste will be disposed offsite at a licensed waste facility.	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) Waste Management Procedure (L290-AH-PRC-10295)	During commissioning	Contractor Subcontractor
6.4.40	A vacuum truck service will be available to be called out to respond to spills within the AOC/COC drainage network.	GIIP	During commissioning	Contractor Subcontractor
6.4.41	An emergency response plan for responding to high	GIIP	During	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	volume chemical spills will be in place.		commissioning	
6.4.42	Just in time delivery will be utilised for high volume chemicals which exceed the dangerous goods and hazardous materials warehouse capacity for that chemical (e.g. amines, heating oil).	GIIP	Prior to delivery of chemicals	Subcontractor
6.4.43	A Marine Emergency Response Vessel will be available to respond to spill events to the Darwin Harbour.	GIIP	At all times	Contractor
	Commissioning Systems			
6.4.44	**Drainage and Effluent Treatment (System 750/1/2):** Suitably qualified and competent vendors will be used to commission the WWTP. Operators will undertake performance based water quality monitoring and analyses using the onsite laboratory.	*Water Act* (NT) EPA7-4 (as amended)	At all times	Subcontractor
6.4.45	System is designed and constructed to produce effluent within performance parameters required for discharge to Darwin Harbour. The system must have the following features: • process alarm system for exceedances • observation basin to contain water prior to approved discharge • online sensor monitoring of basin downstream of the WWTP (turbidity, pH and TOC). The quality of treated wastewater will achieve Darwin	GIIP	Prior to start of commissioning water being discharged via the WWTP into the Harbour	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Harbour Water Quality Objectives in the receiving environment and discharge through the permanent jetty outfall is subject to approval by the NT EPA and DoE.			
6.4.46	An outfall must be provided for discharge of compliant water. The ocean outfall diffuser is to be tested. The objective of the test is to demonstrate that diffuser can achieve its expected performance, by diluting the effluent once released into the ocean via diffuser ports. A WDL must be obtained for discharges through the WWTP permanent jetty outfall.	*Water Act* (NT) EPA7-4 (as amended) ANZECC & ARMCANZ 2000 Water Quality Guidelines Volume 2 Appendix 1 Mixing zones adjacent to effluent outfalls. NT EPA Guidelines on Mixing Zones, 2013, Version 1.2	Prior to start of commissioning water being discharged via the WWTP into Darwin Harbour	Company or Contractor
6.4.47	During commissioning AOC spills are contained into the holding basin (as shown in Figure 6-3). This basin is located upstream of the WWTP and must have isolatable sections of system for containment of spills. During commissioning COC spills are collected within local bunds or within the COC collection header; once collected COC is disposed offsite (as shown in Figure 6-5).	Environmental Commitments Register Item 23.17	Prior to the start of commissioning activities	Contractor
6.4.48	**Firefighting (System 790/1/2):** All flushing and deluge testing will occur with potable water. There will not be any firefighting chemicals added. This reduces the contaminant risk profile of the spent flushing water, which may then be considered for	*Water Act* (NT) Water Discharge Procedure (L290-AB-	Prior to the flush or deluge test	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	reuse or discharge. Reuse will be pursued in the first instance. Where this is not feasible, then discharge, appropriate to the water quality criteria will be pursued. Water quality monitoring and analyses must be undertaken to determine the quality of the spent flushing firewater after first flushing, and prior to discharge. Water from the second and subsequent rinsing cycles will be clean and managed as per non-contaminated potable water and allowed to passively leave Site. Deluge testing will be managed as per non-contaminated potable water and allowed to passively leave Site. A water management map will be prepared for each area subject to deluge testing. The map will be based on the volume of water to be generated and provision of a water containment strategy to allow for water management on Site.	PRC-10265) WDL 211 (as amended)		
6.4.49	Cleaning with potable water or brine, or mechanical cleaning, is required to keep biofouling to a minimum.	GIIP	Prior to start of commissioning activities	Contractor Subcontractor
6.4.50	**Acid Gas Removal (System 551 and 552):** Suitably qualified and competent vendors will undertake the AGRU degreasing and flushing activities. The AGRU system has a dedicated chemical sewer system, and any spills of solvents are directed into this system. Non-contaminated water can be diverted to the	GIIP *Water Act* (NT)	Prior to the start of commissioning activities	Contractor Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	area and S750 holding basin. Water quality monitoring and analyses must be undertaken to determine the quality of the AGRU degreasing, or flushing water prior to determining appropriate end use. Reuse will be pursued in the first instance. Where this is not feasible, then discharge, consistent with Table 6-14, will be pursued.			
6.4.51	**Cooling medium (System 650/1/2):** Circulation line pressure test must be undertaken prior to filling the cooling system with passivation chemical dosed water.	GIIP	Prior to the start of commissioning activities	Contractor
6.4.52	The cooling medium system is located within the AOC area which directs and contains any spills within the S750 holding basin.	GIIP	Prior to the start of commissioning activities	Contractor
6.4.53	Water quality monitoring and analyses must be undertaken to determine the quality of the cooling system flushing water prior to determining the end use. Reuse will be pursued in the first instance. Where this is not feasible, then discharge consistent Table 6-14 will be pursued.	*Water Act* (NT) Water Discharge Procedure (L290-AB-PRC-10265)	During commissioning	Contractor
6.4.54	Specialist operators will be provided to undertake water treatment to improve spent degreasing, or flushing water, if required. Available technologies include reverse osmosis or demineralised water treatment plants.	GIIP	As required.	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.4.55	**Air compressor system (System 680):** The air compressor plant is located within the AOC area which directs and contains any spills within the S750 holding basin.	GIIP	Prior to the start of commissioning activities	Contractor
6.4.56	**Demineralised Water (System 721/2)** Water quality monitoring and analyses must be undertaken to determine the quality of the brine prior to determining the end use. Reuse will be pursued in the first instance. Where this is not feasible, then discharge consistent with Table 6-14 will be pursued.	*Water Act* (NT) Water Discharge Procedure (L290-AB-PRC-10265)	During commissioning	Contractor
6.4.57	Specialist operators will be provided to undertake water treatment to improve spent degreasing, or flushing water, if required. Available technologies include reverse osmosis or demineralised water treatment plants, which are fit for purpose and temporary only.	GIIP	As required	Subcontractor
6.4.58	Demineralised water plant is located within the AOC area which directs and contains any spills within the S750 holding basin.	Environmental Commitments Register Item 23.17	Prior to the start of commissioning activities	Contractor
6.4.59	**LPG Storage and Loading (System 420):** An alarm system is in operation for leakages. Quick shutoff valves are operational.	GIIP	At all times	Contractor Subcontractor
6.4.60	Biodegradable hydraulic fluid will be used in the hydraulic systems for the loading arms. The design of the hydraulic arms incorporates a bunded	GIIP	At all times	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	hydraulic skid, which the hydraulic arms are situated over whenever the loading arms are not in use. The design also incorporates a counterbalance so if a loss of circulation is detected (such as if there is a leak), the arms automatically are drawn back over the bunded area. The volume that could be lost is considered minor.			
6.4.61	A Marine Emergency Response Vessel will be available to be called out to respond to spills from the jetty.	GIIP	At all times the system is being operated	Contractor
6.4.62	**Combined Cycle Power Plant (System 780):** Water quality monitoring and analyses must be undertaken to determine the quality of the steam loop blowdown water prior to determining the end use. Reuse will be pursued in the first instance. Where this is not feasible, then discharge consistent with Table 6-14 will be pursued.	Water Discharge Procedure (L290-AB-PRC-10265)	During commissioning	Subcontractor
6.4.63	Specialist operators will be provided to undertake water treatment to improve flushing water, if required.	GIIP	As required.	Subcontractor
6.4.64	Boiler water with corrosion inhibitor and diesel pump fluid with biocide added will be disposed using a licensed contractor offsite.	GIIP	At all times	Subcontractor
6.4.65	**HVAC (systems 300/310), Liquefaction (systems 591/592) and refrigeration (systems 601/602)** Suitably qualified and competent operators will undertake the testing and filling activities.	GIIP	At all times.	Contractor Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.4.66	The HVAC system will be pressure tested to detect any leaks prior to filling with refrigerant.	GIIP	Prior to filling with refrigerant.	Contractor Subcontractor
	Monitoring and Inspection			
6.4.67	Compliance monitoring of the temporary STP at the effluent tank outlet, regulatory mixing zone and reference sites will be conducted in accordance with the conditions of WDL 192. Monitoring of receiving surface-water quality will be expanded by an additional four monitoring locations, to determine if receiving water is being adversely impacted by discharge of the treated effluent. Compliance monitoring as proposed by Contractor is included in the WDL 192.	EIMP (L290-AH-PLN-10013) WDL 192 (as amended)	Monthly/seasonally, as per EIMP and requirements of WDL 192	Contractor
6.4.68	During hydrotesting activities, water quality monitoring requirements will apply during filling with PWC potable water, which will provide advance warning of any actual or potential exceedance of water quality criteria per Water Discharge Procedure. Compliance monitoring of the discharge of spent hydrotest water will be conducted in accordance with the conditions of WDL 211.	Water Discharge Procedure (L290-AB-PRC-10265) WDL 211	During hydrotesting	Subcontractor Contractor
6.4.69	All construction water will be monitored prior to discharge offsite to confirm compliance with the water quality criteria in Table 6-14. Where there is potential for construction water to be contaminated with	Water quality objectives for the Darwin Harbour region (NRETAS 2010a)	At all times	Subcontractor Contractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	hydrocarbons or metals, water will require testing for hydrocarbons and metals in accordance with Table 6-14 and the Water Discharge Procedure, prior to discharge. Construction waters are to be handled and managed in accordance with the Water Discharge Procedure. Runoff actively discharged from a controlled detention basin must comply with Table 6-14. The discharge water quality criteria in Table 6-14 do not apply to the overflow discharge from a controlled detention basin where the design rainfall specification is exceeded (deemed 'stormwater runoff'), where the basin has been designed, implemented and operated in accordance with IECA (2008). Runoff and water accumulated in equipment bunds must comply with the water quality criteria shown in Table 6-14. Where there is potential or suspected contamination with hydrocarbons, chemicals or contaminants the water will be tested for relevant parameters from Table 6-14 prior to reuse, discharge or disposal, in consultation with Contractor. Water that intercepts ASS and is required to be discharged must comply with the water quality criteria shown in Table 6-14. Where pH testing indicates a pH level below 6, this will trigger further laboratory testing for metals in accordance with Table 6-14. Groundwater that has collected in excavations or trenches, which is proposed to be discharged will be sampled and assessed against Table 6-14. If compliant, discharge may be undertaken. If not suitable for discharge, the groundwater shall be treated and reused on site once compliant with Table 6-14, or sent offsite	Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) Guidelines for sampling and analysis of lowland acid sulfate soils (ASS) in Queensland 1998 (QASSIT 1998). Water Discharge Procedure (L290-AB-PRC-10265		

Number	Mitigation measure	Reference	Timing	Responsibility
	for disposal with a licensed contractor. Wastewater generated by washdown facilities and from concrete batch plants and other areas for production of cementitious materials will not be discharged from Site.			
6.4.70	Spent hydrotest water will be monitored to confirm compliance with the applicable water quality criteria in WDL 211 prior to reuse.	GIIP	Prior to reuse of spent hydrotest water	Subcontractor Contractor Project Environmental Manager
6.4.71	Spent hydrotest water will be monitored to confirm compliance with WDL 211 conditions prior to offsite discharge.	GIIP	Prior to offsite discharge of spent hydrotest water	Subcontractor
6.4.72	If either of the following events occur, the requirements in Section 8 will be implemented: • water is discharged that does not comply with the applicable discharge water quality criteria or WDL conditions, or • the environmental impact monitoring or compliance monitoring in Darwin Harbour deviate statistically (by more than 10%) from reference sites and/or trigger values.	CEMP Section 8	At all times	Subcontractor
6.4.73	Water-quality sampling will be performed by a suitably qualified environmental or water-quality professional. Sampling including collection, preservation, handling, storage and transportation will be carried out in	AS/NZS 5667:1998, Water quality—Sampling	At all times	Project Environmental Manager Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	consideration of the relevant Australian standard(s). Monitoring of parameters in situ will be conducted using calibrated hand-held monitoring devices. Monitoring devices will be calibrated at the frequency recommended by the manufacturer, taking into consideration how often the device is used i.e. daily, weekly, fortnightly). Calibration records shall be maintained on site and made available to Contractor upon request. All laboratory analyses of water samples will be undertaken by a NATA-accredited laboratory, or equivalent. NATA-certified methods will always be used where available. QA/QC protocols, for sample collection and analysis will be followed in accordance with relevant Australian standard(s). Design of sampling regimes and interpretation of results will aim to provide an accurate representation of the system at the time of sampling.			
6.4.74	In the event that exceedances of surface water monitoring criteria and/or WDL criteria are detected, the steps below will be followed to determine whether the change detected during the monitoring is related to Project activities, and further investigation or incident reporting is required. The stepwise process concludes if there is no correlation able to be made between the activity, results or impacts measured in the receiving environment: 1. Document comparison of sampling results with relevant receiving environment criteria from Table	Incident and hazard reporting procedure (L290-AH-PRC-0021) CEMP Section 8 EIMP (L290-AH-PLN-10013) Water Discharge Procedure (L290-ABPRC-10265) WDL 192	At all times	Subcontractor Contractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	6-14 or associated WDL criteria and conditions. Proceed to next step. 2. Review records of recent liquid discharges from site including from dewatering events, hydrotest discharges, wastewater discharge and significant storm events. Proceed to next step. 3. Undertake EIMP spatial impact assessment involving comparison of the impact site sample against the reference, upstream and downstream samples using Table 6-14 to determine whether the result is potentially attributable to liquid discharges from the site. Where the exceedances in the downstream samples may be attributable, proceed to next step. 4. Undertake 80th percentile evaluation, or where 80 percentile cannot be calculated then compare to trigger value ±10%. Where the receiving environment median exceeds 10% above the reference 80th percentile dataset and is potentially attributable to a liquid discharge, this would initiate the incident reporting process, as per Section 8. Proceed to next step. 5. Conduct incident investigation and determine the event category, immediate and temporary controls, sequence of events, contributing factors and root causes. Undertake appropriate corrective and preventative action (may include actions such as temporarily stopping or restricting dewatering permits, stopping use of water treatment chemicals and flocculants, review of current	WDL 211 (as amended)		

Number	Mitigation measure	Reference	Timing	Responsibility
	discharge practices and procedures, review of erosion and sediment controls and ESCP). Proceed to next step. 6. Compare against next quarterly round of EIMP surface water, mangrove, sediment and bioindicator monitoring results. Define if there is an ongoing correlation between the discharge event and impacts to the receiving environment, incorporating the spatial impact assessment. Provide management recommendations. 7. All values that have been exceeded must be investigated at the time of the exceedance to determine likely impact, in accordance with the approved EIMP, and be reported in the annual environmental monitoring report, unless the exceedance triggers reporting requirements of an environment protection approval or waste discharge licence.			

6.4.9 Trigger action response plan for surface water quality

For toxicants, ANZECC (2000a) confirms that trigger values are concentrations that, if exceeded, would indicate a potential environmental problem, and so 'trigger' a management response, i.e. further investigation. Table 6-19 provides a trigger action response plan for receiving environment water quality for copper and zinc, based on the decision trees quoted in ANZECC (2000a). If concentration data for copper or zinc from a receiving environment monitoring site exceeds an associated trigger value, Table 6-19 will be used to determine if:

- There is a real risk of impacts and a management response should be triggered, or
- The test values are inappropriately (unnecessarily) 'triggering' risk and no management response is required.

It is important to note that the trigger values for the Project do not represent concentrations that are anticipated to cause impacts to the identified receptors in Darwin Harbour (ANZECC 2000a):

> *The Guidelines are intended to provide government, industry, consultants and community groups with a sound set of tools that will enable the assessment and management of ambient water quality in a wide range of water resource types, and according to designated environmental values. They are the recommended limits to acceptable change in water quality that will continue to protect the associated environmental values. They are not mandatory and have no formal legal status. They also do not signify threshold levels of pollution since there is no certainty that significant impacts will occur above these recommended limits, as might be required for prosecution in a court of law. Instead, the guidelines provide certainty that there will be no significant impact on water resource values if the guidelines are achieved.*

The surface water TARP has been prepared to detail the monitoring and feedback decision process for discharge of surface waters generated from Site activities. The TARP uses the relevant sediment, and seafood trigger values to provide warning of when concentrations are approaching levels where additional management actions are required and prior to environmental harm occurring. The EIMP will continue to be implemented to demonstrate no adverse environmental impact to the receiving environment.

The trigger action response plan (TARP) in Table 6-18 outlines the activities that would be undertaken in the case of a trigger exceedance.

Table 6-18: Trigger action response plan for receiving environment monitoring triggers

Step	Level 1 – Receiving environment impact monitoring indicates a trend towards exceedance of the receiving environment sediment or bioindicator trigger values for copper or zinc	Level 2 - Environmental impact monitoring indicates an exceedance of the receiving environment sediment or bioindicator trigger value for copper or zinc
1	Undertake a comparison of receiving environment monitoring results for impact and reference sites. If the comparison with reference sites shows a regional trend, proceed with discharges, as per Table 6-14.	Determine attributability to Project activities/discharges. This would entail examining multiple lines of evidence, such as: • potential Project contamination sources on Site and pathways (a review of activities on Site) • rainfall occurrence • tidal state (e.g. neap/spring) • data analysis (e.g. Piper and Turner Plots, charting of key ratios) • comparison of up-gradient and down-gradient receiving environment monitoring results • Darwin Harbour receiving environment trends using reference sites • wave climate, wind conditions in the Harbour • spills and leaks from other operators (through enquiry to NT EPA) • review of laboratory results for outliers.
2	Determine attributability to Project activities/discharges. This would entail examining multiple lines of evidence, such as: • potential Project contamination sources on Site and pathways (a review of activities on Site) • rainfall occurrence • tidal state (e.g. neap/spring) • data analysis (e.g. Piper and Turner Plots, charting of key ratios) • comparison of up-gradient and down-gradient receiving environment monitoring results	If the result of the assessment in Step 1 indicates the increasing trend for copper and zinc is not attributable to Project activities, proceed with discharges, as per Table 6-14.

Step	Level 1 – Receiving environment impact monitoring indicates a trend towards exceedance of the receiving environment sediment or bioindicator trigger values for copper or zinc	Level 2 - Environmental impact monitoring indicates an exceedance of the receiving environment sediment or bioindicator trigger value for copper or zinc
	• Darwin Harbour receiving environment trends using reference sites • wave climate, wind conditions in the Harbour • spills and leaks from other operators (through enquiry to NT EPA) • review of laboratory results for outliers.	
3	If the result of the assessment in Step 2 indicates the increasing trend for copper and zinc could be attributable to Project activities: • review options for pre-treatment/improved treatment • review opportunity for alternative disposal options • continue to review receiving environment monitoring results for evidence of a continued trend • consider if additional or more frequent receiving environment monitoring is required • review upcoming planned discharges for opportunity to either discharge to an alternative location or over a longer period.	If the result of the assessment in Step 1 indicates the exceedance for copper and zinc could be attributable to Project activities: • cease discharge, and • review options for pre-treatment/improved treatment • review opportunity for alternative disposal options • temporarily cease or restrict dewatering permits • review use of water treatment chemicals and flocculants • review current discharge practices and procedures and compliance with these • review erosion and sediment controls and ESCP.
4	If the result of the assessment in Step 2 indicates the increasing trend for copper and zinc is not attributable to Project activities, proceed with discharges, as per Table 6-14.	On becoming aware of an exceedance of the receiving environment monitoring trigger for copper or zinc, which is attributable to discharges from Site, undertake a receiving environment risk assessment to determine potential for adverse effect on environment: 1. Review monitoring results for mangrove health, sediments and bioaccumulation. 2. Review monitoring results for water quality.

Step	Level 1 – Receiving environment impact monitoring indicates a trend towards exceedance of the receiving environment sediment or bioindicator trigger values for copper or zinc	Level 2 - Environmental impact monitoring indicates an exceedance of the receiving environment sediment or bioindicator trigger value for copper or zinc
		3. Review potential receptors and sensitivities and determine potential or actual adverse impact on sensitive receptors. 4. Compare all results against Project reference sites and other significant Darwin Harbour activities that may have occurred during the period.
5		Within 24 hours of becoming aware, report attributable exceedance to NT EPA (Company) in accordance with EPA7 (as amended) Condition 24 (as a non-conformance with the approval). If the risk assessment indicates a potential significant impact to matters of national environmental significance or to habitat of listed species in Darwin Harbour, report the exceedance and outcomes of risk assessment to DoE (Company), within 24 hours of becoming aware.
6		Within seven days of notifying the NT EPA and/or DoE, provide the attributability assessment and outcomes of the risk assessment to NT EPA and/or DoE, along with corrective actions, as applicable.
7		If after two consecutive monitoring events the exceedance for receiving environment trigger values for copper or zinc are no longer evident when compared against Project reference sites, the discharge trigger values in Table 6-14 would continue to be applied for all discharges to Darwin Harbour.
8		In the event of any exceedance for copper or zinc being considered attributable to Project activities, and therefore a potential contamination event has occurred, the pre-event

Step	Level 1 – Receiving environment impact monitoring indicates a trend towards exceedance of the receiving environment sediment or bioindicator trigger values for copper or zinc	Level 2 - Environmental impact monitoring indicates an exceedance of the receiving environment sediment or bioindicator trigger value for copper or zinc
		historical background values will be frozen and set as the targets to return the ecosystem to the pre-disturbance condition.

6.5 Erosion and sediment control

This section outlines the potential impacts and mitigation measures for water erosion and the movement of sediment through and off the Site. The potential impacts and management measures for wind erosion leading to potential ground instability are included in this section. The potential impacts and mitigation measures for wind erosion leading to suspended soil particles in the air (e.g. dust) and causing potential air quality issues are described in Section 6.10.

6.5.1 Current conditions

Topography and surface soil characteristics of the Site have changed as a result of bulk earthworks and ground improvement works to achieve the required design level for construction of LNG facilities. The variation of 10 m in the topography of the Site prior to bulk earthworks was reduced to 1.5 m through cut and fill activities.

General bulk fill for cut and fill works were sourced from within the Site and from the EMA. The soils used for bulk fill were largely from the Bladin and Hotham soil families, which have high and moderate risks of dispersion respectively. Some of these were blended as part of the cut and fill process. Consequently, surface soil across the Site at the completion of earthworks closely resembles the characteristics associated with the Bladin and Hotham soil families, and/or the blend of these.

Erosion and sediment control plan

An ESCP is prepared for the Site prior to each wet season to detail the controls to be implemented to effectively manage erosion and subsequent sediment mobilisations. The ESCP is reviewed and updated, as required, and at least annually prior to the onset of the wet season to reflect changes in site conditions as construction progresses. The ESCP for the approved 2015/2016 wet season is currently in place. The ESCP for the 2016/2017 wet season will be prepared and submitted to regulatory agencies with adequate time to allow for review and approval prior to the start of the wet season. It is not envisaged that the commissioning or operation areas will require temporary erosion or sediment controls due to permanent design being completed. An erosion assessment will be conducted on these areas by a Certified Practitioner in Erosion and Sediment Control (CPESC) during the planning phase of the ESCP development. If any temporary controls are required specific to commissioning works areas, they will be documented in the site-wide ESCP.

The site ESCP is submitted to and approved by the consent authority on the advice of an independent suitably qualified expert in accordance with condition 2A of Development Permit DP12/0065 (the Bladin Point site development permit) and on the advice of the DLRM in accordance with condition 1 of Development Permit DP13/0501 (the gas export pipeline development permit). An endorsed copy of the ESCP then forms part of the development permits.

6.5.2 Key activities, potential impacts and residual risk levels

The key activities and potential environmental impacts identified for erosion and sediment control are listed in Table 6-19. The residual risk levels after the implementation of the control measures contained in Table 6-21 are also identified.

Table 6-19: Key activities, potential environmental impacts and residual risk levels for erosion and sediment control

Activity	Potential environmental impact	Residual risk level
Vegetation clearing and bulk earthworks	• Addition of sediment onto access and/or public roads by construction related traffic resulting in sediment transport in stormwater causing: increased nutrient, sediment, and other contaminant concentrations in receiving waters and/or deterioration of nearshore water quality • Disturbance of natural soil material leading to destabilisation of the ground and slumping • Liquefaction of soils from failed stabilisation.	Moderate
General onshore, intertidal zone and nearshore construction activities conducted on non-stabilised ground surfaces (including ground disturbance activities, trenching, excavations, construction of temporary and permanent facilities, construction of the MOF causeway, MOF and the Jetty, ground improvement works)	• Soil erosion and sediment transport during construction activities resulting in: – increased nutrient, sediment, salt and other contaminant concentrations in receiving waters – deterioration of onshore and nearshore water quality and of aquatic environmental health – an increase in sediment loads on the fringing vegetation community, smothering the vegetation and invertebrate fauna and resulting in damage or death. – deterioration of soil quality and fertility due to increased erosion – modification of natural overland flow velocities/volumes resulting in changes in sediment transport.	Low

6.5.3 Objectives, targets and indicators

The objectives, targets and indicators for erosion and sediment control that have been established are outlined in Table 6-20.

Table 6-20: Erosion and sediment control objectives, targets and indicators

Objective	Target	Indicator
To minimise transport of sediment from the Site into immediate surroundings, including	• ESCPs are completed and endorsed by CPESCs prior to the commencement of works where there are	• CPESC endorsed ESCP approved by Contractor and Company and

Objective	Target	Indicator
adjacent land, intertidal areas and receiving surface waters	risks of erosion and sedimentation. ESC design should be in accordance with the guidelines in Best practice erosion and sediment control (IECA 2008) or other industry best practice guidelines • Contractor's site-wide ESCP is endorsed and implemented prior to the commencement of the wet season, defined as 1 October, and all Subcontractor ESCPs align with site-wide ESCP • Implement ESCPs prior to the commencement of construction works where there are risks of erosion and sedimentation, especially prior to the onset of each wet season • Stormwater actively discharged from a controlled detention basin to receiving waters comply with the water-quality criteria listed in Table 6-14	accepted by DLPE and DLRM/NT EPA prior to commencement of wet season works. • CPESC report confirming that ESCP is adequately implemented prior to 1st October each year. • Number of non-compliant stormwater discharges • Dewatering permits

6.5.4 Mitigation measures

The erosion and sediment control management strategy aims to minimise offsite impacts by diverting overland surface flows to sediment controls, and to manage any active discharge so that it meets the water-quality criteria shown in Table 6-14 as per the IECA (2008) guidelines for discharge from detention basins.

The IECA (2008) guidelines will be used as the default guidance for mitigation measures related to erosion and sediment control on Site.

In conjunction with the ESCPs, the mitigation measures that will be implemented to achieve the established objectives and targets are described in Table 6-21.

Table 6-21: Erosion and sediment control mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.5.01	Site inductions will include the following specific components for erosion and sediment control: • description of the mechanism by which erosion and sedimentation occur, and the associated environmental impacts • the use of erosion and sediment control devices to mitigate impacts, and ideal operation of these devices • the requirement for erosion and sediment control devices to be implemented and maintained in accordance with the ESCP.	Company Environmental Policy Contractor HSES Policy CEMP Section 9	Before entering Site	HSES Manager Subcontractor Project Environmental Manager Company
6.5.02	Erosion and sediment control toolboxes will be implemented across site as relevant and required in regards to the works being undertaken.	GIIP	Prior to and during Works	HSES Manager
	Planning and Design			
6.5.03	Design of erosion and sediment control features must comply with IECA (2008) guidelines including providing erosion risk assessments and designing control features commensurate to the risks.	Best practice erosion and sediment control (IECA 2008) IFC General EHS Guideline Section 4 Construction and Decommissioning (IFC 2007)	Prior to and during Works	Contractor Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.5.04	Contractor will develop a master ESCP to document the erosion and sediment controls for the whole site. Contractor ESCP will provide an overarching plan and incorporates ESCPs from Subcontractors for their individual work packages and areas. Contractor ESCP will be endorsed by CPESC, approved by Contractor and Company and accepted by DLPE and DLRM prior to commencement of wet season works.	Best practice erosion and sediment control (IECA 2008) IFC General EHS Guideline Section 4 Construction and Decommissioning (IFC 2007)	Prior to and during Works August each year	Contractor
6.5.05	ESCPs shall be prepared by each Subcontractor conducting construction activities where there are risks of erosion and sediment runoff, to manage and minimise the risks. Each ESCP will be endorsed by a Certified Professional Erosion and Sediment Control (CPESC) and approved by the Project Environmental Manager. These shall be updated regularly to reflect progressive work phases and potential risk changes. All ESCP updates are to be re-endorsed by the CPESC. Each Subcontractor ESCP must: • be fully compliant with IECA (2008) guidelines • detail Subcontractor environmental controls for the upcoming wet season that incorporates the proposed stages of works against the erosion hazard risk assessment • address the management of surface water runoff • identify key construction stages that may require changes/updates to the plan • include a timeframe for implementation of the plan • include a list of personnel responsible for implementation of the ESCP and management of	Environmental Commitments Register items 11.05 & 11.06 Best practice erosion and sediment control (IECA 2008) IFC General EHS Guideline Section 4 Construction and Decommissioning (IFC 2007)	Prior to and during Works	Subcontractor Project Environmental Manager

Number	Mitigation measure	Reference	Timing	Responsibility
	surface water runoff discharge and obtaining discharge permits including managers, supervisors, labourers • include training records and statement of experience in erosion and sediment control or surface water management for the identified personnel responsible for implementation of the ESCP • contain the planned or anticipated products or materials required to manage surface water including items such as soil stabilisers and flocculants, number and size of pumps and water treatment units, and other water management products/materials/equipment; and the timing for procuring these materials/equipment and their arrival on site • detail the plant and equipment required to implement the ESCP both for construction and operation maintenance of the nominated ESCs including excavators, spray carts, water carts; and the timing for procuring these plant/equipment and their arrival on site.			
6.5.06	During the wet season (1 October to 30 April), erosion and sediment controls will remain in place until the area is stabilised or equivalent ESC measures are implemented consistent with the IECA guidelines and ESCP. During the dry season (1 May to 30 September), erosion and sediment controls may be temporarily removed, but must be reinstated prior to the following wet season and prior to forecast rain during the dry season.	Best practice erosion and sediment control (IECA 2008)	At all times	Subcontractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	Implementation and Maintenance			
6.5.07	All erosion and sediment controls of endorsed ESCPs must be implemented prior to the commencement of works for which they have been designed, especially prior to the onset of the wet season annually.	Environmental Commitments Register items 11.04 Best practice erosion and sediment control (IECA 2008)	Prior to works Prior to 1 October every year	Subcontractor
6.5.08	All erosion and sediment control features, plant/equipment must be maintained, e.g. restoring capacity of the sedimentation basins and rock filter dams through desilting as necessary after rainfall events, subject to daily inspections and when weather conditions permit, in accordance with the IECA (2008) guidelines. Sediment controls other than detention basins, shall be desilted prior to accumulation of silt up to one third of the capacity. In the event this does not occur, the requirements in Section 8 will be implemented.	Best practice erosion and sediment control (IECA 2008) CEMP Section 8	As required	Subcontractor
6.5.09	The discharge of hydrotest water will be managed to control erosion and sedimentation risk. Temporary pipework and fittings used for filling shall be connected to the water source and inspected and flushed as required to a contained and scour protected location. Discharge pipework will be connected to hydrotest equipment and secured and flushed as required to a contained and scour protected location.	GIIP	As required during hydrotest	Subcontractor Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.5.10	Active discharge of water from a detention basin offsite requires approval from Contractor Environmental Representative as per the Water Discharge Procedure (L290-AB-PRC-10265). Water being actively discharged from sedimentation basins must comply with the relevant discharge trigger values of Table 6-14.	Water Discharge Procedure (L290-AB-PRC-10265)	Prior to discharge	Subcontractor
6.5.11	Personnel who are involved in maintenance of erosion and sediment controls, and dewatering activities will be suitably trained in the appropriate installation and operation of controls, discharge water-quality requirements, treatment processes and incident reporting procedures.	Best practice erosion and sediment control (IECA 2008) CEMP Section 9	At all times	Subcontractor
6.5.12	Erosion and sediment control management of stockpiles is to be consistent with IECA (2008) guidelines and the most recently endorsed ESCP.	Environmental Commitments Register Item 14.06 Best practice erosion and sediment control (IECA 2008)	At all times	Subcontractor
6.5.13	Long-term soil stockpiles will be protected to avoid or minimise erosion. Short-term stockpiles (<1 month) will be stabilised if warranted by site-specific risks. Stabilisation techniques may include compaction, soil stabilisers, matting or other slope stabilisation products.	Environmental Commitments Register Item 14.06 Best practice erosion and sediment control (IECA 2008)	At all times	Subcontractor
6.5.14	If soil erosion is evident, exposed surfaces at the affected area will be stabilised with whatever means is considered	Environmental Commitments Register	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	practicable and satisfactory (e.g. matting, soil stabiliser, mulching) to mitigate and stabilise the area in accordance with the relevant ESCP to meet the IECA guidelines.	Item 11.05 IFC General EHS Guideline Section 4 Construction and Decommissioning (IFC 2007)		
6.5.15	Site roads will be bitumen sealed (where appropriate) to minimise sediment transport to surface drainage channels.	Environmental Commitments Register Item 19.04	At all times	Subcontractor
6.5.16	Contaminated soils (including sediment removed from basins and rock filter dams that is suspected of being contaminated) will be managed in accordance with Section 6.12.	CEMP Section 6.12	At all times	Subcontractor
6.5.17	Sediment in basins, rock filter dams and drains that is suspected of being ASS or PASS will be managed as per Section 6.6.	CEMP Section 6.6	At all times	Subcontractor
6.5.18	Following completion of construction activities, the site will be progressively stabilised and/or revegetated in line with the final site designs as approved by Contractor and Company.	Best practice erosion and sediment control (IECA 2008) CEMP Section 6.9	At completion of Works (earthworks)	Subcontractor
	Monitoring and Inspection			
6.5.19	Erosion and sediment control devices and stabilised surfaces including sealed areas will be inspected regularly to check they are maintained and are in good working order.	Best practice erosion and sediment control	Weekly and following rainfall events (>10 mm	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Inspections should also be undertaken following rainfall events to assess the requirements for maintenance or upgrades to sediment and erosion control devices. All monitoring and inspection will be undertaken in accordance with the IECA (2008) guidelines and any relevant procedures.	(IECA 2008)	in 24 hours)	
6.5.20	Assessment of the relevant discharge parameters listed in Table 6-14 will be carried out prior to active discharge offsite from detention basins, excavations or other areas of collected water. Monitoring of the parameters will be conducted using calibrated hand-held monitoring devices.	Best practice erosion and sediment control (IECA 2008)	As required	Subcontractor
6.5.21	Water quality sampling will be performed by a suitably qualified environmental or water quality professional. Sampling, including collection, preservation, handling, storage and transportation, will be carried out in consideration of the relevant Australian standard(s). All laboratory analyses of environmental samples will be undertaken by a NATA-accredited laboratory.	AS/NZS 5667:1998, Water quality—Sampling CEMP Section 9	At all times	Project Environmental Manager Subcontractor
6.5.22	Contractor shall conduct weekly ESC compliance inspections to assess and report on the level of compliance throughout the wet season. Contractor ESC compliance inspection reports shall be provided to Company. In the event that a non-compliance is identified, Company shall be notified using the online event reporting database in accordance with Section 8.	CEMP Section 8 Water Discharge Procedure (L290-AB-PRC-10265) Site ESCPs (2015/16 wet season, and future 2016/2017 wet season)	During the wet season	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.5.23	Erosion and sediment control events which require reporting in accordance with Section 8 include but are not limited to: • Any erosion and sediment control non-compliance with this CEMP, site ESCP/s, IECA guidelines, permits or approval conditions • Site inspections or audits identify that an ESCP has not been properly developed, approved or implemented prior to the commencement of construction activities • An ESC has failed during a rain event that it was design to withstand • Site ESC inspections are not conducted at the required frequency • ESCPs have not been fully implemented prior to the commencement of the wet season • Capacity of sediment controls is not restored in accordance with IECA timeframes following rain events.	CEMP Section 8 Water Discharge Procedure (L290-AB-PRC-10265) Site ESCPs (under development for 2015/16 wet season)	At all times	Subcontractor Contractor

6.6 Acid sulfate soil management

ASS are formed by natural processes and can be found in intertidal areas and marine, wetland, estuarine or river settings. There are two main sub-categories of ASS. These are actual acid sulfate soils (AASS) and PASS. AASS are different to PASS in that the soils, having been exposed to oxygen, have already begun to oxidise and therefore have a lower pH than PASS. The soil families Mullalgah, Euro, Maand and Rinnamatta are identified as containing some level of ASS, and are typically associated with mangrove swamp, melaleuca, saline flats and coastal sand dune habitats. ASS encountered during site preparation activities and as the construction work progresses has undergone treatment in-situ and on treatment pads located across the site, as per the current (2014) QASSIT guidelines.

Discharges of ASS-impacted groundwater have the potential to impact upon sediment quality through the neutralisation and subsequent precipitation of metals. Consequently, the parameters and criteria for sediment quality described in Table 6-22 will be monitored. Further detail is available in the EIMP (L290-AH-PLN-10013).

The bio-accumulation of metals within the food chain has the potential to impact upon the health and vitality of ecosystems and humans. Metal concentrations within bio-indicators (predominantly mud whelks) will therefore be analysed and assessed for negative temporal trends and compared to the food standards listed in Table 6-23. This bio-accumulation of metals will be assessed as part of the mangrove health monitoring process in accordance with the EIMP (L290-AH-PLN-10013).

The deep soil mixing (DSM) ground improvement method that was utilised within a section of PASS within the GEP corridor, also neutralised the soil acidity to an extent, through the addition of cement. Treatment verification in accordance with QASSIT criteria (<0.03% oxidisable S) was achieved for 800 m of the 1200 m section of the GEP corridor between KP1.2 and KP2.4 where DSM was applied. A 400 metre section remains which requires additional neutralisation in order to be verified as treated in accordance with QASSIT. Retreatment rates have been determined through post DSM soil sampling. This material will be treated in situ by laying a treatment dose layer of lime over the trench surface, which will be mixed with and incorporated into the trench material prior to excavation. Samples will be collected for verification testing and treated material stockpiled on the seaward side of the trench excavation. Further details on ASS treatment are included in Subcontractor document L280-AH-PRC-10050 Acid Sulfate Soil Disturbance Permit and Protocols Procedure.

Due to the nature of ASS and the potential impacts associated with disturbance of ASS, this section of ASS management are inherently linked to the surface-water, groundwater and sediment and erosion control management within this CEMP. The management measures identified in each of these sections, and the monitoring required, will be integrated and the data gathered will be reviewed holistically to mitigate the impact of ASS disturbance by proven mitigation measures listed in Table 6-26.

Table 6-22: Sediment quality parameters and trigger criteria

Parameter	Detection method	Trigger criteria (mg/kg dry weight)	Reference
Antimony	Laboratory	25.0	Australian and New Zealand guidelines for fresh and marine water quality (ANZECC 2000)
Arsenic		70.0	
Cadmium		10.0	

Parameter	Detection method	Trigger criteria (mg/kg dry weight)	Reference
Chromium		370.0	
Copper		270.0	
Lead		220.0	
Mercury		1.0	
Nickel		52.0	
Silver		3.7	
Zinc		410.0	

Table 6-23: Bio-indicator quality parameters and trigger Criteria

Parameter	Detection method	Trigger criteria (mg/kg)	Reference
Arsenic	Laboratory	1	Food Standards Australia New Zealand (2011)
Cadmium		2	
Lead		2	
Mercury		mean of 0.5	

6.6.1 Key activities, potential impacts and residual risk levels

The key activities and potential environmental impacts identified for ASS management are listed in Table 6-24. The residual risk levels after the implementation of the control measures contained in Table 6-26 are also identified.

Table 6-24: Key activities, potential environmental impacts and residual risk levels for ASS management

Activity	Potential environmental impact	Residual risk level
Vegetation clearing	• Potential acidification and heavy-metal contamination of surrounding soil, surface water and groundwater. • Potential impact on growth and health of vegetation due to modified pH levels in the	Low

Activity	Potential environmental impact	Residual risk level
	soil, surface water and groundwater. • Impact on the productivity of the local soils due to pH change and increased bioavailability of metals within the soil profile.	
Excavation/dewatering, ground improvement works such as remove and replace works, DSM, drill and socket of piles, drill and pre-boring of CMC, stockpiling/handling of ASS materials during treatment	• Potential acidification and heavy-metal contamination of surrounding soil, surface water and groundwater. • Potential impact on growth and health of vegetation due to modified pH levels in the soil, surface water and groundwater. • Impact on the productivity of the local soils due to pH change and increased bioavailability of metals within the soil profile.	Moderate
Deep soil mixing earthworks and ground improvement work	• Lowering of groundwater table and potential for seawater intrusion and potential for PASS to oxidise if not in an anaerobic state in surrounding areas	Moderate

6.6.2 Objectives, targets and indicators

The objectives, targets and indicators for ASS management that have been established are presented in Table 6-25.

Table 6-25: ASS management objectives, targets and indicators

Objective	Target	Indicator
To manage all ASS encountered on site in accordance with the QASSIT (1998) guideline	• Zero incidents of ASS disturbance beyond the Site • All sampled soil with an oxidisable sulfur percentage of ≥0.03% (as identified during Pre-disturbance sampling (Phase one sampling) and during excavation (Phase two sampling) is treated and neutralised • Oxidisable sulfur percentage reduced to <0.03% (as identified	• Number of incident reports and the area of disturbance outside the Site • Verification test results indicating Oxidisable sulfur percentage (%S) • Verification test results indicating Oxidisable sulfur percentage (%S) or equivalent nett acid generation potential (TPA/TAA in mol H^+/tonne)

Objective	Target	Indicator
	by verification sampling before the soil is verified as non ASS	
To minimise the impacts of ASS resulting from construction activities on sediments and bioindicators	• Zero incidents of exceedances in the intertidal sediment quality criteria listed in Table 6-22 attributed to Project activities. • Zero incidents of exceedances in the bioavailability of heavy metals in bioindicators criteria in Table 6-23 attributed to Project activities.	• Results from sediment quality and bioindicator monitoring.

6.6.3 Mitigation measures

The ASS mitigation measures that will be implemented to achieve the established objectives and targets are described in Table 6-26.

Table 6-26: ASS mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.6.01	Site inductions will include the following specific components for ASS management: • description of ASS and the objectives relating to ASS management • locations of areas where ASS is likely or known to occur • awareness of ASS sampling and treatment and disposal activities that will be undertaken on site to manage ASS • the obligation to report suspected ASS material to supervisor.	Company Environmental Policy Contractor HSES Policy CEMP Section 9	Before entering Site	HSES Manager Subcontractor
	Planning and Design			
6.6.02	Subcontractor shall undertake a detailed ASS assessment to quantify and qualify the distribution of ASS, in accordance with the following guidelines, in decreasing order of importance: • Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines v4.0 (QASSIT 2014) • Where Subcontractor works are identified to have risks of ASS an ASS management plan must be developed to manage the risks, in accordance with the above procedures and meet Contractor requirements. Construction activities must be undertaken in accordance with the ASS management plan.	Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines v4.0 (QASSIT 2014)	Prior to the commencement of construction activities	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.6.03	ASS distribution, depths and neutralisation requirements/liming rates will be indicated on relevant construction drawings and in the ASS register, and will be provided as a series of diagrams and spreadsheets.	GIIP	Prior to the commencement of construction activities	Subcontractor
6.6.04	ASS management plans will include maps of known locations of ASS to allow for easy identification in the field.	Environmental Commitments Register Item 12.01	Prior to the commencement of construction activities	Subcontractor
6.6.05	ASS treatment pad(s), stockpile areas, stormwater/leachate diversion drains and detention basin will be constructed in accordance with the following requirements: • ASS treatment and stockpiling area will be sized to accommodate treatment as per relevant guidelines. • A buffer distance of 30 m will be maintained between ASS treatment pads and surface water bodies where practicable, to help to avoid incidents of accidental release of pollutants to water. • Bund walls and diversion channels will be constructed around the entire perimeter of the treatment pad/stockpile area to divert uncontaminated surface run-on around the area. • Leachate diversion channels will divert leachate/stormwater from the ASS treatment pads/stockpile area to an appropriately sized detention basin for treatment.	Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines v4.0 (QASSIT 2014) Environmental Commitments Register 12.03	Prior to the commencement of construction activities	Subcontractor Contractor
6.6.06	A supply of neutralising agent will be readily available at all	Queensland Acid Sulfate	Prior to and during	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	times for treatment of acid sulfate material and acidic waters. NOTE: Liming rates for ASS have been calculated based upon the assumption that fine agricultural lime will be used as the neutralising agent for treatment of ASS. If another neutralising agent is used instead of fine agricultural lime, liming rates will need to be adjusted accordingly.	Soil Technical Manual – Soil Management Guidelines v4.0 (QASSIT 2014)	construction activities	
	Sampling			
6.6.07	An ASS sampling regime will be implemented during construction in accordance with the QASSIT guidelines. This regime will include pre-disturbance sampling, sampling during excavation and verification sampling. Environmental sampling will be performed by a suitably qualified environmental or water quality professional in accordance with the relevant Australian standard. Environmental samples collected for analysis will be collected, stored and transported in accordance the relevant Australian standard. All laboratory analyses of environmental samples will be undertaken by a NATA-accredited laboratory or equivalent.	Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines v4.0 (QASSIT 2014) AS 4969:2008, Analysis of acid sulfate soil EIMP (L290-AH-PLN-10013)	At all times	Subcontractor Contractor
	ASS Excavation			
6.6.08	Approval from the Project Environmental Manager or delegate will be obtained before the commencement of excavation and treatment of ASS. The Project Environmental Manager will take weather conditions into account when	Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines v4.0 (QASSIT	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	deciding whether to issue approval. Sampling and laboratory analysis of ASS during excavation will be conducted at frequencies recommended by the relevant guidelines. Sampling and analysis methods recommended in these guidelines will also be adhered to.	2014)		
	ASS Management and Treatment			
6.6.09	ASS will be contained during transport, with checks for leaks carried out prior to transport. Excess water is to be drained to the extent practicable prior to loading and transport.	GIIP	At all times	Subcontractor
6.6.10	ASS or suspected ASS that has been transferred to the treatment pads or contained facilities will be treated in accordance with the following: • ASS treatment shall be undertaken during appropriate weather conditions (as determined by the Project Environmental Manager). • The ASS placed on treatment pad or contained facilities will be treated with the selected neutralising agent at a rate determined by soil sampling results in accordance with QASSIT. • All ASS treatment shall achieve <0.03% oxidisable sulfur percentage or equivalent nett acid generation potential (TPA/TAA in mol H+/tonne) (as confirmed by verification sampling)	Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines v4.0 (QASSIT 2014)	At all times	Subcontractor
	Verification Sampling			

Number	Mitigation measure	Reference	Timing	Responsibility
6.6.11	Verification sampling will use the frequencies and sampling and analysis methods recommended by the current QASSIT guidelines.	Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines v4.0 (QASSIT 2014)	At all times	Subcontractor
6.6.12	ASS must not be removed from the ASS treatment pad or contained facilities until laboratory results have verified the soils to be below the ASS criteria. Once the ASS is treated and laboratory verification sampling indicates that the soils are neutralised, the treated material will no longer be considered ASS. As such, the treated material can be placed as non-structural fill (where appropriate) within the Site or within the EMA. If the treated material cannot be re-used, it may be buried within the Site or the EMA in location(s) where environmental impacts are minimal (i.e. not in sensitive areas, threatened species or cultural heritage sites). Records of all ASS treatment verification sampling must be retained by Contractor. Where treated and verified material is disposed of to the EMA, records of verification and the location of disposal must be maintained on site and made available to the Department of Mines and Energy annually as part of the revised MMP. In the event that verification sampling results do not confirm that the soils have been treated to below the ASS criteria, the material will be retreated and reverified in accordance with the QASSIT guidelines.	Environmental Commitments Register Item 12.03 Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines v4.0 (QASSIT 2014)	Upon successful neutralisation of ASS	Subcontractor
	Monitoring and Inspection			

Number	Mitigation measure	Reference	Timing	Responsibility
6.6.13	The intertidal marine sediments and bio-indicators monitoring described in the EIMP will be implemented to determine if construction activities undertaken in ASS have resulted in changes in pH and in the bio-availability of heavy metals in adjacent marine sediments. Monitoring will occur in close proximity to detention basins and construction areas with a high ASS risk. Marine sediments must comply with the sediment criteria in Table 6-22. Bio-availability of metals in bio-indicators must comply with the criteria in Table 6-23.	Environmental Commitments Register Item 2.03 EIMP (L290-AH-PLN-10013)	As required	Project Environmental Manager
6.6.14	ASS management events which require reporting in accordance with Section 8 include but are not limited to: • Any ASS non-compliance with this CEMP, site ASS management plans or procedures, QASSIT guidelines, permits or approval conditions • Site inspections or audits identify that disturbed ASS are not being managed in accordance with guidelines • ASS treatment pads do not conform to guideline requirements • ASS is identified in areas where it has not been identified by ASS investigation sampling • Soil sampling records and results are not available to show that all soil has been verified as non-ASS, i.e. has an oxidisable sulfur percentage of <0.03% or equivalent nett acid generation potential (TPA/TAA in mol H^+/tonne) • Significant trend in bio-indicator quality indicates a	CEMP Section 8 Water Discharge Procedure (L290-AB-PRC-10265) GEP-1 Acid Sulfate Soil Disturbance Permit and Protocols Procedure L280-AH-PRC-10050 Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines v4.0 (QASSIT 2014)	At all times	Subcontractor Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	general degradation in quality and concentrations exceed the trigger criteria listed in Table 6-23.			

6.7 Groundwater management

6.7.1 Current conditions

The alteration of Site topography, surface and soil characteristics due to vegetation clearing, bulk earthworks and ground improvement has the potential to modify groundwater behaviour from its natural state. The decrease in surface-water infiltration in areas of ground improvement and sealed areas and the installation of erosion and sediment controls may have an effect on groundwater levels. Ground improvement works are also likely to influence groundwater flows and paths from the Site and groundwater retention on Site.

Groundwater monitoring has occurred monthly since June 2012. Monitoring data was initially collected from four wells before the network was expanded with monitoring of 30 wells most recently. Refer to EIMP (L290-AH-PLN-10013) for groundwater well locations.

Groundwater salinity ranged from fresh to hypersaline, with hyper-salinity centred on the isthmus and north western side perimeter and freshwater in the centre of the site and the EMA. Groundwater salinity varied depending on proximity to the coastal margins. Outside of the hypersaline areas, salinity was lowest during the wet season compared to the dry season at each corresponding location.

Groundwater levels are influenced by seasonal rainfall and tidal fluctuations. Bores located closer to the coastal margin were not as influenced by rainfall as those located in the centre of the Site, with seasonal groundwater level fluctuations not exceeding 4 m for the majority of the bores. The bores located closest to the coastal margin were influenced by tidal variations, which were typically less than 1 m and diminished with distance from the intertidal zones.

Temporal trends since the commencement of monitoring to date indicate the groundwater elevations are relatively constant for corresponding location during the wet season, although greater variation is observed for the dry season with trends being less discernible.

The groundwater pH levels are neutral to acidic (pH to as low as 3.5) and elevated metals, with the range remaining relatively consistent since the commencement of monitoring to date. The presence of low pH and high metals and nutrients has been associated with natural groundwater interaction with acidic or organic rich soils historically present at the Site (AEC 2015). The groundwater quality was consistent with regional groundwater assessments for the shallow Cretaceous aquifer (Radke et al. 1998), the 2008 dry season and the 2009 wet season groundwater baseline study (INPEX Browse, Ltd 2010).

6.7.2 Key activities, potential impacts and residual risk levels

The key activities and potential environmental impacts identified for groundwater management are listed in Table 6-27. The residual risk levels after the implementation of the mitigation measures contained in Table 6-30 are also identified.

Table 6-27: Key activities, potential environmental impacts and residual risk levels for groundwater management

Activity	Potential environmental impact	Residual risk level
On-site handling and storage of	• Groundwater contamination as a result of leaks from ablution blocks or underground storage	Low

Activity	Potential environmental impact	Residual risk level
waste and on-site generation of sewage; incorrect assessment and classification and/or cross-contamination	tanks and/or disposal of sewage • Sewage pipe strike or rupture leading to localised groundwater contamination	
Extraction and disposal of groundwater pooling in excavation pits/trenches	• Temporary lowering of groundwater level exposes ASS to oxygen and results in the generation of sulfuric acid • Potential acidification and heavy-metal contamination of surrounding soil and groundwater	Low
Disturbance of ASS during construction activities (excavation, dewatering, displacement)	• Potential acidification and heavy-metal contamination of surrounding soil, surface water and groundwater	Low
Ground improvement works	• Compaction causing modified soil permeability leading to increased surface water runoff, decreased infiltration/recharge and altered groundwater flows, alteration of groundwater table due to compaction of soil pore spaces and localised lowering of water table and potential for seawater intrusion • Reduced health or mortality of hinterland mangrove community because of reduced flow through of fresh groundwater • Contamination of soil, surface water and groundwater including modified pH levels in surface water and groundwater with potential deterioration of aquatic environmental health	Low
Sealing of the ground surface throughout the Site	• Sealing of the Site leading to increased surface water runoff, decreased infiltration/recharge and altered groundwater flows, localised lowering of water table and potential for seawater intrusion • Reduced health or mortality of hinterland mangrove community because of reduced flow through of fresh groundwater	Low
On-site handling and storage of hydrocarbons, hazardous substances and	• Groundwater contamination as a result of uncontrolled release of dangerous goods or hazardous materials, hydrocarbons and other chemicals with potential migration of	Moderate

Activity	Potential environmental impact	Residual risk level
other chemicals	contaminants to Darwin Harbour	
Cementitious (concrete and grout) production and works	• Groundwater pollution as a result of: – spills during concrete and grout production and delivery – spills during pours – liquid discharge during agitation and vehicle and equipment washout	Moderate
Ground improvement works	• The deep soil mixing may change the soil profile to impermeable causing lowering of groundwater table and potential for seawater intrusion and potential for PASS to oxidise if not in an anaerobic state in surrounding areas • Disturbance of soil (e.g. mud wave) during ground improvement activities has the potential to change elevations and consequently cause mangrove damage or mortality due to changed groundwater levels and erosion impacts	Moderate

6.7.3 Objectives, targets and indicators

The established objectives, targets and indicators for groundwater management for the Site are outlined in Table 6-28.

Table 6-28: Groundwater management objectives, targets and indicators

Objective	Target	Indicator
To minimise changes in groundwater levels and/or quality resulting from construction activities	• No statistically significant trend showing a deterioration of groundwater levels outside of historical background seasonal fluctuations and that is attributable to construction activities. • No statistically significant trend showing a deterioration of groundwater quality listed in Table 6-29 and in excess of 10% of seasonal background	• Groundwater height data. • Groundwater monitoring results.

Objective	Target	Indicator
	concentrations and no plume trend that is attributable to construction activities.	

Groundwater quality trigger criteria values are presented in Table 6-29. These values are based upon recommended toxicant guideline values including ANZECC trigger concentrations for slightly to moderately disturbed environments (95 percentile protection levels with some bioaccumulative analytes having 99 percentile) and for physiochemical stressors, the Water quality objectives for the Darwin Harbour region—background document (NRETAS 2010a).

Groundwater monitoring data will be assessed against Table 6-29 and trigger criteria in mitigation measure 6.7.08. For further detail on how project trigger values are applied, Table 6-30 mitigation measures.

Table 6-29: Groundwater quality trigger criteria

Parameter	Detection method	Trigger criteria	Reference
Physico-chemical Parameters			
pH	In situ	Lower limit 6 and upper limit 8.5	Water quality objectives for the Darwin Harbour region—background document (NRETAS 2010)
Total suspended solids (TSS)	Laboratory	Assessed for temporal variation	N/A
Turbidity	In situ		
Nutrients and Biological Parameters			
Ammonia	Laboratory	20.0 µg N/L*	Water quality objectives for the Darwin Harbour region—background document (NRETAS 2010a)
Total nitrogen (TN)	Laboratory	300.0 µg N/L	
Total phosphorus (TP)	Laboratory	30.0 µg P/L	
Oxides of nitrogen (NO_x)	Laboratory	20.0 µg N/L	
Filterable reactive phosphorus (FRP)	Laboratory	10.0 µg P/L†	
Toxicants			

Parameter	Detection method	Trigger criteria	Reference
Aluminium	Laboratory	24.0 µg/L	Golding et. al. 2015
Arsenic	Laboratory	2.3 µg/L	Australian and New Zealand guidelines for fresh and marine water quality (ANZECC 2000a; 2000b)
Cadmium	Laboratory	0.7 µg/L	
Chromium(III)	Laboratory	10.0 µg/L	
Chromium(VI)	Laboratory	4.4 µg/L	
Cobalt	Laboratory	1.0 µg/L	
Copper	Laboratory	1.3 µg/L	
Lead	Laboratory	4.4 µg/L	
Manganese	Laboratory	390.0 µg/L	J. Stauber and R. Van Dam Pers. Com. 23rd March 2015
Mercury	Laboratory	0.1 µg/L	Australian and New Zealand guidelines for fresh and marine water quality (ANZECC 2000a; 2000b)
Nickel	Laboratory	7.0 µg/L	
Silver	Laboratory	1.4 µg/L	
Vanadium	Laboratory	100.0 µg/L	
Zinc	Laboratory	15.0 µg/L	
Hydrocarbons			
Benzene	Laboratory	500.0 µg/L	Australian and New Zealand guidelines for fresh and marine water quality (ANZECC 2000a; 2000b)
Toluene	Laboratory	180.0 µg/L	
Ethylbenzene	Laboratory	5.0 µg/L	
Xylenes	Laboratory	75.0 µg/L	
Naphthalene	Laboratory	50.0 µg/L	
Total petroleum hydrocarbons (TPH)/total recoverable hydrocarbons (TRH)[§]	Laboratory	600.0 µg/L	Ministry of Infrastructure and the Environment 2013, Groundwater

Parameter	Detection method	Trigger criteria	Reference
			intervention value

* *micrograms of nitrogen per litre (µg N/L)*

† *micrograms of phosphorous per litre (µg P/L)*

§ *Laboratory analysis for oil/grease/total recoverable hydrocarbons and BTEX is required if visible oil sheen or odour is detected or in the event hydrocarbon contamination of groundwater is suspected. The analytical method used is TRH by Gas Chromatography-FID method [MPL is LTM-ORG-2010]. Where TRH is detected over the prescribed limits a silica gel clean-up is undertaken and re analyses to remove false positive natural oil results. Further interrogation in specific types of hydrocarbons can be undertaken, if needed, through interpretation of the chromatography signatures. Characterisation of specific types of hydrocarbons may be required initially to determine composition and variation in composition, if any.*

6.7.4 Mitigation measures

The mitigation measures that will be implemented to minimise the impacts to groundwater and to achieve the established objectives and targets are described in Table 6-30.

Table 6-30: Groundwater mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.7.01	Site inductions will include the following specific components for groundwater management: • requirements for reporting incidents of suspected groundwater contamination • how construction activities could impact groundwater quality	Company Environmental Policy Contractor HSES Policy CEMP Section 9	Before entering Site	HSES Manager Subcontractor Company
	Site Management			
6.7.02	The first preference for groundwater that has been collected in excavations or trenches and requires removal, is for it to be reused on site for dust suppression or other construction purposes.	GIIP Water Discharge Procedure (L290-AB-PRC-10265)	At all times	Subcontractor
6.7.03	Any intercepted, dewatered or abstracted groundwater will be managed as construction water. Groundwater will be collected and treated to meet the water quality criteria in Table 6-14 prior to discharge.	CEMP Section 6.4 Water Discharge Procedure (L290-AB-PRC-10265) EIMP (L290-AH-PLN-10013) CEMP Section 5	At all times	Subcontractor Contractor
6.7.04	Water will be diverted around all excavations, where practicable, as standard. Where groundwater is intercepted during excavation, a diversion bund will be built upslope to	Best Management Practice Erosion and Sediment Control, Books	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	divert any surface water around the excavation pit.	1 to 3 (IECA 2008)		
	Monitoring and Inspection			
6.7.05	The groundwater level and quality monitoring described in the EIMP will be implemented to determine if activities in the Site adversely impact on groundwater quality.	Environmental Commitments Register Item 2.10 EIMP (L290-AH-PLN-10013)	Monthly	Project Environmental Manager
6.7.06	In the event there is a statistically significant trend showing a deterioration of groundwater levels and/or quality (Table 6-29) and per Measure 6.7.08, the requirements in Section 8 will be implemented.	CEMP Section 8	At all times	Subcontractor
6.7.07	Groundwater quality sampling will be performed by a suitably qualified environmental or water-quality professional. Sampling including collection, preservation, handling, storage and transportation will be carried out in consideration of the relevant Australian standard(s). Laboratory analyses for environmental samples will be undertaken by a NATA-accredited laboratory. NATA-certified methods will be used where available.	AS/NZS 5667:1998, Water quality—sampling AS/NZS 5667.11:1998, Water quality—sampling, Part 11: Guidance on sampling of groundwater CEMP Section 9	Monthly	Project Environmental Manager
6.7.08	In the event that exceedances of groundwater monitoring level trends or criteria are detected, the steps below will be followed to determine whether the change detected during the monitoring is related to Project activities, and further investigation or incident reporting is required. The stepwise investigation concludes if there is no correlation between the	CEMP Section 8 EIMP (L290-AH-PLN-10013) Water Discharge Procedure (L290-AB-	At all times	Subcontractor Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	bores that would indicate a plume, or the concentrations are determined to be within background natural variation or historical conditions at site. **Groundwater Levels** 1. Compare groundwater levels with historical dataset. Where a statistically significant trend of reducing groundwater elevation is observed in groundwater monitoring locations outside of historical background seasonal fluctuations. Proceed to next step.. 2. Commence investigation into correlations between site activities and the observe depression of groundwater levels. Define if depressed groundwater levels correlate with lower than anticipated rainfall to date for the year. If they do not correlate, this would initiate the incident reporting process. Proceed to next step. 3. Compare against next EIMP sampling results against EIMP criteria. Define if the depressed groundwater trend continues, whether any mobilisation of metals has occurred and whether there are measurable impacts to the mangrove sites. Incorporate the EIMP spatial impact assessment and provide management recommendations. **Quality** 1. Groundwater laboratory results compared with groundwater criteria in Table 6-29. Where laboratory results show exceedances of the criteria, proceed to next step. 2. Comparison of the potential impact bore water results against the 80 percentile for the bore—see EIMP for	PRC-10265) EPA7 (as amended) Condition 8 Water quality objectives for the Darwin Harbour Region—background document (NRETAS 2010a) AS/NZS 5667:1998, Water quality—sampling AS/NZS 5667.11:1998, Water quality—sampling, Part 11: Guidance on sampling of groundwater		

Number	Mitigation measure	Reference	Timing	Responsibility
	further information. Groundwater quality not to exceed 10% above the 80 percentile dataset for the bore, or where 80 percentile cannot be calculated then compare to trigger value ±10%. Where the above is exceeded then proceed to next step. 3. Comparison of the potential impact bore water results with the up gradient and down gradient bores to determine if there is a plume. Undertake EIMP spatial impact assessment involving comparison of the impact site sample against the upstream and downstream samples to determine whether result is potentially attributable to construction activities, spills or ASS. Where the exceedances in the downstream samples may be attributable, this would initiate the incident reporting process. Proceed to next step. 4. Conduct incident investigation and determine the event category, immediate and temporary controls, sequence of events, contributing factors and root causes. Undertake appropriate corrective and preventative action (may include actions such as spill remediation, groundwater remediation and source pathway receptor analyses). Proceed to next step 5. Compare against the next month's EIMP groundwater sampling results against EIMP criteria. Define if the plume has propagated and reached the mangrove receiving environment. Incorporate the EIMP spatial impact assessment and provide management recommendations, as required. Update incident report and present findings to Company and NT EPA. **Dewatering activities**			

Number	Mitigation measure	Reference	Timing	Responsibility
	Refer to Measure 6.4.46			

6.8 Bushfire prevention

Bushfires can occur in most vegetated areas with the presence of an ignition source, sufficient fuel and suitable climatic conditions. Fire is part of the Northern Territory landscape as a result of controlled burns and man-made or natural wildfires. Any controlled bushfires would be conducted by the Northern Territory Fire and Rescue Service (NTFRS), which is responsible for bushfire management adjacent to or near the Site.

There is a policy of no unauthorised fires on the Site.

6.8.1 Key activities, potential impacts and residual risk levels

The risk of bushfire has significantly decreased within the Site as the area has been predominantly cleared. Other construction activities such as storage and handling of hydrocarbons and other flammables, hot works (welding, cutting and grinding) present a low risk of initiating a bushfire.

The key activities and potential environmental impacts identified for bushfire prevention are described in Table 6-31. The residual risk levels after the implementation of the mitigation measures contained in Table 6-33 are also identified.

Table 6-31: Key activities, potential environmental impacts and residual risk levels for bushfire prevention

Activity	Potential environmental impact	Residual risk level
Operating machinery; undertaking hot works (grinding, welding, gas cutting, post weld heat treatment) and other	• Bushfire and subsequent loss of flora and fauna and reduced air quality	Low
Uncontrolled events such as lightning strike and arson		
Faulty electrical equipment		
Spontaneous combustion of mulched vegetation stockpiles		
Careless disposal of cigarette butts		
Incorrect transportation, storage and handling of fuel and other flammable and combustible materials, leading to release and the potential for a fire/explosion event	• Bushfire and subsequent loss of flora and fauna and reduced air quality	Moderate
Onshore clearing, earthworks and construction activities (including in intertidal zone); and the storage, handling and/or transfer fuel, oils, greases, chemicals and other flammable substances leading to fire/explosion event		

6.8.2 Objectives, targets and indicators

The objectives, targets and indicators for bushfire prevention within the Site are outlined in Table 6-32.

Table 6-32: Bushfire prevention objectives, targets and indicators

Objective	Target	Indicator
To reduce bushfire risk	• Maintain clear, continuous firebreaks inside all external boundaries each year (before the beginning of the dry season) • Zero incidents of unauthorised burning within the Site by project personnel	• The number/area of conforming firebreaks (100% clear, no vegetation regrowth) in place before the beginning of the dry season (May). • The number of incident reports of unauthorised burning

6.8.3 Mitigation measures

Management measures for the prevention of bushfire and not the response to a bushfire are detailed in this section. Bushfire response will be addressed in a Site emergency response plan as well as in Site health and safety procedures.

The mitigation measures to prevent bushfires and to achieve the established objectives and targets are described in Table 6-33.

Table 6-33: Bushfire prevention mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.8.01	Site inductions will include the following specific components for bushfire prevention: • training and awareness of bushfire prevention measures • training and awareness of the ecological values of the Site	Company Environmental Policy Contractor HSES Policy CEMP Section 9	Before entering Site	HSES Manager Subcontractor Company
	Firebreaks			
6.8.02	A minimum 4-m-wide firebreak will be maintained inside the perimeter of the Site, specifically adjacent to woodlands, except where clearing of the Site or remnant construction works such as rock armour constitutes an equivalent firebreak, in accordance with advice from the NT Fire and Rescue Service (NTFRS). Subcontractor is not permitted to undertake construction activities within the firebreak.	Environmental Commitments Register Item 18.02 Land clearing guidelines (NT) (NRETAS 2010) Fire and Emergency Regulations, Section 3 Firebreaks	At all times	Subcontractor
	Fuel/Biomass Control			
6.8.03	Burning of weeds may occur to reduce available fuel loads/biomass and reduce the risk of wildfires. Prior to conducting this, approval is required from the NT Fire and Rescue Service (NTFRS).	GIIP In accordance with the NTFRS Permit to Burn	Prior to clearing of vegetation	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Burning of weeds on Site is not permitted after the introduction of PWC commissioning gas.	GIIP	When weeds are identified on Site, after introduction of PWC commissioning gas	Company Contractor
6.8.04	A slashing and maintenance program along firebreaks will be implemented to avoid build-up of fuel.	GIIP	During construction	Subcontractor
6.8.05	Grassy vegetation (including areas of retained native vegetation and emergent weed infestations) in the onshore development area will be controlled to reduce available fuel loads and to prevent wildfire. Control methods may include slashing and spraying.	Environmental Commitments Register Item 18.05	At all times	Subcontractor
6.8.06	Burning of stockpiled vegetation is not permitted except where a permit to burn has been obtained from the NT Fire and Rescue Service (NTFRS) Hazard Abatement Officer. Cleared vegetation will be stockpiled in areas away from potential ignition sources.	Environmental Commitments Register Item 14.07	At all times	All Site personnel
	Burning of stockpiled vegetation on Site is not permitted after the introduction of PWC commissioning gas.	GIIP	When burning is proposed, after introduction of PWC commissioning gas	Company

Number	Mitigation measure	Reference	Timing	Responsibility
	Permits			
6.8.07	"Hot work" permits must be obtained from Contractor prior to undertaking cutting, welding, grinding or other work considered to have a high potential to start a fire. All conditions of the permit must be implemented.	Environmental Commitments Register Item 18.07 HSES Contractor Permit to work Procedure (L290-AH-PER-0001)	Prior to undertaking "hot work"	Subcontractor
	Post PWC gas-in, the Contractor Health, Safety, Environment and Security Contractor Permit to Work Procedure (L290-AH-PER-0001) will continue to regulate the individual work permits within the Contractor controlled areas, unless the Company directs that the Company Permit to Work System is to be applied. Company personnel entering these areas shall comply with the Contractor requirements. Post PWC gas-in, areas in which both Company and Contractor are carrying out activities (i.e. SIMOPS), or areas adjacent to those SIMOPS areas, will be authorised by Company by the use of Area Permits. Area Permits will also apply to any other Contractor controlled areas that Company deems require Company oversight. The Area Permit will allow Company to require Contractor to implement required safety measures to manage SIMOPS and will outline conditions to apply over all Permits to Work operating within the specified area. This allows construction and commissioning to proceed according to the Contractor Permit to Work System under the governance of Company SIMOPS risk assessment process.	GIIP	Once PWC commissioning gas is introduced to Site	Company

Number	Mitigation measure	Reference	Timing	Responsibility
6.8.08	Prior to introduction of PWC commissioning gas on to Site, the planned use of fire for any construction-related purpose may only occur under a "permit to burn" issued by NTFRS.	Fire and Emergency Act (NT) Fire and Emergency Regulations (NT)	At all times (and only prior to introduction of PWC commissioning gas on to Site)	All Site personnel
	Burning on Site is not permitted after the introduction of PWC commissioning gas.	GIIP	When use of fire is proposed, after introduction of PWC commissioning gas	Company Contractor
	General Management			
6.8.09	Designated smoking areas will be established and suitable receptacles will be provided for cigarette butts.	Environmental Commitments Register Item 18.08	At all times	Subcontractor Contractor Company
6.8.10	Subcontractors shall empty cigarette butt containers located in work areas under their control.	GIIP	As required	All Site personnel
6.8.11	Designated smoking areas will be located away from vegetation stockpiles and dangerous goods storage areas.	GIIP	At all times	All Site personnel
6.8.12	No smoking is permitted in working areas or when operating equipment or driving.	GIIP	At all times	All Site personnel
	Monitoring and Inspection			

Number	Mitigation measure	Reference	Timing	Responsibility
6.8.13	Firebreaks and general construction work areas will be inspected for evidence of increasing fuel loads. Inspections of waste management practices will be undertaken to identify potential accumulation of combustible materials.	GIIP	Weekly	Contractor Subcontractor
6.8.14	Formal weekly inspections of all work areas will be undertaken to identify any potential fire hazard. Where an increase in fire hazard is identified, the requirements in Section 8 will be implemented	GIIP CEMP Section 8	Weekly	Subcontractor

6.9 Rehabilitation management

6.9.1 Current conditions

As construction activities progressively conclude, demobilisation of temporary construction facilities and rehabilitation will be carried out to bring the Site to the final configuration for the operations phase of the facility.

As completion of the construction activities progresses, it will be necessary to re-establish initial handover conditions where relevant, or complete the area to final basis of design surface configurations. Equipment and temporary construction infrastructure including underground services, temporary STP and outfall, and other cabling and piping will be removed as necessary. Disturbed areas, areas not required for subsequent construction activities or for the operational phase of the Project will be stabilised to Site requirements including minor earthworks to create the required landform and manage drainage, spreading topsoil and/or mulch, and reseeding.

Prior to demobilising temporary construction facilities, equipment and underground services, Contractor and Company shall review opportunity for those amenities to supplement operations, be reused or recycled in another facet, and or be dismantled and materials reused, recycled or disposed of as waste. Contractor and Company shall consider waste hierarchy, reduce, reuse and/or recycle of temporary site facilities, equipment, services and materials to be demobilised as a preference, where practical. Impacts and management associated with waste(s) resulting from rehabilitation and demobilisation activities are detailed in Section 6.12.

Routinely during construction, rehabilitation of individual work areas and assessment and clean-up of any remaining areas will be done prior to demobilisation of individual Subcontractors with reinstatement of the work areas to handover conditions or as directed by Contractor.

The rehabilitation and demobilisation of the temporary site facilities undertaken will be consistent with the rehabilitation and demobilisation plan, and final landscaping plans for the Site, which are to be developed.

Following completion of commissioning activities, the commissioned system(s) shall become fully operational, with no anticipated requirement for decommissioning and rehabilitation of those areas.

6.9.2 Key activities, potential impacts and residual risk levels

The key activities and potential environmental impacts identified for demobilisation of temporary construction facilities and rehabilitation management are listed in Table 6-34. The residual risk levels after the implementation of the mitigation measures contained in Table 6-36 are also identified.

Table 6-34: Key activities, potential environmental impacts and residual risk levels for demobilisation and rehabilitation management

Activity	Potential environmental impact	Residual risk level
Seeding/revegetation	• Improper revegetation using non-endemic species or vegetation mixed with weeds leading to disturbance of the natural ecosystem and/or loss of adjacent native vegetation • Native seed not viable due to long storage of	Low

Activity	Potential environmental impact	Residual risk level
	topsoil or poor storage procedures • Reinstatement/rehabilitation /stabilisation landscaping utilising imported topsoil leading to disturbance of rehabilitated areas	
General onshore construction activities, including vehicle and machinery movement	• Inadequate planning and/or disturbance of rehabilitated areas resulting in unstabilised areas at completion of works, leading to long-term erosion and sediment control issues, poor revegetation success and potential weed infestations	Low
Demobilisation/ decommissioning of temporary construction facilities and infrastructure	• Pollution and contamination of land, groundwater and surface water resulting in physical, social and/or economic impacts	Low

6.9.3 Objectives, targets and indicators

The objectives, targets and indicators for rehabilitation management that have been established are outlined in Table 6-35.

Table 6-35: Demobilisation and rehabilitation objectives, targets and indicators

Objective	Target	Indicator
Minimise environmental impacts of demobilisation of temporary construction facilities and infrastructure	• Demobilisation works apply the waste hierarchy	• Documentation of where facilities or components of facilities were reused, recycled or disposed as waste
To leave disturbed areas rehabilitated	• Rehabilitation work is commenced as soon as is practicable • Rehabilitation works are consistent with rehabilitation and final landscaping plans • Rehabilitated areas are weed free, erosion resistant and free draining	• Rehabilitation inspection records

6.9.4 Mitigation measures

The mitigation measures that will be implemented to minimise impacts relating to demobilisation of temporary construction facilities and rehabilitation and to achieve the established objectives and targets are described in Table 6-36.

Table 6-36: Demobilisation and rehabilitation mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Site Demobilisation and Rehabilitation			
6.9.01	Opportunities to reuse, reduce, and/or recycle facilities, equipment and materials shall be considered as a preference over disposal	CEMP Section 6.12 EPA7 (as amended) Condition 16 Waste Management Procedure (L290-AH-PRC-10295)	Prior to demobilisation	Company Contractor Subcontractor
6.9.02	A rehabilitation plan will be prepared and include: • methods to be used for rehabiltation • proposed timing and schedule for rehabilitation activities • rehabilitation completion criteria • the control of introduced weed species • native species found in the vegetation communities present in the area • visual amenity consideration • landform and drainage considerations.	Environmental Commitments Register items 11.01, 14.01, 15.01 & 17.02	Prior to rehabilitation of disturbed areas	Contractor
6.9.03	The completion criteria for rehabilitation will be established in collaboration with key stakeholders including Company. It will take into account the nature of rehabilitated areas, the post-operations land use, and any limitations or potential limitations to achieving these desired end uses. Rehabilitation completion criteria for each area will need to	GIIP IECA (2008)	Prior to rehabilitation of disturbed areas	Project Environmental Manager

Number	Mitigation measure	Reference	Timing	Responsibility
	address broad objectives including the safety of the area, stability, plant species diversity, density and cover, resilience (fire, diversity and structural attributes), compatibility with surrounding vegetation communities and the absence of weed species for each area.			
6.9.04	In the event that imported topsoil is required for rehabilitation purposes, topsoil must be certified as being weed free prior to being brought to Site. Imported topsoil must be stockpiled and managed to prevent erosion, sedimentation and dust and regularly inspected for evidence of erosion and weeds. Imported topsoil stockpiles must be located and managed in accordance with Measures 6.6.06, 6.5.16 and 6.5.17.	CEMP Section 6.3 CEMP Section 6.5 CEMP Section 6.6 CEMP Section 6.10	At all times	Subcontractor
6.9.05	Cleared vegetation will be stockpiled, and used for ground surface reinstatement and soil stabilisation. Vegetation will be stockpiled adjacent to cleared areas for ease of ground surface reinstatement, where possible. Any stockpiles of vegetation containing soil will need to be managed for erosion and sediment control. Stockpiles of whole or mulched mangrove roots will need to be managed for ASS.	Environmental Commitments Register items 14.06 & 14.07 CEMP Section 6.5 CEMP Section 6.6	At all times	Subcontractor
	Monitoring and Inspection			
6.9.06	A rehabilitation monitoring program will be developed and periodic surveys of rehabilitated areas will be undertaken to determine the level of success of rehabilitation programs.	Environmental Commitments Register Item 2.16	Twice yearly (initially)	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Records of rehabilitation will be kept.			
6.9.07	In the event areas requiring rehabilitation have not been effectively rehabilitated to the agreed completion criteria then subsequent the requirements in Section 8 will be implemented.	CEMP Section 8	Prior to handover	Subcontractor

6.10 Dust and air quality management

6.10.1 Current conditions

The primary issue of concern for air quality during the construction phase is fugitive dust.

Wind erosion is a key contributor to dust-generation and to the significance of dust impacts. During the wet season Darwin is dominated by westerly and west-north-west winds. During the dry season, winds are predominantly from the south-east and east. Prevailing winds during the dry season are typically away from the nearest residential area located at Palmerston.

Soils at Bladin Point are considered susceptible to erosion and prone to dust-generation.

Sensitive receptors relevant to dust and air quality impacts include mangrove vegetation communities adjacent to the construction activities and local residents and businesses surrounding the Site.

6.10.2 Air quality related to dust generation

The air quality (dust) criteria that apply to construction activity on Site are described in Table 6-37.

Table 6-37: Air quality (dust) criteria

Parameter	Criteria	Reference
Visible dust	Above-typical levels for the Site and/or a complaint received	GIIP
Dust deposition	Annual average of 4 g/m^2/month (where no background level can be determined)	New South Wales Department of Environment and Climate Change, Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2005).
PM_{10}	Daily (24 hour) average of 50 µg/m^3	National Environment Protection (Ambient Air Quality) Measure, August 2003
Sediment lensing from dust	Instantaneous time weighted daily (24 hour) average of 75 µg/m^3	GIIP
Sediment lensing from dust	Instantaneous time weighted daily (24 hour) average of 50 µg/m^3	National Environment Protection (Ambient Air Quality) Measure, August 2003
Sediment lensing from dust	No increase beyond 5 cm in ground level, averaged over 1 m^2 and a 12-month period attributed to sediment (veneer) deposition in comparison to reference sites.	GIIP

6.10.3 Commissioning air quality

Introduction

The Ambient Air Quality National Environmental Protection Measure (NEPM) (NEPC 1998) was created to provide a benchmark to ensure that people throughout Australia have protection from the potential health effects of air pollution. The standards apply at ground level. The standards were developed by taking into account the most current information that was available regarding health related air pollution research from around the world, and the information available on the state of Australia's major airsheds. They represent a high degree of consensus among leading health professionals, varied to reflect what can be realistically achieved in Australia within a ten year timeframe.

As NEPM standards are intended to apply to general ambient air in both urban and regional areas, the pollutants of most concern identified for inclusion in the Ambient Air Quality NEPM were determined to be NO_2, O_3, PM_{10}, SO_2, CO, and lead.

The potential contribution of the emission of NO_2 as a measure of NO_x and its contribution to the creation of O_3 (ground level ozone), SO_2, and PM_{10} are also of interest (INPEX 2010). The relevant air quality criteria (INPEX 2010 based upon NEPC 1998) are presented in Table 6-38.

Table 6-38: National Environment Protection Standards used as assessment criteria

Pollutant	Averaging Period	Maximum Concentration	Outcome
NO_2	1 hour	246 µg/m^3	Protection of human health
	1 year	62 µg/m^3	
	1 year	49–66 kg/ha as NO_2	Protection of vegetation
Photochemical oxidants (as O_3)	1 hour	214 µg/m^3	Protection of human health
	4 hours	171 µg/m^3	
SO_2	1 hour	572 µg/m^3	Protection of human health
	1 day	227 µg/m^3	
	1 year	57 µg/m^3	
	1 year	8–16 kg/ha as SO_2	Protection of vegetation
Particles as PM_{10}	1 day	50 µg/m^3	Protection of human health

Source: INPEX (2010) from NEPC (1998)

Note: concentrations are at 0^{o}C and 101.3 kPa.

Table 6-38 shows that the maximum allowed concentrations vary as a function of the averaging period, being higher for shorter averaging periods. Therefore, attention has to

be paid to a range of likely emissions scenarios, both under the normal and upset conditions, to ensure the prescribed levels are not exceeded during commissioning to maintain acceptable air quality.

The air quality assessment for the operational phase, encompassing several emergency scenarios, has been undertaken (INPEX 2010; Pacific Environment 2014) to predict the air quality in the vicinity of the onshore facilities, review the background (and including existing industrial sources) air quality in the project area, and to provide an assessment of the likely future impact of atmospheric discharges on air quality during the operational phases of the onshore facilities.

This air quality assessment concluded with the following key findings:

- Throughout any year, no exceedances of the relevant air quality standards are expected for any of the pollutants studied.
- NO_2 depositions due to emissions from the proposed gas processing facility on Bladin Point will be insignificant.
- The very low sulfur emissions from the proposed development contribute insignificantly to SO_2 deposition in the region surrounding Bladin Point.
- The most challenging scenario, with impact well below the air quality target, was the full operation of the plant, with all the systems in operation.

Further predictive modelling has been undertaken (Pacific Environment 2014), to affirm the modelling undertaken during the EIS and also reflecting detailed design previously unavailable. This revised modelling concluded that the ground level concentrations predicted for each pollutant-averaging period combination during full operation of the Onshore Plant is well below the relevant criteria. No significant change is noted in any concentrations predicted. The minor changes noted are the following:

- Maximum 1-hour O_3 concentration reduces from 0.06 ppm to 0.02 ppm (for both revised EIS results and latest design results) due to correction by CSIRO of an error in the previous version of the CSIRO TAPM model (i.e. no change in maximum 1-hour O_3 concentration from revised EIS results to current model results).
- Maximum 4-hour O_3 concentration reduces from 0.05 ppm to 0.02 ppm (for both revised EIS results and latest design results) due to correction by CSIRO of an error in the previous version of the CSIRO TAPM model (i.e. no change in maximum 4-hour O_3 concentration from revised EIS results to current model results).
- Maximum 1-hour NO_2 concentration reduces from 0.04 ppm to 0.03 ppm.
- Maximum 1-hour SO_2 concentration reduces from 0.03 ppm to 0.02 ppm.
- Maximum 1-hour PM_{10} concentration increases from 10 $\mu g/m^3$ to 11 $\mu g/m^3$.

Emission sources during commissioning

The location of each stationary emission source (permanent infrastructure) is shown in Table 6-39. Generation of dust by the commissioning activities will be negligible. Emissions to atmosphere from combustion sources during commissioning will also be negligible and have no significant impact on air quality. Commissioning air emissions will be significantly less than during normal operations and will be mainly generated by combustion during commissioning, start-up and running of the CCPP, purging systems with nitrogen and drying of equipment via air injection.

Table 6-39: Location of stationary (permanent) emission sources

Source	East (m)	North (m)
Compressor turbine WHR West 1 (frame 7)	708,506	8,615,448
Compressor turbine WHR West 2 (frame 7)	708,771	8,615,589
Compressor turbine WHR East 1 (frame 7)	708,626	8,615,222
Compressor turbine WHR East 2 (frame 7)	708,891	8,615,363
Power generation turbine 1 (Frame 6)	709,055	8,615,177
Power generation turbine 2 (Frame 6)	709,011	8,615,154
Power generation turbine 3 (Frame 6)	708,966	8,615,130
Power generation turbine 4 (Frame 6)	708,897	8,615,093
Power generation turbine 5 (Frame 6)	708,853	8,615,069
Utility Boiler unit # 1	708,923	8,615,157
Utility Boiler unit # 2	708,895	8,615,142
Utility Boiler unit # 3	708,867	8,615,127
Incinerator 1	708,692	8,615,709
Incinerator 2	708,813	8,615,483
Hot oil furnace 1	708,346	8,615,452
Hot oil furnace 2	708,362	8,615,461
Ground flare 5 (Warm)	708,309	8,614,986
Ground flare 2 (Cold)	708,463	8,614,702
Ground flare 1(spare)	708,369	8,614,879

Source	East (m)	North (m)
Tank flare 1 (LNG)	707,892	8,615,433
Tank flare 2 (LPG)	707,947	8,615,329
Tank flare 3 (spare)	707,919	8,615,381
Off spec condensate (liquid) flare	708,541	8,614,568

The air emissions from hydrocarbon combustion typically include:

- carbon dioxide (CO_2)
- oxides of nitrogen (nitrogen dioxide - NO_2 as a measure of NO_x)
- carbon monoxide (CO)
- volatile organic compounds (VOCs) from non-combusted hydrocarbons
- particulate matter (expressed as PM_{10})
- oxides of sulfur (sulfur dioxide - SO_2 as a measure of SO_x).

Emissions during commissioning are related to three aspects:

- the number of emission sources operating at the same time
- emission rates of individual sources
- properties of the gas (or gases) being combusted.

Emission rates will vary during commissioning but will always be well below emission rates during start-up and operations. Key features of the operational phases (which are not the subject of this CEMP), in relation to the likely air emissions, can be summarised as follows:

- During the operational phase fuel gas and isopentane sourced from Ichthys field gas will be used, while during commissioning only PWC commissioning gas will be used.
- Normal operation accounts for the largest air emissions from the project, reflecting many sources operating at their respective design emission rates. During commissioning on the other hand, the contribution of various systems will occur only a few at a time, reflecting staging in the commissioning process. Therefore, the total emission rate at any given time will be much smaller than that of steady state operations.
- During the start-up phase of the CCPP both feed gas and isopentane will be burned but this will also be a staged process, i.e. one sub-unit at the time.

The number of air emission sources will be significantly smaller during commissioning than during start-up and operation of the Onshore facility. Figure 6-6 provides an example of emissions during commissioning and during flaring (for example during LNG or LPG import), as compared to full operation of the LNG plant.

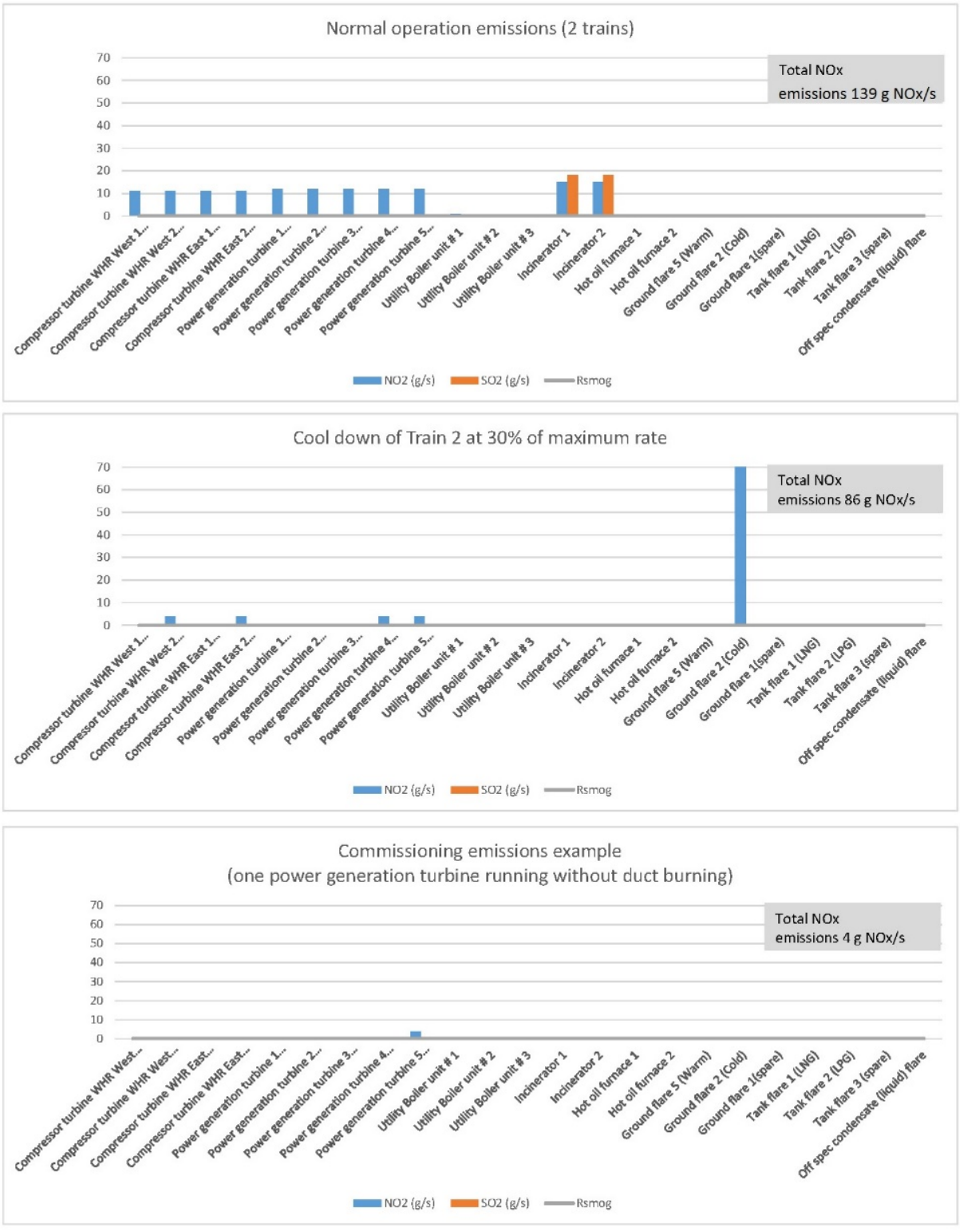

Figure 6-6: Examples of emissions during commissioning and flaring during cool down, in comparison to operations

The emissions will be mainly generated by hydrocarbon combustion during commissioning and start-up of the power plant and purging/drying of equipment. Mixed

refrigerant/propane refrigerant turbine runs will be short and generally only one piece of fuel burning equipment will be commissioned at any one time. Therefore the air emissions will be well below the modelled results (EIS INPEX 2010) where all fuel burning equipment was operational. Individual emissions sources for all phases (commissioning, and later start-up and operation of the Onshore facility) are shown in Figure 6-7. Of relevance to commissioning specifically are the compressor gas turbine stack, gas turbine and utility boiler stacks.

Commissioning air emissions for all the facilities, as well as the start-up phase of the CCPP, are not expected to significantly affect ambient air quality and the impact on regional air quality is expected to be negligible.

Operation of the CCPP to support commissioning

During operation of the CCPP during commissioning, the specific activities that have potential to affect air quality if left unmitigated include:

- combustion of fuel gas and incomplete combustion of fuel (boilers and turbines)
- combustion of diesel from use of testing or start-up diesel generators
- planned flaring during LNG/LPG import and introduction to PWC fuel gas to Site and unplanned flaring in the event of CCPP trips
- thermal radiation from steam vents, and hot oil pipe.

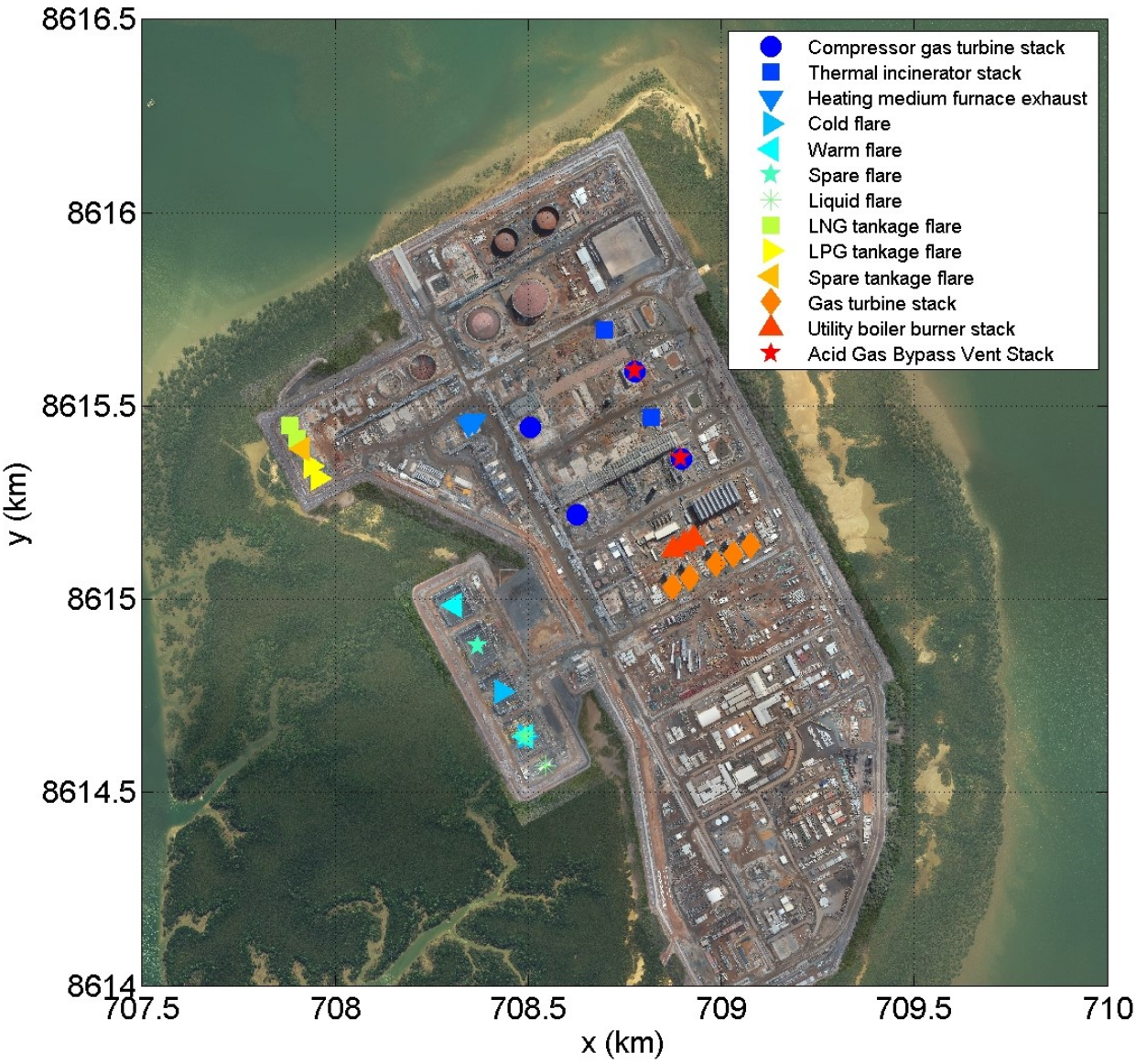

Figure 6-7: Emissions sources during commissioning, and later start-up and operation of the Onshore facility

6.10.5 Key activities, potential impacts and residual risk levels

The key activities and potential environmental impacts identified for dust and emissions management are listed in Table 6-40. The residual risk levels after the implementation of the mitigation measures contained in Table 6-42 are also identified.

Table 6-40: Key activities, potential environmental impacts and residual risk levels for dust and air quality management

Activity	Potential environmental impact	Residual risk level
General construction activities including clearing, earthworks, ground improvement, civil works, concrete batch plants and vehicle movements	• Dust deposition smothering surrounding vegetation and reducing growth • Nuisance, impacts on amenity on nearby communities	Low
Operating machinery, undertaking hot works and other general construction activities, spontaneous combustion of vegetation stockpiles	• Bushfire and subsequent reduced air quality	Low
Uncontrolled events such as lightning strike and arson		
General construction activities, including marine vessel movements, generating combustion emissions	• Increasing levels of atmospheric pollution (e.g. NO_x, SO_x)	Low
Incorrect transportation, storage and handling of fuel and other flammable and combustible materials, leading to release and the potential for a fire/explosion event	• Bushfire and subsequent reduced air quality	Moderate
Onshore clearing, earthworks and construction activities (including in intertidal zone); and the storage, handling and/or transfer fuel, oils, greases, chemicals and other flammable substances leading to fire/explosion event		
Commissioning and Operation of CCPP (System 780): • Steam blowing • CCPP commissioning and start-up of GTG/heat recovery steam generator (HRSG)/utility boilers	• Air quality exceeds Project commitments or generates community complaint • Visual nuisance reported • Air quality impacts from emissions	Low
Air blowing using compressor	• Air quality levels exceed	Low

Activity	Potential environmental impact	Residual risk level
	Project commitments or generates community complaint	
Nitrogen purging	• Uncontrolled release to air • No adverse environmental impact	Low
Furnace drying operation	• Reduced air quality from point source and fugitive emissions of gases	Low
Refrigeration equipment commissioning	• Air quality impacts from leaks and fugitive emissions • No adverse environmental impact	Low
Pre-operational testing of flare systems with PWC gas Flaring during LPG/LNG import	• Emission of NO_x, SO_x, particulates (PM_{10}) • Dark-smoke causing reduction in visual amenity • O_3 (as a secondary pollutant, not a primary emission) • Reduction in ambient air quality	Low (planned flaring) Moderate (unplanned flaring)

6.10.6 Objectives, targets and indicators

The objectives, targets and indicators for dust and air quality management that have been established for the Site are outlined in Table 6-41.

Table 6-41: Dust and air quality management objectives, targets and indicators

Objective	Target	Indicator
To minimise impacts of dust-generation on the nearby receptors (mangroves and adjacent communities) during construction	• No significant visible dust attributable to the Project outside the Site • Compliance with the air quality criteria listed in Table 6.10.3 • No deterioration of greater than 30% in	• Number of complaints of visible dust causing nuisance from the community • Air quality monitoring data • Dust deposition monitoring data • Mangrove and

Objective	Target	Indicator
	mangrove community health • No increase beyond 5 cm in ground level, averaged over 1 m^2 and a 12-month period attributed to sediment (veneer) deposition in comparison to reference sites.	sediment monitoring data
To ensure activities do not exceed Project air quality commitments To ensure no external complaints are received	• Compliance with the air quality criteria listed in Table 6-38	• Number of community complaints of visible emissions creating a nuisance • System performance monitoring • Air quality monitoring data from the NT Air Quality Network
To minimise impacts to air quality from flaring and venting and fuel combustion in fuel burning equipment		

Stack monitoring will not be undertaken for environmental purposes during commissioning; however, performance monitoring will be undertaken to verify the equipment complies with its design. Turbines and other fuel burning equipment will be commissioned individually, and due to the sequencing of commissioning, not all equipment will run concurrently, significantly reducing the number of sources generating emissions at any one time. The commissioning phase does generally not allow the fuel burning equipment to be tested at operational capacity rates and operate in the designed emission reduction modes (dry low NO_x modes for gas turbines. etc.). It is considered that air emissions during the commissioning phase will be minimal due to the small volume of fuel expected to be consumed and the duration of the commissioning activities. The NT Air Quality Network data will be examined in relation to Site activities should a community complaint be received, to assess attributability to commissioning activities. However, it is considered there will be negligible impact to ambient air quality from commissioning activities.

6.10.7 Mitigation measures

The mitigation measures that will be implemented to minimise air quality impacts and to achieve the established objectives and targets are described in Table 6-42.

Table 6-42: Dust and air quality mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.10.01	Site inductions will include the following specific components for dust and air quality management: • dust and air quality management objectives, including the avoidance of dust generation during works • key dust and air quality management measures	Company Environmental Policy Contractor HSES Policy CEMP Section 9	Before entering Site	HSES Manager Subcontractor Company
	Dust Avoidance and Suppression			
6.10.02	Planning of construction activities will consider dust management requirements where practicable.	GIIP	At all times	Subcontractor
6.10.03	Where the avoidance of dust-generation is not practicable, dust-suppression techniques to protect vegetation, worker health and amenity must be applied. Techniques may include spraying surfaces with water trucks, irrigation and stabilisation and controls such as temporary enclosures. Dust generation during abrasive blasting will be controlled by blasting in an enclosure as approved by the Project Environmental Manager. Dust-suppressant additives may be used to increase effectiveness and to reduce the volume of water required.	Environmental Commitments Register items 11.05, 19.03 & 30.04 IFC General EHS Guideline Section 1.1 Air Emissions and Ambient Air Quality (IFC 2007)	At all times	Subcontractor
6.10.04	Dust management and suppression will be undertaken	Environmental	During clearing	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	during and following vegetation clearing activities.	Commitments Register Item 19.03	activities	
6.10.05	Sources of water for dust suppression will include: • PWC mains water • reuse water from detention basins/ponds, on-site water tanks, dewatered excavations and spent hydrotest water that meets reuse water quality criteria.	IFC General EHS Guideline Section 1.1 Air Emissions and Ambient Air Quality (IFC 2007)	At all times	Construction Manager
6.10.06	Dust from onsite concrete batching will be minimised using suitable dust suppression techniques such as application of water spray, enclosures, covers or other methods. Dust associated with the operation of concrete batch plants and other small mobile mixing equipment will be managed consistent with the Environmental best management practice guideline for concreting contractors (NSW DEC 2004) and the Environmental guidelines for the concrete batching industry (EPA 1998).	IFC General EHS Guideline Section 1.1 Air Emissions and Ambient Air Quality (IFC 2007) Environmental best management practice guideline for concreting contractors (NSW DEC 2004) Environmental guidelines for the concrete batching industry (EPA 1998).	At all times	Subcontractor
	Haul/Access Road Management			
6.10.07	On-site roads required for operation phase will be sealed during the construction phase.	Environmental Commitments Register	At all times	Construction Manager

Number	Mitigation measure	Reference	Timing	Responsibility
	Construction of all permanent roads is to occur early in the construction sequence and up to finished layer (i.e. excluding final finish coat) as a minimum. The main Site access road is to be bitumen sealed.	Item 19.04		
6.10.08	For unpaved roads, the periodic application of water will be used for dust suppression. The frequency of application will be dependent on weather conditions and traffic volumes. Further measures for high-volume traffic areas, such as temporary gravel cover, may also be required. For paved roads, the removal of accumulated material from roadways may occur via cleaning with spray trucks with brushes and/or by personnel with hand equipment (e.g. shovels, bristle brooms).	IFC General EHS Guideline Section 1.1 Air Emissions and Ambient Air Quality (IFC 2007)	At all times	Construction Manager
6.10.09	Site access will be via designated access points only. These points will be stabilised through gravel pad or similar means.	GIIP	At all times	All Site personnel
	Materials Handling and Management			
6.10.10	Multiple handling of soil and rock materials will be minimised.	Environmental Commitments Register Item 19.05 IFC General EHS Guideline Section 4 Construction and Decommissioning (IFC 2007)	At all times	All Site personnel

Number	Mitigation measure	Reference	Timing	Responsibility
6.10.11	Loads in all trucks transporting soil, aggregate or other dust-generating materials to and from the construction area must be wetted down or covered.	Environmental Commitments Register Item 19.06 IFC General EHS Guideline Section 4 Construction and Decommissioning (IFC 2007)	At all times	All Site personnel
6.10.12	All trucks entering and leaving the site of works are to have any loads constrained in such a manner as to prevent the dropping or tracking of materials onto streets, including ensuring that all wheels, tracks and body surfaces are free of mud and other contaminants before entering the sealed road network (including the use of shaker screens or rubble pads).	Condition 12, Development Permit DP12/0065	At all times	All Site personnel
6.10.13	Dust generation from offloading/handling materials will be reduced by minimising the height of the drop, and by use of a chute, screens, enclosures, sprays, covers, dust guards, and dust extraction systems etc. as appropriate.	GIIP	At all times	Subcontractor
	Stockpile, Spoil and Laydown Area Management			
6.10.14	Dust from open sources will be minimised by implementing control measures such as compaction, enclosures and covers, and by increasing moisture content. Stockpiles will be managed to reduce dust-generation. Controls may include:	IFC General EHS Guideline Section 4: Construction and Decommissioning (IFC 2007) IECA (2008) guidelines	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	• locating stockpiles in areas protected from wind • minimising the number and size of stockpiles • using watering sprays and/or plastic covers on piles if wind is lifting material. Stockpile management shall be in accordance with IECA (2008) guidelines.			
	Vehicle, Equipment, Machinery and Vessel Emissions			
6.10.15	All vehicles and machinery will be fitted with appropriate emission-control equipment, will be maintained frequently and will be serviced to the manufacturers' specifications. Pre-start checklists and equipment maintenance logs indicating maintenance schedule shall be completed.	IFC General EHS Guideline Section 1.1 Air Emissions and Ambient Air Quality (IFC 2007)	At all times	All Site personnel
6.10.16	Low-sulfur fuel will be used when available to minimise emissions from vehicles, equipment and vessel operation. All fuel use will be recorded and reported to Contractor on a monthly basis. Invoices for fuel will be maintained on site as an auditable record to verify fuel usage reported. Fuel invoices will be made available to Contractor upon request.	Protection of the Sea (Prevention of Pollution from Ships) Act (Cwlth) GIIP	At all times	Subcontractor
	Atmospheric Emissions			
6.10.17	Construction activities will be managed to minimise the generation of air emissions, if practicable. Measures may include: • efficient use of fuel and electricity	IFC Performance Standard 3 Resource Efficiency and Pollution Prevention	At all times	All Site personnel

Number	Mitigation measure	Reference	Timing	Responsibility
	• establishing plant and machinery maximum idling times • adhering to the transport strategy, including scheduled bus movements from the workforce accommodation village to Site • recycling and reusing construction materials. • selection of materials and consumables with a lower greenhouse gas footprint • load detection equipment for automatic starting and stopping of power generating sets with demand • engineering (as-built) controls and design • process monitoring, detection and alarm systems • commissioning and operational testing procedures • inspections and preventative maintenance • visual monitoring.			
6.10.18	Emissions of pollutants/contaminants to the atmosphere from welding, grinding, cutting, post weld heat treatment, abrasive blasting, painting and other related works will be minimised by the use of emission controls such as encapsulation, filtration, blast chambers, grinding shrouds and fume extractors.	Abrasive Blasting Procedure (L290-AH-PRC-0032)	At all times	Subcontractor
	Commissioning Systems			
6.10.18	**Combined Cycle Power Plant (System 780):** Emission controls will be installed as per system design specifications.	Company Environmental Policy Contractor HSES Policy	Prior to commissioning	Contractor Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Air emission predictions undertaken by Company and relevant approvals obtained reflect design emission rates.	Ozone Protection Act 1989 (Cwlth) Energy Efficiency Opportunities Act 2006 (Cwlth) National Environment Protection Council. 2003 National Environment Protection (Ambient Air Quality) Measure (NEPM). National Environment Protection Council. 2011 National Environment Protection (Air Toxics) Measure (NEPM). IFC General EHS Guideline Section 1.1 Air Emissions and Ambient Air Quality (IFC 2007) BoD for the system 780 (S-0780-1222-0002 Rev 0) EIS (INPEX 2010) Commissioning Subsystem and Separable Portion Definition List (L290-	During commissioning of the various process subsystems and prior to operations	

Number	Mitigation measure	Reference	Timing	Responsibility
		AR-LIS-10009) Commissioning HSES Plan (L290-AR-PLN-10017) CEMP Table 6-38P		
6.10.19	System relevant commissioning procedures, PTW, JHAs and Safe Work Method Statements (SWMS) will be developed.	Commissioning HSES Plan (L290-AR-PLN-10017)	During commissioning of the various process subsystems	Contractor Subcontractor
6.10.20	Site notification of energisation will be issued to communicate the intent to pressurise or energise plant equipment for the first time with fluids or energy.	Commissioning Notice of Energisation Procedure L290-AR-PRC-10076 Rev 1	During commissioning	Contractor
6.10.21	Community awareness bulletins (or similar) will be released to minimise public concerns in relation to the visual impact of steam emissions.	GIIP	During commissioning	Contractor
6.10.22	Coloured steam blow and HRSG burn off will be undertaken as night time operations to minimise the visual impact.	GIIP	During commissioning of the utility boilers and HRSGs	Contractor
6.10.23	Air blowing using compressor: System design – emission controls will be installed as per design specifications for air compressor.	CEMP Table 6-38	Prior to commissioning	Contractor Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.10.24	Pre cleaning of pipes will be undertaken to minimise emissions generated by air blowing.	GIIP	During commissioning of the system	Contractor Subcontractor
6.10.25	Filtration of emitted air will be undertaken should emissions exceed dust criteria.	GIIP	During commissioning of the system	Contractor Subcontractor
6.10.26	Air blowing of pipes will be undertaken in sections to minimise potential to exceed dust criteria.	GIIP	During commissioning of the system	Contractor Subcontractor
6.10.27	Nitrogen purging: System design – emission controls will be installed as per design specifications for nitrogen purging.	CEMP Table 6-38	Prior to commissioning	Contractor Subcontractor
6.10.28	Attended transfer of tankers delivering N_2 will be undertaken to minimise potential for collision and spill.	CEMP Table 6-55 CEMP Table 6-58	During commissioning of the system	Contractor Subcontractor
6.10.29	Furnace drying operation: System design – emission controls will be installed as per design specifications for furnace drying operation	BoD for the system 640 (S-0640-1222-0001 Rev 1)	Prior to commissioning	Contractor Subcontractor
6.10.30	Use of clean PWC gas for combustion will minimise air emissions.	BoD for the system 640 (S-0640-1222-0001 Rev 1)	During commissioning	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.10.31	Refrigeration equipment: System design – emission controls installed as per design specifications for refrigeration equipment	CEMP Table 6-38	Prior to commissioning	Contractor Subcontractor
6.10.32	Refer also to Section 6.14 for additional measures relating to spills.	CEMP Section 6.14	During commissioning	Contractor Subcontractor
	Flaring during Commissioning			
6.10.33	The flare system has been designed and engineered to have in-built controls as per basis of design. This includes process monitoring and detection and alarm systems which serve to alert panel operators to manually instigate mitigation measures or will initiate automatic safety systems.	Basis of Design	During design phase	Company
6.10.34	The flare system is operated in accordance with procedural controls and operating procedures which ensure safe operations of the system, and maintains all parameters within the operational design envelope	Operations Management System	At all times	Company
6.10.35	Company will conduct regular risk-based inspections (including daily operator rounds) and routine preventative maintenance according to a risk based schedule.	Operations Management System	During use of flare system	Company
6.10.36	Company will conduct visual monitoring for dark smoke, via camera systems attached the flare system, during all flaring events.	Operations Management System	During flaring events	Company

Number	Mitigation measure	Reference	Timing	Responsibility
6.10.37	Company will conduct community engagement activities prior to any flaring occurring.	Company Community Engagement Strategy	Prior to any flaring	Company
	Monitoring and Inspection			
6.10.38	Visual inspections for airborne dust and dust deposition will be undertaken within and adjacent to Subcontractor's work area to evaluate the effectiveness of dust controls.	IFC General EHS Guideline Section 1.1 Air Emissions and Ambient Air Quality (IFC 2007) EIMP (L290-AH-PLN-10013)	Daily	Subcontractor
6.10.39	Dust monitoring will be undertaken to confirm that the generation of dust is within the agreed criteria.	IFC General EHS Guideline Section 1.1 Air Emissions and Ambient Air Quality (IFC 2007)	During commissioning of systems	Contractor Subcontractor
6.10.40	Visual airborne-dust inspections will be conducted across common work areas (e.g. haul roads) to determine whether dust suppression is required and to determine the effectiveness of existing dust-suppression controls.	IFC General EHS Guideline Section 1.1 Air Emissions and Ambient Air Quality (IFC 2007)	Daily	Contractor Area Construction Manager
6.10.41	Vegetation dust management occurs in accordance with Section 8. Incident reporting is triggered if stated below. In the event that the trigger values are exceeded, an investigation will commence as per steps below. The stepwise investigation concludes if there is no correlation	EIMP (L290-AH-PLN-10013) CEMP Section 8	Monthly for dust deposition Quarterly for sediment lensing	Subcontractor Contractor Environment Department

Number	Mitigation measure	Reference	Timing	Responsibility
	between dust and mangrove community health impacts outside of the background natural variation at site. **Mangrove health** 1. Mangrove monitoring locations will be visually inspected for evidence of dust deposition as per the approved EIMP. Where mangrove monitoring shows a decrease in community health by more than 30%, and the closest dust-deposition gauges exceed the trigger criteria in the EIMP and sediment lensing attributed to dust accumulates by more than 5 cm [averaged over 1 m^2 and a 12 month period], then immediately verbally notify Company and report as an Environmental Incident. Proceed to next step. 2. Compare against next quarterly round of EIMP surface water, mangrove, sediment and bio indicator results. Define if there is a correlation between dust deposition and impacts to the receiving environment. Incorporate the EIMP spatial impact assessment and provide management recommendations.		and mangrove health	
6.10.42	Nuisance dust management occurs in accordance with Section 8. Incident reporting is triggered if stated below. In the event that the trigger values are exceeded, an investigation will commence as per steps below. 1. Review results from real-time monitoring for particulate matter (PM_{10}) at site boundary and key sites representative of downstream communities to determine air quality (dust) levels. PM_{10} levels of up to 25% above trigger criteria in the EIMP (based on	Environmental Commitments Register Item 19.02 IFC General EHS Guideline Section 1.1 Air Emissions and Ambient Air Quality (IFC 2007) EIMP (L290-AH-PLN-	Continuous monitoring based on 24 h mean	Subcontractor Contractor Environment Department

Number	Mitigation measure	Reference	Timing	Responsibility
	daily average) less than seven consecutive days is considered to have met the dust nuisance management objective. Where the above PM_{10} criterion is exceeded, proceed to the next step. 2. Compare PM_{10} levels above the trigger criteria in the EIMP (based on daily average) with the complaints register. Where there is no correlation with dust complaints with the of PM_{10} exceedance of the closest upstream monitoring station, there is no nuisance impact and the dust nuisance management objective has been met. If there is a correlation between dust complaints and the exceedance of the closest upstream dust station, then immediately verbally notify Company immediately and report as an Environmental Incident.	10013) CEMP Section 8		
6.10.43	In the event visible dust is above typical conditions, a complaint is received from outside receptors and dust monitoring results (PM_{10}) for the monitor closest to the location of the complaint exceed the acceptable levels, then the requirements in Section 8 will be implemented.	CEMP Section 8	At all times	Subcontractor
6.10.44	Regular inspection and maintenance of vehicles/plant/equipment/machinery for good working conditions to minimise emissions through faults.	GIIP	As required per equipment maintenance checklist	Subcontractor Contractor Company
6.10.45	Review of the NT Air Quality Network data will be undertaken at times of potential peaks of emissions during commissioning.	GIIP	During commissioning	Company (related to flaring)

Number	Mitigation measure	Reference	Timing	Responsibility
				Contractor Subcontractor

6.11 Noise and vibration management

6.11.1 Current conditions

Airborne noise and vibration

Wickham Point Detention Centre, located south of the Site near the intersection of Wickham Point Road and Bladin Point Road, is the nearest noise-sensitive receptor. As the land use of this Centre is classified as industrial, for the purpose of monitoring airborne noise, Contractor will apply the industrial noise limits to the Centre (refer to Table 6-43) acknowledging that the primary industrial activity is effectively residential.

Other noise-sensitive receptors in the vicinity of the Site include residential suburbs and urban centres around Darwin Harbour. Darwin's CBD is located 10 km to the north-west of the Site and the nearest residential area is Palmerston, located approximately 4 km to the east and north-east. The relatively large distances between the Site and the sensitive receptors minimise the risks of noise and vibration related amenity impacts.

The airborne noise limits for the Project are described in Table 6-43.

Table 6-43: Project airborne noise limits

Parameter	Detection method	Location	Trigger criteria	Reference
Construction and commissioning noise	Sound level meter	Offsite: residential	55 dB(A) daytime (0700 to 1900 h) 45 dB(A) night-time (1901 to 0659 h)	EIS, Section 10.3.10
	Sound level meter	Offsite: industrial (site boundary)	70 dB(A) all times	EIS, Section 10.3.10

Underwater noise

The underwater noise environment in Darwin Harbour is influenced by shipping traffic as well as biological sources and the weather. Factors such as shallow water, tidal range and seabed types cause wide variations in the propagation of underwater noise.

Baseline underwater noise monitoring was conducted to characterise the noise environment of the nearshore area (SVT 2009). The monitoring determined that the peak ambient noise level in East Arm, Darwin Harbour, is 150–170 dB re 1 $\mu Pa^2/Hz$ (sound pressure levels) within the 0–50 Hz spectrum. This is largely influenced by existing recreational and commercial vessel traffic which is active throughout the year, as well as biological sources and weather. During 2008–09, approximately 1600 trading vessels and 5600 non-trading vessels visited the Port of Darwin and this number is expected to increase.

Sensitive receptors in the nearshore environment of the works include fish species, sea snakes and megafauna (including dolphins, whales, dugongs, turtles and crocodiles). These species may potentially occur in the vicinity of the nearshore development area,

although this area is unlikely to provide nesting or significant habitat for these fauna.

Note: Dredging is not Contractor scope of works and is not considered in this CEMP.

Commissioning noise

During commissioning activities intermittent noise of varying levels will occur across a number of different activities. The main sources of noise emission resulting from commissioning will likely arise from:

- steam blowing from power generation and distribution system
- hot alignment, coupled operation of machinery, and uncoupled runs of machinery
  - train 1 and 2
  - inlet facility
  - utilities
  - offsite
- CCPP start-up
- flushing and air blowing using permanent pumps and compressor systems.

Operational noise levels have been adopted for commissioning purposes.

Noise under normal operations

Predicted on Site noise contours for normal operation are presented in Figure 6-8.

The predicted environmental noise emission level under normal operation at the Palmerston outskirts reference location is 38 dBA. This predicted noise level complies with the environmental noise limits of 55 dB(A) during the daytime and 45 dB(A) during night-time for residential, institutional and educational areas.

Operational noise levels are predicted to comply with the 70 dB(A) LAeq noise limit at the site boundary.

It is noted that there may be potential for short term spikes in the noise levels at times. Taking the modelling for Emergency Flaring (Cold Flare, 158 dB(A) noise level data as a worst case scenario for potential noise output during commissioning, then the attenuated noise level at boundary is modelled to be at a level of 69 dB(A), which is 1 dB(A) below the permitted site boundary trigger value of 70 dB(A), demonstrating compliance to the industrial trigger level at site boundary.

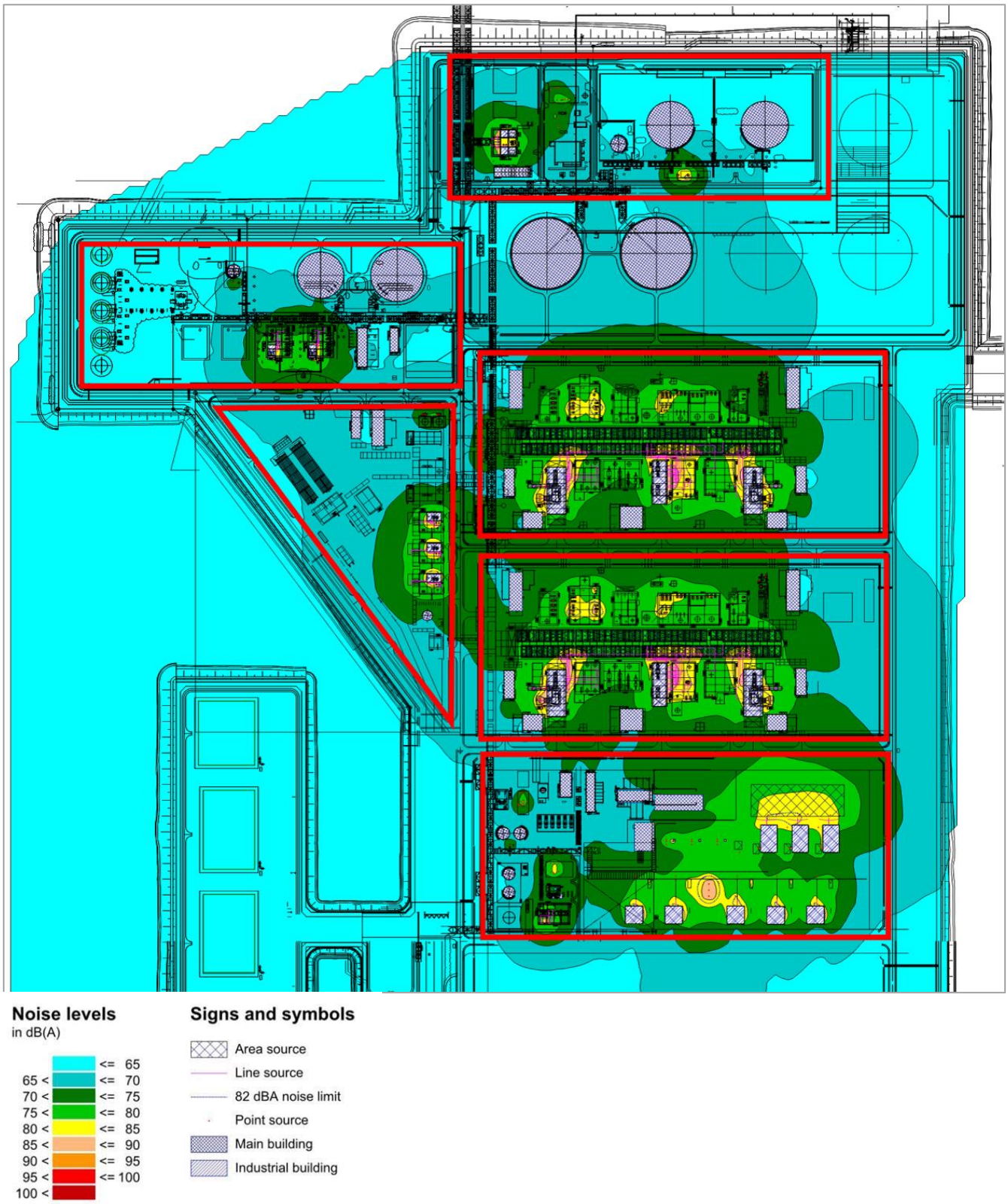

Figure 6-8: Overview of predicted noise levels under normal operating conditions

System design parameters

The environmental noise level limits (as per Table 6-43) that apply to design of the plant include:

- The maximum allowable noise level at site boundary is 70 dB(A).
- During the day at residential, institutional and educational areas the maximum allowable noise level is 55 dB(A).
- At night at residential, institutional and educational areas the maximum allowable noise level is 45 dB(A).

The plant is designed so that the noise level will not exceed 82 dB(A) or peak noise level of 140 dB(C) in any general Work Area, which is not designated as a restricted area during normal operations.

During commissioning and start-up, excursion/deviation may occur from 70 dB(A), and monitoring will be required at sources within the plant and at site boundary to determine if noise has potential to exceed environmental trigger values.

Absolute maximum noise levels

It is recognized that noise levels within the following enclosures could exceed 115 dB(A) due to equipment noise emissions and the closed reverberant environment. The following enclosures will be subject to administrative controls such as warning signs and provision of PPE:

- MR/HP PR Compressor gas turbine enclosure at Train 1 and Train 2
- LP/MP MR Compressor gas turbine enclosure at Train 1 and Train 2
- CCPP gas turbine generator enclosure
- CCPP gas turbine enclosure
- CCPP TK88 enclosure
- CCPP DLN enclosure
- CCPP steam turbine enclosure
- CCPP steam turbine generator enclosure.

6.11.2 Key activities, potential impacts and residual risk levels

General construction—airborne noise and vibration

Work hours vary across the Site and throughout construction. Detailed civil works and installation of the permanent LNG facilities are expected to occur during daytime hours only; however, there is the potential for unexpected delays in the construction schedule to be addressed via extended work hours. Operational hours of the concrete batch plants will need to be flexible to meet the changing demands of concrete on site. The temporary STP will operate 24 hours per day, 7 days per week. MOFTP is designed to be operational 24 hours a day to provide flexibility in the delivery of modules to site.

Numerous construction activities on Site have the potential to generate airborne noise and vibration though it is unlikely that general construction activities will result in airborne noise or vibration impacts within the receiving environment. However, as a consequence of works occurring outside of "standard" hours, Contractor requires that mitigation measures consistent with the Noise guidelines for development sites in the Northern Territory (NRETAS 2011) be implemented on Site.

Vehicle movement to and from the Site may generate noise impacts for sensitive

receptors along traffic road routes. These offsite impacts will be managed in accordance with the Road Transport Management Plan (L290-AB-PLN-0147).

Onshore piledriving is required as part of the detailed civil works to support the permanent LNG plant facilities. There will be multiple piling rigs functioning simultaneously at different locations across Site. The average daily range would be from 14 to 20 piles per day, with a piling rig striking a pile once every two seconds.

Using Australian Standard AS 2436:2010, Guide to noise and vibration control on construction, maintenance and demolition sites, the expected airborne noise from this scenario was evaluated, with a sound pressure level of 125 to 137 dBA of piling hammers. Assuming 10 dBA reduction due to no clear line of sight between source and receiver, average sound levels (LAeq) were calculated and were below established airborne noise limits for the nearest sensitive receptors. Accurate airborne noise analyses are conducted by monitoring noise levels from test piling prior to onshore piling works to ensure noise trigger criteria are not exceeded. If required, mitigation measures will be implemented consistent with AS 2436:2010. Examples of these measures are included in Table 6-46.

Underwater noise and vibration

An Underwater Noise Management Plan (UNMP; L290-AH-PLN-10015) was developed and approved as per Condition 9 of the EPBC Approval 2008/4208. All piledriving activities for the site have been completed to date. Any revisiting of these activities would require the UNMP to be revised and reapproved.

Activities which may still generate underwater noise and vibration in the marine (nearshore) environment include operation of the MOFTP and vessel movement.

The key activities, potential environmental impacts and residual risk levels identified for noise and vibration management for the Site are listed in Table 6-44. The residual risk levels after the implementation of the mitigation measures contained in Table 6-46 are also identified.

Table 6-44: Key activities, potential environmental impacts and residual risk levels for noise and vibration management

Activity	Potential environmental impact	Residual risk level
General construction activities (including onshore piledriving, blasting (if required), nearshore bulk fill and conveyors)	• Airborne noise or vibration causing nuisance, disturbance or health impacts to local community • Airborne noise and vibration impacts temporarily displacing terrestrial fauna	Low
General nearshore construction e.g. MOF causeway ground improvement works and operation of MOFTP	• Underwater noise or vibration impacting marine fauna • Underwater noise leading to physiological damage (injury) and/or death of marine megafauna • Underwater noise leading to adverse behavioural impact to marine megafauna	Moderate
Commissioning:	• Noise emissions exceed limits in Table	Low

Activity	Potential environmental impact	Residual risk level
• uncoupled runs of machinery Train 1 and 2, Inlet facility, Offsite and Common utilities • hot alignment and coupled operation of machinery Train 1 and 2, Inlet, Offsite and common utilities	6-43 or cause a community complaint	
Steam blowing during commissioning of the CCPP (System 780)	• Noise emissions exceed limits in Table 6-43 or cause a community complaint (assumes silencers and modelled cumulative noise for Project)	Low
CCPP Start-up, including combustion tuning GTG/ HRSG/utility boilers	• Noise impacts from operating turbines	Low
Use of rotating/ moving equipment Flaring (planned and unplanned).	• Contribution to offsite noise/vibration effects at nearest receptors • Nuisance to the community • Change in fauna behaviour (e.g. mating, feeding) • Fauna moving away from or avoiding habitat areas • Adverse effects on the natural environment and human health	Low

6.11.3 Objectives, targets and indicators

The objectives, targets and indicators identified for noise and vibration management for the Site are listed in Table 6-45.

Table 6-45: Noise and vibration management objectives, targets and indicators

Objective	Target	Indicator
To minimise the impacts of construction noise, including from commissioning, and vibration on local communities (nearest sensitive receptors)	• No environmental nuisance infringements as a result of construction activities	• Feedback trends within the stakeholder management system
	• No exceedance of the	• Noise monitoring

Objective	Target	Indicator
	noise limits defined in Table 6-43 which correlate with noise complaints.	results at Palmerston and adjacent to Bladin Point development park • Subcontractor monitoring results at source demonstrate that activity does not exceed design criteria/ performance

6.11.4 Mitigation measures

The mitigation measures that will be implemented to minimise the impacts of noise and vibration and to achieve the established objectives and targets are described in Table 6-46.

Table 6-46: Noise and vibration mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.11.01	Site inductions will include the following specific components for noise and vibration management: • noise and vibration sources during construction • potential impacts of excessive noise emissions on marine megafauna and other sensitive receptors • the importance of managing noise at the source • noise monitoring that will be carried out on Site.	Company Environmental Policy Contractor HSES Policy CEMP Section 9	Before entering Site	HSES Manager Subcontractor Company
6.11.02	Marine Megafauna Interaction and Observation Procedures have been developed by Company to provide guidance regarding marine megafauna management, and its prescriptions will be adhered to by Contractor and Subcontractor.	Environmental Commitments Register Item 7.01	Prior to commencement of works	Subcontractor Contractor
6.11.03	Site inductions will include the following specific components for noise and vibration management: • noise and vibration sources during commissioning • potential impacts of excessive noise emissions on marine megafauna and other sensitive receptors • the importance of managing noise at the source • noise monitoring that will be carried out on Site.	Company Environmental Policy Contractor HSES Policy	Before entering site	Subcontractor Contractor Company
	Site Management			

Number	Mitigation measure	Reference	Timing	Responsibility
6.11.04	Construction activities will be managed consistent with the requirements of Australian Standard AS 2436:2010, Guide to noise and vibration control on construction, maintenance and demolition sites. Management of routine construction activities to minimise noise will be addressed by: • regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration • regular identification of noisy activities and adoption of improvement techniques (via JHAs, inspections etc.) • controlling noise and vibration at the source (e.g. by operating plant and equipment in the quietest and most efficient manner) • restricting vehicle access and movement around site to defined access roads • minimising the movement of materials and plant • scheduling respite periods • where practicable, using temporary site buildings and material stockpiles as noise barriers.	AS 2436:2010, Guide to noise and vibration control on construction, maintenance and demolition sites Noise guidelines for development sites in the Northern Territory (NRETAS 2011) IFC EHS Guideline Section 1.7 Noise (IFC 2007)	At all times	Subcontractor
6.11.05	A comprehensive feedback procedure has been developed to provide a standard process for responding to and resolving issues raised by the community, including complaints in relation to local amenity. Site personnel are required to direct all community feedback/complaints to the 24/7 community hotline.	Noise guidelines for development sites in the Northern Territory (NRETAS 2011) IFC EHS Guideline Section 1.7 Noise (IFC 2007) Community Relations Plan L290-AB-PLN-0150	At all times	All Site personnel

Number	Mitigation measure	Reference	Timing	Responsibility
	Vehicle Movement			
6.11.06	The Road Transport Management Plan (L290-AB-PLN-0147) prepared to manage noise associated with the movement of construction vehicles and plant to and from the Site will be complied with. The plan complies with: • Conditions of the Development Permit relating to traffic • Noise guidelines for development sites in the Northern Territory (NRETAS 2011).	Environmental Commitments Register Item 29.05 Noise guidelines for development sites in the Northern Territory (NRETAS 2011) Development Permit DP 12/0065	Prior to traffic routes being utilised by construction vehicles	Subcontractor
	Onshore Piledriving – Airborne Noise Management			
6.11.07	Prior to the commencement of piledriving activities, notification of the works will be issued to residents that are at risk of being impacted by noise emissions.	Community Engagement Plan (C025-AG-PLN-0026)	Community Engagement Plan	Contractor
6.11.08	Piledriving activities will be undertaken during daylight hours. Any piledriving after dark will only be onshore and only resorted to if Project construction activities fall significantly behind schedule and it is agreed to by Subcontractor, Contractor and Company, with appropriate management measures accommodated. Any night-time onshore piling will be subject to a risk assessment conducted by Subcontractor and Contractor and approved by Company, to ensure all technical and environmental objectives are properly addressed prior to	Environmental Commitments Register items 7.12 & 29.04	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	the initiation of works. Refer to the UNMP (L290-AH-PLN-10015) for additional requirements relating to nearshore piledriving.			
6.11.09	A detailed airborne noise analysis will be conducted prior to the execution of the onshore piledriving works, and for the noise level assessment in relation to the project noise trigger criteria (Table 6-43). Based on the above analysis, appropriate mitigation measures will be implemented, such as the following examples: • enclosing hammerhead and tip of pile in acoustic screen • acoustically dampening sheet piles to reduce vibration and resonance • using resilient pad between pile and hammerhead • fitting more-efficient silencer or exhaust or power units and/or base machines • acoustically dampen panels and covers of power units and/or base machines.	AS 2436:2010, Guide to noise and vibration control on construction, maintenance and demolition sites EIMP (L290-AH-PLN-10013)	Prior to the commencement of onshore piledriving	Subcontractor
6.11.10	At the commencement of, and periodically during, onshore piledriving works, noise monitoring will be conducted at the source to verify compliance with the noise criteria.	GIIP EIMP (L290-AH-PLN-10013)	During onshore piledriving works	Subcontractor
	Commissioning General			
6.11.11	System relevant commissioning procedures, PTW, JHA, and	Noise Control Specification, L290-AH-	Prior to commencement of	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	SWMS. All commissioning SWMS prepared by Contractor. Engineering design (all applicable standards, codes of practice, international codes, guidelines) - covers noise levels. Comply with Australian Standard for managing noise on construction sites.	SPC-0002 Noise guidelines for development sites in the Northern Territory (NRETAS 2011) IFC EHS Guideline Section 1.7 Noise (IFC 2007)	work	
6.11.12	Community notifications prior to works of 24 hour, 6 day week working schedule. Publication of community hotline for feedback and grievances.	Community Relations Plan L290-AB-PLN-0150	At all times	Company Contractor
6.11.13	Noise monitoring including baseline (to be conducted at one meter from the equipment surface or acoustic enclosure if noise abatement measure is applied)	Noise Control Specification, L290-AH-SPC-0002 EIMP (L290-AH-PLN-10013)	Commissioning notice of energisation (NOE) procedure L290-AR-PRC-10076 Rev 1 Continuous, reported as 12 hr L_{Aeq}	Contractor Subcontractor
6.11.14	Activities will be conducted preferentially during the day, so that receptors are not exposed to high noise levels at night.	Noise guidelines for development sites in the Northern Territory (NRETAS 2011) IFC EHS Guideline Section 1.7 Noise (IFC	As required	Contractor, Subcontractor, Company

Number	Mitigation measure	Reference	Timing	Responsibility
		2007)		
	Commissioning Systems			
6.11.15	**Combined Cycle Power Plant (System 780):** Noise is mitigated through absorption. Absorption involves installation of silencers on stacks. Duration of steam blow restricted to 1 hour to mitigate exposure. Operator of plant has confirmed max 1 hour duration for max noise level event.	Noise Control Specification, L290-AH-SPC-0002	Prior to commencement of work	Contractor
6.11.16	Site notification of energisation will be made to communicate the intent to pressurise or energize plant equipment for the first time with fluids or energy.	Noise Control Specification, L290-AH-SPC-0002	24hrs prior to energization, 6 days a week	Contractor, Subcontractor
6.11.17	Noise is mitigated through design – enclosures (acoustic insulation). Enclosures involve either overall isolation or housing using fully sound proof enclosures or hoods. Partial isolation also is achieved through use of screens, embankments, etc.	Noise Control Specification, L290-AH-SPC-0002	Prior to commencement of work	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Monitoring and Inspection			
6.11.18	Unattended noise monitoring terminals will be used to continuously monitor sound levels (in decibels) during general construction activities. Results from the noise loggers will be assessed on a monthly basis, or following receipt of a noise complaint. Audio will be continuously recorded and these recordings will be referenced if project noise limits are exceeded or complaints are received.	IFC EHS Guideline Section 1.7 Noise (IFC 2007) EIMP (L290-AH-PLN-10013)	Refer to EIMP (L290-AH-PLN-10013)	Contractor
6.11.19	Where noise complaints are received during construction, attended noise monitoring will be conducted to confirm actual construction noise levels and inform potential changes to construction planning and management.	IFC EHS Guideline Section 1.7 Noise (IFC 2007)	As required	As required
6.11.20	In the event a complaint is received or noise monitoring results exceed the noise criteria, then the requirements in Section 8 will be implemented.	CEMP Section 8	As required	As required
6.11.21	Assessment of sound levels dB(A) will be undertaken and compared to initial noise data. Monitoring will be conducted on a continual basis. Permanent sound monitors will be deployed, which will also continuously record sound. These recordings will be referenced if Project noise limits are exceeded or complaints are received.	Noise Control Specification, L290-AH-SPC-0002 EIMP (L290-AH-PLN-10013)	Prior to and during commissioning	Subcontractor Contractor
6.11.22	Nuisance noise management occurs in accordance with Section 8. Incident reporting is triggered if stated below. In the event that a noise related complaint is received, the	EIMP (L290-AH-PLN-10013) Community Relations	As required	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	following steps will be taken: 1. Review noise monitoring data closest to the complainant's location to determine whether there has been an exceedance. Audio will be continuously recorded and these recordings will be referenced if project noise limits are exceeded or complaints are received. Determine if the exceedance is associated with construction activities, or natural sounds. If construction activities then immediately verbally notify Company and report as an incident. Proceed to next step. 2. Assist the Community Relations Manager to prepare an appropriate response to the complainant as per the Community Relations Plan.	Plan L290-AB-PLN-0150 CEMP Section 8		
6.11.23	Where airborne noise monitoring results exceed the noise criteria the following steps will be taken: • The exceedance will be reported as an incident in accordance with Section 8 • Compare results to other noise monitoring locations to assess if they are consistent. • Check monitoring data for outliers, i.e. results that look suspiciously high compared with previous results. If outliers exist, redo field measurements.	EIMP (L290-AH-PLN-10013) CEMP Section 8	As required	Contractor

6.12 Waste management

6.12.1 Description of construction waste types

The various types of solid and liquid wastes expected to be generated by construction activities are:

- listed wastes
- non-listed wastes
- hazardous wastes
- non-hazardous wastes
- quarantine wastes
- recyclables
- controlled wastes.

A description of each type is provided below.

Listed wastes

Listed wastes are wastes listed under Schedule 2 of the WMPC Regulations. Listed wastes are detailed in Appendix E. The main listed wastes to be generated on Site include but are not limited to:

- spent blast materials including potentially contaminated Garnet and steel grit
- treated timber
- hydrocarbon based propellants
- paints and solvents
- tyres
- batteries
- hydrocarbon-impacted materials, including rags, contaminated soils and used spill-response equipment, and oily water
- greases, waste oils, and lubricants
- sewage and sewage sludge
- clinical wastes.

Non-listed wastes

All other types of wastes not indicated in Schedule 2 of the WMPC Regulations are considered non-listed wastes.

Hazardous wastes

Hazardous wastes are wastes that pose a threat or risk to public health, safety or the environment. They include substances which may be toxic, infectious, mutagenic, carcinogenic, explosive, flammable, corrosive, oxidising or radioactive. Hazardous wastes include medical waste, excess or spent chemicals, contaminated scrap metals or drums, oily rags and absorbents, solvents, batteries, fluorescent tubes, oily sludge, paints and paint drums, oil filters, sewage and contaminated soil. All hazardous wastes are considered listed wastes.

Non-hazardous wastes

Non-hazardous wastes are wastes composed of, or containing, materials which are not harmful to humans and which would not have a serious impact on the environment. Non-hazardous wastes include putrescible solids and liquids, and inert solids, including paper, domestic waste, scrap metal, plastics, wood, glass, concrete, grout and cardboard. Some non-hazardous wastes are classified as listed waste (e.g. tyres).

Quarantine wastes

Quarantine wastes are materials or goods of quarantine concern as determined by the DAWR Biosecurity and which are subject to and/or identified under the *Biosecurity Act 2015* and associated legislation. They include materials used to pack and stabilise imported plant and equipment; galley food and other waste from overseas vessels; human, animal or plant waste brought into Australia; refuse or sweepings from a hold of an overseas vessel; and any other waste or material that has come into contact with the quarantine waste. Quarantine wastes associated with the Project will be identified/generated during quarantine inspections at the Port of Darwin East Arm Wharf DAWR facility and on board vessels at the MOF and the quarantine premises at Bladin Point. Quarantine wastes only refer to wastes managed as quarantine products under direction of DAWR or in line with quarantine management procedures. Waste managed at the quarantine facility is only quarantine waste when a quarantine issue is identified and the quarantine pad is actively managed as quarantine approved pad, at all other times waste generated at the quarantine facility is to be managed in accordance with the general site waste requirements

Recyclables

Recycle/recovery is the conversion of wastes into usable materials and/or extraction of energy or materials from wastes. Recyclable materials include paper and cardboard, plastics, glass, metal, wood, tyres, and vegetation and organic matter.

The anticipated waste types for the onshore and nearshore construction works, based on scopes of works, are summarised in Table 6-48.

Waste receptacles will be strategically located around the Site and temporary facilities as required.

Controlled wastes

Controlled wastes are wastes listed under NT EPA Guide for Completing Controlled Waste Consignment Authorisation (CWCA) Form, and NT EPA Guide for Completing Waste Transport Certificate (WTC). Controlled wastes include all listed wastes with further additions such as quarantine waste.

6.12.2 Commissioning waste sources

The majority of commissioning wastes generated are related to hydrocarbon waste streams, and will be handled as listed (controlled) wastes when these cannot be treated on Site.

The main types of process wastes include but are not limited to wastes such as contaminated amine, caustic wash water, chemical cleaning solution, rejected strainers or cartridges that were hydrocarbon contaminated, oil sludge, filters and used solvent, chemicals and adsorbents residual wastes. Others include liquid discharges from cleaning the process trains, CCPP and slug catchers. The main waste generation activities are summarised in Table 6-47, reflecting commissioning waste streams that are of modest or

larger volumes that may need to be treated prior to discharge. Minor waste streams are not included as testing of pumps is undertaken as recirculation; pressure leak test water and cleaning water has been included in hydrotesting; hot oil/lube oil flushing is considered in the context of accidental spills/leaks only.

Table 6-47: Summary of wastes sources during commissioning

Source of Waste	Activity
CCPP	Hydrostatic testing
	Hydrostatic testing with ammonia
	Blowdown neutralisation
AGRU Degreasing Water (3wt% caustic)	Chemical cleaning
AGRU Rinsing Water	Rinsing
Cooling System Initial Flushing Water	Flushing
Cooling System Passivation Water	Chemical passivation
Firewater system testing (with potable water)	Functional testing

Bulk packaging wastes, chemicals or adsorbents that are consumed or rejected during commissioning will be managed as per its SDS and in accordance with the mitigation measures in Table 6-51. Just in time delivery is adopted for chemicals and adsorbents procurement to minimise waste generation from spillage or expiration.

Table 6-48: Anticipated types of wastes

Waste type	Recyclable	Listed	Schedule 2 category (as applicable)
Domestic waste			
Aluminium cans	Y	N	N/A
Cardboard cartons/paper	Y	N	N/A
Food containers (inorganic)	Y	N	N/A
Food waste	N	N	N/A
Glass bottles	Y	N	N/A
Plastic	Y	N	N/A

Waste type	Recyclable	Listed	Schedule 2 category (as applicable)
Non-hazardous waste			
Bitumen	Y	N	N/A
Bulbs (non-fluorescent)	Y	N	N/A
Cables	Y	N	N/A
Cement claddings	N	N	N/A
Concrete	Y	N	N/A
Glass	Y	N	N/A
Insulation material	N	N	N/A
Lime	N	Y	Basic solutions or bases in solid form
Metals	Y	N	N/A
Packaging material (miscellaneous)	N	N	N/A
Packing cartons	Y	N	N/A
Paint, drums (set, dry)	Y	Y	Containers that are contaminated with residues of a listed waste
Plastic containers	Y	N	N/A
Plastic wrapping	N	N	N/A
Printer toners	Y	N	N/A
Soil contaminated with weeds/seeds	N	N	N/A
Stationery	N	N	N/A
Tyres	Y	Y	Tyres
Vegetation	Y	N	N/A
Vehicle washdown sludge/sediment*	N	Y	Soils contaminated with a listed waste

Waste type	Recyclable	Listed	Schedule 2 category (as applicable)
Welding rods (containing chromium)	Y	Y	Chromium compounds (hexavalent and trivalent)
Welding rods (not containing chromium)	Y	N	N/A
Wood, non-treated	Y	N	N/A
Wood, treated	Y	Y	Waste from the manufacture, formulation and use of wood-preserving chemicals
Hazardous waste			
Acids	N	Y	Acidic solutions or acids in solid form
Adhesives, glues, resins (cured or uncured)	N	Y	Waste resin, latex, plasticiser, glue & adhesive
Ammonium hydroxide, alkaline cleaners, amines, waste lime and cement powder	N	Y	Basic solutions or bases in solid form
Bases, caustic neutralised waste	N	Y	Basic solutions or bases in solid form
Batteries (Lead acid)	Y	Y	Lead; lead compounds
Batteries (Ni-Cd)	Y	Y	Cadmium; cadmium compounds
Containers (drums and barrels) contaminated with a listed waste	Y	Y	Containers that are contaminated with residues of a listed waste (that have not been cleaned)
Contaminated soil and sediment*	N	Y	Soils contaminated with a listed waste
Fluorescent lamps	N	Y	Mercury; mercury compounds
Grease	Y	Y	Waste mineral oils

Waste type	Recyclable	Listed	Schedule 2 category (as applicable)
Lubricants (synthetic, non-synthetic)	Y	Y	Waste mineral oils
Oily rags and filters	N	Y	Waste mineral oils
Oily water	N	Y	Waste oil/hydrocarbons mixtures/emulsions in water
Paint drums (not set)	N	Y	Containers that are contaminated with residues of a listed waste
Paints, dyes, lacquers, varnish	N	Y	Waste ink, dye, pigment, paint, lacquer & varnish
Raw sewage	N	Y	Sewage sludge & residues
Refrigerants	N	Y	Organohalogen compounds not elsewhere listed
Solvents	N	Y	Organic solvents
Spent blast material (containing garnet, paint, etc.)*	N	Y	Waste from the production, formulation and use of inks, dyes, pigments, paints lacquers and varnish
Spill clean-up materials, used	N	Y	Waste mineral oils
Vehicle wash waters, industrial plant washwaters	N	Y	Waste oil/hydrocarbons mixtures/emulsions in water
Waste cement	N	Y	Basic solutions or bases in solid form
Waste chemicals (amines, ammonia, others)	N	Y	Basic solutions or bases in solid form
Waste oil	Y	Y	Waste mineral oils unfit for their original intended use
Clinical waste			
Dressings, bandages, syringes	N	Y	Clinical and related wastes

Waste type	Recyclable	Listed	Schedule 2 category (as applicable)
Empty medical containers	N	Y	Clinical and related wastes
Excess or waste medicines/solutions	N	Y	Clinical and related wastes

* *Will require testing to determine level of contamination to characterise waste for disposal.*

6.12.3 Contractor Waste Management Procedure

Contractor has developed the Waste Management Procedure (WMP) (L290-AH-PRC-10295), which describes the waste management strategies at Bladin Point in detail, defining the process for waste identification, implementation of waste mitigation measures using the waste management hierarchy of control, characterisation, profiling, packaging, storage, labelling, inspection, transport onsite and transfer to the appropriate waste vendor, including completion of all required characterisation, transportation, and disposal documentation. Of particular importance is the management of Listed and Controlled wastes on Site, where the WMP addresses these in detail including Subcontractor responsibilities in each stage of the process. The WMP also outlines regulatory context and requirements for the project specifically the WMPC Act, and WMPC Regulations.

The WMP applies to all activities within Contractor's scope and outlines the processes required to be followed by Contractor, and Subcontractors (including Lower Tier Subcontractors) for the appropriate management of construction wastes.

6.12.4 Key activities, potential impacts and residual risk levels

The key activities and potential environmental impacts identified for waste management are listed in Table 6-49. The residual risk levels after the implementation of the mitigation measures contained in Table 6-51 are also identified.

Table 6-49: Key activities, potential environmental impacts and residual risk levels for waste management

Activity	Potential environmental impact	Residual risk level
Storage, transport or disposal of non-hazardous waste (including domestic waste)	• Incorrect assessment and classification and/or cross contamination leading to: – pollution of the marine environment and waterways, including eutrophication – attraction of native and pest animals (e.g. seagulls) to waste-collection sites and buildings – odours – increased fire risk – reduced visual amenity	Low
Generation of waste material	• Contamination of recyclable items • Pollution of non-waste items • Excessive disposal to landfill	Low

Activity	Potential environmental impact	Residual risk level
	• Excessive resource consumption	
Storage, transport, disposal or release of wastes containing weeds and seeds (e.g. vegetation waste sediment or sludge from the vehicle washdown bay)	• Spread and introduction of weeds and pest species, leading to non-compliance	Low
Temporary storage of sewage from ablutions facilities	• Increased nutrient and other contaminant concentrations in receiving waters resulting from leaking wastewater storage tanks • Pollution of the marine environment and waterways, including eutrophication • Odours	Low
Storage, transport or disposal of hazardous liquid, solid, or semi-solid waste (including sewage from ablutions and temporary STP waste by-products)	• Improper waste collection and disposal method causing a spill or leak, or incorrect assessment and classification and/or cross contamination leading to: – atmospheric contamination – surface water and groundwater pollution – soil contamination – pollution of the marine environment and waterways – effects on flora and fauna – toxic effects on marine biota – death or injury to native animals – odours – increased fire risk – risk to human health – reduced visual amenity	Moderate
Reporting and recording of wastes, including listed wastes and sewage	• Incorrect reporting of wastes, resulting in a breach of permit conditions	Moderate
Commissioning general	• Residual product in waste containers, being incorrectly disposed of, causing pollution the environment	Low
Commissioning of Drainage and Effluent System	• Generation of sludge cake	Low

Activity	Potential environmental impact	Residual risk level
(System 750)		

6.12.5 Objectives, targets and indicators

The objectives, targets and indicators for waste management that have been established are outlined in Table 6-50.

Table 6-50: Waste management objectives, targets and indicators

Objective	Target	Indicator
To prevent environmental impacts from waste generated during construction	• Zero environmental incidents associated with waste management • Chemicals and hazardous substances used during all phases of the Project will be selected and managed to minimise the potential adverse environmental impact associated with their disposal. • Implement recycling/re-use • Minimise the quantity of wastes disposed to landfill	• Number of incident reports and severity of incidents resulting from waste management i.e. incorrect characterisation or disposal • Records of materials selection process • Records of waste quantities (annual volumes of waste produced) disposed of, methods of disposal, end point location and volumes of waste recycled/reused
To maximise commissioning waste reuse and recycling	• 100% reuse and recycle of reusable, recyclable materials	• Records of recyclable, reusable materials
To minimise the impacts of commissioning generated liquid discharges, solid wastes on receiving environment	• Zero releases of non-compliant discharges into the receiving environment • Zero solid waste disposal infringements	• Number of incident reports

6.12.6 Mitigation measures

The waste hierarchy shown in Figure 6-9 will be used to guide waste management for construction, with avoidance and re-use being the preferred options. Waste disposal is

the least preferred option.

The WMPC Act requires that reasonable and practicable measures be taken to prevent or minimise the pollution or environmental harm associated with waste management and reduce the amount of waste produced.

The mitigation measures that will be implemented to achieve the established objectives and targets in accordance with the waste hierarchy (Figure 6-9) are described in Table 6-51.

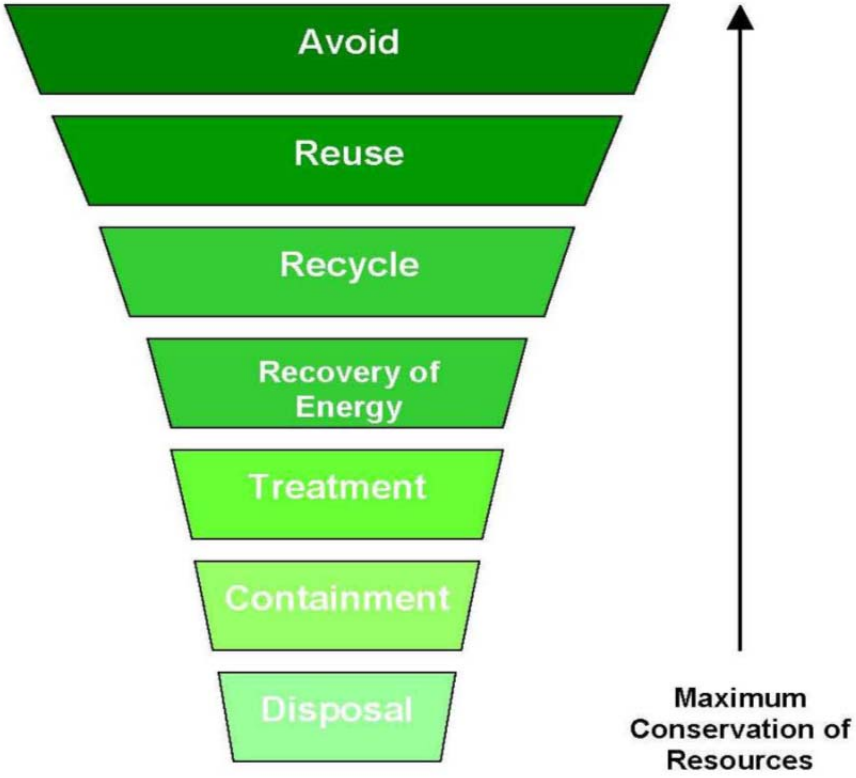

Figure 6-9: Waste management hierarchy

Source: WasteNet, Australia

Table 6-51: Waste mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.12.01	Site inductions will include the following specific components for waste management: • identification of waste types, including non-hazardous waste, hazardous waste and Listed/Controlled waste • key requirements for handling, transportation and storage, including segregation of wastes • waste storage facilities on the Site.	Company Environmental Policy Contractor HSES Policy CEMP Section 9 IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) Waste Management Procedure (L290-AH-PRC-10295)	Before entering Site	HSES Manager Subcontractor Company
6.12.02	Personnel who routinely handle hazardous materials or wastes or Listed/Controlled wastes (e.g. refuelling personnel, pump operators, mechanics, and stores personnel) will receive training in handling, transporting and storing hazardous materials or wastes or Listed/Controlled; in reporting and documentation requirements; and in spill clean-up techniques and practices.	Environmental Commitments Register Item 21.06 CEMP Section 6.13 CEMP Section 6.14 CEMP Section 9 IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) WMPC Regulations Waste Management	Before entering Site	HSES Manager Subcontractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
		Procedure (L290-AH-PRC-10295)		
	Waste Management Procedure			
6.12.03	The Contractor Waste Management Procedure (WMP) for the Site will be implemented across the project. The WMP adheres to NT EPA Guidelines for Waste Transport Certificate (WTC) and Controlled Waste Consignment Authorisation (CWCA). The WMP includes information to aid in the development of work method statements and to direct waste practices, waste profiling to develop a detailed understanding of the projects construction waste streams.	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) Environmental Commitments Register Items 22.04 and 22.02 NT EPA Guide for Completing Controlled Waste Consignment Authorisation (CWCA) Form NT EPA Guide for Completing Waste Transport Certificate (WTC) Waste Management Procedure (L290-AH-PRC-10295)	At all times	All Site personnel
	Avoid and Reduce			
6.12.04	Chemicals and hazardous substances used during all phases of the Project will be selected and managed to minimise the potential adverse environmental impact	Environmental Commitments Register	Procurement	Subcontractor Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	associated with their disposal	Item 22.04		Company
6.12.05	Waste minimisation will be included in the tendering and contracting process.	Environmental Commitments Register Item 22.02	Procurement	Procurement and contracts personnel Subcontractor
	Re-use			
6.12.06	Existing items will be re-used where practicable to reduce the need for additional purchases, such as steel and timber formwork, waste concrete, etc. Details and extent of materials re-use are found in Contractor WMP.	WMPC Act (NT) IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) Waste Management Procedure (L290-AH-PRC-10295)	At all times	All Site personnel
6.12.07	New items/materials should be stored separately from the items for re-use.	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007)	At all times	Subcontractor Contractor Company
	Recycle / Recovery			
6.12.08	Where avoidance and re-use is not possible, recycling or recovery (the conversion of wastes into usable materials and/or extraction of energy or materials from wastes) will be considered.	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007)	At all times	Subcontractor Contractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	This principle will be incorporated into the development of work methods, supply contracts and subcontractor waste management plans.	Waste Management Procedure (L290-AH-PRC-10295)		
6.12.09	Recycling bins will be provided in the office, crib rooms and on board vessels for the following materials: • paper and cardboard • aluminium tins/cans • plastics • glass.	IFC General EHS Guideline Section 1.6 Waste management EPA7 (as amended) Condition 16	At all times	Subcontractor Contractor Company
6.12.10	All metal wastes that are not reused will be recycled. Designated recycling bins will be provided during construction works for metal wastes and other recyclable construction waste where appropriately segregated. The contents will be taken by a licensed subcontractor to a specialist recovery facility for recycling.	EPA7 (as amended) Condition 16 Waste Management Procedure (L290-AH-PRC-10295)	At all times	Subcontractor
6.12.11	Chemicals and adsorbents suppliers will collect and remove products storage containers from site where feasible for reuse.	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) Waste Management Procedure (L290-AH-PRC-10295)	At all times	Subcontractor Contractor
	General Waste Handling, Housekeeping and Storage			

Number	Mitigation measure	Reference	Timing	Responsibility
6.12.12	Handling of all wastes will be undertaken in accordance with the SDS (where applicable) and relevant HSE requirements, including PPE and manual handling as per the Site safety procedures.	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) IFC General EHS Guideline Section 2.0 Occupational Health and Safety (IFC 2007)	At all times	Subcontractor
6.12.13	Appropriate temporary containment facilities will be used for the storage of chemicals, fuel, hazardous, and Listed/Controlled waste until permanent infrastructure is in place. These facilities will comply with the appropriate standards, bunding and containment requirements in Section 6.13.	Environmental Commitments Register items 21.07 & 22.05 IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) Waste Management Procedure (L290-AH-PRC-10295)	At all times	Subcontractor Contractor Company
6.12.14	The hazardous waste storage facility on Site will: • be appropriately equipped with spill kits, fire extinguishers, PPE, first-aid kits, hand-wash stations, and SDS for key substances stored as required • have appropriate controls to prevent ingress of and inundation where there is a potential for contamination. i.e. open waste metal skips do not pose any threat if skips drain freely	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) CEMP Section 6.13 Waste Management Procedure (L290-AH-PRC-10295)	At all times Housekeeping inspections as per inspection schedule	Subcontractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	• have adequate stormwater drainage, which will include diversion of contaminated water from hazardous waste storage facilities to a contained area where treatment can be applied if required. • be kept in a neat, clean and safe condition • be subject to regular housekeeping inspections.			
6.12.15	Waste will be stored in bins or skips at designated waste stations. Waste stations will consist of bins for multiple waste streams placed together as relevant to waste streams generated in that area. Waste will be separated into Listed/Controlled waste and non-Listed/non-Controlled waste. Non-Listed/non-Controlled waste will, where possible, be separated into recyclable or reusable waste. In the unlikely event of the discovery of any unidentified, unlabelled wastes, they will be treated as Listed/Controlled waste and handled and stored accordingly, as per Contractor WMP.	Environmental Commitments Register Item 22.09 IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) EPA7 (as amended) Condition 16 Waste Management Procedure (L290-AH-PRC-10295)	At all times	Subcontractor Contractor Company
6.12.16	Sufficient and appropriate waste receptacles, including on Project vessels, will be provided and must meet the following provisions: • adequate number of bins for waste segregation (recycling, re-use and disposal) and sufficient volume • labelling that clearly identifies contents and, where relevant, is in accordance with Section 6.13 • sufficient capacity	Environmental Commitments Register items 22.03, 22.06 & 22.09 IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) CEMP Section 6.13	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	• appropriateness to the waste being contained—be compatible, leak-proof and fit for purpose • adequate access to area and appropriate location • putrescible waste bins will have a cover or lid to prevent ingress of rain as required to the waste type and/or to prevent animals being attracted or having access to putrescible wastes.	EPA7 (as amended) Condition 16 Waste Management Procedure (L290-AH-PRC-10295)		
6.12.17	Any unplanned release of waste, particularly hazardous liquids will be managed in accordance with Section 6.14.	CEMP Section 6.14	During spill response	All Site personnel
6.12.18	All wastes generated on board Project vessels in the nearshore development area, including food scraps, will be retained on the vessels, and will be appropriately segregated and transported to the onshore facilities for disposal. No waste from international shipping vessels will be disposed of via the site.	Environmental Commitments Register Item 22.15 Marine Pollution Act (NT) Protection of the Sea (Prevention of Pollution from Ships) Act (Cwlth) Waste Management Procedure (L290-AH-PRC-10295)	At all times	Subcontractor
6.12.19	There will be no discharge or unloading of any liquid wastes including wastewater from other vessels within the Site including by ocean going vessels making deliveries to the MOF.	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) Waste Management Procedure (L290-AH-	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
		PRC-10295)		
	Listed (Controlled) Waste Management			
6.12.20	Dedicated waste receptacles suitable for storage and segregation of Listed and Controlled wastes will be provided. Listed/Controlled waste storage containers and storage areas will comply with storage requirements as per the SDS and the relevant Australian standards.	Environmental Commitments Register Item 22.07 IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) WMPC Act (NT) WMPC Regulations CEMP Section 6.13 CEMP Section 6.12.1 Waste Management Procedure (L290-AH-PRC-10295)	At all times	Subcontractor
6.12.21	Listed/Controlled waste will be handled, stored, transported and disposed of as per the Contractor Waste Management Procedure (WMP). Listed/Controlled wastes which are also hazardous will be stored, transported and disposed of in accordance with the provisions listed in Section 6.13. Prior to transport offsite, all Listed/Controlled waste must be securely packaged and labelled in accordance with the WMP, and relevant legislative requirements. Where controlled waste is transported from the NT to	WHS (NUL) Act WHS (NUL) Regulations Hazardous Waste (Regulation of Exports and Imports) Act (Cwlth) IFC General EHS Guideline Section 1.6 Waste management	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	another state or territory for disposal, the appropriate consignment authorisation will be obtained from that jurisdiction.	(IFC 2007) WMPC Act (NT) CEMP Section 6.13 NT EPA Guide for Completing Controlled Waste Consignment Authorisation (CWCA) Form NT EPA Guide for Completing Waste Transport Certificate (WTC) Waste Management Procedure (L290-AH-PRC-10295)		
6.12.22	Spill clean-up materials (such as waste oil, oil rags and used spill response equipment) and contaminated water and/or soils will be stored in a suitable, leak-proof (metal or plastic) container, which must be clearly labelled with the contents, have lids that can be sealed and disposed of as Listed/Controlled waste.	CEMP Section 6.14 Waste Management Procedure (L290-AH-PRC-10295)	After a spill	Subcontractor Contractor Company
6.12.23	Project vessels will adhere to the following requirements: • Sewage will not be discharged within three nautical miles of land. • Treated sewage (macerated to fragment diameters less than 25 mm) may discharge between three and twelve nautical miles of land.	Environmental Commitments Register Item 23.11 Protection of the Sea (Prevention of Pollution from Ships) Act (Cwlth)	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	• Untreated sewage may be discharged beyond 12 nautical miles of land. On-board sewage treatment systems will be IMO certified. Temporary storage of sewage from ablution facilities will occur on board the MOFTP in a contained blackwater tank. The waste will be collected via a sucker truck and returned to shore for offsite disposal. The waste management practices required for all project vessels, apply to the MOFTP.	Marine Pollution Act (NT)		
6.12.24	Bilge water will be stored in the bilge tanks and later pumped out and disposed of onshore by a licensed waste contractor. Tanks will have measures to prevent accidental spill and discharge into the waterways.	Environmental Commitments Register Item 23.14 Annex I of the International convention for the prevention of pollution from ships, 1973, as modified by the protocol of 1978 relating thereto (MARPOL 73/78) (IMO 1978) Marine Pollution Act (NT)	At all times	Subcontractor
6.12.25	Quarantine waste, as identified by the Quarantine Officer, must only be handled by personnel authorised by DAWR and must only be managed, transported and disposed of using DAWR procedures. Quarantine waste and	DAWR standards International convention for the prevention of pollution	In the event that quarantine waste requires management	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	substances banned from import will be disposed of in accordance with DAWR requirements and relevant international, national and regional regulatory requirements. For measures relating to quarantine washdown water, refer to Section 6.15.	from ships, 1973, as modified by the protocol of 1978 relating thereto (MARPOL 73/78) (IMO 1978) Biosecurity Act 2015		
6.12.26	Sewage within the temporary and permanent STP is containerised within treatment process units which each have separate containment. The system is controlled electronically and monitored by the plant operator on a daily basis to detect any leaks during the treatment process. Once sewage has passed through the full treatment process, the treated effluent is stored in a holding tank and/or basin prior to discharge to Darwin Harbour (refer to Section 6.4). In the event of a sewage spill during operations, the relevant plant operator will initiate spill response measures detailed in Section 6.14. Waste by-products produced from the treatment process will be managed in accordance with mitigation measures 6.12.29, 6.12.30, 6.12.32, 6.12.33 and 6.12.34, as relevant.	Waste Management Procedure (L290-AH-PRC-10295) WMPC Act (NT) WMPC Regulations (NT)	During operation of the STPs	Subcontractor
6.12.27	Strainers, filters that were used and contaminated by hydrocarbon removed as listed waste.	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007)	At all times	Subcontractor Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
		Waste Management Procedure (L290-AH-PRC-10295)		
	Transport			
6.12.28	Waste will be removed by approved and licensed waste subcontractors and taken to an appropriately licensed recovery or disposal facility.	Environmental Commitments Register Item 22.08 IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) WMPC Act (NT) WMPC Regulations (NT) Waste Management Procedure (L290-AH-PRC-10295)	During waste transport	Subcontractor Contractor
6.12.29	Waste subcontractors collecting, transporting, storing and recycling, treating or disposing of listed wastes will have an environmental protection licence, in accordance with the WMPC Act (NT).	WMPC Act (NT) WMPC Regulations (NT) Waste Management Procedure (L290-AH-PRC-10295)	During waste transport	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.12.30	All waste generated, stored and disposed of will be recorded, manifested and tracked to ultimate disposal. Waste records/receipts must be retained in accordance with Section 7 and the WMPC Regulations, and passed on to Contractor. Contractor WMP provides the above process in more detail.	WMPC Act (NT) WMPC Regulations (NT) IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) CEMP Section 7 Waste Management Procedure (L290-AH-PRC-10295)	During waste transport	Subcontractor
	Waste records will be provided to Company monthly.		Monthly	Contractor
6.12.31	Waste such as used lube oil and other liquid wastes that do not meet discharge criteria will be removed by approved and licensed waste subcontractors and taken to on site hazardous and controlled waste storage facility, or directly to an appropriately licensed recovery or disposal facility.	Environmental Commitments Register Item 22.08 IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) WMPC Act (NT) WMPC Regulations Waste Management Procedure (L290-AH-PRC-10295) WDL 211 (as amended)	During waste transport	Subcontractor Contractor
	Treatment and Disposal			

Number	Mitigation measure	Reference	Timing	Responsibility
6.12.32	Waste by-products from the temporary and permanent STP shall be managed as follows: • Waste Streams are to be handled and collected by appropriately trained personnel. • Screened materials at the inlet point, and dewatered sludge generated from the STP treatment process are collected in separate containers to be disposed offsite to a licensed waste facility.	Waste Management Procedure (L290-AH-PRC-10295) WMPC Act (NT) WMPC Regulations (NT)	During operation of the temporary and permanent STP (Note: The frequency of waste collection will increase and decrease as the capacity of the temporary STP changes over time)	Subcontractor
6.12.33	All waste will be disposed of at a waste facility which is licensed to receive that type of waste.	WMPC Act (NT) WMPC Regulations (NT) National Environment Protection (Movement of Controlled Waste between States and Territories) Measure as varied December 2004 IFC General EHS Guideline Section 1.6 Waste management (IFC 2007)	At all times	Subcontractor
6.12.34	Contaminated liquid wastes such as sewage that is not treated at an STP will be disposed of by a licensed waste contractor.	Environmental Commitments Register Item 23.17, 23.19	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Vehicle washdown water will be reused or disposed of by a licensed waste contractor. Stormwater runoff and treated effluent will be managed as per Section 6.4.	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) CEMP Section 6.4		
6.12.35	Darwin City Shoal Bay Waste Management Facility will be used for the disposal of non-Listed wastes and certain Listed wastes, in accordance with the Shoal Bay Waste Management Facility Environment Protection Licence Number 12-03. The accepted listed wastes specified on the licence are: • tyres • soils contaminated with a listed waste • sewerage sludge and residues including nightsoil and septic tank sludge • clinical and related wastes • asbestos • animal effluent and residues. As per the licence conditions, approval will be sought and obtained from Darwin City Council's Executive Officer for the disposal of Listed waste not specified in the licence.	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) Shoal Bay Waste Management Facility Environment Protection Licence Number 12-03 Waste Management Procedure (L290-AH-PRC-10295)	At all times	Project Environmental Manager
6.12.36	Dead animals that are found on Site will be recorded, handled and/or disposed of as per Section 6.2.	CEMP Section 6.2	At all times	Subcontractor
6.12.37	In the event the disposal of waste results in soil, surface water or groundwater contamination, then the requirements in Section 8 will be implemented.	CEMP Section 8	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.12.38	Process oily water will be transported offsite or (if available) to the permanent WWTP to be treated by the corrugated plate interceptor oil/water separator. The treated oily water will be sent to the permanent jetty outfall (once EPA7-4 is amended) or to the temporary MOF outfall and discharged if discharge trigger values can be met. For measures relating to different streams of commissioning water management, refer to Section 6.4.	Commissioning Subsystem and Separable Portion Definition List (L290-AR-LIS-10009) Waste Management Procedure (L290-AH-PRC-10295) WMPC Act (NT) WMPC Regulations EPA7-4 (as amended)	During commissioning of the various process subsystems	Subcontractor Contractor
6.12.39	Used lubricating oils are stored onsite for reuse; slob, process sludges and used solvents are stored in temporary holding tank/basin, and transported offsite periodically for recycling or treatment.	Commissioning Subsystem and Separable Portion Definition List (L290-AR-LIS-10009) Waste Management Procedure (L290-AH-PRC-10295) WMPC Act (NT) WMPC Regulations	During commissioning of the various process subsystems	Subcontractor Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.12.41	Screened materials at the inlet point, and dewatered sludge generated from the sanitary sewage treatment process are collected in separate containers to be disposed offsite to a licensed waste facility. Where feasible, off specification sanitary sewage will be transported to the temporary WWTP for further treatment and disposal under WDL 192 (as amended), or trucked offsite.	Waste Management Procedure (L290-AH-PRC-10295) WMPC Act (NT) WMPC Regulations WDL 192 (as amended)	During commissioning and operation of the permanent WWTP	Subcontractor Contractor
6.12.42	Dislodged pipe scales, sludge and monoethylene glycol will be drained into a bunded location at end of the pig receiver, removed and transported to a licence waste facility.	Waste Management Procedure (L290-AH-PRC-10295) WMPC Act (NT) WMPC Regulations	During commissioning of the GEP	Subcontractor Contractor
	Monitoring and Inspection			
6.12.43	General and process waste storage facilities will be inspected to assess compliance with this CEMP and the Contractor WMP.	WMPC Act (NT) WMPC Regulations (NT) Waste Management Procedure (L290-AH-PRC-10295)	Quarterly	Project Environmental Manager
	General and process waste storage facilities will be inspected to assess compliance with this CEMP			Company
6.12.44	Reviews of waste management procedures and the quantity of regulated wastes generated on Site will be carried out to aid continual improvement and waste minimisation.	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) WMPC Act (NT)	Quarterly	Project Environmental Manager Company

Number	Mitigation measure	Reference	Timing	Responsibility
		WMPC Regulations (NT) Waste Management Procedure (L290-AH-PRC-10295)		
6.12.45	Reviews of commissioning chemicals and adsorbents usage, determination of their waste categories per SDS guideline, and managed accordingly.	IFC General EHS Guideline Section 1.6 Waste management (IFC 2007) WMPC Act (NT) WMPC Regulations Waste Management Procedure (L290-AH-PRC-10295)	At all times	Subcontractor Contractor

6.13 Dangerous goods and hazardous materials management

6.13.1 Description of dangerous goods and hazardous materials

Dangerous goods and hazardous materials are defined as follows:

- Dangerous goods are material and articles classified on the basis of immediate physical or chemical effects such as fire, explosion, corrosion, spontaneous combustion, or toxicity that can rapidly affect people, the environment or property. Dangerous goods are defined as substances or materials which are defined and listed in the Australian Code for the Transport of Dangerous Goods by Rail and Road (ADG Code).
- Hazardous substances are chemicals or other materials that can cause acute or chronic harm to health. Hazardous substances are defined as any substance, mixture or article that:
  - is listed in NOHSC:10005; or
  - has been classified as a hazardous substance by the manufacturer or importer in accordance with NOHSC:1008; or
  - meets the criteria for hazard classification set out in Part 3 (Health Hazards) of the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Chemicals delivered to site will be accompanied with a Safety Data Sheet (SDS), and will be classified and labelled on Site according to the GHS in accordance with the WHS (NUL) Act and Regulations.

The GHS came into effect on 1 January 2012 and will be mandatory after 31 December 2016, superseding the current classification and labelling system under the National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)] and the Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)].

Under the GHS, both hazardous substances and dangerous goods are deemed "hazardous chemicals".

Table 6-52 provides a summary of the NOHSC and GHS transitional arrangements.

Table 6-52: Summary of NOHSC and GHS transitional arrangements relating to classification, labelling and SDS

Until 31 December 2016	From 1 January 2012 mandatory after 31 December 2016)
Hazardous substances Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)]	Hazardous chemicals Globally Harmonized System of Classification and Labelling of Chemicals, 3rd Revised Edition
Dangerous goods Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code)	

6.13.2 Key activities, potential impacts and residual risk levels

Hazardous materials used during construction

Substances likely to be used or generated during construction include:

- hydrocarbons (fuels, oils, greases, lubricants, coolants, degreasers and solvents)
- chemicals such as detergents, paints, drilling fluids, corrosives and acids
- oxy-acetylene welding sets
- insecticides, pesticides and herbicides
- oily or other contaminated wastewater
- cement
- lime
- aggregates
- hazardous wastes.

Many of the above substances are flammable, toxic, corrosive and/or have the potential to pollute receiving environments or water bodies.

Dangerous goods and hazardous materials stores within the onshore temporary support facilities include:

- a hazardous chemicals store workshop
- double skinned fuel tanks (i.e. 80 000-L bulk diesel storage tanks)
- metal waste oil container
- washdown bays (i.e. effluents)
- concrete batch plants
- temporary STP.

Dangerous goods and hazardous materials likely to be stored and used on project vessels working within the nearshore development area include:

- paints, oils, solvents and other chemicals
- self-bunded generators and associated diesel tanks
- double-skinned 4000-L diesel tanks.

Project vessels will be refuelled at the East Arm Wharf refuelling facilities.

Nearshore construction equipment on board vessels are refuelled from diesel tanks, which are filled on land and taken on board. The tanks meet the requirements of Australian Standards AS 1692 and AS 1940, and be equipped with separate pumps, metering and a refuelling bowser with an automatic shut-off nozzle.

The commencement of delivery and transfer of modules from ocean vessels to the MOF and the onshore facilities introduces further potential risks for hydrocarbon spills, during refuelling activities as well as other activities. However, the MOFTP will be refuelled while moored at a secure refuelling connection point built into the pontoon.

The temporary STP is designed to treat incoming sewage to a suitable quality prior to discharge of effluent to Darwin Harbour. The onsite sewage collection system will direct sewage to the temporary STP for treatment. The treatment process will generate waste by-products. The mitigation measures relating to the temporary storage and then disposal offsite of these waste products are described in Section 6.12, while the

management of the treated effluent is described in Section 6.4. The storage of sewage in the temporary ablutions facilities is another source of hazardous waste.

Hazardous materials used during commissioning

A range of dangerous goods and hazardous substances will be required during the commissioning phase which will present potential environmental risks that will need to be appropriately managed. Key hazardous substances which will be used or generated during commissioning activities include acids, caustic solutions, corrosion inhibitors, oxygen scavengers, biocides, de-emulsifiers, heating oil, nitrogen gas, hydrocarbon refrigerants, coolants, degreasers, solvents, greases and lubricants, fuels and mineral oils.

A number of the above substances are flammable, toxic, corrosive and/or have the potential to pollute receiving environments or water bodies.

The principle strategy for minimising the larger volumes of dangerous goods and hazardous materials being temporarily stored onsite is to specify 'just in time' supply for the chemicals required. This includes:

- filling of process chemicals (amines and refrigerants)
- AGRU degreasing solution (acids and caustic solutions)
- cooling systems (charging, passivation, anti-corrosion and biocide)
- diesel for the EDG and firewater system
- boiler cleaning chemicals (ammonium hydroxide, tri-sodium phosphate).

Onsite storage of dangerous goods and hazardous materials

Onsite storage of dangerous goods and hazardous materials will be necessary during commissioning. These will be stored within the Hazardous Materials Warehouse that will be available for use in quarter two of 2016.

The warehouse provides for controlled storage location for materials requiring special consideration and/or segregation from other materials. The warehouse has bunded floor areas with sufficient capacity to contain spillage or storage container rupture in compliance with statutory regulations. Floor slabs are graded and shaped to ensure effective drainage of the entire bunded floor area to sumps or floor drain points.

The internal building areas drain to local sumps which are readily accessible to pumping out and cleaning. The external storage area drains to a "Humeceptor" neutralising pit system with 1500 L storage capacity ahead of discharge to the stormwater system.

The laboratory will be commissioned for evaluation of performance and will contain dangerous goods and hazardous materials. The internal building areas drain to local sumps which are readily accessible to pumping out and cleaning. All non-sanitary drainage from the laboratory is drained to a double containment storage tank with minimum capacity 20,000 L suitable for vacuum truck pump out. The tank has level monitoring equipment with alarms for 75 percent and 95 percent full levels.

Temporary storage of dangerous goods and hazardous materials

Commissioning activities will require dangerous goods and hazardous materials are temporarily stored in the vicinity of the system being commissioned including for filling, flushing, cleaning and degreasing activities. Depending on the location, commissioning activities will either drain through the AOC network to the permanent WWTP and/or through the COC network to the dissolved air flotation and filter package, respectively (when these are online).

Temporary storage of dangerous goods and hazardous materials outside of the warehouse are required to have suitable mitigation measures put in place as per Section 6.13. A storage risk assessment, consistent with Section 5, is required to be prepared and approved by Contractor and Company against drainage scenarios for storage of temporary chemical stores outside the permanent facility. All storage of chemicals outside of the permanent facility must adhere to the approved risk assessment for that system or location.

The drainage network has been designed to ensure that any spills or leaks of dangerous goods and hazardous materials can be contained for treatment to improve quality on site until suitable for reuse or discharge, or be removed and disposed offsite:

- The AOC network directs any spills within the S750 holding basin which has a capacity of 2,200 m3. The basin has been designed to contain up to 468 mm accumulation of rainfall draining from the Common Utility Area and equates to three days continual rain for a 5 year ARI rainfall event. The holding basin will be monitored as required for the commissioning activities. Where a spill is observed or notified, the basin design will initially contain the spill and it will be removed using the vacuum truck for offsite licensed disposal.
- Some commissioning activities will also occur within the COC network, which directs any spills through an oily water separator to the COC 1 basin (pit) located within the Operations Complex area, and will be removed by vacuum truck for offsite licensed disposal.
- Sewage from the Operations Complex area, LIR and the Utility Shutdown Village is collected in pits near each building and spills will be removed by vacuum truck for offsite licensed disposal.
- For any commissioning activities that cannot occur within the AOC or COC areas, suitable controls must be in place to contain any spills and other mitigation measures in place.

Further details on the drainage system and permanent sewage treatment plant are provided in Section 6.4. During the commissioning activities, any incidents resulting in spill events will initiate implementation of spill response as described in Section 6.14. Disposal off site of these waste products is described in Section 6.12.

6.13.3 Key activities, potential impacts and residual risk levels

The key activities, potential environmental impacts identified for dangerous goods and hazardous materials management are listed in Table 6-53. The residual risk levels after the implementation of the mitigation measures contained in Table 6-55 are also identified.

Table 6-53: Key activities, potential environmental impacts and residual risk levels for dangerous goods and hazardous materials management

Activity	Potential environmental impact	Residual risk level
Use of construction plant and equipment on the MOF and MOFTP including transfer of fuel (refuelling)	• Spill of chemicals or hydrocarbons leading to pollution of the nearshore environment	Low
Storage of hydrocarbons and other chemicals on construction vessels working in the nearshore environment	• Spill of chemicals or hydrocarbons leading to pollution of the nearshore environment	Low
Use of construction plant and equipment on the MOF and MOFTP including transfer of fuel (refuelling)		
Onshore and nearshore temporary storage of sewage from ablution facilities	• Increased nutrient and other contaminant concentrations in receiving waters resulting from leaking wastewater storage tanks • Pollution of the marine environment and waterways, including eutrophication • Odours • Pollution of groundwater from leaking/overflow of tanks	Low
General construction activities (including vehicle movement) and the storage, handling and/or transfer of fuel (including refuelling), cement, oils, greases, chemicals and other dangerous goods and hazardous substances	• Uncontrolled release of dangerous goods or hazardous substances resulting in: – atmospheric contamination – soil, surface-water and groundwater pollution – odours – effects on flora and fauna – pollution of the marine environment and waterways – a fire/explosion event – risk to human health – reduced visual amenity	Moderate
General nearshore activities including module offloading operational activities including washdown, ramp, general waste (liquid, solid and ablution) generation, storage/handling of fuels, oils, greases, chemicals, and other dangerous goods and hazardous substances		

Activity	Potential environmental impact	Residual risk level
Rollover of lifting or transportation equipment, vessel collision, destabilisation of module or equipment during unloading operations on the MOF causing a spill	• Spill of chemicals or hydrocarbons leading to pollution of the nearshore environment	Moderate
Onsite storage of chemicals	• Loss of containment, spill or incorrect storage resulting in: – atmospheric contamination – soil, surface-water or groundwater contamination – effects on flora and fauna – odours – fire/explosion event – risk to human health – reduced visual amenity	Low
General commissioning activities: • loading and transfer of process chemicals, catalysts and resins • system pressurisation • flushing, cleaning and degreasing, blowdown, chemical cleaning, aqua milling, soda boiling • system drying • uncoupled and coupled runs of machinery • fuel storage and handling • lube oil flushing • cooling system charging and passivation	• Loss of containment or spill resulting in: – atmospheric contamination – soil, surface water or groundwater contamination – effects on flora and fauna – odours – risk to human health – reduced visual amenity	Low
Commissioning of system: • ship LPG/LNG storage and loading facilities over water	• Spills over water resulting in surface-water contamination effects on flora and fauna	Low
Commissioning of system: • WWTP and outfall diffuser • flushing of fire water	• Inadequate treatment or loss of containment resulting in: – surface-water contamination	Moderate

Activity	Potential environmental impact	Residual risk level
system • deluge spray testing	– effects on flora and fauna	

6.13.4 Objectives, targets and indicators

The objectives, targets and indicators for the management of dangerous goods and hazardous materials that have been established are listed in Table 6-54.

Table 6-54: Dangerous goods and hazardous materials management objectives, targets and indicators

Objective	Target	Indicator
To prevent environmental impacts from dangerous goods and hazardous materials	• Zero environmental incidents resulting from mismanagement of dangerous goods and hazardous materials	• Number of incident reports from mismanagement of dangerous goods and hazardous materials

6.13.5 Mitigation measures

The mitigation measures to minimise impacts associated with dangerous goods and hazardous materials management and to achieve the established objectives and targets are described in Table 6-55.

Table 6-55: Dangerous goods and hazardous materials mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.13.01	Site inductions will include the following specific components for dangerous goods and hazardous materials management: • summary of types of dangerous goods and hazardous materials that are likely to be present on Site • key requirements for handling, transportation and storage • identification of dangerous goods and hazardous materials, including awareness of other items/substances such as unexploded ordnances (UXO) and the findings of UXO surveys that have been carried out.	Company Environmental Policy Contractor HSES Policy CEMP Section 9	Before entering Site	HSES Manager Subcontractor Company
6.13.02	Personnel who routinely handle hazardous materials or wastes (e.g. refuelling personnel, pump operators, mechanics, and stores personnel) will receive training in handling, transporting and storing hazardous materials or wastes; in reporting and documentation requirements; and in spill clean-up techniques and practices. Training may be in the form of formal training courses provided by a registered training organisation, or toolbox/awareness sessions conducted on site.	Environmental Commitments Register Item 21.06 CEMP Section 6.12 CEMP Section 6.14 CEMP Section 9	Before entering Site	HSES Manager Subcontractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	Chemical Selection and Management			
6.13.03	Contractor, Subcontractor and Company will use electronic and auditable system software to maintain a hazardous materials register and database of information relating to each chemical, including health hazards and precautions, safe handling procedures, requirements for storage and transport, environmental fate and ecological toxicity, and emergency and first aid advice. The hazardous materials tracking system will have the capability to generate reports, labels, printouts of the SDS, risk assessment modules, chemical registers and stock management reports.	Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014)	At all times	Contractor Subcontractor Company
6.13.04	A chemical approval and selection process and management controls will be implemented to minimise the potential adverse environmental impacts associated with the storage, transport, use and disposal of chemicals.	Environmental Commitments Register items 21.04 & 22.04 IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007)	At all times	Subcontractor Contractor Company
6.13.05	Prior to procurement or being brought on Site by Subcontractor, all chemicals and hazardous materials will be submitted to Contractor for review and approval.	Environmental Commitments Register Item 23.05 IFC General EHS Guideline Section 1.5 Hazardous materials	Prior to procurement or chemicals and hazardous materials being brought on Site	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	The review process will examine the following: • ecotoxicological data in the SDS • legislative and other requirements • exposure pathways and potential environmental impact of release, and risk assessment • preference for lowest toxicity, lowest bioaccumulation potential and highest biodegradation and lowest content of volatile organic compound (VOCs) • suitable and less-toxic alternatives • procedures covering transport, storage, handling and disposal • training needs • information and reports available via the hazardous materials management system. Chemicals will be entered into the hazardous materials management system. Where chemical approval may result in a changed risk level for an activity, this will be incorporated into the environmental risk register and communicated to Company. Chemicals and hazardous materials brought onto Site by Company will follow the Company Chemical Selection Procedure and entered into ChemAlert.	management (IFC 2007) CEMP Section 6.14	At all times	Contractor Company
	The chemicals register will be provided by Contractor to Company upon request.		On request	Contractor
6.13.06	A dangerous goods and hazardous materials register	WHS (NUL) Act	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	will be maintained on site using a hazardous materials management system and will comply with the following requirements: • include a list of all hazardous materials used, handled or stored at the workplace • be maintained monthly to check the information is up to date • include the current SDS for each substance listed • be readily accessible to workers involved in using, handling or storing hazardous chemicals, or any personnel with the potential for exposure to hazardous substances, including first-aid and emergency response personnel.	WHS (NUL) Regulations	Review and maintain register at least monthly	Contractor Company
6.13.07	Safety Data Sheets (SDS) will accompany all chemicals brought to site. SDS will be made available where chemicals are stored, handled or used to aid the identification of appropriate handling procedures, spill clean-up and disposal methods, and first-aid response.	WHS (NUL) Act WHS (NUL) Regulations IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007)	At all times	Subcontractor Contractor Company
6.13.08	Use of the following substances is prohibited on Site and any project vessels or equipment: • polychlorinated biphenyl (PCB) type fluid • asbestos • antifouling paints containing tributyltin (TBT) compounds.	Company Environmental Requirements for the Ichthys Gas Field Development Project (C075-AH-SPC-0001) Environmental	At all times	Subcontractor Contractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
		Commitment Register Item 23.12 Protection of the Sea (Harmful Anti-fouling Systems) Act IMO Convention on the Control of Harmful Anti-fouling Systems on Ships IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007)		
6.13.09	Appropriate licences will be obtained for the storage of dangerous goods in accordance with the Dangerous Goods Regulations.	Dangerous Goods Act Dangerous Goods Regulations	At all times	Subcontractor Contractor Company
6.13.10	Dangerous goods and hazardous materials, as defined above, will be stored, handled and used in dedicated locations around the Site to minimise the likelihood of, and impacts resulting from, the release of hydrocarbons and chemicals. All chemical use, storage, handling and transport must comply with legislative and other requirements, including Australian standards and Codes of Practice as applicable to the activity.	WHS (NUL) Act WHS (NUL) Regulations Dangerous Goods Act Dangerous Goods Regulations IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007)	At all times	Subcontractor Contractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
		AS 1940:2004, The storage and handling of flammable and combustible liquids AS/NZS 3833:2007, The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers Globally Harmonized System of Classification and Labelling of Chemicals, 3rd Revised edn Model Code of Practice—Labelling of Workplace Hazardous Chemicals 2011 Codes of practice approved under the WHS Act and under the WHS (NUL) Act and WHS (NUL) Regulations		
6.13.11	The volumes of dangerous goods and hazardous materials removed from dedicated storage facilities on any one day will be minimised to volumes required for the day or the task, whatever is the lesser.	GIIP	At all times	Subcontractor Contractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	Primary Containment			
6.13.12	Primary storage containers must: • be designed and used in accordance with the applicable Australian standards • be labelled in accordance with the Globally Harmonized System of Classification and Labelling of Chemicals and the approved codes of practice under the *Dangerous Goods Act* • have lids and no dents or damage • comply with the WHS (NUL) Act and WHS (NUL) Regulations.	WHS (NUL) Act WHS (NUL) Regulations Dangerous Goods Act Dangerous Goods Regulations Model Code of Practice—Labelling of Workplace Hazardous Chemicals 2011 Globally Harmonized System of Classification and Labelling of Chemicals, 3rd Revised edn IFC General EHS Guideline Section 1.5 Hazardous materials management AS/NZS 3833:2007, The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers AS 1940:2004, The storage and handling of	At all times	Subcontractor Contractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
		flammable and combustible liquids		
	Secondary Containment			
6.13.13	All liquids classified as dangerous goods and hazardous materials must be secondarily contained. This includes using double-skinned tanks, or storing hazardous materials within a sealed bund compound or over a portable bund.	IFC General EHS Guideline Section 4 Construction and decommissioning (IFC 2007) IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007) AS 1940:2004, The storage and handling of flammable and combustible liquids	At all times	Subcontractor Contractor Company
6.13.14	Activities such as refuelling of plant and equipment maintenance which have potential to result in the spillage of a chemical, fuel or lubricant, must not be carried out without appropriate temporary bunding in place. Bunding must be undertaken in accordance with relevant legislation and standards. Refuelling must be attended and visually monitored at all times. Adequate quantities of suitable spill kits materials must be readily available to use for clean-up in the event of a spill.	Dangerous Goods Regulations IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007) IFC General EHS Guideline Section 1.8 Contaminated Land	At all times	Subcontractor Contractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
		(IFC 2007) AS 1940:2004, The storage and handling of flammable and combustible liquids		
6.13.15	Dangerous goods and hazardous chemical storage areas must be suitably located and bunded to minimise the impact of any spillage of contamination. Bunding must be undertaken in accordance with relevant legislation and standards.	Dangerous Goods Regulations IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007) AS 1940:2004, The storage and handling of flammable and combustible liquids	At all times	Subcontractor Contractor Company
6.13.16	Bunded water shall be managed as per Section 6.4.	GIIP	At all times	Subcontractor Contractor Company
6.13.17	Bunds and sumps will be inspected on a regular basis; in particular, prior to extreme weather events and after rain.	GIIP	As per the Site inspection schedule	Subcontractor Contractor Company
6.13.18	Suitable firefighting equipment and spill-containment equipment appropriate to the hazardous substances and chemicals must be provided and made readily	WHS Regulations CEMP Section 6.14	At all times	Subcontractor Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	accessible to personnel in the event of a spill.			Company
6.13.19	Limited volumes of hydrocarbons and other chemicals will be stored on board barges and other Project vessels. These substances will be stored in bunded areas or dedicated approved dangerous goods cabinets and in accordance with appropriate vessel safety procedures.	GIIP	At all times	Subcontractor
6.13.20	Generators on construction barges will be fully self-contained to minimise the potential for leaks/spills of hydrocarbons. The generator fuel tanks will also be self-bunded.	GIIP	At all times	Subcontractor
6.13.21	On-board nearshore construction equipment will be refuelled from diesel tanks, which are filled on land and taken on board. The tanks will meet the requirements of Australian Standard AS 1692 and AS 1940, and be equipped with separate pumps, metering and a refuelling bowser with an automatic shut-off nozzle.	GIIP AS1692:2006, Steel tanks for flammable and combustible liquids AS 1940:2004, The storage and handling of flammable and combustible liquids	At all times	Subcontractor
	Handling and Transportation			
6.13.22	The delivery of hydrocarbon and chemical products (that are classified as dangerous goods) to Site will be carried out by specialised subcontractors licensed under the Northern Territory regulation, Transport of Dangerous Goods by Road and Rail (National Uniform	Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Regulations IFC General EHS	At all times	Subcontractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	Legislation) Regulations.	Guideline Section 3.5 Transport of hazardous materials (IFC 2007) AS 1940:2004, The storage and handling of flammable and combustible liquids		
6.13.23	The handling and transportation of hydrocarbon and chemical products will be in closed and appropriately labelled containers.	Australian Code for the Transport of Dangerous Goods by Rail and Road (7th edn) Dangerous Goods Act Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Regulations WHS (NUL) Regulations WHS Act IFC General EHS Guideline Section 3.5 Transport of hazardous materials (IFC 2007) AS 1940:2004, The storage and handling of flammable and combustible liquids	At all times	Subcontractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	Transfer and Refuelling Procedures			
6.13.24	Work instructions such as work method statements will be developed by Subcontractor and used to manage refuelling activities, and appropriate training is to be provided to personnel engaged in refuelling operations. These work instructions will include emergency response, and key requirements will be incorporated in relevant vehicle movement, traffic and logistics/transport plans.	IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007) IFC General EHS Guideline Section 4 Construction and decommissioning (IFC 2007)	Prior to activity	Subcontractor
6.13.25	Prior to transferring hazardous materials between storage containers, drums, tanks or plant and equipment, transfer equipment (e.g. hoses and connections) must be compatible and suitable for the materials being transferred and must be free from defects. During transfer or refuelling: • Secure hose connections (e.g. cam-lock levers) will be used at all times. • Vehicles or equipment being refuelled must be attended at all times. • Continual visual monitoring of hoses, connections and the sea surface (for vessel refuelling) will be undertaken. • Quick-disconnect valve assemblies will be provided on offloading hoses.	IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007) Environmental Commitment Register items 5.19, 5.20 & 5.22	At all times	Subcontractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	• Control valves to be used on hoses, and hoses to be spiral wrapped, as required. • Dry-break, breakaway couplings or similar technology will be installed and used where practicable during vessel refuelling operations. • Radio contact will be maintained between refuelling vessels and other vessels when refuelling activities are being undertaken in accordance with the relevant refuelling work instructions and/or procedures. Where possible, transfer of hazardous materials must take place over an impervious surface which is sufficient to prevent release of drips, splashes or spills into the environment. When refuelling in the field, refuelling equipment must carry adequate spill collection (e.g. drip trays) and response equipment and all refuelling must be carried out on temporary bunding. Where mobile refuelling must occur in high-risk areas (e.g. near busy areas, less than 30 m from waterway, drainage line, on the MOF, barges, etc.), refuelling vehicles with smaller fuel storage tanks will be used e.g. fuel pods, fuel cans/drums.			
6.13.26	Whenever practical, onshore refuelling will take place at dedicated facilities designed and constructed in accordance with Australian standards, including AS 1940:2004, The storage and handling of flammable and combustible liquids, and regulatory requirements. Fixed fuelling facilities will include:	GIIP	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	• containment on which all vehicles and plant will stand during refuelling and which will be graded so that spills will not flow off the Site. Containment shall be sufficient to retain spills including from storage tanks and will enable isolation and recovery of spills. Containment shall be sufficiently impervious and shall be chemically resistant and fire resistant as far as is necessary to fulfil its functions • treatment systems as appropriate for the removal of oil and fuel-based hydrocarbons from water, including rainfall runoff from the contained area prior to discharge. Treated water will comply with discharge trigger values, including visual inspection for visible traces of hydrocarbons (e.g. oily sheen). Any treatment system shall be readily accessible for inspection and hydrocarbon residues in oil–water separators, containment pits and sumps will be removed to a licensed waste disposal facility means to prevent rainfall run-on entering the refuelling containment area.			
	Vessel Management			
6.13.27	Industry standards, port authority, and pollution prevention regulations shall be adhered to during refuelling, transfer, storage and handling of hazardous materials (e.g. bunding, level gauges, overflow protection, drainage systems and hardstands). Vessel audits will be undertaken weekly to verify	Marine Pollution Act International convention for the prevention of pollution from ships, 1973, as modified by the protocol of 1978	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	compliance with the above requirements.	relating thereto (MARPOL 73/78) (IMO 1978) Navigation Act 2012 Darwin Port Corporation Act 2012 Nearshore Oil Spill Contingency Plan (C075-AH-PLN-0007)		
6.13.28	Refuelling within the Site boundary shall be limited to Project vessels. No refuelling will be undertaken by other vessels within the Site boundary including ocean going vessels making deliveries to the MOF which will refuel elsewhere outside of the Site boundary. Detailed refuelling procedures will be developed for use by the vessel subcontractor prior to commencement of work on site. The MOFTP is to include bunding designed for containment of refuelling over water. During refuelling of the MOFTP, appropriate communication will be maintained to the marine control room. A MOFTP crew member is to present at the refuelling point for all refuelling operations.	Marine Pollution Act International convention for the prevention of pollution from ships, 1973, as modified by the protocol of 1978 relating thereto (MARPOL 73/78) (IMO 1978) Environmental Commitments Register Item 5.20 IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007)	During refuelling	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Concrete Batch Plant			
6.13.29	Concrete batch plants established on Site will be operated in accordance with the Environmental best management practice guideline for concreting contractors (NSW DEC 2004) and the Environmental guidelines for the concrete batching industry (EPA 1998). All materials used, stored and handled at the batch plants (such as cement and aggregate) will be managed as per the guideline and in a manner that prevents the uncontrolled release of materials to the environment. The production and handling of cementitious materials such as grout and equivalent materials produced in other mobile mixing equipment (i.e. external to concrete batch plants established on Site) will also be managed as per concrete batch plants described above, where appropriate.	Environmental best management practice guideline for concreting contractors (NSW DEC 2004) Environmental guidelines for the concrete batching industry (EPA 1998)	At all times	Subcontractor
	Asbestos, UXO, ASS and Other Substances			
6.13.30	Upon encountering any unknown substance or item that may be an unexploded ordnance (UXO) all personnel will report the find to the immediate Subcontractor Site Supervisor. The Site Supervisor will immediately notify the HSES Manager and other personnel in the area and the area will be cordoned off.	Department of Defence	At all times	Subcontractor
6.13.31	Upon encountering any unknown substance that may contain asbestos, ASS or other potentially hazardous	GIIP	At all times	All Site personnel

Number	Mitigation measure	Reference	Timing	Responsibility
	material, the Project Environmental Manager shall immediately be notified.			
	Onsite Storage of Chemicals			
6.13.32	System relevant commissioning procedures, PTW, JHA, SWMS must be prepared, approved and followed for onsite storage of chemicals.	Health Safety Environment and Security risk and hazard management procedure (L290-AH-PRC-0008)	Prior to start of commissioning works	Contractor Subcontractor
6.13.33	A dedicated permanent Dangerous Goods and Hazardous Materials warehouse and laboratory facilities will be provided with isolation sumps and drainage containment. Facility must be built to the specifications.	Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014) IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007) AS 1940:2004, The storage and handling of flammable and combustible liquids AS/NZS 3833:2007, The storage and handling of mixed classes of dangerous goods, in packages and	Prior to start of commissioning works	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
		intermediate bulk containers Globally Harmonized System of Classification and Labelling of Chemicals, 3rd Revised edn Model Code of Practice—Labelling of Workplace Hazardous Chemicals 2011 Codes of practice approved under the WHS Act (Cwlth) and under the Onsite storage of chemicals WHS (NUL) Act and WHS (NUL) Regulations Storage and Handling of Workplace Dangerous Goods National Code of Practice NOHSC: 2017(2001) AS 2430.3.1:2004 Classification of Hazardous Areas		
6.13.34	The warehouse isolation sumps and drainage network must be subject to a maintenance and inspection	AS 1940:2004, The storage and handling of	At all times.	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	program.	flammable and combustible liquids AS/NZS 3833:2007, The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers Storage and Handling of Workplace Dangerous Goods National Code of Practice NOHSC: 2017(2001)		
6.13.35	Completion of spill pathway mapping considering high volume quantities, higher risk chemicals and the proposed delivery mechanism and temporary storage locations.	CEMP Section 6.14	Prior to start of commissioning works.	Contractor.
6.13.36	A storage risk assessment approved by Contractor and Company against drainage scenarios for storage of temporary chemical stores outside the permanent facility will be provided for. All storage of chemicals outside of the permanent facility must adhere to the approved risk assessment for that system or location.	CEMP Section 6.14 Dangerous Goods Act 2012 (NT)	Prior to start of commissioning works.	Contractor.
6.13.37	Just in time delivery will be utilised for high volume chemicals which exceed the dangerous goods and	GIIP	Prior to delivery of chemical	Contractor Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	hazardous materials warehouse capacity for that chemical (e.g. amines, heating oil). Where possible, this requirement will be specified in the supply Contracts.			
	Commissioning General			
6.13.38	System relevant commissioning procedures, PTW, JHA, SWMS will be prepared, approved and followed.	Health Safety Environment and Security risk and hazard management procedure (L290-AH-PRC-0008)	Prior to start of commissioning works.	Contractor Subcontractor
6.13.39	A storage risk assessment approved by Contractor and Company against drainage scenarios for storage of temporary chemical stores outside the permanent facility will be provided for. All storage of chemicals outside of the permanent facility must adhere to the approved risk assessment for that system or location. Storage will be in accordance with the relevant Australian Standards and Work Health and Safety (National Uniform Legislation) Act and associated Regulations.	CEMP Section 6.14	Prior to start of commissioning works	Contractor
6.13.40	Filling, flushing, cleaning and degreasing activities are to be undertaken within the AOC drainage area which directs and contains any spills within the S750 holding basin. The holding basin will be observed and the spill will be collected and disposed of offsite, via vacuum	CEMP Section 6.4 CEMP Section 6.14 Transport of Dangerous Goods by Road and Rail (National Uniform	Prior to start of commissioning activity	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	truck. For any activities that cannot occur within the AOC area, suitable containment must be in place to capture any spills.	Legislation) Regulations WMPC Act (NT)		
6.13.41	The AOC/COC drainage system has isolatable sections for containment of spills.	CEMP Section 6.4 CEMP Section 6.14	Prior to start of commissioning activity	Contractor
6.13.42	A vacuum truck service will be available to be called out to respond to spills within the AOC/COC drainage network.	CEMP Section 6.4 CEMP Section 6.14 Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Regulations WMPC Act (NT)	At all times	Contractor
6.13.43	An Emergency Response Plan is to be approved by Contractor and Company for responding to high volume chemical spills. The ERP shall take into account the spill mapping produced for the commissioning activities.	CEMP Section 6.14	Prior to start of commissioning works	Contractor
6.13.44	Diesel or oil transfer must occur inside a bunded area. This may be either permanent or temporary bunding which is suitably sized for the total volume of transferred liquid from the delivery truck.	AS 1940:2004, The storage and handling of flammable and combustible liquids AS/NZS 3833:2007, The storage and handling of mixed classes of dangerous goods, in packages and	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
		intermediate bulk containers Globally Harmonized System of Classification and Labelling of Chemicals, 3rd Revised edn Model Code of Practice—Labelling of Workplace Hazardous Chemicals 2011 Codes of practice approved under the WHS Act (Cwlth) and under the WHS (NUL) Act and WHS (NUL) Regulations AS 2430.3.1:2004 Classification of Hazardous Areas		
6.13.45	High level alarms/indicators are on the CCPP EDG and firewater system to reduce the potential for overfilling.	Health Safety Environment and Security risk and hazard management procedure (L290-AH-PRC-0008)	Prior to start of commissioning works	Contractor Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Commissioning Systems			
6.13.46	Suitably qualified and competent operators will undertake the testing and filling activities for HVAC system.	GIIP	At all times	Subcontractor
6.13.47	Pressure testing of the HVAC system will be undertaken to detect any leaks prior to filling with refrigerant.	GIIP	Prior to filling with refrigerant	Subcontractor
6.13.48	Refrigeration chemical leaks will volatilise into the atmosphere. The design of the HVAC system has isolation valves which may be used to reduce the volume lost.	GIIP	Prior to start of commissioning works	Contractor Subcontractor
6.13.49	Suitably qualified and competent operators will be used to commission the WWTP. The operators will undertake performance based water quality monitoring and analyses using the onsite laboratory.	GIIP	At all times	Subcontractor
6.13.50	The AOC/COC drainage system contains any spills within the S750 holding basin. This basin is located upstream of the WWTP and must have isolatable sections of system for containment of spills.	CEMP Section 6.4 CEMP Section 6.14	Prior to start of commissioning works	Contractor Subcontractor
6.13.51	An Emergency response plan is to be approved by Contractor and Company for responding to high volume chemical spills. The ERP shall take into account the spill mapping produced for the commissioning activities.	CEMP Section 6.14	Prior to start of commissioning works	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
6.13.52	Suitably qualified and competent operators will be used to commission the LPG/LNG storage and loading facilities.	GIIP	At all times	Subcontractor
6.13.53	Alarm systems for leakages and quick shutoff valves will be in place.	GIIP	Prior to start of commissioning works for LPG/LNG import	Contractor Subcontractor
6.13.54	A Marine Emergency Response Vessel will be available to be called out to respond to spills from the jetty.	CEMP Section 6.14	Prior to start of commissioning works for LPG/LNG import	Contractor Subcontractor
6.13.55	During commissioning of the firewater system, all flushing and deluge testing will occur with potable water and there must not be any added firefighting chemicals.	GIIP	During commissioning	Contractor Subcontractor
6.13.56	During commissioning of the AGRU, suitably qualified and competent operators will be used to undertake the AGRU degreasing and flushing activities.	GIIP	At all times	Subcontractor
6.13.57	The AGRU system has a dedicated chemical sewer system, and any spills of solvents are directed into this system. Non-contaminated water can be diverted to the S750 holding basin.	CEMP Section 6.4 CEMP Section 6.14	Prior to the start of commissioning activities	Contractor Subcontractor
6.13.58	During commissioning of the cooling system, circulation line pressure test for the cooling system must be	GIIP	Prior to start of commissioning	Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	undertaken prior to filling the cooling system with passivation chemical dosed water.		works	
6.13.59	The cooling system is located within the AOC area which directs and contains any spills within the S750 holding basin.	CEMP Section 6.4 CEMP Section 6.14	Prior to the start of commissioning activities	Contractor
6.13.60	Cooling water with biocide and/or corrosion inhibitor are smaller volumes and subject to licensed offsite disposal.	GIIP	At all times	Subcontractor
6.13.61	The air compressor plant is located within the AOC area which directs and contains any spills within the S750 holding basin.	CEMP Section 6.4 CEMP Section 6.14	Prior to the start of commissioning activities	Contractor Subcontractor
6.13.62	The demineralised water plant is located within the AOC area which directs and contains any spills within the S750 holding basin	CEMP Section 6.4 CEMP Section 6.14	Prior to the start of commissioning activities	Subcontractor
6.13.63	During commissioning of the demineralised water plant, the spent ion exchange resin is to be collected separately in container and disposed offsite as waste.	CEMP Section 6.12	At all times	Contractor
6.13.64	During commissioning of the CCPP, the plant is located within the AOC area which directs and contains any spills within the S750 holding basin.	CEMP Section 6.4 CEMP Section 6.14	Prior to the start of commissioning activities	Contractor Subcontractor
6.13.65	During commissioning of the CCPP, specialist operators will be provided to undertake water treatment to improve spent degreasing, or flushing water, if	GIIP	As required	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	required.			
6.13.66	During commissioning of the CCPP, boiler water with corrosion inhibitor and diesel pump fluid with biocide added are to be disposed of using a licensed contractor offsite.	GIIP WMPC Act (NT) WMPC (Administration) Regulations (NT)	At all times	Subcontractor
	Monitoring and Inspection			
6.13.67	The contents of bulk fuel tanks will be reconciled at least weekly to identify any losses of fuel associated with leaks. This is achieved by dipping the tank or reading the gauge.	IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007)	Weekly	Subcontractor Company
6.13.68	Dangerous goods and hazardous materials storage containers, areas and secondary containment measures such as bunds, sumps and pits including those on vessels will be inspected (for integrity, labelling etc.) as part of the weekly inspection regime.	CEMP Section 7 GIIP	Weekly	Subcontractor Company
	Inspection records will be made available to Company upon request.		On request	Contractor
6.13.69	Fittings, pipes and hoses on tanks or equipment which store hazardous materials will be inspected weekly and maintained as required.	IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007)	Weekly	Subcontractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
		CEMP Section 7		
6.13.70	A weekly dangerous goods and hazardous materials checklist will be developed and will be used to record the findings of weekly inspections, including fuel reconciliation/use, housekeeping and inspections of storage areas.	IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007)	At all times	Subcontractor Company

6.14 Spill prevention and response

A spill is any uncontrolled release of hydrocarbons or other hazardous substances/chemicals which may result in a health and safety hazard or adverse environmental impact, including water and soil contamination and effects on flora or fauna. This includes fuels, chemicals and hazardous substances in any form or state, including solid, liquid, wax, gel and aggregate.

A variety of hydrocarbons and chemicals will be used on Site, many of which are flammable, toxic, corrosive and/or have the potential to pollute receiving environments or water bodies.

Spill prevention and response procedures and control measures are provided to minimise the likelihood of, and impacts resulting from, the uncontrolled release of such substances.

Key sensitive receptors in the nearshore and onshore environment which may be impacted by spills are described in the EIS and include:

- benthic biota
- corals in East Arm
- soft-bottom communities
- mangroves
- monsoon vine thickets
- cycad vegetation communities
- transmissive aquifers below the Site.

Figure 6-10 below shows the locations of spill response equipment on site.

Figure 6-10: Spill response equipment locations

6.14.1 Key activities, potential impacts and residual risk levels

The key activities and potential environmental impacts identified for spill prevention and response are listed in Table 6-56. The residual risk levels after the implementation of the mitigation measures contained in Table 6-58 are also identified.

Table 6-56: Key activities, potential environmental impacts and residual risk levels for spill prevention and response

Activity	Potential environmental impact	Residual risk level
Storage of hydrocarbons and other chemicals on construction vessels working in the nearshore environment	• Spill of chemicals or hydrocarbons leading to pollution of the nearshore environment	Low
Use of construction plant and equipment on the MOF and MOFTP including transfer of fuel (refuelling)		
Refuelling of vessels and marine construction equipment at East Arm Wharf		
Nearshore temporary storage of wastewater from ablution facilities	• Pollution of the marine environment and waterways, including eutrophication • Odours	Low
General construction activities (including vehicle movement); and the storage, handling and/or transfer of fuel, oils, greases, chemicals cement, concrete and other dangerous goods and hazardous substances and wastes	• Uncontrolled release of dangerous goods or hazardous substances resulting in: – atmospheric contamination – soil, surface-water and groundwater pollution – pollution of the marine environment and waterways – odours – effects on flora and fauna – fire/explosion event – risk to human health – reduced visual amenity	Moderate
General nearshore activities including module offloading operational activities including washdown, ramp, general waste (liquid, solid and ablution) generation, storage/handling of fuels, oils, greases, chemicals, and other dangerous goods and hazardous substances		
Rollover of lifting or transportation equipment, vessel collision, destabilisation of module or equipment during unloading	• Spill of chemicals or hydrocarbons leading to pollution of the nearshore environment	Moderate

Activity	Potential environmental impact	Residual risk level
operations on the MOF causing a spill		

6.14.2 Objectives, targets and indicators

Company applies the response principles of People, Environment, Assets and Reputation (PEAR) when managing an incident, including spills. Contractor and Subcontractors will also adopt this principle during construction.

The objectives, targets and indicators for spill prevention and response that have been established are listed in Table 6-57.

Table 6-57: Spill prevention and response objectives, targets and indicators

Objective	Target	Indicator
To prevent environmental impacts from chemical, hydrocarbon and hazardous waste spills	• Zero environmental incidents resulting from chemical, hydrocarbon and hazardous waste spills or leaks	• The number of incident reports and severity of incidents resulting from chemical, hydrocarbon and hazardous waste spill events

6.14.3 Mitigation measures

The mitigation measures that will be implemented to reduce the occurrence and minimise the impacts of leaks and spills and to achieve the established objectives and targets are described in Table 6-58.

The mitigation measures are intended to encompass the requirements and measures to prevent, respond to, and manage spill events for all chemicals used on the Site, including the onshore and nearshore construction areas. A number of other activities related to the general management of hazardous materials, hazardous waste and contaminated water are detailed in Section 6.4, Section 6.7, Section 6.12, and Section 6.13.

Table 6-58: Spill prevention and response mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.14.01	Site inductions will include the following specific components for spill prevention and response: • identification of activities which pose a risk of releasing hazardous substances • spill prevention measures and the principle of "spill, contain, clean-up" when responding to spills • location of spill equipment and use of spill equipment and spill response techniques for common scenarios.	Company Environmental Policy Contractor HSES Policy CEMP Section 9 IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007)	Before entering Site	HSES Manager Subcontractor Company
6.14.02	Training in spill prevention and response will be provided for site supervisors and personnel working directly with chemicals and hydrocarbons. Such training will be identified in a Training Needs Analysis to be prepared under Section 9. Spill drill exercises shall be conducted at least annually.	Environmental Commitments Register Item 21.06 CEMP Section 9 IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007)	Before entering Site	HSES Manager Subcontractor Company
	General			
6.14.03	All spills (any uncontrolled release of hydrocarbon, chemicals, liquid waste or other hazardous substances) must be reported, recorded and cleaned up in a timely manner. For minor non-reportable spills as defined by Table 6-59, Subcontractor records the spill in their spill log and provides	IFC General EHS Guideline Section 4 Construction and decommissioning (IFC 2007)	At all times	All Site personnel

Number	Mitigation measure	Reference	Timing	Responsibility
	to Contractor each month along with their monthly report. Contractor reports total spill numbers and volumes to Company monthly in the monthly report. For spills that are reportable as an environmental incident, as defined by Table 6-59, Subcontractor reports the incident to Contractor. Contractor reports the incident to Company. Company makes a determination on whether the incident is reportable to the NT EPA, and reports accordingly. For marine spills of any volume, Subcontractor reports to Contractor as an environmental incident, Contractor reports to Company. Contractor completes a POLREP and notifies the Darwin Port, the Harbourmaster, Port Management Officer, and AMSA. Contractor simultaneously sends the POLREP to Company and Company forward on to the NT EPA via pollution@nt.gov.au.	CEMP Section 8 Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014)		
6.14.04	Spill-response materials and equipment (including personal protective equipment) will be made available at all times and will be appropriate to the substances being stored on Site.	Environmental Commitments Register items 5.18 & 21.05 IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007) Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014)	At all times	Subcontractor Company
6.14.05	Appropriate and adequate volumes of spill response equipment will be stored at strategic locations around the	Environmental Commitments Register	At all times	Subcontractor Company

Number	Mitigation measure	Reference	Timing	Responsibility
	Site, and will be: • located near areas where chemicals and/or hydrocarbons are stored, handled and used, which may change as construction progresses • visible and easily accessible • kept within service or mobile refuelling vehicles • suitable for the types and volumes substances being used, handled or stored at the location. Locations of spill-response equipment are to be communicated to all personnel, and location plans will be updated regularly. Locations of spill response equipment are included in Figure 6-10. Spill response equipment shall be restocked following a spill, and shall be checked at least monthly by Subcontractors and Company to ensure adequate volumes of equipment are readily available.	items 5.18 & 21.05 Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014)		
6.14.06	Standard maritime safety procedures will be adhered to, including Auscoast warnings via the Australian Maritime Safety Authority (AMSA) where appropriate, radio contact, and display of appropriate navigational beacons and lights. To comply with MARPOL and *Marine Pollution Act* (Section 17) requirements, Subcontractors shall ensure that there are approved vessel specific spill contingency plans and emergency plans (SOPEP and SMPEP) on board vessels with a gross tonnage of 400 tonnes or more. These plans are not project specific, however shall be made	Marine Pollution Act International convention for the prevention of pollution from ships, 1973, as modified by the protocol of 1978 relating thereto (MARPOL 73/78) (IMO 1978) Navigation Act 2012 Darwin Port Corporation Act 2012	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	available to Contractor for review upon request.	Nearshore Oil Spill Contingency Plan (C075-AH-PLN-0007)		
	Prevention			
6.14.07	An inspection and maintenance program is implemented across Site though all phases of construction, to minimise the potential for spills and leaks to occur.	GIIP	At all times	Subcontractor Contractor Company
6.14.08	Spills of spent hydrotest water will be minimised by: Commencing dewatering gradually where possible while all pipework and fittings are inspected for leaks. All temporary dewatering pipework, fittings and hydrotest equipment will be inspected for leaks at the commencement and during dewatering. Assigned observers will inspect the full length of temporary dewatering pipework to determine that all joints remain tight. Leaks from temporary filling pipework and fittings will be addressed as soon as practicable based on flow rate and erosion risk. Filling will be stopped as soon as practicable on identifying any leak from hydrotest equipment.	GIIP	At all times	Subcontractor
6.14.09	Radio contact will be maintained between pump/filling operators and observers of hydrotest equipment and filling pipework routes to report any problems.	GIIP	At all times	Subcontractor
6.14.10	SDS will be made available where chemicals are used and/or stored to aid in the identification of appropriate spill clean-up	Environmental Commitments Register	Prior to and at all times during	Subcontractor Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	and disposal methods.	Item 21.03 CEMP Section 6.13 WHS (NUL) Act WHS (NUL) Regulations	construction	Company
6.14.11	Chemicals and hazardous substances will be stored and managed to minimise the potential adverse environmental impacts associated with their transport, transfer, storage, use and disposal. Chemicals and hazardous substances will be stored in containers which are fit for purpose as per the relevant Australian standard.	Environmental Commitments Register Item 21.04 CEMP Section 6.13	At all times	Subcontractor Contractor Company
6.14.12	Storage facilities (chemical and hazardous substances, waste) shall be tied down in the event of a cyclone to minimise uncontrolled release to the environment. Stationary concrete batch plants will be designed and cyclone rated to withstand cyclones in the Darwin Region C.	GIIP	Prior to cyclone season	HSES Manager Subcontractor Company
6.14.13	Prior to transferring hazardous materials between storage containers, drums, tanks or plant and equipment, transfer equipment (e.g. hoses and connections) must be compatible and suitable for the materials being transferred and must be free from defects. Transfer of hazardous materials must take place over an impervious surface which is sufficient to prevent the release of drips, splashes or spills into the environment.	IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007) CEMP Section 6.13	At all times	All personnel refuelling and transferring hazardous materials
6.14.14	Potential spill scenarios will be included in the Emergency	IFC General EHS	Prior to and at all	HSES Manager

Number	Mitigation measure	Reference	Timing	Responsibility
	Response plan and communicated during spill response drills and/or training sessions.	Guideline Section 1.5 Hazardous materials management (IFC 2007) Emergency Response Plan (L290-AH-PLN-0055)	times during construction	Company
6.14.15	In the event of a spill from plant or equipment, the equipment will be temporarily stood down and the cause or deficiency will be identified and repaired before the equipment is put back into operation.	Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014)	At all times	Subcontractor Company
	Notification			
6.14.16	Upon identification of a spill, the appropriate spill response will be initiated and the appropriate supervisor and site management will be notified.	Incident and hazard reporting procedure (L290-AH-PRC-0021) Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014)	At all times	All Site personnel
6.14.17	For non-reportable spills as per Table 6-59, the Subcontractor Environmental Representative shall maintain records on a spill log and be responsible for ensuring adequate clean up. The spill log will be maintained by Subcontractor and submitted to Contractor as part of the monthly report.	CEMP Table 6-61	At all times	Subcontractor
	For non-reportable spills as per Table 6-59, the Company			Company

Number	Mitigation measure	Reference	Timing	Responsibility
	Senior Environmental Advisor shall maintain records on a spill log and be responsible for ensuring adequate clean up.			
	Spill Response			
6.14.18	The health and safety of workers and the public must always be the first priority when responding to a spill, as per the PEAR response principle.	IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007)	During spill response	All Site personnel
6.14.19	All personnel undertaking spill response and clean-up must wear the appropriate PPE required in the SDS.	Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014)	During spill response	All Site personnel
6.14.20	All contaminated materials used in spill clean-up activities will be stored in appropriately labelled, leak proof contaminated waste bins until collected by the licensed waste subcontractor for disposal. Contaminated soil shall be tested for classification for landfill waste acceptance purposes as per NSW Environmental Protection Authority guidelines and methodologies.	CEMP Table 6-61 CEMP Section 6.12 CEMP Section 6.13	During spill response	Subcontractor Company
6.14.21	Any contaminated equipment, such as shovels or leaking machinery, will be cleaned and/or washed down in designated washdown bays.	CEMP Section 6.4 CEMP Section 6.13	After spill response	Operators of machinery and/or equipment

Number	Mitigation measure	Reference	Timing	Responsibility
	Remediation			
6.14.22	Following a reportable spill (in accordance with Table 6-59) the Project Environmental Manager (or delegate) will conduct a visual assessment of the site after clean-up, supported by validation sampling where appropriate, to determine whether further remediation or ongoing monitoring is required. If remediation is required, a remediation action plan will be developed after a risk assessment has been completed to fully detail the remediation and clean-up program. The remediation action plan will be approved by Company prior to the remediation execution. All Contractor's records related to reportable spills will be documented and maintained within Contractor's database.	WMPC Act Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) Assessment of Site Contamination (NEPC 1998)	After spill clean-up assessment and determination on whether a remediation action plan is required	Project Environmental Manager Subcontractor
	Records will be made available to Company as part of the incident reporting process.		As part of the incident reporting process	Contractor
	Monitoring and Inspection			
6.14.23	Groundwater, surface-water and marine sediment monitoring is being conducted as part of the EIMP. In the event of a spill by Contractor or Subcontractor that requires a remediation action plan, a monitoring program may be designed and implemented to detect contamination in surface water, groundwater and marine sediment (where relevant), and will be appropriate to the spill history and any remediation and clean-up program carried out as required.	EIMP (L290-AH-PLN-10013) IFC General EHS Guideline Section 1.5 Hazardous materials management (IFC 2007)	Throughout construction activities	Contractor Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Monitoring activities following a spill will consider the need for the assessment of impacts on fauna, including mammals, turtles, fish and shore birds.			
	In the event of a spill by Company that requires a remediation action plan, a monitoring program may be designed and implemented to detect contamination in surface water, groundwater and marine sediment (where relevant), and would consider the spill history and any remediation and clean-up program carried out as required. Monitoring activities following a spill will consider the need for the assessment of impacts on fauna, including mammals, turtles, fish and shore birds.			Company
6.14.24	Spill-response equipment will be inspected on a weekly basis to check the kits are adequately equipped. Spill kits will be restocked following spill clean-up activities. The contents of the spill response kit is dependent on construction activities and the environmental risk associated with these.	Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014) GIIP CEMP Section 6.13	Weekly	Subcontractor Company
6.14.25	All reportable spills (in accordance with Table 6-59) must be reported as an environmental incident in accordance with Section 8. Verbal notification by Subcontractor to Contractor Environment Representative shall occur immediately. Contractor will then immediately verbally notify a Company Representative.	CEMP Section 8 EPA7 (as amended) Condition 27	At all times	Contractor Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	Company Representative is responsible for reporting to the regulator/s as required, as soon as practicable, and no later than 24 hours after the event has occurred.		In the event of a reportable spill	Company
6.14.26	In the event of a spill, Subcontractor shall initiate the spill response measures in Table 6-61, and action outcomes as required in Section 8.	CEMP Section 8 CEMP Table 6-61	During spill response	Subcontractor Company
6.14.27	Where a spill is not able to be controlled and contained, this is considered an emergency response situation. If this occurs, the ERT shall be notified and will attend to assist with spill response and clean-up as required.	CEMP Section 8.3 Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014)	During spill response	Contractor Subcontractor Company
6.14.28	Spill incidents where reporting is required in accordance with Table 6-59 would need to undergo an assessment for environmental consequence as per Section 8 for further appropriate levels of internal and external reporting.	CEMP Table 6-59 CEMP Section 8 Hazardous chemicals, substances and materials procedure (L290-AH-PRC-0014)	After a spill	Contractor Company
6.14.29	A Marine Pollution Incident Report (POLREP) must be completed for marine spills of any volume. The POLREP must be reported to the: • NT EPA • Darwin Regional Harbourmaster • Port Management Officer. Refer to Table 6-60 for spill response emergency contact	Marine Pollution Act Marine Pollution Regulations Ports Management Act	Immediately following a marine spill	Company Contractor

Number	Mitigation measure	Reference	Timing	Responsibility
	details.			
6.14.30	Vessel operations shall be compliant with requirements of the *Marine Pollution Act*. In accordance with Section 50 of the Act, any reportable incidents that occur will be reported to the NT EPA.	Marine Pollution Act Marine Pollution Regulations	At all times	Contractor Subcontractor Company

Table 6-59: Internal spill reporting levels

		Spill volume (L)		
	Hydrocarbon	<20	20–200	>200
	Sewage	<1000	1000–10 000	>10 000
	Non-hazardous chemical e.g. many paints and detergents	<20	20–200	>200
	Hazardous chemical as per Safe Work classification	<2	2–20	>20
	Contaminated water where water exceeds the discharge trigger values presented in Section 6.4	<1000	1000–10 000	>10 000
Receiving environment	Bund or contained impervious area	Not reportable*	Not reportable*	Reportable×
	Compacted or sealed surface (hardstand, road or work area)†	Not reportable*	Reportable×	Reportable×
	Permeable surfaces or detention pond/sump (land based)	Reportable×	Reportable×	Reportable×
	Nearshore, shoreline, waterway, marine environment (not sensitive)	Reportable×	Reportable×	Reportable×
	Sensitive ecosystem‡ (reef systems, intertidal range, seabird habitats, creeks)	Reportable×	Reportable×	Reportable×

* *Non-reportable spills do not need to be reported as an incident, however must be recorded in a subcontractor spill log or similar, and provided to Contractor with monthly report. All spill response measures and management controls outlined in this CEMP still apply.*

× *All reportable spills shall be reported to Contractor and Company as an environmental incident in accordance with Section 8.*

† *Assumes that the spill can be cleaned up without residual contamination.*

‡ *Assumes that the spill is within 20 m of a sensitive ecosystem or has the potential to impact a sensitive ecosystem.*

Table 6-60: Spill response emergency contacts

Contact	Phone	Email	Online	Comment
NT EPA Pollution Hotline (24 hours)	1800 064 567	pollution@nt.gov.au	http://www.ntepa.nt.gov.au/waste-pollution/hotline	Company (only) to report pollution incidents (including POLREPs)
Department of the Environment	1800 803 772	post.approvals@environment.gov.au	http://www.environment.gov.au/about-us/contact-us	Company (only) to report incidents
Darwin Regional Harbourmaster (24 hours)	08 8999 3867 0419 840 041	tony.omalley@nt.gov.au	http://www.darwinport.nt.gov.au/contacts	Contractor to notify in the event of a spill into the marine environment (POLREP)
Darwin Port Management Officer	08 8999 3949	ian.niblock@nt.gov.au	http://www.darwinport.nt.gov.au/about-corporation/port-management-group	Contractor to notify in the event of a spill into the marine environment (POLREP)
Australian Maritime Safety Authority	02 6230 6868	rccaus@amsa.gov.au	http://www.amsa.gov.au/contact-us/	Contractor to notify in the event of a spill into the marine environment (POLREP)

Table 6-61: Spill response measures and actions

Spill type	Control	Contain	Clean up
Hydrocarbon spills on land	• Stop work. • Identify the spilled substance. • Alert others in the area. • All spills to the marine environment must be reported by Company to the Darwin Port Harbourmaster. • All spills requiring urgent attention must be reported by Company to the Pollution Hotline. • Control the spill at source when it is safe to do so (e.g. by closing valves, isolating burst hydraulic hose). • Remove heat and ignition sources. (e.g. switch off vehicles, equipment and electrics; beware of static from metal shovels). • Conduct Site assessment, considering: – dangers or hazards – precautions and other relevant information on the SDS – whether a warning or evacuation is required – fumes and wind direction (fumes accumulate at the lowest point) – weather conditions (e.g. rainfall and ambient temperature) – flash point of hydrocarbons	If it is safe to do so, contain the extent of spill by: • blocking drains • diverting and absorbing spill using booms, pads, and particulates. Particulate material may need to be worked into the spill with a broom • collecting any free product using waste sucker truck • building containment dykes or digging cut-off trench if necessary to prevent flow offsite or into watercourse • preventing spills entering drains or the oily-water separator.	• Collect affected soil and used spill-containment materials with shovels and place in appropriate containers. • Store affected soil and used spill-containment materials in a sealed container and place in a designated bunded area. • Any hydrocarbon residues may be removed by applying a quick-break degreaser, working in with a broom and hosing into the oily-water separator for treatment. • Where a spill inadvertently flows into the oily-water separator, notify the operator so the hydrocarbons can be pumped out and disposed of appropriately.
Hydrocarbon spills on water†		Refer to the Nearshore Oil Spill Contingency Plan (C075-AH-PLN-0007). If it is safe to do so, contain the	Refer to the Nearshore Oil Spill Contingency Plan (C075-AH-PLN-0007) • Clean up as directed by

Spill type	Control	Contain	Clean up
	– potential reagents and by-products – PPE such as gloves, goggles, apron, respirator, boots, etc..	extent of the spill by: • deploying booms to divert the spill from nearby sensitive areas • angling the booms and surrounding the spill to prevent flow downstream • ensuring booms are connected or overlapped adequately to contain spill • considering anchoring equipment to hold booms in place. Use anchoring equipment if necessary to hold booms in place • using skimmer or absorbent pads or pillows to recover spill. If required, notify marine vessels in the vicinity of the spill.	Project Environmental Manager. • Manage and dispose of oily water that is recovered as per Section 6.12. • Spills retained on riverbanks and vegetation may be removed by flushing with low-pressure water flow, and oily water will be collected in a suitable pit, container or similar, for storage and disposal. • Minor diesel spills which only create a thin layer/sheen may be treated by applying high-pressure water spray to break up the oil and accelerate evaporation.
Raw sewage		If it is safe to do so, contain the spill by: • using sand or earth to prevent spill from entering into waterways or drains • where spills have entered waterways, monitoring any nearby drains and	• Where possible, collect wastewater using a sucker truck for treatment at the WWTP. • Apply liquid sodium hypochlorite or similar disinfectant* to disinfect the affected area, including

Spill type	Control	Contain	Clean up
		downstream sensitive areas.	waterways and any remaining wastewater and solids. • Natural mixing/turbulence in the water body may be helpful in promoting dispersion of the wastewater and breakdown of organic compounds.
Solid materials and aggregates, e.g. cement powder, grout		If it is safe to do so, contain the spill by: • using appropriate containment procedures and materials (refer to the SDS) • preventing spill from entering waterways or drains, using sand or earth. If necessary, the solid may be slightly moistened with water to prevent the spread of dust. If material is water reactive, use another inert liquid (e.g. ethylene glycol*).	• Collect spilt substance and impacted material using spark-proof shovels, as per the SDS. • Store collected material in suitable bags, drums, bins or containers. • Remaining residue may be removed using minimal detergent and water. Resulting wastewater must be collected for appropriate treatment and/or disposal.
Other chemicals, e.g. compressed gases, flammables,		If it is safe to do so, contain the spill by: • using appropriate containment procedures	• Collect spilt material and impacted material for disposal as per the SDS. • Store collected material in

Spill type	Control	Contain	Clean up
corrosives		and materials (refer to the SDS) • preventing spill from entering waterways or drains, using sand or earth.	suitable bags, drums, bins or containers. • Where required, apply neutralising agents* to affected areas as per the SDS.

* *Some neutralising agents, disinfectants, or other chemicals (e.g. ethylene glycol) used in spill response may have associated environmental risks, i.e. be toxic to aquatic organisms or create adverse reactions with other chemicals or combustible materials. The use of any chemical during spill response will be in accordance with a work instruction specifically developed for the use of the chemical or the appropriate SDS. Refer to the mitigation measures in Table 6-58.*

† *Refer to the latest approved version of the Nearshore Oil Spill Contingency Plan (C075-AH-PLN-0007) for further detail on the required response to hydrocarbon spills in the nearshore environment.*

6.15 Quarantine management

Quarantine refers to the examination, exclusion, detention, observation, segregation, isolation, protection, treatment and regulation of vessels, installations, human beings, animals, plants or other goods or things; or the seizure and destruction of animals, plants, or other goods or things.

The objective of quarantine management for the Project is the control and prevention of the introduction, establishment and/or spread of diseases or pest animals or plants that could cause significant damage to the biodiversity values of Darwin Harbour, as well as the commercial and recreational industries such as fisheries, tourism, aquaculture and port industries. Such diseases and pests include weeds and weed seed, pathogens, insects, spiders and other invertebrates and their eggs, rodents, reptiles and amphibians. Typical transportation vectors include crevices or retained soil on machinery, corners and undersides of packing crates, in bulk-bagged or packaged construction materials, and within or on the superstructure of vessels.

Quarantine management also includes control and prevention of the introduction, establishment and/or spread of marine pests introduced from their natural environment to an area where they can threaten biodiversity in Darwin Harbour. The National Introduced Marine Pests Coordination Group (now the Marine Pests Sectoral Committee) identified 55 marine species that are known to be invasive in Australia, are invasive elsewhere or are considered to be potentially invasive.

The Ichthys Project area is within the North Australian Quarantine Strategy (NAQS) zone, which is especially vulnerable to the introduction of foreign pests due to large stretches of coastline, sparse population and the proximity of neighbouring countries. The NAQS is administered by DAWR, which is responsible for international quarantine matters and management.

In 1999, a population of the highly invasive black-striped mussel (*Mytilopsis sallei*) was detected in marinas in Darwin Harbour. A multimillion-dollar eradication program was put in place and was successful in eradicating the mussels. At present, none of the 55 target species are known to occur in Darwin Harbour and the region is considered to be free of marine pests (DoR 2011).

The Aquatic Biosecurity Unit within the Northern Territory Government's Department of Primary Industry and Fisheries maintains a surveillance program to detect the introduction of aquatic pests into the Northern Territory, to coordinate the inspection and treatment of high-risk vessels, and to conduct emergency response activities to the introduction of invasive species.

Interstate quarantine matters are managed by Northern Territory Quarantine (NTQ), which is a part of the Department of Primary Industry and Fisheries.

A quarantine premises has been constructed adjacent to the MOF. It is equipped with washing facilities with a wastewater system. All waste is fully contained and will be managed in accordance with DAWR requirements. Figure 6-11 illustrates the location of the quarantine premises. The Biosecurity Management Plan (L290-AH-PLN-10092) contains management of the MOF and the quarantine premises to address biosecurity risk from cargo discharged at the MOF.

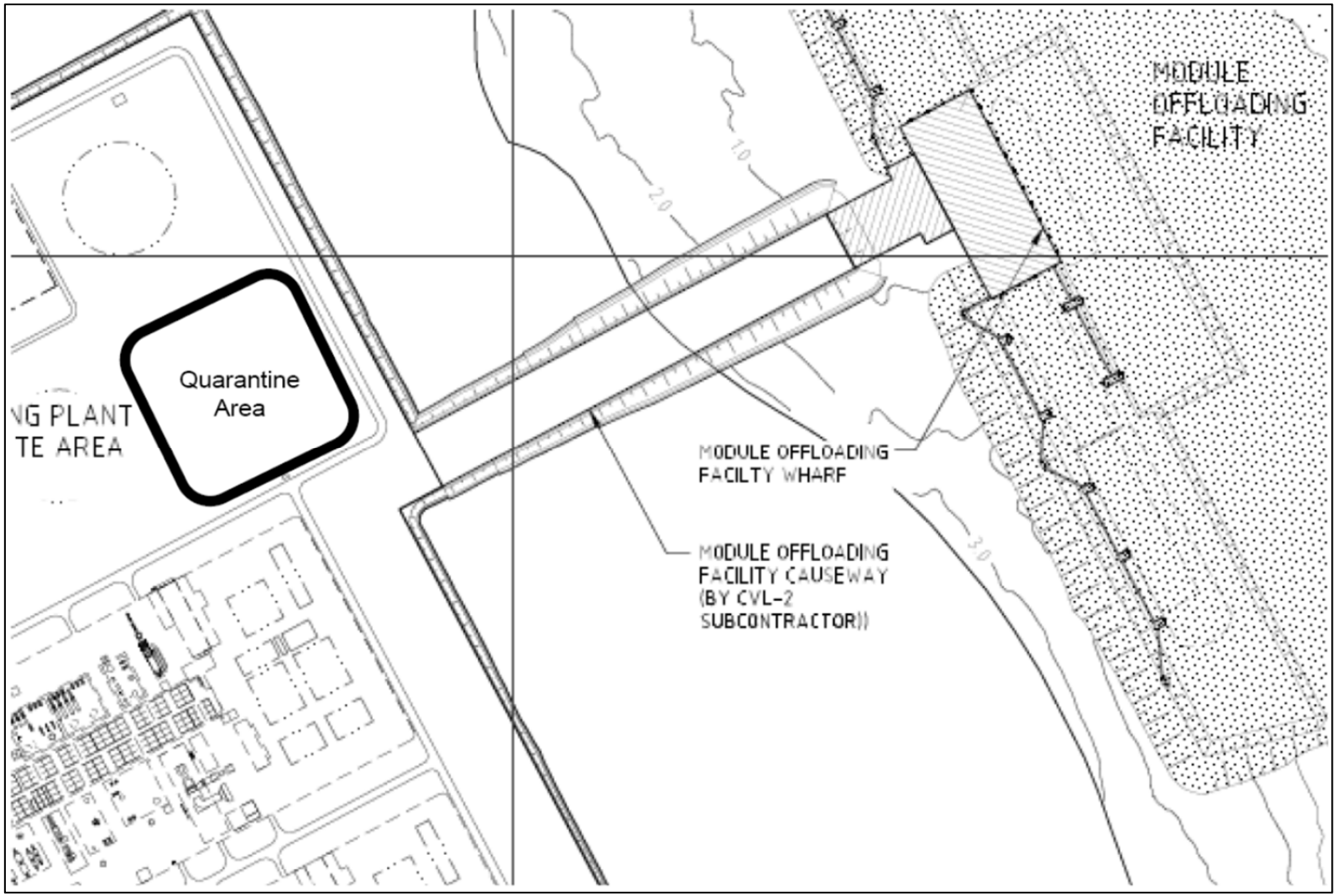

Figure 6-11: Location of quarantine premises

6.15.1 Key activities, potential impacts and residual risk levels

The CEMP includes the following activities:

- quarantine management during the delivery of machinery and equipment by marine vessels from outside Australian waters to the Site via East Arm Wharf
- sea transportation of prefabricated modules and other direct imports to the MOF, including mooring of vessels
- quarantine clearances and the management of the quarantine premises at the MOF.

The key pathways for the introduction of terrestrial pest species include:

- infestations on board vessels
- equipment, machinery and materials transported to Darwin
- packaging (e.g. wooden crates).

The key pathway for the introduction of marine pest species are:

- biofouling on the hull of the vessels
- transportation in vessel ballast water.

Quarantine management via East Arm Wharf

All goods and equipment imported from overseas must be transported via East Arm Wharf, with the exception of any direct imports unloaded at the MOF, which has common-user quarantine and customs facilities managed by DAWR.

All Project-related goods passing through this facility will be received, inspected and authorised by DAWR for entry into Australia. All subcontractors using East Arm Wharf must comply with DAWR requirements and procedures and assist DAWR in any inspections or other actions. Upon receiving quarantine clearance from DAWR for goods received at East Arm Wharf, subcontractors are responsible for the transport of the goods to Site and for the associated vehicle hygiene requirements.

Upon offloading to land, the transport of materials by road and the associated weed, pest and vehicle hygiene will be managed by the strategies listed in Section 6.3.

Quarantine management at Bladin Point

Prefabricated modules and other direct imports to be offloaded at the MOF will have DAWR inspection at the MOF or at the quarantine premises adjacent to the MOF. In the event of a washdown of materials that have not been cleared by DAWR i.e. materials with quarantine issues, the sump collecting waste water will be isolated to contain all washdown water, and the pump station will pump into an above ground collector tank, until collection and disposal as quarantine wastewater in consultation with DAWR. Similarly, other biosecurity waste will be contained e.g. in designated biosecurity bins until collection and disposal in accordance with DAWR requirements.

The washdown of materials that have been cleared by DAWR is not treated as quarantine waste, and will either be reused on site, discharged (refer to Table 6-14) or collected and disposed of via a licensed waste contractor.

The key activities and potential environmental impacts identified for quarantine management are listed in Table 6-62. The residual risk levels after the implementation of the mitigation measures contained in Table 6-64 are also identified.

Table 6-62: Key activities, potential environmental impacts and residual risk levels for quarantine management

Activity	Potential environmental impact	Residual risk level
Foreign marine vessels entering from outside Australian waters; infestation of the vessel, ballast water, plant and equipment, or packaging	• Accidental introduction of marine pest species to Bladin Point and Middle Arm Peninsula, displacing native species and altering and degrading habitats and ecosystem function both in the Darwin Harbour and in mangrove habitats in the nearshore environment • Effects on the biodiversity of Darwin Harbour	Low
Marine vessels entering the nearshore development area from elsewhere in the Northern Territory or Australia		Moderate

6.15.2 Objectives, targets and indicators

The objectives, targets and indicators for quarantine management that have been established are outlined in Table 6-63.

Table 6-63: Quarantine management objectives, targets and indicators

Objective	Target	Indicator
To prevent the introduction of terrestrial and marine invasive species into Darwin Harbour	• Zero introductions of terrestrial and marine invasive species attributable to goods or Project vessels brought into Darwin Harbour	• The number of confirmed reports of terrestrial and marine invasive species on Site or within the waters surrounding the Site
	• Zero breaches of terrestrial and marine quarantine management requirements	• The number of incidents relating to breach of terrestrial and marine quarantine management requirements

6.15.3 Mitigation measures

The mitigation measures that will be implemented to achieve the established objectives and targets for quarantine management are described in Table 6-64.

Table 6-64: Quarantine mitigation measures

Number	Mitigation measure	Reference	Timing	Responsibility
	Inductions and Training			
6.15.01	Site inductions will include the following specific components for quarantine management: • awareness of quarantine risks including general identification of pests and quarantine material • quarantine risk exposure pathways for marine cargo and vessels • the requirement to adhere to weed hygiene and quarantine procedures • awareness of human vectors in the introduction of weeds and pests, including clothing as well as vehicle and equipment use.	Company Environmental Policy Contractor HSES Policy CEMP Section 9	Before entering Site	HSES Manager Subcontractor Company
6.15.02	Training will be provided to personnel involved with quarantine issues, including procurement, transport and logistics supply chain, on the general identification, location and reporting of introduced weed species and fauna and an overview of DAWR requirements and processes.	CEMP Section 9	Prior to commencement	HSES Manager Subcontractor Company
	General			

Number	Mitigation measure	Reference	Timing	Responsibility
6.15.03	The latest approved versions of the following quarantine documents will be implemented at all times, to ensure compliance with biosecurity and quarantine requirements: • Logistics quarantine management procedure L290-AG-PRC-0025 • Site quarantine plan L290-AB-REP-0016 • Biosecurity management plan L290-AB-PLN-10092.	Biosecurity Act 2015 Fisheries Act Plant Health Act IFC Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources Logistics quarantine management procedure L290-AG-PRC-0025 Site quarantine plan L290-AB-REP-0016 Biosecurity management plan L290-AB-PLN-10092	At all times	Subcontractor Contractor
6.15.04	All equipment imported from overseas and the superstructure of international vessels will be inspected by a DAWR inspector upon arrival at East Arm Wharf in the Port of Darwin or upon arrival at the MOF, in accordance with DAWR standards.	Environmental Commitment Register Item 17.08	Prior to departure and upon arrival at East Arm Wharf or Bladin Point	Subcontractor Contractor
6.15.05	Vessels engaged in Project work will be subjected to a biofouling risk assessment which may result in hull inspections or cleaning.	Environmental Commitment Register Item 8.03 Marine Quarantine Guidelines (C075-AH-	During procurement and/or prior to shipment	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
		GLN-0016)		
6.15.06	Quarantine management plans and supporting documentation will be developed and their prescriptions will be implemented in accordance with the requirements of the DAWR, the Northern Territory's Department Primary Industry and Fisheries and the Darwin Port.	Environmental Commitment Register items 8.01 & 17.01	Prior to commencement of construction and/or prior to shipment	HSES Manager Subcontractor
6.15.07	Project vessels will be required to maintain satisfactory records of antifouling management, hull-cleaning action and ballast-water exchange.	Environmental Commitment Register Item 8.04 Australian Ballast Water Management Requirements (DA 2013) International convention on the control of harmful antifouling systems on ships (IMO 2001) Code of practice for antifouling and in-water hull cleaning and maintenance (ANZECC 1997) Site Quarantine Plan (L290-AB-REP-0016)	At all times	Subcontractor
6.15.08	Quarantine waste and substances banned from import will be disposed of in accordance with DAWR requirements and	International convention for the prevention of	At all times	Subcontractor

Number	Mitigation measure	Reference	Timing	Responsibility
	relevant international, national and regional regulatory requirements.	pollution from ships, 1973, as modified by the protocol of 1978 relating thereto (MARPOL 73/78) (IMO 1978)		
	Incidents and Corrective Actions			
6.15.09	All quarantine-related incidents, including breaches of the quarantine process, will be reported in accordance with Section 8.	CEMP Section 8 Biosecurity Act 2015	At all times	Subcontractor Contractor
6.15.10	Quarantine non-conformances or incidents that are identified by a DAWR inspector or at DAWR facilities will be handled, actioned and rectified as per DAWR advice.	Biosecurity Act 2015	At all times	Subcontractor Contractor

7 Auditing, Reporting and Communication

The following section outlines the auditing, reporting and communication processes to be followed, in line with INPEX's Environmental Policy which requires *continual improvement in environmental performance through monitoring, auditing and reviews*.

7.1 Inspections

7.1.1 Company inspections

The Company Environmental Advisor or delegate will complete weekly environmental inspections of each Company work area, in addition to inspections described in Section 6. Company will record findings on appropriate inspection checklist(s). The inspections will target identification of environmental hazards and verification that works are being undertaken in line with environmental legislative requirements, conditions of approval and the commitments within this CEMP. The frequency for inspections may be reviewed for specific low risk activities, as identified in the environmental risk register.

Actions arising from inspections will be raised, recorded and followed through using the online event reporting database to verify that corrective actions are being implemented and are effective (refer to Section 8).

7.1.2 Contractor inspections

The Contractor Project Environmental Manager or delegate along with the Subcontractor Environmental representative will complete weekly environmental inspections of each Subcontractor's work area, in addition to inspections described in Section 6, and Contractor and Subcontractor will record findings on appropriate inspection checklist(s). The inspections will target identification of environmental hazards and verification that construction is being undertaken in line with environmental legislative requirements, conditions of approval and the commitments within this CEMP. The frequency for inspections may be reviewed for specific low risk activities, as identified in the environmental risk register.

Actions arising from inspections will be raised, recorded and followed through using the online event reporting database to verify that corrective actions are being implemented and are effective (refer to Section 8).

Contractor requires that each Subcontractor's Environmental Representative complete a weekly inspection of their work area to monitor environmental performance. This weekly inspection may be undertaken concurrently to the abovementioned Contractor Project Environmental Manager's (or delegate) weekly environmental inspection.

7.2 Auditing

Regular environmental management audits will be conducted during the construction and commissioning phases to validate compliance with legal, HSES Management Systems and management plan requirements, and to provide an opportunity to identify and correct any non-compliance. This will include internal and external auditing by both Company and Contractor.

7.2.1 Internal auditing

Company and Contractor will carry out the regular internal audits described in Table 7-1. Contractor will carry out internal audits in accordance with its Quality and health, safety, environment and security audit procedure (L290-AQ-PRC-0003).

Table 7-1: Indicative Contractor audits

Audit type	Scope	Frequency
HSES Management System	A systems audit by Contractor and Company of the environmental aspects of the HSES Management Systems	At least annually
Compliance with CEMP	Compliance audit by Contractor and Company of site activities against CEMP requirements	Six monthly
Compliance with ESCP	Compliance audit by Contractor for the implementation of ESC and compliance with ESCP/s	Twice annually (once prior to commencement of wet season in September and once during wet season)
Legal (approvals) compliance	Internal audit by Company and Contractor to evaluate compliance with conditions of Project approvals	Annual
Subcontractor CEMP audit	Audit by Contractor of individual Subcontractors for compliance with their approved Subcontractor CEMP	As specified in the Contractor audit schedule

Contractor audit frequency may change based upon changes in its HSES audit schedule.

Company and Contractor will complete and maintain audit forms to document findings and log close-out of issues raised.

Contractor requires Subcontractors to submit an internal audit schedule within one month of mobilisation.

Company has an approvals and compliance tracking system for tracking compliance with all approval requirements. Contractor has developed a database to register and track environmental commitments and obligations contained in this CEMP, the EIS, project approvals, contracts and other obligations that may arise during the Project (e.g. actions arising from risk assessments). The database records the commitment, the timeframe in which the commitment must be executed and the person responsible for compliance (this may be Company, Contractor or Subcontractor personnel, depending on the nature of the commitment).

7.2.2 External auditing

Contractor environmental management will be audited annually by Company to evaluate compliance with EPA7 (as amended), the WMPC Act, the *Water Act*, plus commitments made in the CEMP and EIS. Company will engage an auditor to complete the audit. The external auditor will be appropriately qualified (i.e. a qualified person in accordance with

Section 68 of the WMPC Act).

This audit may include a system audit and/or a detailed compliance audit against Project commitments and regulatory requirements.

Company will engage an external auditor to complete the audit. The external auditor will be appropriately qualified (i.e. a qualified person in accordance with Section 68 of the WMPC Act).

The proposed scope of the annual environmental audit must be submitted to the NT EPA for review and approval no later than 20 business days prior to the proposed commencement date of the environmental audit (which must be specified when the proposed scope is submitted). The environmental audit must not commence until written approval is received from the NT EPA noting that the NT EPA may require Company to revise, amend or resubmit the proposed scope.

An environmental audit report must be:

- completed within two calendar months of receipt of approval from the NT EPA unless otherwise agreed
- signed by the qualified person conducting the audit
- provided in full to the NT EPA within five business days of being signed by the qualified person conducting the audit.

It is recognised that the Site may be subject to external audits by relevant regulatory agencies, including the NT EPA and DoE. Contractor and Subcontractor will cooperate fully with any regulator-initiated audits.

7.3 Communication

7.3.1 Company, Contractor and Subcontractor communications

Effective communication between Company, Contractor and Subcontractor will be vital to the successful delivery of the Project. Prior to Company's Operation team moving onto Bladin Point, communications between Company and Contractor will be based on Contractor having responsibility for day to day environmental management of the Site, and liaison with Subcontractors, as illustrated in Figure 7-1.

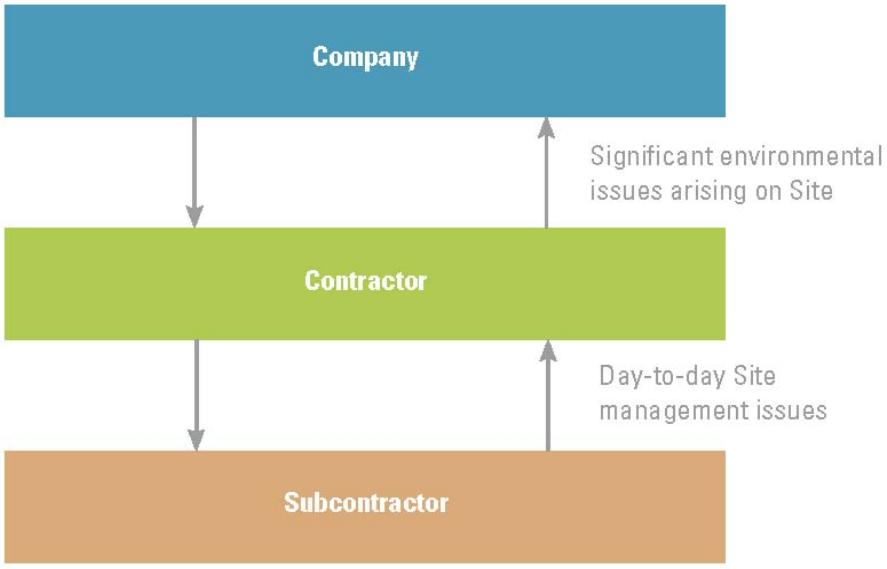

Figure 7-1: Communication channels

Each Subcontractor shall appoint an Environmental Representative, or equivalent, who has primary responsibility for overseeing the implementation of the CEMP. The Subcontractor Environmental Representative will consult directly with the Project Environmental Manager (or delegate) in regards to application of the CEMP to their works and in day-to-day site management issues, and will attend a weekly environmental performance review meeting.

The Project Environmental Manager will communicate directly with Company's Lead Environmental Advisor Onshore (or delegate) in regards to all environmental events and non-compliances with approvals, on the day the event occurs or when the non-compliance is first discovered, as well as any significant environment-related matters arising on Site. The Lead Environmental Advisor Onshore will confer with the Senior Environmental Advisor Onshore Operations as necessary.

Once Company's Operations team moves onto site, Contractor will continue to maintain effective communication flow of HSEQ information throughout all phases of the Project using various methods as described in Section 7.3.2. In addition, Company will communicate relevant HSEQ information to all Contractor, Subcontractor and vendor personnel entering Company controlled areas.

Formal reporting mechanisms between each of the parties are described in Section 7.4.

7.3.2 Contractor Internal communication tools

A range of communication tools will be utilised by Contractor to inform Site personnel of environmental requirements and any emerging issues. Such tools will include:

- a HSES induction, which will provide comprehensive information on the environmental issues and requirements of the Site
- weekly toolbox meetings, which will include specific environmental issues
- environmental noticeboards/posters to inform Site personnel of relevant environmental information such as minutes of meetings, results of monitoring and performance standards
- environmental incident alerts.

7.3.3 Stakeholder and government engagement and communications

Company has prepared a Social Impact Management Plan (SIMP) for the management and mitigation of social impacts associated with the Project and Contractor is committed to implementing the actions within the approved SIMP.

Company has also produced a Community Engagement Plan to manage stakeholder relations for the construction phase of the Project. The plan outlines the clear lines of responsibility in the community relations arena and how Company and Contractor will manage and coordinate activities to provide consistency.

As illustrated in Figure 7-2, Company is responsible for communication and engagement with higher level stakeholders including government, elected representatives and other external stakeholders, with input from Contractor as requested. Lower level notification, communications and engagement will largely be the responsibility of Contractor in liaison with subcontractors, under the supervision of the Community Relations Working Group, as shown in Figure 7-2.

Subcontractors may only engage directly with external stakeholders with the prior approval of both Company and Contractor, and must document outcomes of such communications in their monthly reports.

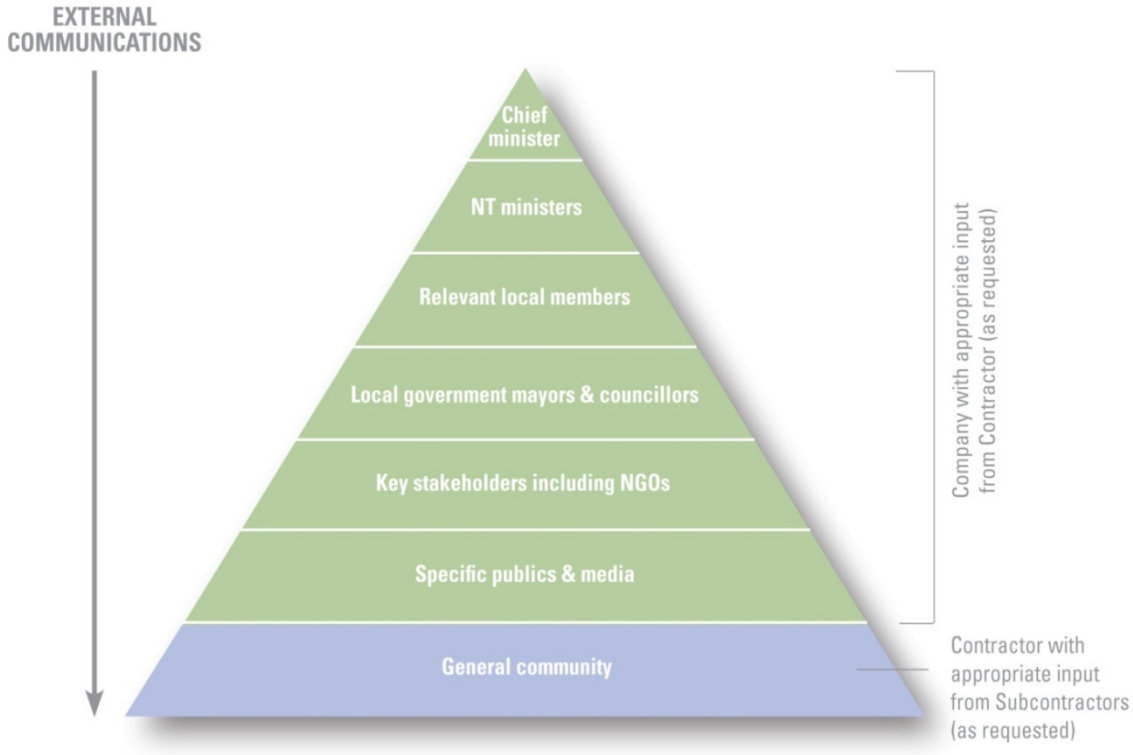

Figure 7-2: Communication management

Community relationships are established and supported through the building of trust and respect with local authorities, social organisations and residents of the communities within the Project's area of influence. Available feedback mechanisms for the community to Company and Contractor include:

- verbal communication with a Company or Contractor representative
- a free call community feedback phone number (1300 724 795)
- public or private meetings
- web-site feedback pro forma (managed by Company)
- mail.

The community hotline is staffed on a 24/7 basis. Community members are encouraged to use the feedback phone number to provide feedback to the Project. All feedback is responded to within 24 hours of contact.

7.4 Reporting

INPEX's Environmental Policy requires the organisation to *communicate openly on environmental issues with internal and external stakeholders*. Project reporting will include reporting by Subcontractors to Contractor, Contractor to Company, and Company to Stakeholders. All reports will be clear and concise, and will use graphs, tables and photographs wherever possible to indicate emerging trends and proposed measures to improve performance. Reporting requirements are summarised in Table 7-2.

Table 7-2: Project reporting requirements

Report type	Responsibility	Content	Frequency	Report recipient
Monthly Subcontractor Environmental Report	Subcontractor	Provide a monthly environmental report to the Project Environmental Manager that includes: • Compliance with project approvals and conditions • Compliance with the CEMP • Environmental incidents and hazards • Environmental improvement initiatives • Results of environmental inspections and audits • A copy of the current environmental risk register • Marine megafauna sightings records • Registers including Fauna and Spill registers • Environmental performance statistics, including: – motor vehicle data – fuel consumption – electricity purchased – waste disposal type and recycling – water usage.	Monthly, as an attachment to the Subcontractor monthly progress report	Contractor
Contractor Monthly Progress Report	Contractor	• Environmental performance statistics, including: – motor vehicle data – fuel consumption – electricity purchased	Monthly	Company

Report type	Responsibility	Content	Frequency	Report recipient
		– waste disposal type and recycling • Water usage • Summary of environmental activities • Status of regulatory compliance audits conducted and responses received • A copy of the current environmental risk register • Marine megafauna sightings records • Summary of environmental compliance • Environmental incidents and hazards • Environmental improvement initiatives • Results of environmental inspections and audits		
Quarterly Contractor Compliance Registers	Contractor	Status of compliance, per Subcontract, against relevant conditions of approval	Quarterly	Company
Monthly Subcontractor Environmental Report	Subcontractor	Results, outcomes and trends of routine monitoring tasks	Monthly, quarterly with annual compilation of results	Contractor
Environmental monitoring reports	Environmental Monitoring Specialist (Consultant)	Refer to Section 8	Refer to Section 8	Contractor

Report type	Responsibility	Content	Frequency	Report recipient
Incident reporting	Subcontractor	Refer to Section 8	Refer to Section 8	Contractor Company
Incident reporting (regulator)	Company	Refer to Section 8	Within 24 hours	NT EPA DoE

7.5 Document control, data and records management

7.5.1 Document control

Environmental documents will be controlled in accordance with Company and Contractor document control procedures.

This CEMP will be managed as a controlled document and revisions will be reviewed and approved by Company.

Contractor requires that the Subcontractor CEMP (initial version and any subsequent revisions) be submitted for review and approval by the Project Environmental Manager. The Project Environmental Manager or delegate will review compliance of the Subcontractor CEMP with the approved CEMP.

7.5.2 Data retention and records management

All records will be legible, identifiable and traceable to the activity, product or service involved. Records will be stored and maintained so that they are readily retrievable and protected against damage, deterioration or loss.

Environmental monitoring results and data will be stored in an electronic format. This data will be stored for seven years following the completion of construction except where file size and relevancy dictate otherwise (specifically noise files). For security reasons, electronic data is replicated at two offsite locations.

Contractor is required to retain accurate records of the amount, in tonnes or kilolitres, of listed waste that is generated, collected, transported, stored, recycled, treated or disposed of by Subcontractors. Contractor will make these records available for Company each month. Waste records are to be made available for inspection by an authorised officer, upon request. Records of listed wastes are to be retained for two years after the end of the 12-month period to which the record relates, in compliance with Regulation 11 of the Waste Management and Pollution Control (Administration) Regulations. Waste records are also stored electronically.

8 Corrective and Preventative Action

8.1 Environmental event definitions

Contractor environmental event reporting and investigation will be conducted in accordance with the Project Incident and Hazard Reporting Procedure L290-AH-PRC-0021. Company environmental event reporting and investigation will be conducted in accordance with the INPEX Event Reporting and Investigation Procedure (0000-AH-PRC-60005).

This section describes the process to be implemented in response to the identification of environmental events. The objective of managing environmental events is to implement corrective actions to rectify and report where potential or actual environmental harm or impact is identified.

Environmental events include the following:

- Non-compliance – failure to comply with a condition, commitment or requirement of an environmental plan, procedure or approval.
- Incident event – an unplanned event, action or occurrence that causes or has potential to cause harm or impact to the environment, reputation, social or cultural heritage, or legal compliance.
- Hazard event (near miss) – a set of conditions or circumstances that has potential to cause harm or impact to the environment, reputation, social or cultural heritage, or legal compliance.
- HAZOB – environmental hazard observation (an environmental hazard with a potential severity/consequence of F)
- Minor environmental event – event with an actual severity/consequence classified as E or F or potential/worst severity/consequence classified as D, E or F
- Major environmental event – event with an actual severity/consequence classified as A, B, C or D or potential/worst severity/consequence classified as A, B or C, and events notified by Company to the NT EPA.

8.2 Environmental event management

The management of non-compliances/hazards and incidents is based on:

- Identification
- Classification
- Notification
- Reporting and investigation including development, implementation and closeout of corrective actions.

Contractor notification, classification, investigation and reporting of all environmental events identified/occurring on Site must be in accordance with the Incident and Hazard reporting Procedure L290-AH-PRC-0021. Refer to the sections below for more details on the key steps in each of these processes.

8.2.1 Identification

Environmental events may be identified in a number of ways, including, but not limited to, observations by site personnel during routine construction activities and movement around site as well as project audits, management reviews, monitoring and inspections.

8.2.2 Classification

All environmental events will be classified based on the Environmental Risk Matrix presented in Table 5-1.

The Project Environmental Manager or their delegate will make the final determination of severity for all environmental events, prior to reporting to Company, who will make their own assessment.

All environmental non-compliances and incidents will be classified and reported as an environmental incident event to Company. All environmental non-compliances will be reported as an environmental incident, including minor and major non-compliances.

Environmental hazards with a potential A, B, C, D and E and which do not result in an environmental non-compliance will be reported as an Environmental Hazard Event.

All environmental hazards with a potential severity/consequence of F, will be reported as an environmental hazard observation (HAZOB).

In the instance multiple consequence elements are applicable to an incident event, the resulting classification will be based on the highest consequence severity.

Environmental incidents and non-compliances with a potential A, B, C, D, E or F will be reported as an Environmental Incident Event.

Events classified as minor environmental events will require a minor investigation, and events classified as major environmental events will require a major root cause analysis (RCA) investigation.

8.2.3 Internal Notification and Reporting

Subcontractor will immediately provide notification to Project Environmental Manager or their delegate of any environmental event. Contractor will then provide immediate verbal notification to Company Environmental Representative (within business hours) or the Company Duty Manager (outside of normal business hours).

Formal notification of environmental incident and hazard events via the online event reporting system will follow initial verbal notification, and will involve the Project Environmental Manager or their delegate reviewing and approving the notification information and event classification. The Project Environmental Manager or their delegate will make the final determination of severity for all environmental events, and may re-classify an event as necessary. In this instance, the required management of the event will correspond to the final event classification.

An investigation is required to be undertaken for all environmental incident events and environmental hazard events to determine event details, contributing factors, root causes and associated corrective actions. All investigations will be recorded using the Contractor online reporting system and submitted to the Project Environmental Manager or their delegate for approval. Subcontractor will undertake the investigations and provide comprehensive reporting information.

For all minor event investigation reports, the Subcontractor will provide Contractor with the report within five days via the online event reporting system for review. Contractor should review or accept the event report within two days of submission and the final report should be finalised within seven days of the event.

For major events requiring a root cause analysis (RCA) investigation, Subcontractor shall complete the event report in the online event reporting system and attach a copy of the draft RCA investigation report, within 21 days of the date the event occurred, unless otherwise agreed by Contractor. Contractor will then review the report and provide feedback. The final RCA report must be completed within 28 days, unless otherwise

agreed by Contractor.

Where a detailed root cause investigation is required, Project Environmental Manager will appoint a Contractor representative to the investigation team and determine the required level of investigation, reporting, timeframes and the participants in the investigation team, which will include Subcontractor, Contractor and Company representatives as required.

Regulatory Authority representatives may exercise their right to investigate an incident and will be provided with appropriate access, information and facilities to complete the investigation, as required by legislation. Refer to the Incident and Hazard reporting Procedure L290-AH-PRC-0021 for full details.

All non-compliance and incident events will be recorded and managed using the online reporting system. This includes the formal notification, investigation and reporting documentation, corrective actions and close-out as required.

Company will access the online reporting system to facilitate their reporting requirements as described below in Section 8.2.4.

8.2.4 External notification and reporting

External notification and reporting to Administering Agencies or Regulators will be undertaken by either Contractor Project Environmental Manager (or delegate) or Company Lead Environmental Advisor (or delegate) as per Table 8-1.

Table 8-1: External reporting responsibilities

Description	Notification responsibility
Non-compliances and incidents reportable under EPA7 (as amended) or Section 14 of WMPC Act, or marine spills (POLREP): notify NT EPA	Company
Prior to commencement and on conclusion of planned flaring, and in the event of unplanned flaring, as soon as practicable after the commencement and on conclusion, for each flaring event: notify NT EPA via pollution@nt.gov.au	
Breach of *Northern Territory Aboriginal Sacred Sites Act* or AAPA Authority certificate conditions: notify AAPA	
Breach of *Heritage Act 2011*: notify DLPE	
Incident resulting in a significant impact to matters of national environmental significance or habitat for listed species in Darwin Harbour: notify DoE	
Non-compliances and incidents reportable under any WDL held by Company: notify NT EPA	
Marine spills: complete POLREP and notify AMSA, Darwin Regional Harbourmaster and Port Management Officer	Project Environmental Manager
Biosecurity risk (for Contractor and Subcontractor	

Description	Notification responsibility
activities): notify DAWR—Biosecurity	
Non-compliances related to any WDLs held by Contractor: notify NT EPA	

Non-compliance reporting to the NT EPA

EPA7 (as amended) requires the Approval Holder (Company) to notify the Administering Agency soon as practicable, and any case within 24 hours, after first becoming aware of any non-compliance that is not trivial or negligible.

Company will be notified by Contractor within required timeframes of all non-compliances first verbally and then through the Contractor online reporting system. Company will make the determination on which events are considered not trivial or negligible for reporting to the Administering Agency.

Incident reporting to the NT EPA

EPA7 (as amended) requires the Approval Holder (Company) to notify the Administering Agency immediately and in any case within 24 hours of any potential or actual environmental harm or pollution.

Company will be notified by Contractor of any potential or actual environmental harm or pollution verbally, immediately or as soon as practicable and then through the Contractor online reporting system.

Refer to the Incident and Hazard Reporting Procedure L290-AH-PRC-0021 and individual licence/approvals/permit/certificates for reporting details relevant to other Administering Agencies and Regulators.

Incident reporting to DoE

Should an event occur that has the potential to have a significant impact on matters of national environmental significance, Company will notify DoE within 24 hours of becoming aware of the event. As Approval Decision EPBC 2008/4208 Condition 8 (Liquid Discharge Management Plan) focuses specifically on habitat for listed species in Darwin Harbour, any event related to liquid discharges with the potential to have a significant impact on such habitat is also specifically required to be report to DoE.

8.3 Emergency preparedness and response

The contact details of the designated 24-hour Contractor emergency response contact person are:

Contact name: Contractor Duty Manager

Mobile: 0418 907 860

The contact details of the designated 24-hour Company emergency response contact person are:

Contact name: Company Duty Manager

Mobile: 0418 237 232

The 24-hour Company emergency response contact details are displayed at the primary road entrance to the Site.

Prior to the introduction of PWC gas, Contractor is responsible for Emergency Management and Response as described by Contractor Emergency Response Plan (L290-AH-PLN-0055). Contractor emergency response includes Emergency Response Coordinator (ERC) responsible for overseeing response to emergencies and Emergency Operations Officer (EOO) responsible for directing and coordinating from the Emergency Operations Centre (EOC).

The Contractor response teams play the lead role in responding to an emergency. The Field Response Team (FRT) is a team of trained Site personnel and will respond to the emergency alarm, reporting to ECC or area of concern and take directions from the ERC. The Emergency Response Team (ERT) is a team lead by an On-Scene Commander (OSC) and staffed with trained individuals who are present at or travel to the scene of an incident to mount and sustain a hands-on tactical response. Team members will include Company, Contractor and Subcontractor personnel. The OSC is typically the Field Superintendent but may be another appropriately trained individual. The OSC has overall command of the ERT and will maintain communication with ERC and EOO.

The FRT will respond to Level 1 Emergency (local) events. If the event develops into a Level 2 (project) or Level 3 (global) Emergency, the FRT and the ERT will manage the event. Level 3 Emergency will require the involvement of the Crises Management Team (CMT). Level 1, 2 and 3 Emergency will require involvement of the project management team.

INPEX's Environmental policy requires the Project to establish, maintain and regularly test emergency management processes and procedures.

Contractor will prepare for emergencies on Site by implementing the actions described in Table 8-2.

Table 8-2: Emergency response actions

Number	Response action	Reference	Timing	Responsibility
1	A detailed construction emergency response plan will be prepared and implemented. The plan will prescribe actions to be implemented in the event of specific emergencies, including major spills and cyclones/floods.	GIIP	At all times	HSES Manager
2	Emergency response teams (Field Response Team and Emergency Response Team) will be established.	GIIP	At all times	HSES Manager
3	Appropriate training will be provided to response teams.	GIIP	Prior to an emergency	FRT and ERT
4	Emergency communication lines will be maintained.	GIIP	An on-site exercise will be performed	All Site personnel

Number	Response action	Reference	Timing	Responsibility
			once every six months.	
5	A log of events and facts of the emergency situation will be recorded on standard forms.	GIIP	At all times	HSES Manager
6	Periodic drills, along with follow-up evaluations, will be conducted, to measure performance and to maintain equipment and site personnel in a state of readiness.	GIIP	At all times	HSES Manager

The Contractor process for a controlled and coordinated response to emergencies is detailed in Emergency Response Plan (L290-AH-PLN-0055). Emergency response includes Emergency Response Coordinator (ERC) responsible for overseeing response to emergencies and Emergency Operations Officer (EOO) responsible for directing and coordinating from the Emergency Operations Centre (EOC).

The response teams play the lead role in responding to an emergency. The Field Response Team (FRT) is a team of trained Site personnel and will respond to the emergency alarm, reporting to ECC or area of concern and take directions from the ERC. The Emergency Response Team (ERT) is a team lead by an On-Scene Commander (OSC) and staffed with trained individuals who are present at or travel to the scene of an incident to mount and sustain a hands-on tactical response. Team members will include Company, Contractor and Subcontractor personnel. The OSC is typically the Field Superintendent but may be another appropriately trained individual. The OSC has overall command of the ERT and will maintain communication with ERC and EOO.

The FRT will respond to Level 1 Emergency (local) events. If the event develops into a Level 2 (project) or Level 3 (global) Emergency, the FRT and the ERT will manage the event. Level 3 Emergency will require the involvement of the Crises Management Team (CMT). Level 1, 2 and 3 Emergency will require involvement of the project management team.

After the introduction of PWC gas, all emergency response notifications on site will go through the Central Control Room (CCR) by dialling 8931 8888 or by pressing the red button on the provided TETRA Radio. The CCR is located within the Central Control Building (CCB) and is manned 24/7. The Company Production Team Leader (PTL) or delegate will liaise with the Emergency Response Coordinator (ERC) or delegate to determine the most appropriate resources (Company or Contractor) to activate.

If the emergency event escalates to a Level 2, then the Company Incident Management Team (IMT) will be activated as per the local incident management processes. Contractor's Senior Representative forms an integral part of the Darwin IMT if required for Level 2 events. The Company IMT will coordinate all external support and Company Crisis Management Team (CMT) activation. This will ensure single accountability for external communications.

Post introduction of PWC commissioning gas, Contractor will continue to conduct regular drills to verify the effectiveness of their Emergency Response Plan and ensure personnel

are trained to execute emergency procedures. Contractor and Company will participate in joint drills as required.

9 Responsibilities, Training and Awareness

9.1 Roles and responsibilities

Company and Contractor will assign suitable resources to oversee the execution of this CEMP. The Contractor environmental function organisational chart for all physical locations—Yokohama office, Perth office, Darwin office and Site—is shown in Figure 9-1.

A summary of key environmental roles and responsibilities is included in Table 9-1.

Subcontractor environmental roles and responsibilities will be shown in the Subcontractor organisational structure and detailed in the Subcontractor management plans.

Where responsibility is assigned to a role, the task may also be performed by a suitable delegate. Unless stated otherwise, all positions referenced in this CEMP are Contractor Site positions.

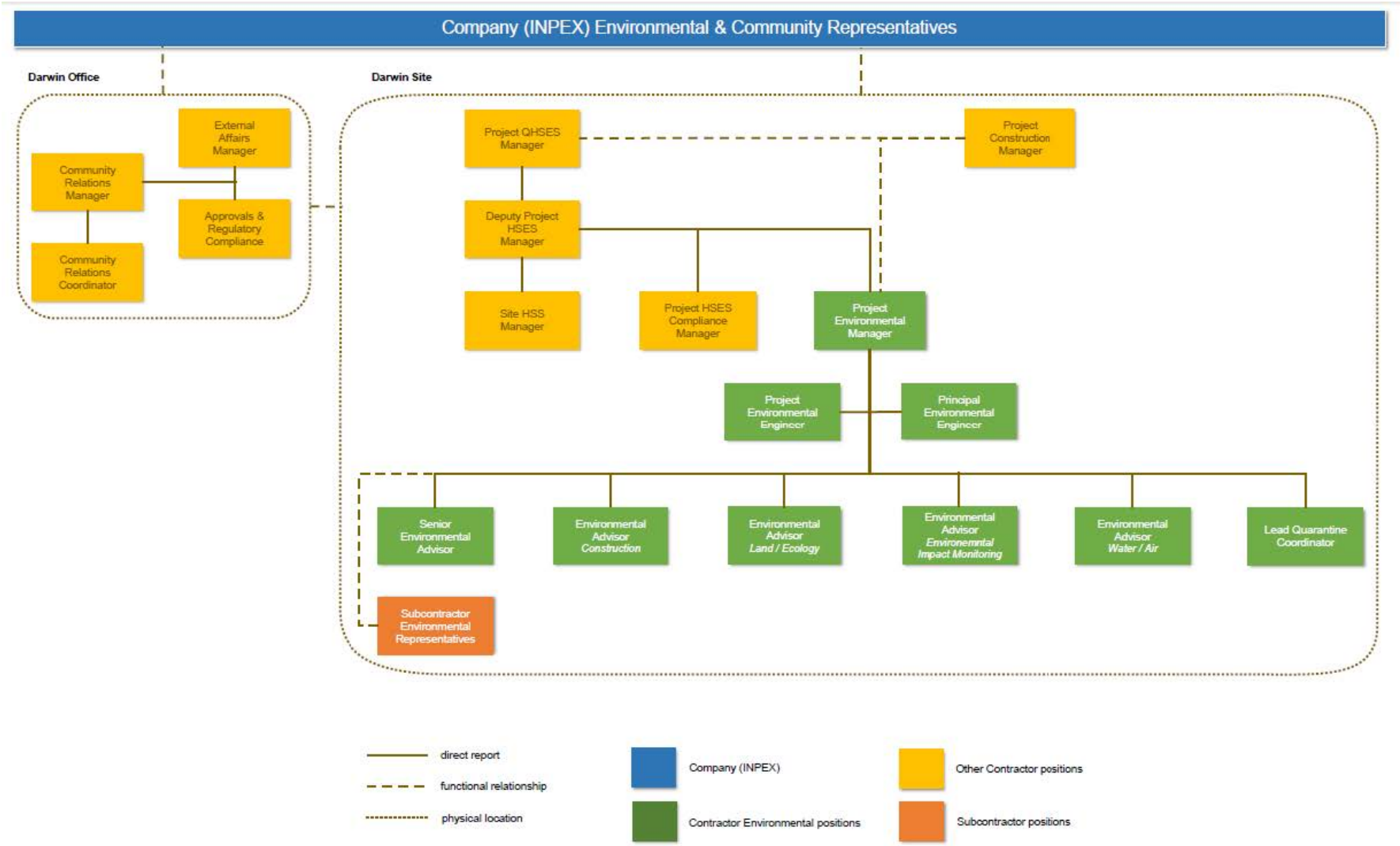

Figure 9-1: Contractor environmental function organisational chart

Table 9-1: Summary of key environmental roles and responsibilities

Role	Key responsibilities
Company – Operations	
General Manager Onshore Operations	• Following the handover of a SP, the General Manager Onshore Operations assumes HSEQ responsibility for the handed over area. • Following the introduction of PWC commissioning gas, the General Manager Onshore Operations increases oversight of safety management on the entire site and may elect that Contractor implements the Company Permit to Work system, in the areas in which Contractor's scope of work includes hot commissioning activities (i.e. with hydrocarbon or steam). • In the event of any emergency involving hydrocarbons, all work permits are suspended and Company will direct and coordinate all emergency responses for the entire site. Work will only resume upon Company authorisation.
Onshore Production Manager	• Nominated person responsible for all areas under Company control. • Responsible for the application of the Company Area Permits, management of the SIMOPS process and ensuring the overall health, safety and welfare of personnel at all times.
Company Duty Manager	• Responsible for determining, based on the information provided by the caller to the Central Control Room, the appropriate emergency response required, and mobilisation of response resources, following introduction of PWC commissioning gas. • Management and coordination of SIMOPs during an emergency response.
Senior Environmental Advisor Operations Onshore	• Communication of the requirements of this CEMP to the Company operations workforce • Participation in HSE meetings and promoting environmental awareness • Ongoing monitoring of environmental performance in relation to relevant sections of this CEMP • Facilitating and/or participation in regular audit and review process to maintain the effectiveness of this CEMP • Carrying out regular environmental inspections • Responding to and participating in investigations of environmental incidents and hazards • Consult with regulators and other key stakeholders in relation to this CEMP
Contractor	
Construction	• Overall responsibility for management of environmental

Role	Key responsibilities
Manager	performance • Meet the requirements of the Contract, including the environmental specifications • Liaises with Company's environmental representatives on site environmental-related issues • Reviews environmental management performance on a monthly basis • Implements appropriate management actions to facilitate compliance with all legal requirements • Provides appropriate resources so that the requirements of the CEMP are met • Demonstrates effective leadership to all Site personnel with respect to matters concerning the environment • Promotes effective communication of environmental requirements to Contractor personnel and subcontractors.
HSES Manager	• Coordinates activities between health, safety, security and environmental groups • Supports site management and supervisors in the implementation of management plans and monitoring the effectiveness of the plans in achieving targeted performance • Facilitates and maintains inductions and ongoing environmental awareness training to the construction workforce.
Project Environmental Manager	• Acts as the primary environmental contact/resource for the Yokohama office and engineering design activities so that environment requirements are properly incorporated into each design • Coordinates environmental work and resources between Yokohama, Perth Office, Darwin Office and the Site • Liaises with the Company Environment Representative(s) • Coordinates site environmental management so that works associated with the Project construction (on and offsite) are conducted in accordance with the EIS environmental commitments, applicable environmental laws and regulations, mandatory codes and standards, Project conditions of approval, EIS recommendations, EPC Contract requirements, and Contractor and Company specifications • Advises on reducing the environmental impacts of construction activities to ALARP • Organises and attends environmental management meetings and chairs a regular meeting with the Company environmental representative, Site environmental management, Subcontractors' Site representatives and their environmental managers • Liaises with government agencies as required and in accordance with Company's stakeholder and government

Role	Key responsibilities
	engagement plan • Assists the Approvals & Regulatory Compliance Manager obtain the necessary environmental permits and approvals for the construction works • Maintains the environmental aspects of the HSES Management System, including coordinating environmental audits of Contractor and Subcontractor activities • Monitors and reports on the environmental performance of Site activities against KPIs • Plans, coordinates and participates in Environmental Hazard Identification (ENVID) workshops and environmental risk assessments • Works with health, safety and security personnel to deliver the HSES objectives of the project and provides a coordinated approach • Conducts investigations where a major environmental event has occurred, to identify the cause and potential environmental impact and determine whether remediation or ongoing monitoring is required. • Make Contractor environmental plans and procedures available to Subcontractor. • Act as the management representative as required under AS/NZS 14001:2004 • Notifies Company of non-compliances and events as soon as becoming aware.
Principal Environmental Engineer	• Supports the Project Environmental Manager in liaising with engineering resources on engineering design activities so that environment requirements are properly incorporated into each design • Advises site environmental management so that works associated with the Project construction (on and off site) are conducted in accordance with the EIS environmental commitments, applicable environmental laws and regulations, mandatory codes and standards, Project conditions of approval, EIS recommendations, EPC Contract requirements, and Contractor and Company specifications • Advises on reducing the environmental impacts of construction activities to ALARP • Participates in meetings with government agencies as required and in accordance with Company's stakeholder and government engagement plan • Assists the Approvals & Regulatory Compliance Manager obtain the necessary environmental permits and approvals for the construction works
Senior Environmental	• Provides advice on a variety of environmental issues and potential impacts; in particular, develops and maintains environment documentation as part of the site HSES

Role	Key responsibilities
Advisor—Systems	Management System • Oversees the implementation of the site Outline Environmental Monitoring • Manages all environmental monitoring data (including spatial information) so that it is appropriately stored and easily retrievable for use in routine reporting • Supports the site environmental compliance management system and makes suggestions for its improvement • Assists training personnel to develop and deliver environmental inductions and awareness training sessions • Plans, coordinates and participates in site-based environment inspections and audits and reports on results • Coordinates all internal and external reporting obligations (e.g. NPI, GHG, waste tracking) • Coordinates and liaises with Yokohama, Darwin, and Perth Office-based environment personnel on issues relating to system development and implementation • Supports the Project Environmental Manager and Environmental Advisors as required • Provides advice and guidance on environmental engineering aspects of temporary facilities, waste streams and interface between engineering and environmental compliance. • Advise the Environmental Advisors, construction and subcontractors on relevant engineering components and they pertain to environmental compliance.
Environmental Engineer – Commissioning	• Supports the Project Environmental Manager in liaising with engineering contact/resources, Site commissioning teams to ensure engineering design activities and commissioning outputs are assessing and incorporating environment requirements into each design - specifically for commissioning activities. • Advises site commissioning management so that works associated with the Project commissioning (on and off site) are conducted in accordance with the EIS environmental commitments, applicable environmental laws and regulations, mandatory codes and standards, Project conditions of approval, EIS recommendations, EPC Contract requirements, and Contractor and Company specifications • Advises on reducing the environmental impacts of construction and commissioning activities to ALARP • Participates in meetings with government agencies as required and in accordance with Company's stakeholder and government engagement plan • Assists the Approvals & Regulatory Compliance Manager obtain the necessary environmental permits and approvals for the construction works • Performs environmental engineering reviews, studies,

Role	Key responsibilities
	analysis or other technical assessments to facilitate commissioning works and compliance to this CEMP. • Assist and provide guidance to the Environmental Advisors and project team on commissioning and environmental technical interface matters.
Senior Environmental Advisor—Systems	• Advises on a variety of environmental issues and potential impacts; in particular, develops and maintains environment documentation as part of the site HSES Management System • Supports the site environmental compliance management system and makes suggestions for its improvement • Assists training personnel to develop and deliver environmental inductions and awareness training sessions • Plans, coordinates and participates in site-based environment inspections and audits and reports on results • Coordinates all internal and external reporting obligations (e.g. NPI, GHG, waste tracking) • Coordinates and liaises with project personnel on issues relating to system development and implementation • Assists the Project Environmental Manager and provides advice to Environmental Advisors as required • Provides oversight support to subcontractors as necessary.
Environmental Advisors	• Provide advice on a variety of environmental issues and potential impacts, including: – air quality, noise, – water management issues, including groundwater and surface-water management, discharge water quality, water treatment, marine, erosion and sediment control – quarantine, biosecurity compliance, – land/ecology/waste issues, including weed management and mapping, flora/fauna management, clearing permits, pest control, bushfire management, acid sulfate soils, cultural heritage, – general and regulated waste management, and dangerous goods • Report potential and actual environmental incidents • Liaise with project personnel • Develop technical and regulatory documents, reports and presentations • Support the Project Environmental Manager and Environmental Advisors as required.
Environmental Advisor—Impact monitoring	• Manages the environmental impact monitoring program including execution of all sampling work, reporting, and data collation/storage. • Manages all environmental monitoring data (including spatial information) so that it is appropriately stored and easily

Role	Key responsibilities
	retrievable for use in routine reporting • Liaises to package managers/engineers to identify additional monitoring/sampling work required as a result of any additional construction work commencing on site, and implements the change • Liaises with subcontractors to ensure the monitoring program is executed • Coordinates with subcontractors on reporting of outcomes from the monitoring programs to Company • Reports on environmental compliance for the overall project based on outcomes from the monitoring program.
Project Training Manager	• Facilitates and maintains inductions and ongoing environmental awareness training to the construction workforce.
Community Relations Manager (Darwin-based)	• Provides high-level advice regarding the management of social issues • Develops a procedural interface between Company and Contractor regarding delivery of communications and community relations strategies • Creates and maintains relationship-building efforts for the construction activities • Maintains day-to-day liaison with Company, construction management, key stakeholders and the broader community as required by Company • Organises, facilitates and attends community information sessions, public displays and events as required by Company and Contractor • Prepares and implements a public notification process for planned works • Manages comprehensive documentation of stakeholder and community engagement through the Company database • Provides comprehensive monthly reports across all relevant areas in alignment with Company requirements • Prepares communication materials and reports for specified Contractor requirements • Identifies opportunities for award submissions, marketing and event opportunities, and internal communication materials • Identifies and prepares or commissions articles and visual records (photographs, videos, multimedia, displays, presentations etc.) as required • Manages Company and Contractor media protocols and Company community interface protocols so that they are adopted and practised by all relevant personnel • Provides timely and effective input into Company community notification system.

Role	Key responsibilities
Community Relations Coordinator	• Provides advice to the Community Relations Manager (CRM) regarding social issues, community relations, and communications requirements • Assists the CRM with any tasks related to community relations and social issues • Maintains day-to-day liaison with the construction management, Subcontractors and the broader community as required by the CRM • Organises, facilitates and attends community information sessions, public displays and events as required by Company and Contractor • Prepares and issues public notifications for planned works • Oversees data entry into the Company stakeholder and community engagement database • Supports the CRM to prepare monthly reports aligned to Company requirements • Designs and prepares communication materials and reports for specified Contractor requirements • Provides all employees with induction and training relating to social issues, where required • Supports the CRM to identify and prepare or commission articles and visual records (photographs, videos, multimedia, displays, presentations etc.) as required • Manages Company and Contractor media protocols and Company community interface protocols so that they are promoted, adopted and practised by all relevant personnel and subcontractors • Provides timely and effective input into Company community notification system.
Approvals and Regulatory Compliance Manager (Darwin-based)	• Identifies regulatory approvals requirements in consultation with Company, as required • Schedules regulatory approvals activities • Prepares and submits approvals application packages to the statutory authorities, as required. • Reviews approvals application packages against Company and statutory authority requirements • Submits approvals supporting information to Company for submission to the statutory authorities, as required. • Maintains systems to monitor and report on the key compliance performance indicators for Contractor's and Subcontractors' approvals within Australia • Manages and supports interfaces with statutory authorities in the Northern Territory by the Contractor team and Subcontractors • Reports progress on approvals and compliance performance regularly to Contractor management and Company in

Role	Key responsibilities
	consultation with Site Construction Manager and Project Environmental Manager.
Subcontractor	
Subcontractor Construction Manager	• Demonstrates effective leadership to all Subcontractor personnel with respect to matters concerning the environment and implementation of the CEMP at a project level • Assists the Construction Manager comply with all applicable requirements of the CEMP and legal requirements • Assists in reviews of Risk Register and CEMP in consultation with the Senior Environmental Advisor - Systems • Reviews environmental management performance on a monthly basis and supplies copies of reports to the Project Environmental Manager • Provides for appropriate management actions to be put into place to facilitate compliance with all legal requirements • Reports non-trivial incidents and emergency events to the Project Environmental Manager as soon as reasonably practicable • Communicates environmental matters to Subcontractor personnel • Requires subcontract personnel to comply with Company and Contractor environmental requirements.
Subcontractor Environmental Representative	• Oversees all Subcontractor activities so they comply with the requirements of this CEMP • Provides specialist on-site environmental advice and guidance to Subcontractors as necessary • Monitors environmental parameters and submission of monthly environmental reports • Liaises with the Project Environmental Manager (or delegate) as required • Communicates environmental matters to Subcontractor personnel • Conducts internal audits of works for CEMP and legal compliance • Provides environmental support to the Subcontractor Construction Manager • Supervises and trains Subcontractor personnel to meet the requirements of this CEMP.
All Site personnel	
All Site personnel	• Perform all work in an environmentally responsible manner and in accordance with this CEMP

Role	Key responsibilities
	• Understand the environmental risks associated with their work and within their work areas • Identify and report all environmental incidents and hazards • Assist in the development of environmental work practices and participate in environmental inspections and incident investigations • Attend all inductions and training specified in this CEMP.

9.2 Competency, training and awareness

INPEX's Environmental Policy requires the Project to ensure our personnel have the necessary awareness, training, knowledge, resources and support, to meet environmental objectives and targets.

Within Contractor controlled areas, Contractor and Subcontractors are required to manage the training and competency needs of their personnel in relation to their scope of works in accordance with the Contractor procedures.

All personnel must be suitably trained and competent to perform their specific job role. Under no circumstances shall personnel be allowed to operate machinery or work onsite unless they are deemed competent by Contractor.

All personnel entering a Company controlled area will be required to hold the appropriate competencies for the tasks they undertake.

Once a SP is under Company control, the Contractor will continue to operate in accordance with its procedures and provide evidence to Company upon request that it has successfully completed a Verification of Competency for each individual type of equipment its personnel intend to operate.

Environmental training will be provided to all personnel for competency and awareness in relation to project environmental risks, management practices and procedures, and understanding of the requirements outlined in this CEMP through the site induction. Additional training as required will be undertaken on an as needs basis.

Management strategies to achieve environmental competency and awareness are described in Table 9-2. A list of the various inductions and the environmental content which will be covered are outlined in Table 9-3.

Table 9-2: Environmental training and competency—management measures

Number	Management measure	Reference	Timing	Responsibility
9.2.01	Environmental personnel will be selected on the basis of relevant education and experience. Personnel in environmental positions, including Subcontractors, will have the training and experience required for that position.	GIIP	Prior to mobilisation to site	Project Environmental Manager Subcontractor Company
9.2.02	All personnel, including Company, Contractor, Subcontractors and their vendor personnel, will receive training in the environmental requirements and procedures relating to their work via inductions (refer to Table 9-3), toolbox meetings, and task-specific training/inductions.	GIIP	Prior to mobilisation to site	Project Environmental Manager Subcontractor Company
9.2.03	Inductions and training in health, safety, environment and security will be prepared, managed and facilitated by the Project Training Manager. Specific induction procedures and requirements are addressed in the relevant HSES documentation. The objective of the Site inductions and training is to communicate the following: • HSES policy and procedures and the need to comply with the policy and the requirements of the HSES Management System • environmental hazards and potential impacts of construction and commissioning activities and appropriate management controls • roles and responsibilities to achieve	GIIP	Prior to commencement of construction	HSES Manager Subcontractor Company

Number	Management measure	Reference	Timing	Responsibility
	conformance with the HSES policy and procedures and with the requirements of the HSES Management System, including emergency preparedness and response requirements • potential consequences of deviation from specified procedures • legislative requirements • environmental approval duties in relation to environmental legislation.			
9.2.04	A Contractor Environmental Training Needs Analysis and Matrix will address the following: • key employee/responsibility groups • site activities and associated potential risks • job task–specific inductions • relevant environmental procedures outlined in this CEMP. Note: For Contractor personnel, all Environmental training requirements are recorded in the Contractor Training Needs Analysis. Note: Subcontractors are required to capture Environmental training requirements in its' training plan submission to Contractor.	GIIP	Prior to commencement of construction	Project Environmental Manager Project Training Manager Subcontractor
9.2.05	Toolbox meetings will be held and will include environmental issues and topics relevant to the work being undertaken. Agendas of toolbox meetings and attendance at such meetings will be	GIIP	Weekly	Construction Manager Subcontractor Company

Number	Management measure	Reference	Timing	Responsibility
	maintained.			
9.2.06	Environmental training material will be reviewed at least annually.	GIIP	Annually	Project Environmental Manager Project Training Manager Senior Environmental Advisor Operations Onshore
9.2.07	The Contractor Environmental Training Needs Analysis and Matrix will be reviewed periodically.	GIIP	Periodically	Project Environmental Manager Project Training Manager
9.2.08	Vessel masters will be trained in the appropriate vessel stand-off distances and other vessel–marine megafauna interaction management requirements.	Environmental Commitments Register items 9.01 & 36.01 CEMP Section 9	Before entering Site	Subcontractor Company
9.2.09	Vessel masters will be trained in maritime heritage protection zones locations and restricted work areas defined by AAPA Authority certificates as necessary, as well as marine fauna observations, and incident reporting related to marine heritage and fauna.	CEMP Section 9	Before entering Site	Subcontractor Company
9.2.10	Training in spill prevention and response will be provided for site supervisors and personnel	Environmental Commitments Register	Before entering Site	Project Training Manager

Number	Management measure	Reference	Timing	Responsibility
	working directly with chemicals and hydrocarbons. Such training will be identified in a Training Needs Analysis to be prepared under Section 9.	Item 21.06 CEMP Section 9		Subcontractor Company
9.2.11	The vessel/barge master will have appropriate qualifications and training in maritime procedures, including requirements related to waste management, spill prevention and preventing vessel collisions.	GIIP CEMP Section 9	Before entering Site	HSES Manager Subcontractor
9.2.12	Training will be provided to personnel involved with quarantine issues, including procurement, transport and logistics supply chain, on the general identification, location and reporting of introduced weed species and fauna and with an overview of DAWR Biosecurity requirements and processes.	GIIP CEMP Section 6.15	Prior to commencement	Project Training Manager Subcontractor Company

Table 9-3: Environmental content in inductions

Induction	Environmental content	Timing	Responsibility
Site Induction To be completed by all personnel who are required to work on Site.	• Contractor policies and commitments • an overview of the environmental management system • environmental roles and responsibilities • an overview of the commissioning protocols and procedures • identification of environmental aspects, risks and	Prior to mobilisation to Site Refresher course required every two years	Project Environmental Manager Company Project Training Manager

Induction	Environmental content	Timing	Responsibility
	mitigations to potential environmental impacts from commissioning activities • legislative and other requirements • key site environmental issues • environmental incident reporting process • emergency response procedures • specific environmental content as defined in Section 6		
Site Commissioning Induction To be completed by all personnel who are required to enter a commissioning area	• Contractor policies and commitments • overview of the commissioning protocols and procedures • identification of environmental aspects, risks and mitigations to potential environmental impacts from commissioning activities	Prior to entry into commissioning areas	Project Training Manager Commissioning Manager Project Environmental Manager
Site Short-Term Induction To be completed by non-Project personnel to gain entry to Site to perform limited physical work activities such as servicing and repair works.	• Contractor policies and commitments • environmental roles and responsibilities • emergency response procedures • other relevant information	Prior to entry to Site	Project Environmental Manager Company Project Training Manager
Site Visitor Induction To be completed by any person who enters the Site with a purpose other than to perform work. This includes personnel who normally work in another	• Contractor policies and commitments • environmental roles and responsibilities • key site environmental issues • environmental incident reporting process • emergency response procedures	Prior to entry to site Refresher course required every two years	Project Environmental Manager Company Project Training Manager

Induction	Environmental content	Timing	Responsibility
location and are only temporarily visiting the Site, and members of the public.			

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APPENDIX A: ENVIRONMENTAL LEGISLATION REGISTER

A.1 Environmental Legislation Register

Environmental aspect	Applicable legislation, guidelines, policies and standards
Acid sulfate soil	**Legislation** Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) Soil Conservation and Land Utilisation Act (NT) Waste Management and Pollution Control Act (NT) Water Act (NT) **Guidelines, policies and standards** Acid Sulfate Soils Management Advisory Committee (ASSMAC). 1998. Acid Sulfate Soils Assessment Guidelines. ASSMAC, Wollongbar, NSW. Clay (ed.) 2010. Acid sulfate soils identification, assessment and management—Northern Territory course notes. Department of Environment, Resources and Mining. 2009. Queensland water quality guidelines. Department of Environment, Resources and Mining, Qld. Department of Natural Resources and Mines. 2004. Queensland acid sulfate soil technical manual. Queensland Government, Indooroopilly, Qld. Environmental Protection Authority. 2009. Victorian best practice guidelines for assessing and managing coastal acid sulfate soils. Vic. International Erosion Control Association (IECA)—Australasia. 2008. Best practice erosion and sediment control. IECA, NSW. Land and Water Division, Department of Natural Resources, Environment, the Arts and Sport. 2008. Acid sulfate soils of the Darwin region. Northern Territory Government, Darwin, NT. New South Wales Acid Sulfate Soils Management Advisory Committee. 1998. Acid sulfate soils assessment guidelines. Acid Sulfate Soils Management Advisory Committee, NSW. Queensland Acid Sulfate Soils Investigation Team (QASSIT). 1998. Guidelines for sampling and analysis of lowland acidic sulfate soils (ASS) in Queensland 1998. Queensland Department of Natural Resources, Indooroopilly, Qld.
Air emissions	**Legislation** Ozone Protection Act 1989 (Cwlth) Waste Management and Pollution Control Act (NT) National Greenhouse and Energy Reporting Act 2007 (Cwlth) National Environment Protection Council. 2003 National Environment Protection (Ambient Air Quality) Measure (NEPM). National Environment Protection Council. 2011 National Environment Protection (Air Toxics) Measure (NEPM). National Environment Protection Council. 1998 National Environment Protection (National Pollutant Inventory) Measure (NEPM).

Environmental aspect	Applicable legislation, guidelines, policies and standards
	Guidelines, policies and standards New South Wales Department of Environment and Climate Change Guidelines
Bushfire	**Legislation** Bushfires Act (NT) Bushfires Regulations (NT) **Fire and Emergency Act (NT)** Fire and Emergency Regulations (NT) **Guidelines, policies and standards** North Australian Fire Information. Online mapping. Available at <http://138.80.128.152/nafi2/> (last viewed 1 February 2012)
Flora and fauna (including weeds, pests and quarantine)	**Legislation** Animal Welfare Act (NT) Biosecurity Act 2015 (Cwlth) Bushfires Act (NT) Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) Fisheries Act (NT) National Environmental Protection Council (Northern Territory) Act (NT) Plant Health Act (NT) Protection of the Sea (Harmful Anti-fouling Systems) Act 2006 (Cwlth) Public and Environmental Health Act (NT) Public and Environmental Health Regulations (NT) Quarantine Proclamation 1998 (Cwlth) Quarantine Regulations 2000 (Cwlth) Soil Conservation and Land Utilization Act (NT) Territory Parks and Wildlife Conservation Act (NT) Weeds Management Act (NT) **Guidelines, policies and standards** Australian Petroleum Production and Exploration Association (APPEA). 2004. Search Australian Whales and Dolphins – Interactive CD-ROM Identification Guide. APPEA, Canberra, ACT. Department of Agriculture, Fisheries and Forestry (various guidelines). Department of the Environment and Heritage (DEH). 1999. Whales and Dolphins Identification Guide. Commonwealth Government, Canberra, ACT. Department of the Environment, Water, Heritage and the Arts. 2005. Australian national guidelines for whale and dolphin watching 2005. Commonwealth Government, Canberra, ACT. Department of the Environment, Water, Heritage and the Arts. 2008. Interaction between offshore seismic exploration and whales. EPBC

Environmental aspect	Applicable legislation, guidelines, policies and standards
	Act Policy Statement 2.1. Commonwealth Government, Canberra, ACT. Department of Lands, Planning and the Environment (formerly the Department of Natural Resources, Environment, the Arts and Sport). Native vegetation fact sheets (various). Department of Natural Resources, Environment, the Arts and Sport.2010. Land clearing guidelines. (Originally published as Technical Report No. 27/2002 in 2002 and revised in 2010). Northern Territory Government, Darwin. Department of Natural Resources, Environment, the Arts and Sport. 2009. Northern Territory weed management handbook. Northern Territory Government, Palmerston, NT. Environmental Protection Authority. 2009. Victorian Best Practice Guidelines for Assessing and Managing Coastal Acid Sulfate Soils. Natural Heritage Trust. 2005. Protected Marine Species Identification Guide. Commonwealth Government, Canberra, ACT.
Hazardous substances and dangerous goods	**Legislation** Dangerous Goods Act (NT) Dangerous Goods Regulations (NT) Energy Pipelines Act (NT) Energy Pipelines Regulations (NT) Environmental Offences and Penalties Act 1996 (NT) Hazardous Waste (Regulation of Exports and Imports) Act 1989 (Cwlth) Industrial Chemicals (Notification and Assessment) Act 1989 (Cwlth) Model Work Health and Safety Regulations 2011 (Cwlth) Protection of the Sea (Harmful Anti-fouling Systems) Act 2006 (Cwlth) Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cwlth) Public and Environmental Health Regulations (NT) Waste Management and Pollution Control Act (NT) Work Health and Safety (National Uniform Legislation) Act 2011 (NT) **Guidelines, policies and standards** Work Health and Safety (National Uniform Legislation) Regulations (NT) AS 1940:2004, The storage and handling of flammable and combustible liquids AS 3780:2008, The storage and handling of corrosive substances AS/NZS 3833:2007, The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers AS 4326:2008, The storage and handling of oxidising agents AS/NZS 4452:1997, The storage and handling of toxic substances AS/NZS 4681:2000, The storage and handling of Class 9 (miscellaneous) dangerous goods and articles

Environmental aspect	Applicable legislation, guidelines, policies and standards
	Australian Petroleum Production & Exploration Association (APPEA). 2008. Code of Environmental Practice. APPEA, Canberra, ACT. Australian Pipeline Industry Association. 2009. Code of environmental practice—onshore pipelines. Australian Pipeline Industry Association, Kingston, ACT. Department of Environment and Conservation (NSW). 2004. Environmental Best Management Practice Guideline for Concreting Contractors. Department of Environment and Conservation (NSW), Sydney, NSW. International Maritime Organization's Convention on the Control of Harmful Anti-fouling Systems on Ships Approved Code of Practice– How to Manage and Control Asbestos in the Workplace 2011 (under the Work Health and Safety (National Uniform Legislation) Act) National Standard for the Storage and Handling of Workplace Dangerous Goods [NOHSC:1015(2001)] National Transport Commission. 2007. Australian code for the transport of dangerous goods by road and rail. 7th edn. National Transport Commission, Melbourne, Vic. United Nations. 2009. Globally Harmonized System of Classification and Labelling of Chemicals, 3rd edn. United Nations, New York and Geneva.
Heritage	**Legislation** Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cwlth) Aboriginal Land Rights (Northern Territory) Act 1976 (Cwlth) Australian Heritage Council Act 2003 (Cwlth) Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) Heritage Act (NT) Historic Shipwrecks Act 1976 (Cwlth) Northern Territory Aboriginal Sacred Sites Act (NT) **Guidelines, policies and standards** Northern Territory Heritage Register, available at <http://www.nretas.nt.gov.au/knowledge-and-history/heritage/ntregister> (last viewed 1 February 2012)
Noise	**Legislation** Environmental Protection and Biodiversity Conservation Act 1999 (Cwlth) Waste Management and Pollution Control Act (NT) **Guidelines, policies and standards** ANSI S12.7-1986, Methods for measurement of impulse noise ANSI S1.42-2001, Acoustical terminology AS 2159-2009, Piling—Design and installation AS 2436:2010, Guide to noise and vibration control on construction, maintenance and demolition sites

Environmental aspect	Applicable legislation, guidelines, policies and standards
	Department of Natural Resources, Environment, the Arts and Sport. 2011. Noise guidelines for development sites in the Northern Territory June 2011. Northern Territory Government, Darwin, NT. ISO/PAS 17208-1.2012, Acoustics—Quantities and procedures for description and measurement of underwater sound from ships ISO/DIS 16554, Ships and marine technology—Marine environmental protection—Measurement and reporting of underwater sound radiated from merchant ships.
Soils	**Legislation** Mining Management Act (NT) Mining Management Regulations (NT) Mineral Titles Act (NT) Soil Conservation and Land Utilization Act (NT) Water Act (NT) Water Regulations (NT) **Guidelines, policies and standards** AS/NZS 5667:1998 Water quality—Sampling Department of Natural Resources, Environment, the Arts and Sport. 2006. Erosion and sediment control plan. Fact Sheet. Northern Territory Government, Darwin, NT. Department of Natural Resources, Environment, the Arts and Sport. 2007. Erosion and Sediment control guidelines (Technical Notes—various). Northern Territory Government, Darwin, NT. Department of Environment, Resources and Mining. 2009. Queensland water quality guidelines. Department of Environment, Resources and Mining, Qld. International Erosion Control Association (IECA)—Australasia. 2008. Best practice erosion and sediment control. IECA, NSW. National Environment Protection Council (NEPC). 1999. National Environment Protection (Assessment of Site Contamination) Measure.
Traffic management	**Legislation** Control of Roads Act (NT) Motor Vehicles Act (NT) Traffic Act (NT) **Guidelines, policies and standards** Department of Construction and Infrastructure. 2011. Civil Construction—Permit to work within the NT Government Road Reserve (guideline)
Waste	**Legislation** Building Act (NT) Dangerous Goods Act (NT) Environmental Offences and Penalties Act 1996 (NT) Work Health and Safety (National Uniform Legislation) Act (NT) Environment Protection (Sea Dumping) Act 1981 (Cwlth)

Environmental aspect	Applicable legislation, guidelines, policies and standards
	Hazardous Waste (Regulation of Exports and Imports) Act 1989 (Cwlth) Litter Act (NT) Marine Pollution Act (NT) National Environment Protection Council. 2010. National Environment Protection (Movement of Controlled Waste between States and Territories) Measure as varied November 2010 National Environment Protection Council. 2011. National Environment Protection (Used Packaging Materials) Measure as varied 16 September 2011 Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cwlth) Public and Environmental Health Act (NT) Public and Environmental Health Regulations (NT) Quarantine Act 1908 (Cwlth) Waste Management and Pollution Control Act (NT) Water Act (NT) **Guidelines, policies and standards** Australian Petroleum Production & Exploration Association (APPEA). 2008. Code of Environmental Practice. APPEA, Canberra, ACT. Australian Pipeline Industry Association. 2009. Code of environmental practice—onshore pipelines. Australian Pipeline Industry Association, Kingston, ACT. Department of Agriculture, Fisheries and Forestry—Biosecurity. February 2012. Biosecurity Waste Management Business Policy. v 2. Industry Arrangements Reform Program. Department of Agriculture, Fisheries and Forestry Canberra. ACT. Department of Environment and Climate Change. 2008a. Waste classification guidelines: Part 1—Classifying waste. Department of Environment and Climate Change, Sydney, NSW. Department of Environment and Climate Change. 2008b. Waste classification guideline: Part 2—Immobilisation of waste. Department of Environment and Climate Change, Sydney, NSW. Department of Health and Community Services. 1996. Code of Practice for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent. Northern Territory Government, Darwin, NT. Department of Natural Resources, Environment, the Arts and Sport, Asbestos disposal in the Northern Territory. Northern Territory Government, available at <http://www.nretas.nt.gov.au/environment-protection/waste/guidelines> (last viewed 21 February 2012). Department of Natural Resources, Environment, the Arts and Sport. Guidelines to completing waste transport certificates. Northern Territory Government, available at <http://www.nretas.nt.gov.au/environment-protection/waste/guidelines> (last viewed 21 February 2012).

Environmental aspect	Applicable legislation, guidelines, policies and standards
	Department of Natural Resources, Environment, the Arts and Sport. Shoal Bay waste management facility environmental protection licence number. Department of Natural Resources, Environment, the Arts and Sport, Darwin, NT. International Marine Organisation (IMO). 1972. International convention on the prevention of marine pollution by dumping of wastes and other matter, 1972 [the "London Convention"] and 1996 protocol thereto. International Marine Organisation (IMO). 1978. International convention for the prevention of pollution from ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78). National Transport Commission. 2007. Australian code for the transport of dangerous goods by road and rail. 7th edn. National Transport Commission, Melbourne, Vic. United Nations. 2009. Globally Harmonized System of Classification and Labelling of Chemicals, 3rd edn. United Nations, New York and Geneva. Waste Management and Pollution Control Act (NT) Compliance guidelines, available at <http://www.nretas.nt.gov.au/environment-protection/legislation/management/compliance> (last viewed 21 February 2012).
Water (surface, groundwater and marine)	**Legislation** Darwin Port Corporation Act (NT) Darwin Port Corporation Regulations (NT) Environment Protection (Sea Dumping) Act 1981 (Cwlth) Fisheries Act (NT) Marine Act (NT) Marine Pollution Act (NT) Navigation Act 2012 (Cwlth) Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cwlth) Water Act (NT) Water Regulations (NT) Waste management and Pollution Control Act (NT) Waste management and Pollution Control Regulations (NT) **Guidelines, policies and standards** AS/NZS 5667:1998 Water quality—Sampling Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ). 2000. Australian and New Zealand guidelines for fresh and marine water quality—Volume 1. ANZECC/ARMCANZ. Canberra, ACT. Department of Natural Resources, Environment, the Arts and Sport. Stormwater and washdown water pollution from building sites and Commercial/industrial premises. Fact Sheet. Available at <http://www.nretas.nt.gov.au/environment-

Environmental aspect	Applicable legislation, guidelines, policies and standards
	protection/waste/factsheets> (last viewed 21 February 2012). Department of Natural Resources, Environment, the Arts and Sport. 2010. Water quality objectives for the Darwin Harbour Region—Background Document. Northern Territory Government, Palmerston, NT. International Erosion Control Association (IECA)—Australasia. 2008. Best practice erosion and sediment control. IECA, NSW.

A.2 Environmental Approvals Register

Legislation	Approval type	Scope of Works	Responsibility to Obtain	Status
Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)	Approval (of a controlled action)	Project-wide	Company	Issued 27 June 2011 Revised 27 May 2015
Environmental Assessment Act (NT)	Environmental assessment (NRETAS assessment and recommendation report No. 65)	Project-wide	Company	Issued May 2011
Planning Act (NT)	Development permit (DP12/0065)	Use of development of land for purpose of Ichthys LNG processing plant	Company	Issued 10 January 2012 Revised 30 January 2015
Waste Management and Pollution Control Act (NT)	Environment Protection Approval (EPA 7-3)	Constructing, installing and carrying out works in relation to premises for processing hydrocarbons so as to produce, store and despatch LNG	Company	Issued 19 April 2012 Revised 30 January 2015
Waste Management and Pollution Control Act (NT)	Environment Protection Licence	Collection and removal of listed waste	Subcontractor	Issued
Public and Environmental	Notification of Self-Certification	Septic tanks not connected to the	Contractor	Issued

Legislation	Approval type	Scope of Works	Responsibility to Obtain	Status
Health Act (NT)	for the installation of a septic tank outside of a Building Control Area	temporary wastewater treatment plant		
	Wastewater works design approval	Design of temporary sewage treatment plant	Subcontractor	Issued
	Wastewater works design approval	Design of permanent sewage treatment plant	Contractor	Pending
	Approval to Operate a Tertiary Wastewater Treatment Plant	Operation of temporary sewage treatment plant	Contractor	Issued 7 January 2015
	Wastewater works design approval	Operation of permanent sewage treatment plant	Contractor	Pending
Water Act (NT)	Waste Discharge Licence 192	Discharge from the temporary sewage treatment plant outfall	Contractor	Issued 1 August 2013
	Bore Construction Permit	Baseline groundwater monitoring and ongoing monitoring	Contractor	Issued
	Waste Discharge Licence 211	Discharge of Spent Hydrotest Waters	Contractor	Issued31 August 2015
Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act (NT); and Regulations (NT).	Dangerous Goods Licence – Construction	Transportation of dangerous goods	Contractor	As required
Work Health	A licence to store	Storage of	Subcontractor	As required

Legislation	Approval type	Scope of Works	Responsibility to Obtain	Status
and Safety (National Uniform Legislation) Act (NT);and Regulations	hazardous chemicals (formerly dangerous goods) is not required, Notification of the exceedance of manifest quantities of schedule 11 substances.	dangerous goods		
Territory Parks and Wildlife Conservation Act (NT)	Licence to take or interfere with wildlife	Wildlife handling during works	Contractor	Issued
Heritage Act (NT)	Consent to damage, destroy, alter or carry out work of any sort on declared or prescribed sites	All known sites to be protected Consents required to disturb previously unknown sites detected during construction	Company	As required
	Anchor Management Plan	All known marine sites to be protected	Contractor	Issued
Northern Territory Aboriginal Sacred Sites Act (NT)	AAPA Certificates	Project-wide	Company	Issued
Fisheries Act (NT)	Fisheries Permit	During MOF and JTY construction	Contractor	Issued
Quarantine Act (Cwth)	Quarantine Clearance	During importation of goods into Australia	Contractor/Subcontractor	Ongoing
Radiation Protection Act (NT)	Licence(s) to possess a radiation source	Non-destructive testing	Subcontractor	Ongoing
Energy Pipelines Act (NT)	Pipeline licence, management plans, consent to construct, consent to test, consent to	Gas export pipeline and fuel gas pipeline	Company	Ongoing

Legislation	Approval type	Scope of Works	Responsibility to Obtain	Status
	operate			

APPENDIX B: ENVIRONMENTAL COMMITMENTS AND CONDITIONS REGISTER

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
1	General			
1.01	The Ichthys Project's Health, Safety and Environmental Management Process will align with the requirements of AS/NZS ISO 14001:2004, Environmental management systems—Requirements with guidance for use and AS/NZS 4801:2001 Occupational health and safety management systems—Specification with guidance for use.	Draft EIS	Chapter 11, Section 11.2	Section 4 Environmental management system
2	Receiving environment monitoring			
2.01	Wastewater discharge monitoring will be undertaken in the nearshore environment to confirm modelling predictions for wastewater dispersion.	Draft EIS	Draft EIS: Chapter 7, Section 7.3.4; Chapter 11, Section 11.4; Annexe 10, Section 4	Section 6. 4 Surface Water Management
2.02	A Darwin Harbour water-quality monitoring program will be developed and implemented to determine if Project wastewater discharges are adversely impacting on water quality in the Harbour.	Draft EIS	Chapter 7, Section 7.3.4 Chapter 11, Annexe 10, Section 4	EIMP (L290-AH-PLN-10013) Section 6. 4 Surface Water Management
2.03	A marine sediments and bio-indicators monitoring program will be developed and implemented to determine if construction activities undertaken in acid sulfate soils have resulted in changes in pH and in the bio-availability of heavy metals in adjacent marine sediments.	Draft EIS	Chapter 7, Section 7.3.2 Chapter 8, Section 8.2.2 and 8.6 Chapter 11, Annexe 6, Section 4, Annexe 10, Section 4, Annexe 11, Section 4	EIMP (L290-AH-PLN-10013) Section 6.6 Acid Sulfate Soil Management
2.10	A groundwater quality monitoring program will be developed to determine if activities in the onshore development area adversely impact on groundwater	Draft EIS	Chapter 8, sections 8.2.3 and 8.6 Chapter 11, Annexe	Section 6.7 Groundwater Management EIMP (L290-AH-PLN-

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	quality.		10, Section 4 & Annexe 11, Section 4	10013)
2.13	Airborne noise monitoring will be undertaken to confirm modelling predictions.	Draft EIS	Chapter 10, Section 10.3.10 Chapter 11, Section 11.4	6.11 Noise and Vibration Management EIMP (L290-AH-PLN-10013)
2.14	A marine pests monitoring program will be developed for the nearshore development area. This will be developed in consultation with the relevant agencies.	Draft EIS	Draft EIS: Chapter 7, Section 7.3.9; Chapter 11, Section 11.4; Annexe 13, Section 4	Beyond the scope of this document. Refer to (L384-AH-PLN-0003) Ichthys Project Nearshore Environmental Monitoring Plan
2.15	A weed monitoring program will be developed to monitor the distribution and abundance of listed weeds species in the onshore development area.	Draft EIS	Chapter 8, Section 8.3.4 Chapter 11, Annexe 15, Section 4	Section 6.3 Weed and pest management EIMP (L290-AH-PLN-10013)
2.16	A vegetation rehabilitation monitoring program will be developed and periodic surveys of rehabilitated areas will be undertaken to determine the level of success of rehabilitation programs.	Draft EIS	Chapter 8, Section 8.3.1 Chapter 11, Annexe 15, Section 4	Section 6.9 Rehabilitation management
2.17	A mangrove health monitoring program will be developed to assess the potential effects of Project activities on mangrove health. Additional commitment within the EIS Supplement; mangrove monitoring to be undertaken throughout construction and operation and sediment heights throughout construction.	Draft EIS EIS Supplement	Chapter 8, Section 8.3.1 Chapter 11, Annexe 10, Section 4 EIS Supplement Section 5.2.2.5 Submission 123-238	Section 6.2 Flora and Fauna Management EIMP (L290-AH-PLN-10013)
2.18	INPEX will consider undertaking fish monitoring to	EIS	EIS Supplement	Beyond the scope of this

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	detect changes, beyond natural variation, of key fish species, abundance/distribution resulting from Project construction impacts (e.g. noise, dredging, blasting)	Supplement	Section 5.2.2.12 Submission 128-18	document. Refer to (L384-AH-PLN-0003) Ichthys Project Nearshore Environmental Monitoring Plan
3	Alteration of marine habitats			
3.03	Antifouling paints used on offshore and nearshore infrastructure will be selected in accordance with regulatory-authority requirements.	Draft EIS	Chapter 7, sections 7.2.1, 7.2.3 and 7.3.4	Refer to CEMP Rev 12: Section 6.2 Flora and fauna management, Section 6.13 Dangerous goods and hazardous materials management
5	Accidental marine hydrocarbon spills			
5.11	Hydrostatic testing of the gas export pipeline will be undertaken prior to the introduction of hydrocarbons.	Draft EIS	Chapter 7, Section 7.2.4	Section 2 Scope of Works
5.18	Appropriate spill response equipment will be available on the CPF, the FPSO, and the supply and pipelay vessels as well as at the onshore and nearshore facilities. Regular pollution response exercises will be undertaken.	Draft EIS	Chapter 7, Section 7.2.4 and 7.3.5	Section 6.14 Spill prevention and response
5.19	Visual monitoring of hoses, couplings and the sea surface will be undertaken during refuelling operations.	Draft EIS	Chapter 7, Section 7.2.4	Section 6.14 Spill prevention and response
5.20	Radio contact will be maintained between refuelling vessels and the offshore facilities or other vessels when refuelling activities are being undertaken.	Draft EIS	Chapter 7, Section 7.2.4	Section 6.13 Dangerous goods and hazardous materials management
5.22	Dry-break, breakaway couplings or similar technology will be installed and used where practicable during refuelling operations.	Draft EIS	Chapter 7, Section 7.2.4	Section 6.13 Dangerous goods and hazardous materials management
5.26	The jetty structure is being designed according to Australian Standard AS4997:2005, Guidelines for the design of maritime structures (taking cyclones into	Draft EIS	Draft EIS: Chapter 7, Section 7.3.5	Design Specification for Product Loading Jetty (L381-AW-SPC-0006)

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	account). The jetty loading arms will be designed to allow them to be tied down in the event of a cyclone.			
7	Underwater noise and blast emissions			
7.02	A Piledriving and Blasting Management Plan and supporting documentation will be produced and their prescriptions will be implemented.	Draft EIS	Chapter 7, sections 7.3.1 and 7.3.7	Section 6.11 Noise and vibration management
7.12	Piledriving activities are planned to be undertaken during daylight hours only. Night-time piledriving would only be required if Project construction activities were to fall significantly behind schedule.	Draft EIS	Chapter 7, Section 7.3.7 Chapter 10, Section 10.3.10 Chapter 11, Annexe 12 Section 3.2	Section 6.11 Noise and vibration management
7.13	An observation zone with a radius of 100 m will be designated at the commencement of piledriving activities. This area will need to be confirmed as being clear of cetaceans, dugongs, turtles and crocodiles for 10 minutes prior to the start of operations. EIS Supplement: Changes to the "observation zone" for visual monitoring to 500m for at least 30 minutes.	Draft EIS EIS Supplement	Chapter 7, Section 7.3.7 Chapter 11, Annexe 12 Section 3.2 EISS Supplement: Section 4.1.13	CEMP Revision 12 Section 6.11 Noise and vibration management
7.14	Piledriving will commence with a "soft-start" procedure, where activities are gradually scaled up over a 5-minute period. This will provide an opportunity for any sensitive marine fauna to leave the area before being exposed to the full intensity of underwater noise. EIS Supplement: Soft-start not to proceed until animal has moved outside the zone or is not sighted for 30 minutes; visual monitoring will continue during piledriving works and for 10 minutes after stoppage; Piledriving will temporarily cease if marine mammals approach within 100 m of the piling operation and will	Draft EIS EIS Supplement	Chapter 7, Section 7.3.7 Chapter 11, Annexe 12 Section 3.2 EIS Supplement: Section 4.1.13	CEMP Revision 12 Section 6.11 Noise and vibration management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	not recommence until animals have been observed to have moved outside the observation zone (500 m) or it is not sighted in the observation zone for 30 minutes.			
7.15	A permit to work (or similar) system will be implemented to ensure that areas where blasting and piledriving activities are occurring, or will occur, are clearly identified and that management measures are in place prior to work commencing.	Draft EIS	Chapter 7, Section 7.3.7 Chapter 11, Annexe 12, sections 3.1 and 3.2	Refer to CEMP Rev. 9 Section 6.11 Noise and vibration management
8	Marine pests			
8.01	Quarantine management plans and supporting documentation will be developed and their prescriptions will be implemented in accordance with the requirements of the Department of Agriculture, Fisheries and Forestry (DAFF), the Northern Territory's Department of Primary Industry and Fisheries, and the DPC.	Draft EIS	Chapter 7, sections 7.2.8 and 7.3.9 Chapter 8, Section 8.3.4 Chapter 11, Annexe 13, Section 3	Biosecurity Management Plan (L290-AH-PLN-10092) Site Quarantine Plan (L290-AB-REP-0016) Section 6.15 Quarantine management
8.02	INPEX will ensure that vessels engaged in Project activities comply with the biofouling requirements of the regulatory authorities.	Draft EIS	Chapter 7, sections 7.2.8 and 7.3.9 Chapter 11, Annexe 13, Section 3.2	Biosecurity Management Plan (L290-AH-PLN-10092) Site Quarantine Plan (L290-AB-REP-0016) Section 6.15 Quarantine management
8.03	Vessels engaged in Project work will be subjected to a biofouling risk assessment which may result in hull inspections or cleaning.	Draft EIS	Chapter 7, sections 7.2.8 and 7.3.9 Chapter 11, Annexe 13, Section 3.2	Biosecurity Management Plan (L290-AH-PLN-10092) Site Quarantine Plan (L290-AB-REP-0016) Section 6.15 Quarantine management
8.04	Relevant Project vessels will be required to maintain	Draft EIS	Chapter 7, sections	Section 6.15 Quarantine

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	satisfactory records of antifouling management, hull-cleaning actions and ballast-water exchange.		7.2.8 and 7.3.9 Chapter 11, Annexe 13, Section 3.2	management
9	Marine megafauna			
9.01	A cetacean management plan and supporting documentation will be developed and their prescriptions will be implemented. EIS Supplement: The cetacean management plan will be extended to include dugongs. Also key management controls reconfirmed in SEIS: management measures to be employed through the cetacean management plan: Vessel masters to be trained in cetacean interaction procedures; vessels will be operated at "no wash" speed when within 50–150m of a dolphin and will not intentionally approach a dolphin.	Draft EIS EIS Supplement	Chapter 7, sections 7.2.6, 7.2.9 and 7.3.10 Chapter 11, Section11.3; Annexe 4, Section 3 EIS Supplement: Section 5.2.2.11 Submission 124-48	Section 6.2 Flora and fauna management
9.02	Procedures for avoiding interactions between cetaceans and vessels or helicopters will be developed and implemented.	Draft EIS	Chapter 7, sections 7.2.6, 7.2.9 and 7.3.10 Chapter 11, Annexe 4, Section 3.1.2	Section 6.2 Flora and fauna management
11	Soil erosion			
11.01	A vegetation clearing, earthworks and rehabilitation management plan and supporting documentation will be produced and their prescriptions will be implemented.	Draft EIS	Chapter 8, sections 8.2.1, 8.3.1, 8.3.2 and 8.3.4 Chapter 11, Annexe 15, Section 3	Section 6.2 Flora and fauna management Section 6.9 Rehabilitation management
11.02	A liquid discharges, surface-water runoff and drainage management plan and supporting documentation will be produced and their prescriptions will be implemented.	Draft EIS	Chapter 8, sections 8.2.1 and 8.2.3 Chapter 11, Annexe 10, Section 3	Section 6.4 Surface-water management
11.03	Surface-water drains and discharge points throughout the onshore development area will be designed to	Draft EIS	Chapter 8, Section 8.2.1	Section 6.4 Surface-water management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	minimise erosion.		Chapter 11, Annexe 10, Section 3.1	
11.04	Erosion protection infrastructure (e.g. silt fencing, contouring, and sediment ponds) will be installed to ensure that sediment is contained within the onshore development area as far as is practicable.	Draft EIS	Chapter 8, Section 8.2.1 Chapter 11, Annexe 10, Section 3.5	Section 6.5 Erosion and sediment control
11.05	If soil erosion is evident, exposed surfaces at the affected area will be stabilised with mulched vegetation, dust suppressants or slope-stabilisation products.	Draft EIS	Chapter 8, Section 8.2.1 Chapter 11, Annexe 10, Section 3.5	Section 6.5 Erosion and sediment control
11.06	Large-scale vegetation clearing and earthworks will preferentially be undertaken in dry-season conditions. Should clearing and earthworks be required to be undertaken during the wet season, adequate erosion and sedimentation control measures will be implemented to avoid any possible impacts.	Draft EIS	Chapter 8, Section 8.2.1 Chapter 11, Annexe 10, Section 3.5 Annexe 15, Section 3.3	Section 6.2 Flora and fauna management
12	Acid sulfate soils			
12.01	An acid sulfate soil (ASS) management plan and supporting documentation will be developed and their prescriptions will be implemented.	Draft EIS	Chapter 8, Section 8.2.2 Chapter 11, Annexe 1, Section 3	Section 6.6 Acid sulfate soil management
12.02	Onshore facilities will be designed to minimise excavation of ASSs.	Draft EIS	Chapter 8, Section 8.2.2 Chapter 11, Annexe 1, Section 3.1	Section 6.6 Acid sulfate soil management
12.03	If excavation of ASS is unavoidable, further testing to determine management and disposal options will be undertaken. Disposal options for ASSs include dumping at an offshore disposal ground; treatment of the ASSs with neutralising agents and reuse of the treated ASS as fill material; or treatment of the ASSs with	Draft EIS EIS Supplement	Draft EIS: Chapter 8, Section 8.2.2 Chapter 11, Annexe 1, Section 3.2	Section 6.6 Acid sulfate soil management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	neutralising agents followed by disposal of the treated ASS material off site. EIS Supplement: INPEX is currently investigating ASS management and, as a priority, actual ASS or potential ASS will be managed in situ with disturbance and movement kept to the minimum, or treated with neutralising agents.		EIS Supplement: Section 3.3.3.1	
13	Alteration to surface water and groundwater			
13.01	A liquid discharges, surface water runoff and drainage management plan and supporting documentation will be produced and their prescriptions will be implemented.	Draft EIS	Chapter 8, sections 8.2.1 and 8.2.3 Chapter 11, Annexe 10, Section 3	Section 6.4 Surface-water management
13.02	Culverts will be installed to maintain natural tidal flows underneath the causeway between Bladin Point and Middle Arm Peninsula.	Draft EIS	Chapter 8, Section 8.2.3 Chapter 11, Annexe 10, Section 3.1	Section 6.4 Surface-water management
13.03	Numerous surface water drains will be constructed around the perimeter of the onshore development area, which, where applicable, will distribute fresh water to mangrove areas.	Draft EIS	Chapter 8, Section 8.2.3 Chapter 11, Annexe 10, Section 3.1	Section 6.4 Surface-water management
13.04	Some areas on Bladin Point will remain uncleared or unsealed, which will allow for some groundwater recharge by rainfall.	Draft EIS	Chapter 8, Section 8.2.3 Chapter 11, Annexe 10, Section 3.1	Section 6.7 Groundwater management
14	Vegetation clearing			
14.01	A vegetation clearing, earthworks and rehabilitation management plan and supporting documentation will be produced and their prescriptions will be implemented.	Draft EIS	Chapter 8, sections 8.2.1, 8.3.1, 8.3.2 and 8.3.4 Chapter 11, Annexe 15, Section 3	Refer to CEMP Rev 4 Section 6.2 Flora and fauna management Section 6.9 Rehabilitation management
14.02	Areas to be cleared will be clearly identified prior to	Draft EIS	Chapter 8, Section	Chapter 6 Section 2

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	work commencing. Clearing boundaries will be marked in the field and on site plans, and a register of clearing activities will be maintained.		8.3.1 Chapter 11, Annexe 15, sections 3.3 and 5.2	Flora and fauna management
14.03	The vegetation-clearing footprint for the onshore development area will be minimised during the design of the onshore facilities, subject to constructability and safety operating requirements. EIS Supplement: Confirmed landtake in SEIS as 413 ha with 362 ha of vegetation take (61 ha Monsoon vine thicket; 82 ha mangroves and 73 ha Melaleuca); Temporarily disturbed areas such as those in the vicinity of the pipeline shore crossing and onshore pipeline route will be reinstated and rehabilitated, as will any areas around the plant that do not need to remain cleared.	Draft EIS EIS Supplement	Draft EIS: Chapter 8, Section 8.3.1 Chapter 11, Annexe 15, Section 3.1 EIS Supplement: Section 5.2.2.20 Submissions 118-2, 16-24, 36-9, 89-25, 96-24, 101-26, 102-24	Section 6.2 Flora and fauna management Section 6.9 Rehabilitation management
14.04	All disturbances, including personnel and vehicle movement, will be contained within the designated onshore development area to avoid impacts to surrounding vegetation. Some additional clearances may be required around the perimeter of the site to allow for appropriate firebreaks.	Draft EIS	Chapter 8, Section 8.3.1 Chapter 11, Annexe 15, Section 3.3	Section 6.2 Flora and fauna management
14.05	Temporarily disturbed areas such as those in the vicinity of the pipeline shore crossing and the onshore pipeline corridor, as well as areas around the plant that do not need to remain cleared, will be rehabilitated following the completion of construction activities.	Draft EIS	Chapter 8, Section 8.3.1 Chapter 11, Annexe 15, Section 3.3	Section 6.9 Rehabilitation management
14.06	Some topsoil will be stockpiled from cleared areas for future use in rehabilitation.	Draft EIS	Chapter 8, Section 8.3.1 Chapter 11, Annexe 15, Section 3.3	Section 6.2 Flora and fauna management
14.07	Cleared vegetation will be mulched and stockpiled on	Draft EIS	Chapter 8, Section	Refer to CEMP Rev.12:

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	site boundaries. Where possible, the mulch will be used for both rehabilitation and soil stabilisation to prevent erosion. Cleared vegetation that cannot be reused will be disposed of off site. No stockpiled vegetation will be burned.		8.3.1 Chapter 11, Annexe 15, Section 3.3	Section 6.12 Waste management
15	Alteration of terrestrial habitats			
15.01	A vegetation clearing, earthworks and rehabilitation management plan and supporting documents will be produced and their prescriptions will be implemented.	Draft EIS	Chapter 8, sections 8.2.1, 8.3.1, 8.3.2 and 8.3.4 Chapter 11, Annexe 15, Section 3	Refer to CEMP Rev. 4 Section 6.2 Flora and fauna management Section 6.9 Rehabilitation management
15.02	Major clearing activities will be undertaken in such a manner as to allow animals to move into remaining surrounding vegetation.	Draft EIS	Chapter 8, Section 8.3.2 Chapter 11, Annexe 15, Section 3.3	Refer to CEMP Rev. 4 Section 6.2 Flora and fauna management
15.03	"High-risk" entrapment areas (e.g. deep trenches or pits) will be constructed with sloping egress ramps to allow trapped animals to escape. Targeted inspections will be undertaken of these areas and any animals which have been unable to escape will be removed and released.	Draft EIS	Chapter 8, Section 8.3.2 Chapter 11, Annexe 15, Section 3.3	Section 6.2 Flora and fauna management
16	Creation of breeding habitat for biting insects			
16.01	Natural drainage will be maintained around roads by installing drains and/or culverts, particularly in intertidal areas such as the causeway between Bladin Point and Middle Arm Peninsula.	Draft EIS	Chapter 8, Section 8.3.3 Chapter 11, Annexe 10, Section 3.1	L290-AH-PLN-0064, Ichthys Onshore LNG Facilities Biting Insects Management Plan
16.02	Surface-water drainage channels throughout the onshore development area will be designed to minimise the creation of breeding habitat for biting insects. Drains will be kept free of vegetation.	Draft EIS	Chapter 8, Section 8.3.3 Chapter 11, Annexe 10, sections 3.1 and 3.7	L290-AH-PLN-0064, Ichthys Onshore LNG Facilities Biting Insects Management Plan

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
16.03	Regular inspections will be carried out for mosquito larvae in high-risk areas and controls will be implemented as required.	Draft EIS	Chapter 8, Section 8.3.3 Chapter 11, Annexe 10, Section 4	L290-AH-PLN-0064, Ichthys Onshore LNG Facilities Biting Insects Management Plan
16.04	Temporary sedimentation systems will be designed to minimise their potential to become breeding habitat for biting insects.	Draft EIS	Chapter 8, Section 8.3.3 Chapter 11, Annexe 10, Section 3.1	L290-AH-PLN-0064, Ichthys Onshore LNG Facilities Biting Insects Management Plan
17	Introduced species			
17.01	Quarantine management plans and supporting documentation will be developed and their prescriptions will be implemented in accordance with AQIS, DoR and DPC requirements.	Draft EIS	Chapter 7, sections 7.2.8 and 7.3.9 Chapter 8, Section 8.3.4 Chapter 11, Annexe 13, Section 3	Section 6.15 Quarantine management
17.02	A vegetation clearing, earthworks and rehabilitation management plan and supporting documentation will be produced and their prescriptions will be implemented.	Draft EIS	Chapter 8, sections 8.2.1, 8.3.1, 8.3.2 and 8.3.4 Chapter 11, Annexe 15, Section 3	Section 6.2 Flora and fauna management Section 6.9 Rehabilitation management
17.03	Topsoil containing high densities of weed seeds will not be used in rehabilitation.	Draft EIS	Chapter 8, Section 8.3.4 Chapter 11, Annexe 15, Section 3.3	Section 6.3 Weed and pest management
17.04	Infestations of listed weeds will be controlled in the onshore development area and along the access road from Wickham Point Road.	Draft EIS	Chapter 8, Section 8.3.4 Chapter 11, Annexe 15, Section 3.2	Section 6.3 Weed and pest management
17.05	Machinery used for earthmoving and vegetation-clearing will be cleaned and inspected prior to commencement of work at the onshore development	Draft EIS	Chapter 8, Section 8.3.4 Chapter 11, Annexe	Section 6.3 Weed and pest management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	area to identify any attached material that should be removed for quarantine reasons.		13, Section 3.3	
17.06	A temporary washdown area for earthmoving and vegetation-clearing vehicles will be built for the construction phase.	Draft EIS	Chapter 8, Section 8.3.4 Chapter 11, Annexe 13, Section 3.1	Section 6.3 Weed and pest management
17.07	A temporary dedicated "quarantine-approved premises" (QAP) area will be provided for on Bladin Point during the construction phase. The QAP will be designed to meet AQIS requirements.	Draft EIS	Draft EIS: Chapter 8, Section 8.3.4, Chapter 11, Annexe 13, sections 3.1 and 3.3	Section 6.15 Quarantine management
17.08	Inspections of incoming vessels and modules will be undertaken in accordance with AQIS standards.	Draft EIS	Chapter 8, Section 8.3.4 Chapter 11, Annexe 13, Section 3.2	Section 6.15 Quarantine management
18	Bushfire prevention			
18.01	A bushfire prevention management plan and supporting documentation will be produced and their prescriptions will be implemented.	Draft EIS	Chapter 8, Section 8.3.5 Chapter 11, Annexe 3, Section 3	Section 6.8 Bushfire prevention
18.02	Firebreaks will be established around Project infrastructure which borders woodlands. Advice will be sought from the Northern Territory's Bushfires Council on firebreak requirements for Bladin Point.	Draft EIS	Chapter 8, Section 8.3.5 Chapter 11, Annexe 3, Section 3	Section 6.8 Bushfire prevention
18.03	A firefighting capability will be available and strategically located firefighting stations will be established at the onshore Project site.	Draft EIS	Chapter 8, Section 8.3.5 Chapter 10, Section 10.3.3 Chapter 11, Annexe 3, Section 3.2	Section 6.8 Bushfire prevention
18.04	Firefighting equipment will be available on site at all	Draft EIS	Chapter 8, Section	Section 6.8 Bushfire

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	times, along with accessible supplies of water.		8.3.5 Chapter 11, Annexe 3, sections 3.1, 3.2 and 3.3	prevention
18.05	Grassy vegetation in the onshore development footprint will be controlled to reduce available fuel loads and prevent wildfire. Control methods may include slashing and spraying.	Draft EIS	Chapter 8, Section 8.3.5 Chapter 11, Annexe 3, Section 3.2	Section 6.8 Bushfire prevention
18.06	Cleared vegetation will be stockpiled in designated areas, away from potential ignition sources.	Draft EIS	Chapter 8, Section 8.3.5 Chapter 11, Annexe 3, Section 3.2	Section 6.8 Bushfire prevention
18.07	An internal "hot work" permit system will be implemented for cutting, welding and any other work considered to have a high potential to start a fire.	Draft EIS	Chapter 8, Section 8.3.5 Chapter 11, Annexe 3, Section 3.2	Section 6.8 Bushfire prevention
18.08	Designated smoking areas will be established for all phases of the Project and receptacles for cigarette butts will be provided.	Draft EIS	Chapter 8, Section 8.3.5 Chapter 11, Annexe 3, Section 3.2	Section 6.8 Bushfire prevention
19	Dust emissions			
19.01	A dust management plan and supporting documentation will be produced and their prescriptions will be implemented.	Draft EIS	Chapter 8, Section 8.4.2 Chapter 11, Annexe 7, Section 3	Section 6.10 Dust and air quality management
19.02	Monitoring of dust generation and the effectiveness of management controls will be regularly undertaken.	Draft EIS	Chapter 8, Section 8.4.2 Chapter 11, Annexe 7, Section 4	Section 6.10 Dust and air quality management
19.03	Dust suppression techniques will be applied where necessary to protect vegetation health, worker health	Draft EIS	Chapter 8, Section 8.4.2	Section 6.10 Dust and air quality management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	and amenity. This may include spraying from water trucks, irrigation, or stabilisation and revegetation of cleared areas that are no longer needed as soon as practicable during construction.		Chapter 11, Annexe 7, Section 3.2	
19.04	On-site roads required for the operations phase will be sealed during the construction phase.	Draft EIS	Chapter 8, Section 8.4.2 Chapter 10, Section 10.3.11 Chapter 11, Annexe 7, Section 3.1	Section 6.10 Dust and air quality management
19.05	Multiple handling of soil or rock materials will be minimised.	Draft EIS	Chapter 8, Section 8.4.2 Chapter 11, Annexe 7, Section 3.1	Section 6.10 Dust and air quality management
19.06	Loads in all trucks transporting soil, aggregate or other dust-generating materials to and from the onshore development area will be wetted down to reduce dust.	Draft EIS	Chapter 8, Section 8.4.2 Chapter 11, Annexe 7, Section 3.2	Section 6.10 Dust and air quality management
21	Onshore spills and leaks			
21.01	An onshore spill prevention and response management plan and supporting documentation will be produced and their prescriptions will be implemented.	Draft EIS	Chapter 8, Section 8.6 Chapter 11, Annexe 11, Section 3	Section 6.14 Spill prevention and response
21.02	Onshore facilities will be designed and constructed in such a way that spills and leaks can be constrained or isolated, particularly in areas where there is an elevated risk of spill.	Draft EIS	Chapter 8, Section 8.6 Chapter 11, Annexe 11, Section 3.1	Section 6.14 Spill prevention and response
21.03	Material safety data sheets (MSDSs) will be available on the facilities to aid in the identification of appropriate spill clean-up and disposal methods.	Draft EIS	Chapter 8, Section 8.6 Chapter 11, Annexe 11, Section 3.2	Section 6.14 Spill prevention and response
21.04	Chemicals and hazardous substances used during all phases of the Project will be selected and managed to	Draft EIS	Chapter 7, sections 7.2.5 and 7.3.6	Section 6.14 Spill prevention and response

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	minimise the potential adverse environmental impact associated with their transport, transfer, storage, use and disposal.		Chapter 8, sections 8.5.2 and 8.6 Chapter 11, Annexe 11, Section 3.2 & Annexe 16, Section 3.2	
21.05	Spill response materials and equipment (including personal protective equipment) will be available during all phases and will contain equipment to combat both chemical and hydrocarbon spills.	Draft EIS	Chapter 8, Section 8.6 Chapter 11, Annexe 11, Section 3.2	Section 6.14 Spill prevention and response
21.06	Personnel who routinely handle hazardous materials or wastes (e.g. refuelling personnel, pump operators, mechanics, and stores personnel) will receive training in handling, transporting and storing hazardous materials or wastes; in reporting and documentation requirements; and in spill clean-up techniques and practices.	Draft EIS	Chapter 8, Section 8.6 Chapter 11, Annexe 11, Section 3.2	Section 6.12 Waste management Section 6.13 Dangerous goods and hazardous materials management Section 6.14 Spill prevention and response
21.07	During construction of the onshore facilities, appropriate temporary containment facilities will be utilised for the storage of chemicals, fuel and hazardous waste until permanent infrastructure is in place.	Draft EIS	Chapter 8, Section 8.6 Chapter 11, Annexe 11, Section 3.2	Section 6.14 Spill prevention and response
22	Wastes			
22.01	A waste management plan and supporting documentation will be developed and their prescriptions will be implemented.	Draft EIS	Chapter 7, sections 7.2.5 and 7.3.6 Chapter 8, sections 8.5.1 and 8.5.2 Chapter 11, Annexe 16, Section 3	Section 6.12 Waste management Waste Management Procedure L290-AH-PRC-102
22.02	Waste minimisation will be included in the tendering and contracting process.	Draft EIS	Chapter 7, sections 7.2.5 and 7.3.6 Chapter 8, sections	Section 6.12 Waste management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
			8.5.1 and 8.5.1 Chapter 11, Annexe 16, Section 3.2	
22.04	Chemicals and hazardous substances used during all phases of the Project will be selected and managed to minimise the potential adverse environmental impact associated with their disposal.	Draft EIS	Chapter 7, sections 7.2.5 and 7.3.6 Chapter 8, sections 8.5.2 and 8.6 Chapter 11, Annexe 11, Section 3.2 & Annexe 16, Section 3.2	Section 6.12 Waste management Section 6.13 Dangerous goods and hazardous materials management
22.05	During the early construction phase, appropriate temporary containment facilities will be available for storing waste until permanent infrastructure is in place.	Draft EIS	Chapter 8, Section 8.5.1 Chapter 11, Annexe 16, Section 3.3	Section 6.12 Waste management
22.06	All solid-waste receptacles (e.g. skips and bins) will have covers and be fit for purpose and in good condition. This will prevent scavenging animals from gaining access to putrescible wastes.	Draft EIS	Chapter 8, sections 8.3.2, 8.3.4 and 8.5.1 Chapter 11, Annexe 16, Section 3.2	Section 6.12 Waste management
22.07	All hazardous liquid wastes will be stored over a bund in leakproof sealed containers.	Draft EIS	Chapter 8, Section 8.5.2 Chapter 11, Annexe 16, Section 3.2	Section 6.12 Waste management Section 6.13 Dangerous goods and hazardous materials management
22.08	Only approved and licensed waste contractors will be engaged for waste disposal.	Draft EIS	Chapter 7, sections 7.2.5 and 7.3.6 Chapter 8, Section 8.5.1 Chapter 11, Annexe 16, Section 3.2	Section 6.12 Waste management Section 6.13 Dangerous goods and hazardous materials management
22.09	Waste will be stored in the designated waste stations and appropriately segregated into hazardous waste	Draft EIS	Chapter 7, Section 7.2.5	Section 6.12 Waste management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	and non-hazardous waste, and, where possible, into recyclable or reusable hazardous waste and recyclable or reusable non-hazardous waste. In the event of the discovery of any unidentified wastes, these will be treated as hazardous waste and stored accordingly.		Chapter 11, Annexe 16, Section 3.2	Section 6.13 Dangerous goods and hazardous materials management
22.15	All hazardous and non-hazardous solid wastes generated in the nearshore development area, including food scraps, will be retained on board vessels and transported to onshore facilities for disposal in accordance with the Marine Pollution Act (NT).	Draft EIS	Chapter 7, Section 7.3.6 Chapter 11, Annexe 16, Section 3.2	Section 6.12 Waste management Section 6.13 Dangerous goods and hazardous materials management
23	Liquid discharges			
23.01	A liquid discharges, surface water runoff and drainage management plan and supporting documentation will be developed and their prescriptions will be implemented.	Draft EIS	Chapter 7, sections 7.2.3 and 7.3.4 Chapter 8, Section 8.6 Chapter 11, Annexe 10, Section 3	Chapter 6 Section 4 Surface-water management
23.04	Hydrotest management plans and supporting documentation will be developed prior to precommissioning for approval under the relevant legislation.	Draft EIS	Chapter 7, sections 7.2.3 and 7.3.4 Chapter 11, Annexe 10, Section 3.6	Section 2 Scope of Work
23.05	A chemical selection process will be developed and will include consideration of the potential for ecotoxicity.	Draft EIS	Chapter 7, sections 7.2.3 and 7.3.4 Chapter 11, Annexe 10, Section 3.6	Section 6.13 Dangerous goods and hazardous materials management
23.11	Construction vessels, supply vessels and the mobile offshore drilling unit (MODU) will adhere to the following prescriptions laid down by the Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Cwlth) and the Marine Pollution Act (NT): Sewage will not be discharged within three nautical miles of land.	Draft EIS	Chapter 7, sections 7.2.3 and 7.3.4 Chapter 11, Annexe 10, Section 3.3	Section 6.12 Waste management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	Only treated sewage (macerated to fragment diameters less than 25 mm) will be discharged between three and twelve nautical miles of land. Untreated sewage may be discharged beyond 12 nautical miles of land.			
23.12	Antifouling paints containing tributyltin compounds (TBTs) will not be used on any Project vessels or equipment in accordance with the prescriptions of the International Maritime Organization's International Convention on the Control of Harmful Anti-fouling Systems on Ships and the Protection of the Sea (Harmful Anti-fouling Systems) Act 2006 (Cwlth).	Draft EIS	Chapter 7, sections 7.2.1, 7.2.3 and 7.3.4	Section 6.13 Dangerous goods and hazardous materials management
23.14	Oil-in-water concentrations from the bilge discharges of construction and supply vessels, including the MODU, will meet the regulatory requirements of <15 mg/L in accordance with Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) and the Marine Pollution Regulations (NT). EIS Supplement: INPEX will treat produced water to a specification of 30mg/L hydrocarbon; will use an online analyser that will measure dispersed hydrocarbons. INPEX plans to use MPPE technology.	Draft EIS EIS Supplement	Chapter 7, Section 7.2.4; Chapter 11, Annexe 10, Section 3.3 EIS Supplement: Section 5.2.2.5 Submission 103-3	Section 6.12 Waste management
23.16	The wastewater outfall diffuser will be designed to optimise near-field dispersion of the discharged wastewater.	Draft EIS	Draft EIS: Chapter 7, Section 7.3.4; Chapter 11, Annexe 10, Section 3.1	Section 6.4 Surface Water Management
23.17	Drainage at the onshore development area will be designed to isolate areas that could be exposed to hydrocarbon contamination. Wastewater from these	Draft EIS	Chapter 7, Section 7.3.4 Chapter 11, Annexe	Section 6.4 Surface Water Management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	areas will be directed to an oily-water treatment system.		10, Section 3.1	
23.19	Wastewater streams will be sampled at appropriate frequencies and selected water-quality parameters will be documented.	Draft EIS	Chapter 7, Section 7.3.4 Chapter 11, Annexe 10, Section 4	Section 6.4 Surface Water Management
23.20	Maintenance practices during the operations phase (e.g. drainage of hydrocarbons from tanks and equipment) will avoid discharge of hydrocarbons to the oily-water treatment system.	Draft EIS	Chapter 7, Section 7.3.4; Chapter 11, Annexe 10, Section 3.2	Section 6.13 Dangerous goods and hazardous materials management
25	Housing, social infrastructure and services			
25.03	A first aid capability will be available at the onshore facility during both the construction and the operation phases.	Draft EIS	Chapter 10, Section 10.3.3	Section 2 Scope of work
25.04	INPEX will work in conjunction with the Northern Territory Police, Fire and Emergency Services in order to plan effectively for any major emergencies.	Draft EIS	Chapter 10, Section 10.3.3	Section 8.3 Emergency preparedness and response
25.05	A firefighting capability will be available and strategically located firefighting stations will be established at the onshore Project site.	Draft EIS	Chapter 8, Section 8.3.5 Chapter 10, Section 10.3.3 Chapter 11, Annexe 3, Section 3.2	Section 6.8 Bushfire prevention
25.07	Appropriate quantities of water will be stored and made available for firefighting purposes during both the construction and operations phases at the onshore Project site.	Draft EIS	Chapter 10, Section 10.3.3	Section 6.8 Bushfire prevention
25.08	An emergency response plan will be developed and emergency response teams will be established at the onshore Project site for both the construction and the operations phases of the Project.	Draft EIS	Chapter 10, Section 10.3.3	Section 8.3 Emergency preparedness and response

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
25.10	Temporary ablution blocks and sewage systems will be in place at the onshore Project site to meet sewage management requirements during the construction phase.	Draft EIS	Chapter 10, Section 10.3.3	Section 6.4 Surface Water Management
25.12	Waste-disposal facility capabilities for the construction and operations phases at the onshore Project site will be addressed during the detailed-design phase of the Project; this will be done in consultation with relevant local government authorities.	Draft EIS	Draft EIS: Chapter 10, Section 10.3.3	Section 6.12 Waste management
25.13	Ongoing consultation will be undertaken with local government, the Department of Lands and Planning and Infrastructure (DLP) and the Power and Water Corporation (PWC) in order to plan effectively for the provision of scheme water for Project requirements at the onshore Project site.	Draft EIS	Chapter 10, Section 10.3.3	Section 6.4 Surface Water Management
26	Onshore traffic			
26.01	A traffic management plan and supporting documentation will be produced and their prescriptions will be implemented.	Draft EIS	Chapter 10, sections 10.3.4 and 10.3.10 Chapter 11, Annexe 14, Section 3	Section 6.11 Noise and vibration management
26.04	Designated routes for travel from quarries, the accommodation village, the Darwin central business district, airport and East Arm Wharf will be set for the Project. The selection process for the routes will give consideration to minimising disturbance to local traffic and will be communicated to all relevant personnel. EIS Supplement	Draft EIS EIS Supplement	Draft EIS: Chapter 10, Section 10.3.4 Chapter 11, Annexe 14, Section 3.2 EIS Supplement: Section 3.3.3.2	Section 6.11 Noise and vibration management
27	Marine traffic			
27.04	Shipping traffic schedules during the construction and operations phases will be developed in consultation with the DPC to minimise the impacts of marine traffic	Draft EIS	Chapter 10, Section 10.3.5	--

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	on Darwin Harbour.			
27.05	An application will be made to the relevant government and regulatory agencies to implement safety exclusion zones and restricted navigation zones around LNG, LPG and condensate tankers, and around selected construction vessels such as dredging and pipelay vessels.	Draft EIS	Chapter 10, Section 10.3.5	--
28	Heritage			
28.01	Heritage management plans and supporting documentation will be developed and their prescriptions will be implemented.	Draft EIS	Chapter 10, sections 10.3.8 and 10.3.9 Chapter 11, Annexe 9, sections 3 and 4	Section 6.1 Cultural heritage management
28.02	A Larrakia Heritage Management Committee (LHMC) will be established. It will be made up of representatives of the Larrakia people and INPEX and will have a standing agenda.	Draft EIS	Chapter 10, section 10.3.8 Chapter 11, Annexe 9, Section 3.1	Heritage Management Plan: Heritage Sites (Non-Aboriginal and Aboriginal) in the Onshore Development Area and Sacred Sites in Darwin Harbour (C025-AG-PLN-0010) (HMP)
28.03	Prior to commencement of construction, Aboriginal sites in the onshore development area will be divided into two categories: those which will receive full protection from disturbance and those which may need to be removed. EIS Supplement: INPEX has made alterations to the onshore design to avoid disturbance of known heritage sites within the pipeline corridor and combined operations complex; INPEX has agreed to increase the distance for flagging and fencing of Aboriginal heritage sites to 50m, or to the greatest extent possible where 50m may not be possible.	Draft EIS EIS Supplement	Draft EIS: Chapter 10, Section 10.3.8 Chapter 11, Annexe 9, Section 3.2 EIS Supplement: Section 3.3.2.2 Submission 123-161/123-188, Page 456	Heritage Management Plan: Heritage Sites (Non-Aboriginal and Aboriginal) in the Onshore Development Area and Sacred Sites in Darwin Harbour (C025-AG-PLN-0010) (HMP)

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
28.04	In the case of an Aboriginal heritage site which may have to be moved, INPEX will request permission to do so from both the LHMC and the Heritage Branch of the Northern Territory's Department of Natural Resources, Environment, the Arts and Sport (NRETAS). If permission is granted to remove the site, advice will be sought from the traditional custodians on the correct procedures to be adopted for its removal.	Draft EIS	Draft EIS: Chapter 10, Section 10.3.8; Chapter 11, Annexe 9, Section 3.2	Heritage Management Plan: Heritage Sites (Non-Aboriginal and Aboriginal) in the Onshore Development Area and Sacred Sites in Darwin Harbour (C025-AG-PLN-0010) (HMP)
28.05	Where the external boundary of an Aboriginal heritage site is 10 m or closer to any proposed construction activity, flagging, temporary fencing or similar will be erected 5 m from the site boundary and appropriate signage will be put in place if required by the Larrakia people. The boundary demarcation will be removed when the risk of disturbance no longer exists.	Draft EIS	Chapter 10, Section 10.3.8 Chapter 11, Annexe 9, Section 3.3	Heritage Management Plan: Heritage Sites (Non-Aboriginal and Aboriginal) in the Onshore Development Area and Sacred Sites in Darwin Harbour (C025-AG-PLN-0010) (HMP)
28.06	Daily toolbox meetings, job hazard analyses, permit systems or similar will be implemented on site prior to the commencement of vegetation-clearing or construction activities. These will be undertaken to ensure that work areas are clearly identified before operations commence to avoid accidental disturbance to heritage sites either inside or outside the heritage site boundaries.	Draft EIS	Chapter 10, Section 10.3.8 Chapter 11, Annexe 9, Section 3.3	Heritage Management Plan: Heritage Sites (Non-Aboriginal and Aboriginal) in the Onshore Development Area and Sacred Sites in Darwin Harbour (C025-AG-PLN-0010) (HMP) Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029)
28.07	Anchor management plans will be developed to allow the safe anchoring of vessels undertaking pipelay,	Draft EIS	Chapter 10, sections 10.3.8 and 10.3.9	Section 6.1 Cultural heritage management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	dredging and piledriving activities in the vicinity of any nearshore heritage or sacred sites.		Chapter 11, Annexe 6, Section 3.1.2 Annexe 9, sections 3.3 and 4.2	Section 6.2 Flora and fauna management Non-Aboriginal Heritage Management Plan: Nearshore Development Area (C025-AG-PLN-0029)
28.08	Monitoring will be undertaken for Aboriginal heritage sites. This will involve inspections by Larrakia representatives prior to and during the construction phase and during the commissioning and operations phases. Photographic records will be maintained for each of the sites.	Draft EIS	Chapter 10, Section 10.3.8 Chapter 11, Annexe 9, Section 5	Section 6.1 Cultural heritage management
28.09	To minimise disturbance, a 100-m-radius controlled zone will be established around all known Catalina flying-boat wrecks.	Draft EIS	Chapter 10, Section 10.3.9 Chapter 11, Annexe 9, Section 4.2	Section 6.1 Cultural heritage management
28.10	To minimise disturbance, a 100-m-radius controlled zone for the wreck of the SS Ellengowan will apply (based on the intersection of latitude 12°32’16.3”S and longitude 130°52’06.3”E on the Port of Darwin 1:50 000 map sheet AUS 26).	Draft EIS	Chapter 10, Section 10.3.9 Chapter 11, Annexe 9, Section 4.2	Section 6.1 Cultural heritage management
28.11	To minimise disturbance, a 100-m-radius controlled zone for the wreck of the coal hulk Kelat will apply (based on the intersection of the lines of latitude 12°29’55.4”S and longitude 130°52’40.2”E on the Port of Darwin 1:50 000 map sheet AUS 26).	Draft EIS	Chapter 10, Section 10.3.9 Chapter 11, Annexe 9, Section 4.2	Section 6.1 Cultural heritage management
28.12	Accurate differential GPS (dGPS) locations of all wrecks near the nearshore development area will be obtained prior to the commencement of construction.	Draft EIS	Chapter 10, Section 10.3.9 Chapter 11, Annexe 9, Section 4.2	Section 6.1 Cultural heritage management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
28.14	During the construction and operations phases, INPEX will periodically assess sediment conditions of Catalina wrecks near to the shipping channel and in consultation with DLPE (formerly NRETAS) determine whether any remedial action is required to address impacts should they arise.	Draft EIS	Draft EIS: Chapter 10, Section 10.3.9	Section 6.1 Cultural heritage management
28.15	The World War II historical sites located on Bladin Point are not listed and do not require approval to disturb; however INPEX will consult with the Heritage Branch of NT EPA (formerly NRETAS) before disturbing the sites, and all sites will be surveyed and recorded.	Draft EIS	Draft EIS: Chapter 10, Section 10.3.9; Chapter 11, Annexe 9, Section 4.2	Heritage Management Plan: Heritage Sites (Non-Aboriginal and Aboriginal) in the Onshore Development Area and Sacred Sites in Darwin Harbour (C025-AG-PLN-0010)
28.16	INPEX has made alterations to the onshore design to avoid disturbance of known heritage sites within the pipeline corridor and combined operations complex; INPEX has agreed to increase the distance for flagging and fencing of Aboriginal heritage sites to 50 m, or to the greatest extent possible where 50 m may not be possible.	EIS Supplement	Section 4.7.1.1	Heritage Management Plan: Heritage Sites (Non-Aboriginal and Aboriginal) in the Onshore Development Area and Sacred Sites in Darwin Harbour (C025-AG-PLN-0010) (HMP)
29	Airborne noise			
29.02	Blasting operations will only be undertaken during daylight hours and adequate notice will be provided to communities which could be affected by the sound or activities (e.g. Darwin Harbour users, the City of Palmerston and the Darwin Liquefied Natural gas plant at Wickham Point).	Draft EIS	Chapter 10, Sections 10.3.10 and 10.3.14 Chapter 11, Annexe 12, Section 3.1	Section 6.11 Noise and vibration management
29.04	Piledriving activities are planned to be undertaken during daylight hours only. Night-time piledriving	Draft EIS	Chapter 7, Section 7.3.7	Section 6.11 Noise and vibration management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	would only be required if Project construction activities were to fall significantly behind schedule.		Chapter 10, Section 10.3.10 Chapter 11, Annexe 12, Section 3.2	
29.05	Buses will be utilised for transporting the majority of workers to and from site to reduce the total number of vehicles on the roads and therefore noise emissions.	Draft EIS	Chapter 10, Section 10.3.10 Chapter 11, Annexe 14, Section 3.2	Section 6.11 Noise and vibration management
30	Visual amenity			
30.01	The lighting design for the onshore and nearshore infrastructure will be selected with consideration of the visual impact to the community while meeting personnel safety requirements.	Draft EIS	Chapter 10, Section 10.3.11	Section 6.2 Flora and fauna management
30.04	Dust suppression techniques will be employed where necessary to protect vegetation health, worker health and amenity. This may include spraying from water trucks or irrigation; it may also include stabilisation and revegetation of cleared areas that are no longer needed as soon as practicable during the construction phase.	Draft EIS	Chapter 8, Section 8.4.2 Chapter 10, Section 10.3.11 Chapter 11, Annexe 7, Section 3.1	Section 6.10 Dust and air quality management
32	Public Safety			
32.04	Public access to the onshore development area will be restricted during construction.	Draft EIS	Chapter 10, Section 10.3.14 Chapter 11, Annexe 12, Section 3.1	Site Security Management Plan (L290-AH-PLN-0007)
36	Additional commitments made within the EIS Supplement			
36.01	The cetacean management plan will be extended to include dugongs. Also key management controls reconfirmed in SEIS: management measures to be employed through the cetacean management plan:	EIS Supplement	Section 4.1.13	Section 6.2 Flora and fauna management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	Vessel masters to be trained in cetacean interaction procedures; vessels will be operated at "no wash" speed when within 50–150m of a dolphin and will not intentionally approach a dolphin.			
37	NT EPA (formerly NRETAS) recommendations			
37.01	Recommendation 1 The proponent shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards: • Identified in the Ichthys Gas Field Development Project's Environmental Impact Statement (draft EIS and Supplement); and • Recommended in this Assessment Report. All safeguards and mitigation measures outlined in the Environmental Impact Statement are considered commitments by INPEX Browse Ltd and its joint venture partners.	NT EPA (formerly NRETAS) Recommendations	NRETAS. 2011. Assessment Report 65: Environmental Assessment Report and Recommendations, p. 42	Section 3 Legal and other requirements
37.02	Recommendation 2 The proponent shall advise the Minister of any changes to the proposal in accordance with clause 14A of the Environmental Assessment Administrative Procedures, for determination of whether or not further assessment is required.	NT EPA (formerly NRETAS) Recommendations	Assessment Report 65, p. 43	Section 3 Legal and other requirements
37.16	Recommendation 10 Relevant EMPs are to be amended to include measures for minimising vessel interactions / collisions with dolphins, turtles, dugongs and other large marine fauna. The relevant plans should include: details on procedures to reduce the risk of vessel strikes on large marine vertebrates (marine turtles, dugongs and cetaceans) such as speed limits	NT EPA (formerly NRETAS) Recommendations	Assessment Report 65, p. 63	Section 6.2 Flora and fauna management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	requirements for installation of propeller guards on vessels associated with the Project details on procedures for monitoring and reporting of vessel strikes on large marine vertebrates plans to monitor for stranded, injured or dead large marine vertebrates.			
37.27	Recommendation 15 Appropriate controls to mitigate risks from hydrotesting waste water must be included in the Liquid Discharges, Surface Water Runoff and Drainage Management Plan for Government approval. In preparing the plan, INPEX should also: Investigate options for land-based disposal where practicable; and Select chemical additives that have the lowest practicable risk to the marine environment.	NT EPA (formerly NRETAS) Recommendations	Assessment Report 65, p. 70	Section 2 Scope of work Section 6.4 Surface water management
37.28	Further investigation of land-based disposal is needed to clearly demonstrate that this is not a viable option for all Project waste water, in 'Dry' season conditions.	NT EPA (formerly NRETAS) Recommendations	Assessment Report 65, p. 73	Section 6.4 Surface water management
37.29	INPEX needs to explore further the potential for re-use of treated water in the process, which would potentially reduce reticulated water demand as well as discharge volumes.	NT EPA (formerly NRETAS) Recommendations	Assessment Report 65, p. 73	Section 6.4 Surface water management
37.30	Discharges to the Harbour would be required to meet Water Quality Objectives for the Darwin Harbour Region.	NT EPA (formerly NRETAS) Recommendations	Assessment Report 65, p. 73	Section 6.4 Surface water management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
37.31	All discharges to the Harbour require monitoring for a period prior to commencement of discharge to establish baseline data for determining impact of the discharge; validation of mixing zones where applicable (i.e. where water quality objectives cannot be met); monitoring during the life of the activity; and during remediation of the site on cessation of the activity.	NT EPA (formerly NRETAS) Recommendations	Assessment Report 65, p. 73	Appendix A
37.41	Recommendation 21 The Bladin Point gas facility must incorporate best-practice water conservation measures into the design. The proponent must commit to continuous improvement in minimising potable water use.	NT EPA (formerly NRETAS) Recommendations	Assessment Report 65, p. 89	Section 3 Legal and other requirements
37.44	Recommendation 23 All Environment Management Plans for the Ichthys Gas Field Development Project are to be submitted to Government for approval prior to commencement of any works for which the plans apply. In preparing each plan, the proponent will include any additional measures for environmental protection and monitoring contained in this Assessment Report and Recommendations. The plans shall be referred to relevant Northern Territory Government agencies and key stakeholders for review prior to finalisation. The plans shall form the basis for approvals and licences issued under relevant legislation. The proponent should provide public access to final environmental management plans and a reporting mechanism to inform compliance with the plans.	NT EPA (formerly NRETAS) Recommendations	Assessment Report 65, p. 93	Section 3 Legal and other requirements
38	Commonwealth conditions			
38.08	Condition 8: Liquid Discharge Management Plan The person taking the action must submit for the	EPBC Approval	N/A	Section 6.4 Surface water management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	Minister's approval a Liquid Discharge Management Plan or plans to mitigate the environmental effects of any liquid discharge from the proposal, including sewerage and surface water runoff. The Liquid Discharge Management Plan(s) must be for the protection of the Commonwealth marine area and habitat for listed species in Darwin Harbour and must: identify all sources of liquid discharge; describe any impacts associated with the discharge of liquids, including the cumulative impacts associated with the discharge of sewerage; clearly articulate the objectives of the plan and set measurable targets to demonstrate achievement of these; outline measures to avoid impacts; where impacts are unavoidable describe why they are unavoidable and measures to minimise impacts; demonstrate how any discharges into Darwin Harbour are consistent with the guidelines for discharges and the water quality objectives for Darwin Harbour, developed under the National Water Quality Management Strategy.	2008/4208		
38.09	Condition 9: Noise Management Plan The person taking the action must submit for the Minister's approval a Noise Management Plan to avoid and mitigate the noise impacts associated with construction activities in Darwin Harbour on marine fauna. The Noise Management Plan must be for the protection of listed species in Darwin Harbour and must: identify all sources of noise that may adversely impact	EPBC Approval 2008/4208	N/A	Section 6.11 Noise and vibration management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	fauna in Darwin Harbour; describe any impacts associated with noise generated by pile driving and blasting; provide a schedule of expected pile driving and blasting activities; clearly articulate the objectives of the plan and set measurable targets to demonstrate achievement of these; outline measures to avoid impacts; where impacts are unavoidable describe why they are unavoidable and measures to minimise impacts; include a monitoring regime to determine achievement of objectives and success of measures used; provide for the involvement of an expert panel in the development of the plan and monitoring program required to detect and manage impacts; outline reporting and auditing arrangements; and describe how the plan will apply the principles of adaptive management. In addition, the person taking the action is not permitted to undertake any blasting unless it can be demonstrated that all prudent and feasible alternatives have been ruled out and the Minister has given specific permission to allow blasting. If permission is granted the person taking the action must not undertake blasting activities for more than 28 days in total, without written approval from the Minister, and must not undertake blasting before sunrise or after sunset on any of these days.The plan must be submitted at least three months prior to the commencement of any			

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	pile driving or blasting activities. Pile driving or blasting activities may not commence until the plan is approved. The approved plan must be implemented.			
	Development permit conditions (DP12/0065)			
	Condition 1 Condition requires preparation of various management plans for "pioneering works".	Development Permit DP12/0065B	N/A	Pioneering works are not proposed by Contractor.
	Condition 2A Works may commence once an Erosion and Sediment Control Plan is approved.	Development Permit DP12/0065B	N/A	Section 6.5 Erosion and sediment control
	Condition 2B An Acid Sulphate Soil Management Plan is to be submitted and approved.	Development Permit DP12/0065B	N/A	Section 6.6 Acid sulfate soil management
	Condition 2C A Construction Environmental Management Plan is to be submitted and approved.	Development Permit DP12/0065B	N/A	This document
	Condition 2D A Biting Insect Management Plan is to be submitted and approved.	Development Permit DP12/0065B	N/A	A separate plan has been submitted and approved
	Condition 2E A traffic management plan will be prepared.	Development Permit DP12/0065B	N/A	A separate plan has been submitted and approved
	Condition 2F Prior to the commencement of works associated with the outfall pipe for the temporary waste water treatment plant, an addendum to, or a revised Construction Environmental Management Plan (CEMP) addressing any potential impacts associated with the pipe line is to be submitted to and approved by the consent authority on the advice of the Environment Protection Agency, and a copy of the addendum or	Development Permit DP12/0065C	N/A	Incorporated into this document

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	revised CEMP will form part of this permit..			
	Condition 4 All works relating to this permit are to be undertaken in accordance with the endorsed Erosion and Sediment Control Plans, Acid Sulphate Soil Management Plans, Pioneer Works Environmental Management Plan, Construction Environmental Management Plan and the Biting Insect Management Plans, to the satisfaction of the consent authority.	Development Permit DP12/0065B	N/A	This CEMP describes how Contractor will implement the construction related conditions
	Condition 5 The owner of the land shall ensure that the development is designed, constructed, operated and decommissioned in accordance with the undertakings, environmental commitments and safeguards and recommendations contained within the Ichthys Gas Field Development Project, Bladin Point Environmental Impact Statement and Environmental Assessment Report 65 to the satisfaction of the consent authority.	Development Permit DP12/0065B	N/A	This CEMP describes how Contractor will implement the construction related commitments of the EIS and the recommendations report (as above)
	Condition 6 The owner of the land shall make a copy of this Permit together with all documents referred to in this Permit readily available at all times to the person(s) in charge of the works and operation, and ensure that such person(s) fully understand(s) all conditions and all requirements incorporated by the Permit, to the satisfaction of the consent authority.	Development Permit DP12/0065B	N/A	Copy of the permit and this CEMP to be retained on site
	Condition 12 All trucks entering and leaving the site of works are to have any loads constrained in such a manner as to prevent the dropping or tracking of materials onto streets, including ensuring that all wheels, tracks and	Development Permit DP12/0065B	N/A	Section 6.10 Dust and air quality management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	body surfaces are free of mud and other contaminants before entering onto the sealed road network (including through the use of shaker screens/ rubble pads). Where tracked material on the road pavement becomes a potential safety issue, the developer will be required to sweep and clean the material off the road.			
	Condition 15 The owner of the land shall submit plans and details, and obtain approval from Environmental Health Greater Darwin Region, Department of Health (DoH), for provision of on-site effluent treatment including a recycled water system if applicable, in accordance with DoH's requirements and relevant legislation at the time.	Development Permit DP12/0065B	N/A	Appendix A
	Condition 16 The clearing and use of the land shall not be detrimental to the drainage of the Wickham Point Road road reserve including by the blocking of offlet drains, natural drainage channels or overland flow. Alternative proposals for the above may be considered by Road Network Division of the Department of Lands and Planning.	Development Permit DP12/0065B	N/A	Section 6.4 Surface water management
	Condition 18 Prior to commencement of use, a Biting Insect Management Plan for the operation of the use is to be submitted to and approved. All works relating to this permit are to be undertaken in accordance with the endorsed plan.	Development Permit DP12/0065B	N/A	L290-AH-PLN-0064, Ichthys Onshore LNG Facilities Biting Insects Management Plan
	Condition 25 The owner of the land shall ensure that the facility is designed, constructed and operated in accordance with	Development Permit DP12/0065B	N/A	Section 3 Legal and other requirements

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	any mitigation measures to be recommended under on-going surveillance and monitoring activities, by any Northern Territory Government statutory authority during development and use of the facility, to the satisfaction of the consent authority. Recommendations referred to in subsequent documents required by this Permit are to be implemented as a requirement of this Permit.			
	Condition 30 Prior to the commencement of construction of buildings within the operations area within the operations complex shown on drawing No. 2011/0756/25, additional plans clarifying design details of the buildings must be submitted to and approved by the consent authority. When approved, the plans will be endorsed and will then form part of this permit.	Development Permit DP12/0065B	N/A	Approvals and Regulatory Compliance Plan (L290-AQ-PLN-0004)
	Development permit conditions (DP13/0501)			
	Condition 1 Works may commence once an Erosion and Sediment Control Plan (ESCP) is approved. All works are to be undertaken in accordance with the endorsed ESCP.	Development Permit DP13/0501	N/A	Section 6.5 Erosion and sediment control
	Condition 2 Works may commence once an Acid Sulphate Soil Management Plan (ASSMP) is approved. All works are to be undertaken in accordance with the endorsed ASSMP.	Development Permit DP13/0501	N/A	Section 6.6 Acid sulfate soils management
	Condition 7 The loads of all trucks entering and leaving the site of works must be sealed and a wheel cleaning device is to be located inside the entrance to prevent mud being	Development Permit DP13/0501	N/A	Section 6.10 Dust and air quality management

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	brought out onto the road network.			
	Environment Protection Approval 7—conditions			
	Condition 7 The Approval Holder must at a minimum 7.1. implement and comply with - INPEX, Ichthys Project, Ichthys Onshore LNG Facilities Construction Environmental Management Plan (Company document number L290-AH-PLN-0059)(CEMP), as revised and approved by the NT EPA; 7.2. comply with all applicable laws; and 7.3. comply with all permits and approvals issued in relation to the Activity	EPA7-03	N/A	Section 3 Legal and other requirements
	Condition 8 The Approval Holder must, without limiting any other condition of this Approval, in conducting the Activity, do all things reasonable and practicable to ensure the Activity does not adversely affect the Declared Beneficial Uses and Objectives as declared from time to time, including those applying to; 8.1. the Elizabeth-Howard Rivers Region Groundwater; and 8.2. the Darwin Harbour Region	EPA7-03	N/A	Section 6.4 Surface water management
	Condition 9 The Approval Holder must cause a copy of the current GEMP to be 9.1. available on the Approval Holder's Australian website; and 9.2. provided to the Administering Agency	EPA7-03	N/A	This CEMP http://www.inpex.com.au/
	Condition 10 The Approval Holder must 10.1 Submit all revisions of the CEMP to the	EPA7-03	N/A	Section 1.4 Document review and revision

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	Administering Agency for approval, other than minor revisions involving changes such as typographical changes or revisions to formatting and referencing to other documents; and 10.2 Submit a revised copy of the CEMP to the Administering Agency for information, when the revision has incorporated only minor changes, such as typographical or formatting changes or referencing to other documents.			
	Condition 11 The CEMP must be revised and approved by the to the Administering Agency prior to commencing any works that are not addressed in an approved CEMP and will or may cause or increase the potential for environmental harm, such as by any increase of emissions or discharges	EPA7-03	N/A	Section 1.4 Document review and revision
	Condition 12 Each revision of the CEMP must 12.1 Address all works that will be conducted prior to approval of the next revision of the CEMP; 12.2 Be reviewed and endorsed by a qualified person as meeting the requirements of the Waste Management and Pollution Control Act, prior to submission to the Administering Agency; and 12.3 Be submitted to the Administering Agency for review (with a copy of the qualified person's certified review), at least 30 business days prior to implementation, noting the Administering Agency may require the Approval Holder to revise, amend and re submit the CEMP	EPA7-03	N/A	Section 1.4 Document review and revision

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	Condition 13 The Approval Holder must maintain and operate a 24 hour community telephone contact number and must ensure that the telephone number is provided: 12.1 in a prominent location on the Approval Holder's Australian website; and 12.2. in other publicly available documents relating to the Activity.	EPA7-03	N/A	Section 8 Corrective and preventative action
	Condition 14 The Approval Holder must maintain a log of all complaints made, in relation to the Activity, to any persons involved in the Activity. The log must include details of the following: the date and time of the complaint; the contact details of the complainant if known, or where no details are provided a note to that effect; the nature of the complaint; the nature of events giving rise to the complaint; prevailing weather conditions at the time of the complaint; the action taken in relation to the complaint, including any investigation or follow-up contact with the complainant; and if no action was taken, why no action was taken The log must be retained for the duration of this Approval.	EPA7-03	N/A	Section 8 Corrective and preventative action
	Condition 15 The Approval Holder must maintain a log of events causing or threatening to cause pollution including, but not limited to, fires, accidental spillages and discharges to Darwin Harbour.	EPA7-03	N/A	Section 8 Corrective and preventative action

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	Condition 16 The approval holder must segregate waste for recycling, reuse and disposal.	EPA7-03	N/A	Section 6.12 Waste management
	Condition 17 The approval holder must keep records of listed waste in accordance with Regulation 11 of the Waste Management and Pollution Control (Administration) Regulations.	EPA7-03	N/A	Section 6.12 Waste management
	Condition 18 An annual environmental audit must be undertaken by a qualified person to evaluate compliance with this approval, the Waste Management and Pollution Control Act and the Water Act.	EPA7-03	N/A	Section 7 Auditing, reporting and communication
	Condition 19 The proposed scope for the environmental audit must be submitted, no later than 20 Business days prior to the proposed commencement date of the environmental audit (which must be specified when the proposed scope is submitted), to the Administering Agency for review and approval.	EPA7-03	N/A	Section 7 Auditing, reporting and communication
	Condition 20 The environmental audit must not commence until written approval is received from the Administering Agency noting that the Administering Agency may require the Approval Holder to revise, amend or resubmit the proposed scope.	EPA7-03	N/A	Section 7 Auditing, reporting and communication
	Condition 21 The environmental audit report must be: 21.1 completed within two calendar months of receipt of approval from the Administering Agency unless otherwise agreed;	EPA7-03	N/A	Section 7 Auditing, reporting and communication

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	21.2 signed by the qualified person conducting the audit; and 21.3 provided in full to the Administering Agency within five Business Days of being signed by the qualified person conducting the audit.			
	Condition 22 The Approval Holder must submit a monitoring plan to assess environmental impacts of the Activity to the Administering Agency by 1 June 2012. The monitoring plan must be: 22.1 approved by the Administering Agency, noting that the Administering Agency may require the Approval Holder to revise, amend and/or resubmit the proposed monitoring plan; and 22.2 implemented within 10 Business Days, unless otherwise agreed, of receiving written approval of the monitoring plan from the Administering Agency.	EPA7-03	N/A	EIMP (L290-AH-PLN-10013)
	Condition 23 Any proposed revisions of the monitoring plan must be: 23.1. submitted to the Administering Agency for review; and 23.2. approved by the Administering Agency prior to implementation noting that the Administering Agency may require the Approval Holder to revise, amend and/or resubmit the proposed revision.	EPA7-03	N/A	EIMP (L290-AH-PLN-10013)
	Condition 24 The Approval Holder must as soon as practicable, and in any case within 24 hours, after first becoming aware notify the Administering Agency of non-compliances,	EPA7-03	N/A	Section 8 Corrective and preventative action

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	that are not trivial or negligible, with this Approval			
	Condition 25 Records must be kept of all non-compliances, including those assessed as trivial or negligible, with this Approval	EPA7-03	N/A	Section 8 Corrective and preventative action
	Condition 26 The Approval Holder must comply with the requirements of section 14 of the Waste Management and Pollution Control Act.	EPA7-03	N/A	Section 3 Legal and other requirements Section 7 Auditing, reporting and communication Section 8 Corrective and preventative action Appendix A
	Condition 27 The Approval Holder must immediately and in any case within 24 hours notify the Administering Agency of any potential or actual environmental harm or pollution by contacting the Pollution Hotline on telephone number 1800 064 567 and emailing pollution@nt.gov.au	EPA7-03	N/A	Section 8 Corrective and preventative action
	Condition 28 The Approval Holder must complete the Annual Audit and Compliance Report(AACR), Appendix 1, and provide to the Administering Agency within two calendar months of the anniversary of the commencement date of this Approval for each year of the Approval unless otherwise agreed	EPA7-03	N/A	Section 7 Auditing, reporting and communication
	Condition 29 The Approval Holder must submit a monitoring report to the Administering Agency within two calendar months of the anniversary of the commencement date of this Approval for each year of the Approval unless	EPA7-03	N/A	Section 1.5.1 Environmental Impact Monitoring Program

ID no.	Environmental commitment/condition	Source of commitment/ condition	Source reference	CEMP reference
	otherwise agreed. The monitoring report must 29.1 include but is not limited to a trend analysis and interpretation of analytical data collected as a condition of this Approval; and 29.2. be made available on the Approval Holder's Australian website			

APPENDIX C: ENVIRONMENTAL RISK REGISTER

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
1	Land/Sea Use	Clearing, earthworks, vehicle movement, vessel movement, MOFTP operation	Damage, disturbance or loss of Aboriginal heritage sites or sacred sites (as per AHMP) Impacts to shipwrecks, sunken aircraft etc. as per NAHMP	1. Protection of Aboriginal heritage sites (conservation areas and buffer zones) and sacred sites 2. Training and induction 3. Enforce site controls 4. GPS systems will be onboard all vessels. All identified heritage sites to be uploaded. 5. Marine charts to be onboard as backup measure 6. Adhere to exclusion zones. Heritage sites already surveyed. 7. Commitment to Anchor Management plan	D-Moderate	6-Remote	Low	D-Moderate	6-Remote	Low
2	Land/Sea Use	Clearing, earthworks, vehicle movement, vessel movement, MOFTP operation	Potential risk for damage, disturbance or loss of previously unidentified non-Aboriginal and Aboriginal heritage sites	AHMP and NAHMP contingency measures	D-Moderate	6-Remote	Low	D-Moderate	6-Remote	Low
3	Land/Sea Use	Clearing, earthworks, construction activities and vehicle movement, geotechnical investigations	Disruption/displacement of fauna	1. Pre-clearing fauna surveys 2. Fauna spotters/catchers 3. Staged clearing to allow animals to move into adjoining areas 4. Engage stakeholders (local park rangers) for consultation as part of fauna management during construction 5. Confirm with the fauna spotter the early engagement of the fauna relocation program to minimise impact to fauna during clearing 6. Open excavation management 7. Speed limits on site 8. Appropriate hazardous substances and dangerous goods storage and handling 9. Catching or feeding of native or feral animals is prohibited, and site personnel will be banned from harming or intentionally killing any wildlife. 10. No pets are permitted on site. 11. No guns are permitted on site. 12. Discarding food wastes within the Site is strictly prohibited. 13. Fauna and habitat relocation 14. Training and induction 15. Minimise clearing 16. Approved and delineated clearing boundaries 17. Attend to injured fauna if required 18. Minimise areas of ponding including grading of the roads to prevent water pooling 19. Monitor ponding water and presence of mosquitoes and animals preying on them.	E-Minor	3-Possible	Moderate	E-Minor	3-Possible	Moderate

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4a	Land/Sea Use	General construction activities	Fauna injury or death due to:• fauna trapped in - excavations trenches/pits, - under, in or between pipes, • blocked by fences	1. Pre-clearing fauna surveys and fauna spotters/catchers available 2. Staged clearing to allow animals to move into adjoining areas 3. Engage stakeholders (local park rangers) for consultation as part of fauna management during construction 4. Confirm with the fauna spotter the early engagement of the fauna relocation program to minimise impact to fauna during clearing 5. Trenches/excavations will be visually checked for fauna prior to backfilling 6. Excavations/trenches left open overnight will be inspected for fauna in the morning, no later than four hours after sunrise 7. Sloping egress ramps and/or temporary fauna exit structures (e.g. wooden planks, hessian bags, geotextile mats) will be constructed for high-risk entrapment areas (e.g. deep trenches or pits) 8. Pre-start vehicle checks by the operator including underneath will be carried out prior to operating/driving machines and vehicles 9. Checks also prior to moving materials/equipment potentially providing habitats i.e. walk around pipes to be moved. 10. Fauna refuge (i.e. hessian bags or wood boxes, floating pallets) inserted every 100m along GEP and FGP trench 11. Speed limits to be adhered to on site 12. Appropriate hazardous substances and dangerous goods storage and handling 13. Catching or feeding of native or feral animals is prohibited, and site personnel will be banned from harming or intentionally killing any wildlife. 14. No pets or guns are permitted on site. 15. Discarding food wastes within the Site is strictly prohibited. 16. Fauna and habitat relocation 17. Training and induction 18. Fauna interactions and excavation/trench inspections to be recorded 19. Removal of pipe end caps only at time of tie in 20. Pipe ends, drill holes, foundation holes and pits etc. covered at end of each day where practicable. 21. Ensure the fencing does not completely block off access to any identified habitat	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low
4b	Land/Sea Use	General construction activities	Fauna injury or death due to: • barb wire fence entanglement	Temporary measure: 1. Poly tape installation on all barb wire strands on the external perimeter fence 2. Poly tape installation on all barb wire strands on the inner perimeter fence				F-Insignificant	3-Possible	Low

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				3. Monitoring of the section of site perimeter fence with installed metal plates to confirm effectiveness as permanent solution Long term measure: 1. Ongoing maintenance of poly tape installed. 2. Installation of metal plates along external and inner perimeter fence if proved to be successful.						
5	Land/Sea Use	Earthworks and ground improvement works	Sealing of the site and ground improvement causing compaction leading to modified soil permeability resulting in decreased infiltration/recharge and altered groundwater flows and levels, altered drainage, isolation of groundwater system from freshwater system, reduced health of mangrove community	1. Groundwater modelling as undertaken as part of the Environmental Impact Statement (EIS) process and GEP activities. 2. The final design includes a drainage infiltration area 3. Groundwater quality and level monitoring 4. Maintain natural drainage using culverts (temporary) or flume pipes 5. Inductions and training 6. Site selection of access ways to reduce impacts 7. Use of suitable Northern Territory roads crossing protection (tyres, mats etc.) 8. Mangrove community health monitoring 9. Surface water monitoring	E-Minor	5-Highly Unlikely	Low	E-Minor	5-Highly unlikely	Low
6	Land/Sea Use	Dewatering and discharge of construction water from excavation pits/trenches including extraction and disposal of groundwater	Inappropriate handling and discharge of construction water resulting in: • Contamination of soil, surface water, groundwater and potential migration to Darwin Harbour with deterioration of receiving environment health• Temporary lowering of groundwater level exposes ASS and result in generation of sulfuric acid. Potential acidification and heavy metal contamination of surrounding soil and groundwater	Refer to measures in item 21 1. Construction water including groundwater collected to be tested and treated to meet water quality performance criteria 2. Construction site works design and construction methodology selection 3. Identification of ASS/PASS areas 4. Provision for treatment of water 5. Improve the identification of ASS locations in areas to be excavated 6. Obtain dewatering permits	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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7	Surface water drainage and groundwater infiltration	Earthworks and ground improvement works	The deep soil mixing may change the soil profile to impermeable causing the following potential impacts: • Increased surface runoff • Alteration to surface water drainage and directions • Reduced surface water infiltration to groundwater • Isolated groundwater system from freshwater recharge • Lowering of groundwater table and potential for seawater intrusion and potential for PASS to oxidise if not in an anaerobic state in surrounding areas • Reduced health of mangrove communities, or mortality occurs, due to reduced flow through of fresh groundwater	1. Groundwater modelling as undertaken prior to and during GEP activities. 2. Reinstatement of natural drainage. 3. Groundwater quality and level monitoring 4. Maintain natural drainage using culverts (temporary) or flume pipes 5. Inductions and training 6. Site selection of access ways to reduce impacts 7. Use of suitable Northern Territory roads crossing protection (tyres, mats etc.) 8. Mangrove community health monitoring 9. Surface water monitoring	E-Minor	4-Unlikely	Moderate	E-Minor	4-Unlikely	Moderate
8	Land/Sea Use	General nearshore construction activities including geotechnical investigations	Deterioration of aquatic environmental health including decline in water quality and seabed impacts	1. Volume of liquid stored on the vessels will be limited. 2. Liquids will be stored in bunded areas with sufficient capacities. 3. Spill response plan to be in place, reviewed and training will be provided. 4. Spill kits will be on each vessel to suit the materials onboard. 5. Double skin fuel storage tanks 6. Biodegradable hydraulic fluid	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
9	Land/Sea Use	General nearshore construction activities including geotechnical investigations	Temporary, localised disruption of natural behaviour or displacement of marine megafauna, e.g. due to Jack Up Barge (JUB) spud leg placement and intake of ballast water for MOFTP operation	1. Jacking structure are raised and lowered using mechanical system. JUB spud legs will be lowered to the seabed in a slow and controlled manner which allows sufficient time for marine megafauna to escape. 2. Trained fauna observers. 3. Provide gratings on sea chest/ballast intakes (1000x50mm)	D-Moderate	6-Remote	Low	D-Moderate	6-Remote	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
10	Land/Sea Use	General nearshore construction activities	Disturbance to benthic communities and marine fauna in the nearshore area, e.g. anchoring of vessels, due to JUB spud leg placement, STP outfall construction, MOF/Jetty construction, ballasting of MOFTP operation leading to seabed scouring	1. Commitment to have Anchor Management Plan. 2. Non-trenching method installation of STP outfall 3. MOF/Jetty on edge of dredge pocket already dredged by others	E-Minor	6-Remote	Low	E-Minor	6-Remote	Low
11	Land/Sea Use	General nearshore construction activities	Turbidity and sedimentation impacts due to MOFTP ballasting operation discharging at high velocity leading to seabed scouring	1. Aim to operate at slow and steady movement for MOFTP where possible depending on module load 2. Case by case analysis of load and ballast water discharge rate to be carried out to minimise operating at high discharge rate. 3. Ballast discharge angle parallel to seabed 4. Aim to not operate the MOFTP ballast at high discharge velocity 5. Vessel movement limited to work areas only.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
12	Land/Sea Use	General nearshore construction activities including geotechnical investigations	Turbidity and sedimentation impacts on benthic communities e.g. due to disposal of drill cuttings from marine piling and geotechnical investigation works, displacement of water with fill material from bulk filling for MOF cells and MOF causeway construction, and laying of pipeline onto the seabed.	1. Small volume of solid discharge 2. Not continuous activity 3. No proven containment method for this scale 4. Minimal quantities of sediment 5. Seabed dredged already 6. Lack of fauna in vicinity 7. Impact is minimal 8. Standard industry practice 9. Selection of materials for fill to minimise turbidity impact 10. Visual inspection and monitoring 11. Physical controls e.g. sedimentation curtains, containment bays 12. Selection of pipe laying method e.g. 'float and sink' onto the seabed that minimises disturbance to sediment. 13. Return of drill cuttings to minimise disturbance of materials in the water column. 14. Selection of drill fluid	E-Minor	6-Remote	Low	E-Minor	6-Remote	Low

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13	Land/Sea Use	Vessel movements	Injury or death of marine megafauna due to vessel strike	1. Trained Fauna observers will be appointed 2. Limit vessel movements to Worksite operations 3. Propeller guards where required (Align with Marine Safety Procedure) 4. Commitment Register 9.01 Reference - A cetacean management plan and supporting documentation will be developed and their prescriptions will be implemented. EIS Supplement. The cetacean management plan will be extended to include dugongs. Also key management controls reconfirmed in SEIS: management measures to be employed through the cetacean management plan: Vessel masters to be trained in cetacean interaction procedures; vessels will be operated at "no wash" speed when within 50-150m of a dolphin and will not intentionally approach a dolphin.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
14	Land/Sea Use	Vessel movements	Temporary, localised disruption of natural behaviour or displacement of marine megafauna	1. Trained Fauna observers will be appointed 2. Limit vessel movements to Worksite operations 3. Propeller guards where required (Align with Marine Safety Procedure) 4. Commitment Register 9.01 Reference - A cetacean management plan and supporting documentation will be developed and their prescriptions will be implemented. EIS Supplement. The cetacean management plan will be extended to include dugongs. Also key management controls reconfirmed in SEIS: management measures to be employed through the cetacean management plan: Vessel masters to be trained in cetacean interaction procedures; vessels will be operated at "no wash" speed when within 50-150m of a dolphin and will not intentionally approach a dolphin.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
15	Land/Sea Use	Vessel movements	Anchoring of vessel anchors or placement of JUB spud legs causing disturbance to benthic communities and marine fauna in the nearshore area	1. Anchor Management Plan controls.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
16	Land/Sea Use	Vessel movements including MOFTP operation	Vessel collision causing spill of hydrocarbons into Darwin Harbour, leading to damage to benthic communities and injury to, or fatality of, marine fauna	1. Spill response plan to be in place, reviewed and training will be provided. 2. Trained and competent vessel personnel 3. International Marine Contractors Association (IMCA) survey and NT vessel surveys to be completed/current for all vessels 4. Control of Commercial marine traffic by DPC as per Australian Maritime Safety Authority (AMSA) requirements 5. Simultaneous operations (SIMOP's) and interface between marine contractors 6. Establish exclusion zones	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
				7. Issue notice to mariners8. Marine Emergency Response Vessel availability						
17	Land/Sea Use	Vessel movement and operations, including placement of jack up barge spud legs and anchors, and MOFTP operation	Damage or disturbance to maritime heritage sites listed under the Heritage Act 2011 (NT) or Historic Shipwrecks Act 1976 (Cwlth)	1. GPS systems will be used on board vessels. All identified heritage sites in the vicinity of works will be uploaded onto GPS. 2. Marine charts to be onboard as backup measures. 3. Adhere to controlled zones. 4. Heritage survey prior to works. 5. Anchor management. 6. NAHMP controls	D-Moderate	6-Remote	Low	D-Moderate	6-Remote	Low
18	Land/Sea Use	Vessel movement and operations, including placement of jack up barge spud legs and anchors	Potential risk for damage, disturbance or loss of previously unidentified maritime heritage sites	1. Anchor management.	D-Moderate	6-Remote	Low	D-Moderate	6-Remote	Low
19	Land/Sea Use	Vessel movement and operations, including placement of jack up barge spud legs and anchors and ballasting during MOFTP operation	Sedimentation scouring resulting from propeller wash as vessels pass over or near shipwrecks or sunken aircraft	1. GPS systems will be used on board vessels. All identified heritage sites/protection zones in the vicinity of works will be uploaded onto GPS for each major vessel. 2. Vessel movement limited to work areas only.	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low
20	Land/Sea Use	Vessel movement and operations, including ballasting during MOFTP operation	Sea bed scouring	1. Vessel movement limited to work areas only. 2. Aim to operate the MOFTP ballast at high discharge velocity	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low

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21	Land/Sea Contamination	Onshore clearing, earthworks and constructionactivities (including in intertidal zone); and the storage, handling and/or transfer of cement, fuel, oils, greases, chemicals and other dangerous goods and hazardous substances	Uncontrolled release of dangerous goods or hazardous substances resulting in: • Atmospheric contamination• Soil, surface water and groundwater pollution• Odours• Effects on flora and fauna• Potential eventual migration of contaminants to Darwin Harbour• Fire/explosion event.	1. Appropriate hazardous substances storage and handling (Minimise stored and working volumes, bunding) 2. Training and induction (Emergency response competency) 3. Chemical selection (through ChemAlert). Approved chemicals only 4. Maintain dangerous goods and hazardous substance register (through Chemalert). NT Worksafe notification 5. Safety Data Sheets (SDSs) 6. Communication with emergency services 7. Design and monitoring to include containment of contamination in the environmental controls (e.g. bunding, booms, sediment retention areas) 8. Monitoring 9. Banning the use of polychlorinated biphenyls (PCBs) and asbestos 10. Approved transport and equipment. Daily plant/vehicle inspections completed 11. Regular Hazchem audits 12. Waste management plans 13. NDT by trained operators under controlled environment with appropriate storage, licences and permits 14. No storage within 30m of a drainage line unless approved. Park vehicles/equipment away from waterways/tidal areas. 15. Scheduled maintenance undertaken in workshops. If field servicing is required, this is undertaken above HAT. 16. Spill kits to be stationed at key work front locations, all refuelling operations and on machines working below HAT 17. Weekly monitoring of storage areas 18. Impact monitoring beyond the Site 19. Construction to utilise neap tides where possible to minimise tidal exposure 20. Only daily storage below HAT; no longer term storage below storm surge. 21. Encapsulation/containment abrasive blasting, spray painting work areas 22. Emissions control equipment e.g. filters, fume extractors etc.	E-Minor	4-Unlikely	Moderate	E-Minor	4-Unlikely	Moderate

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22	Land/Sea Contamination	General nearshore activities including module offloading operational activities including washdown, ramp, general waste (liquid, solid and ablution) generation, storage/handling of fuels, oils, greases, chemicals, and other dangerous goods and hazardous substances	Uncontrolled release of liquid and solid wastes, contaminants, dangerous goods or hazardous substances resulting in: • Atmospheric contamination • Surface water pollution • Odours • Effects on marine flora/ fauna • Fire/explosion event.	1. Appropriate hazardous substances storage and handling 2. Training and induction (Emergency response competency) 3. Notification NT WorkSafe 4. Chemical selection (through ChemAlert) 5. Maintain dangerous goods and hazardous substance register (through Chemalert) 6. Safety Data Sheets (SDSs) 7. Communication with emergency services 8. Design and monitoring to include containment of contamination in the environmental controls (e.g. bunding, booms) 9. Liquid wastes from washdown water and ablution to be contained and transfer to onshore to be trucked off site by a licensed waste service provider for offsite disposal. 10. Banning the use of polychlorinated biphenyls (PCBs) and asbestos 11. Approved transport and equipment 12. Approved chemicals only 13. Regular Hazchem audits 14. Wastewater management plans 15. Maintain general good housekeeping. 16. Use biodegradable products where possible 17. Refuelling procedures 18. MOFTP refuelling containment 19. 30m buffer zone from drainage lines to be observed when locating/placing temporary ablution facilities. If the 30m buffer zone cannot be achieved due to space limitations then the location of such a facility may be approved subject to risk assessment by Subcontractor.	E-Minor	4-Unlikely	Moderate	E-Minor	4-Unlikely	Moderate

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
23	Land/Sea Contamination	Onshore refuelling and vehicle movement including in intertidal zones	Uncontrolled release of dangerous goods or hazardous substances from refuelling (e.g. truck rollover; interaction of vehicles with the tidal flow) leading to:• Soil, surface water and groundwater pollution• Potential eventual migration of contaminants to Darwin Harbour	1. Appropriate hazardous substances storage and handling 2. Secondary containment3. Designated refuelling procedures 3a. SHEWMS/JHA to be developed and available at point of refuelling. . In addition to this, refuelling operations should be manned at all times, and not be left to autofill. 4. Spill kits to be present at all refuelling operations and on machines working below HAT and be stationed at key work front locations. 5. Training and induction (Emergency response competency) 6. Communication with emergency services 7. SDSs 8. NT Worksafe notification 9. Determine high risk areas and control vehicles movements in these areas 10. Chemical delivery through licensed subcontractors 11. Reduce the size of the refuelling vehicle in high risk areas (e.g. fuel pods). 12. Ensure refuelling trucks have self-closing fuel nozzles to prevent loss of containment. 13. Comply with Australian Standards 14. Observe refuelling distance from waterways 15. All light vehicle servicing to occur at the temporary workshop or off site at established workshop facilities. 16 All light vehicle refuelling to occur off site or at the designated re-fuelling bay. 17. Journey’s planned and only approved roads used 18. Schedule for work in the intertidal zone to maximise work during low tides. 19. Approved equipment and operators only 20. Daily plant/vehicle inspections completed 21. No refuelling to be undertaken in areas below HAT. 22. Chemical selection through ChemAlert 23. No temporary storage below HAT or permanent storage below storm surge.	D-Moderate	5-Highly unlikely	Moderate	D-Moderate	5-Highly unlikely	Moderate

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
24	Land/Sea Contamination	Refuelling of vessels and large marine construction equipment	Spill of chemicals or hydrocarbons including roll-over of refuelling equipment leading to pollution of the nearshore environment	1. Volume of liquid stored on the vessels will be appropriate. 2. Liquids will be stored in bunded areas or with appropriate containment with sufficient capacities. 3. Spill response plan to be in place, reviewed and training will be provided. 4. Spill kits will be on each vessel to suit the materials onboard. 5. Appropriate spill containment at the refuel point e.g. seal couplings, shutoff valves 6. Approved Hydrocarbon Management Plan 7. Dedicated containment bund for MOFTP for refuelling over water from MOF to MOFTP 8. Non-project vessels to refuel at East Arm Wharf 9. Availability of Marine Emergency Response Vessel	E-Minor	5-Highly Unlikely	Low	E-Minor	5-Highly unlikely	Low
25	Land/Sea Contamination	Storage, handling and disposal of hydrocarbons and other chemicals (up to ~5000 litres) associated with construction vessels working in the nearshore environment	Spill or incorrect disposal of chemicals or hydrocarbons leading to deterioration of aquatic environmental health including decline in water quality and seabed impacts	1. Volume of liquid stored on the vessels will be limited. 2. Liquids will be stored in bunded areas with sufficient capacities. 3. Spill response plan to be in place, reviewed and training will be provided. 4. Spill kits will be on each vessel to suit the materials onboard. 5. Double skin fuel storage tanks 6. Biodegradable hydraulic fluid 7. Availability of Marine Emergency Response Vessel	F-Insignificant	4-Unlikely	Low	F-Insignificant	4-Unlikely	Low
26	Land/Sea Contamination	Clearing, earthworks, ground improvement	Excavation/dewatering / displacement of ASS/PASS leading to:• oxidation of ASS leading to generation of sulfuric acid• potential acidification and heavy-metal contamination ofsurrounding soil, surface water and groundwater• temporary lowering of groundwater level, which exposes ASS to oxygen and results in the generation of sulfuric acid• potential impact on growth and health of vegetation due to modified pH levels in the soil, surface water and groundwater• impact on the productivity of	1. Construction site works design and construction methodology selection 2. Identification of ASS areas in accordance with QASSIT sampling guidelines prior to works commencing 3. Inductions and training 4. Work schedule to consider the tidal activity. 5. Obtain dewatering permits 6. Deep soil mixing campaign will be initially verified during a trial period and continually monitored. 7. ASS management plan implemented 8. ASS disturbance permitting process implemented. 9. Improve the identification of ASS locations in areas to be excavated 10. Daily visual inspections during deep soil mixing to detect PASS/ASS exposure signs. 11. Treated soil sampled and tested in accordance with QASSIT to verify neutralisation. 12. Locations where validation is not achieved to be retreated. Additional dosing rates will be identified by the NATA laboratory from the samples provided and not validated. 13. Provision for treatment of water.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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			the local soils due to pH change and increased bioavailability of metals within the soil profile.							
27	Land/Sea Use	Extraction and disposal of groundwater pooling in excavation pits/trenches	Temporary lowering of groundwater level exposes ASS and result in generation of sulfuric acid. Potential acidification and heavy metal contamination of surrounding soil and groundwater	1. Construction site works design and construction methodology selection 2. Identification of ASS areas in areas to be excavated 3. Provision for treatment of water 4. Obtain dewatering permits 5. Groundwater collected to be treated to meet water quality performance criteria.	F-Insignificant	4-Unlikely	Low	F-Insignificant	4-Unlikely	Low
28	Land/Sea Contamination	General construction including construction of access roads, soil stockpiling and earthworks	Introduction of contaminated fill, leading to contamination of soil, surface water and groundwater	1. Validation of all imported fill (where is the fill coming from? EMA? Or outside source. If outside source, then state that the quarry should supply "clean certified fill"). 2. Monitoring and visual inspections 3. Conduct a derailed site investigation (DSI) in accordance with relevant Guidelines (NSW EPA?) to characterise materials prior to any extraction taking place.	F-Insignificant	4-Unlikely	Low	F-Insignificant	4-Unlikely	Low
29	Land/Sea Contamination	Clearing and earthworks	Discharge from the sediment basin/equivalent type control/containment resulting in: • Increased nutrient, sediment, and other contaminant in receiving waters • Deterioration of nearshore water quality and of aquatic environmental health	1. Designed in accordance with International Erosion Control Association (IECA) guidelines 2. Monitoring of water quality (pH, turbidity, etc.) on the discharge to Darwin Harbour 3. Provision for treatment of water in the sediment basins 4. Dewatering and discharge permit 5. Training and induction 6. Clarify the proposed operation of sediment basins and management philosophy for controlling sediment basin discharge 7. Ensure the permanent drainage design discharge points are controlled. 8. Cleared areas and storm protection barrier to be stabilised as soon as possible (gravel cover, hydromulch, jute matting, and revegetation). 9. Use of silt fences or equivalent during the wet season. 10. Implement the erosion and sediment control plan 11. Minimise clearing 12. Approved and delineated clearing boundaries 13. Inductions and training 14. Work method statement for the clearing of mangroves	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
30	Land/Sea Contamination	Concrete batch plant, concrete works and on-site cleaning of concrete trucks and equipment	Impact on soil, surface water, groundwater and deterioration of aquatic environmental health including decline in water quality and seabed impacts	1. Education and training of staff 2. Dedicated sealed area for concrete washout 3. Schedule pours in the morning 4. Work scheduled to avoid wet season where possible and consider weatherimpacts. 5. Selected and approved curing compounds 6. Regular maintenance and inspection 7. Recycle process water system 8. Quantities required are those ordered to reduce excess waste materials for disposal 9. All concrete to be poured, return unused quantities of concrete to supplier for recycling if possible or managed in approved washout bay. 10. Regular inspection 11. Concrete batching plant will incorporate a closed water loop process with no discharge. Wastewater produced from cleaning of concrete trucks and from washing down vehicles will not be discharged to the environment and will bereused within the batching plant.	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low
31	Land/Sea Contamination	Concrete batch plant, concrete works and on-site cleaning of concrete trucks and equipment	Loss of concrete due to rain impact causing rain generated surface water run off of concrete	1. Education and training of staff 2. Dedicated sealed area for concrete washout 3. Schedule pours in the morning 5. Work scheduled to avoid wet season where possible and consider weather impacts. 6. Selected and approved curing compounds 8. Regular maintenance and inspection 9. Recycle process water system 10. Quantities required are those ordered to reduce excess waste materials for disposal 11. All concrete to be poured, return unused quantities of concrete to supplier for recycling if possible or managed in approved washout bay. 12. Regular inspection 13. Concrete batching plant will incorporate a closed water loop process with no discharge. Wastewater produced from cleaning of concrete trucks and from washing down vehicles will not be discharged to the environment and will be reused within the batching plant.	E-Minor	4-Unlikely	Moderate	E-Minor	4-Unlikely	Moderate
32	Land/Sea Contamination	Clearing, earthworks (including in intertidal zone)	Vehicle wash leading to impact on ground or surface water	1. Dedicated sealed area for washout 2. Oil-water separator 3. Chemical approval process 4. Regular inspection 5. Wastewater from the vehicle washdown bay will be retained on site and recycled and/or used for dust suppression. 6. Vehicles to be gravel / rock rubble treated at exits to limit potential for material to be tracked onto public road.	D-Moderate	4-Unlikely	Moderate	D-Moderate	4-Unlikely	Moderate

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				7. Clean down of road if required.						
33	Land/sea contamination	General construction activity	Stormwater/construction water that has been exposed to ASS potentially has decreased pH and higher heavy metal concentrations. If discharged off Site, this water may have detrimental effects on pH levels and heavy-metal concentrations of surrounding surface waters. If stored on site in ponds, or in a tank that leaks, these waters have the potential to contaminate groundwater through percolation.	1. Construction site works design and construction methodology selection 2. Identification of ASS areas in areas to be excavated 3. Provision for treatment of water 4. Obtain dewatering permits 5. Groundwater collected to be treated to meet water quality performance criteria if discharged 6. See measures for Item 23	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
34	Land/sea contamination	General construction activity	Uncontrolled release of construction materials (i.e. grout, bentonite), welding, grinding, drilling, facing and cutting particulates etc. in drainage to surrounding environment resulting in:• Soil, surface-water and groundwater pollution• Potential eventual migration of contaminants to Darwin Harbour• impacts to mangrove healthPotential Legal impacts due to classification as listed	1. Containment in place to capture potential run off from work areas with treatment for removal of contaminants. 2. Wash down area for equipment established and maintained. 3. Quantities of materials required are pre-calculated according to the work require 4. Visual inspection for excessive loss of product 5. Activity planned to avoid rain event. 6. Washout bay, concrete washout sumps, hydrocarbon residue in oil-water separators disposed of as hydrocarbon contaminated waste and recorded on waste register 7. Compaction completed to specification. 8. Drainage designed and constructed to design 9. Work scheduled to avoid high tides through areas below HAT. 10. Surface water monitoring program undertaken and results reviewed against background values.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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			waste (waste resulting from surface preparation of metals and plastics).	11. All waste removed and put into waste receptacle. 12. Weekly inspections for waste management / housekeeping related issues.						
35	Erosion	Clearing, earthworks and ground improvement	Uncontrolled release of sediment (e.g. from severe weather, failed erosion and sediment controls, delayed installation of ESC or due to exposure to soils) leading to decreased water quality and impact to marine life	1. Critical weather event procedure 2. Designed in accordance with IECA guidelines 3. Drainage plans 4. Staged earthworks, where practicable, to minimise the area of exposed soil 5. Accelerated work program (large –scale clearing) to be conducted in the dry season 6. Vegetation and clearing earthworks method statement 7. Monitoring and visual inspections 8. Clarify and review the design basis for the sediment basins in relation to critical weather events and assess it against the works program 9. Prior to the wet season, develop a wet season plan for the management of site discharge and mitigation strategies for site preparation in the event of a cyclone warning 10. Maximise clearing buffers 11. Training and induction 12. Erosion protection infrastructure (e.g. silt fencing, contouring, and sediment basins) will be installed to ensure that sediment is contained within the Site as far as is practicable 13. Stockpile management 14. Soil stabilisation, re-seeding and planting of vegetation to occur upon completion of earthworks 15. Enforcement of site controls 16. Sediment retention area construction 17. Root stock will be retained in areas where topsoil is not required to be stripped. The root stock will assist with retention of topsoil. (other than DSM areas where root stock is required to be removed)	E-Minor	4-Unlikely	Moderate	E-Minor	4-Unlikely	Moderate

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36	Erosion	Earthworks and construction	Exposure of soil to erosive forces (e.g. tide interaction, rainevents etc.) during construction activities, including construction of the Module Offloading Facility (MOF) causeway crossing and GEP construction works, resulting in soil erosion and increased sediment loading of nearby waterways.	1. Selected fill including minimal fines in the fill material 2. Visual inspections to identify loss of material 3. Maximise construction during low tide 4. Training and inductions 5. Cleared/disturbed areas and storm protection barrier to be stabilised as soon as possible (gravel cover, hydromulch, jute matting, and revegetation). 6. Surcharge material placed and compacted on the disturbed surface of the completed deep soil mixing area. 7. Backfilled material is compacted to specification. 8. Erosion and sediment controls installed on downstream side of GEP trench to capture potential run off. 9. Material stockpiles on upstream side of trench where possible so that trench captures material moving due to water influence prior to it leaving site. 10. Short term stockpiling (i.e. same day where possible) and surplus stockpiled material to be removed 11. Surface water monitoring 12. Roadside drainage ensures surface water moves away from work area whilst excavations open.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
37	Erosion	Earthworks	Soil erosion and sedimentation due to the removal of vegetation or lost through tidal influences, leading to soil instability and declined health of vegetation	1. Soil stabilisation of long-term stockpiles and exposed areas which may include re-seeding and planting of vegetation 2. Designed and constructed in accordance with IECA guidelines 3. Monitoring and visual inspections 4. Staged earthworks, where practicable, to minimise the area of exposed soil 5. Accelerated work program (large–scale clearing) to be conducted in the dry season 6. Vegetation health monitoring 7. Training and induction	E-Minor	5-Highly unlikely	low	E-Minor	5-Highly unlikely	Low

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38	Surface water	Installation of pipeline using push-pull method	Dewatering water from the trench/excavation contains foreign material i.e. cement and/or sediment, and pollutants that have been washed off machine parked to anchor pipe string in tidal area during high tides Pollutants enter surface water as the tide recedes	1. Roadside drainage modified to ensure drainage moves away from work area whilst excavations open. 2. Maintain natural drainage using culverts (temporary) or flume pipes 3. Dial before you dig permit in place 4. Conduits for cross flow of water. 5. Dewatering undertaken in accordance with an approved dewatering and discharge permit. 6. Water reused on site for dust suppression where possible 7. All sand/cement used to divide sections in the trench (non DSM areas) will be stabilised in the GEP trench 8. Daily Pre-start inspection of plant parked overnight to identify loss of pollutants and impacts to machine. 9. Keep trench clean and tidy of debris 10. Well maintained equipment only to undertake this task 11. Floating booms placed around machine during tidal influence to capture potential hydrocarbon based materials washed off machine 12. Put slight crown on trench line for areas of Type A & B. 13. Visual inspections to identify low lying areas that require filling. 14. Provision of treatment of water dewatered from trench or excavation to meet management criteria depending on application e.g. reuse or discharge back into Harbour.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
39	Erosion	Earthworks	Sedimentation impacts on vegetation (erosion and deposition)	1. Vegetation health monitoring 2. Designed in accordance with IECA guidelines 3. Cleared areas and storm protection barrier to be stabilised as soon as possible (gravel cover, hydromulch, jute matting, and revegetation) 4. Staged earthworks, where practicable, to minimise the area of exposed soil 5. Accelerated work program (large–scale clearing) to be conducted in the dry season 6. Vegetation and clearing earthworks method statement 7. Monitoring and visual inspections 8. Enforcement of site controls 9. Training and induction	E-Minor	5-Highly unlikely	low	E-Minor	5-Highly unlikely	Low
40	Erosion	Earthworks, ground improvement	• Disturbance of natural soil material leading to destabilisation of the ground and slumping• Liquefaction of soils	1. Temporary works design, modelling and reporting within design reports2. Develop mangrove community health monitoring program 3. Soil monitoring4. Mangrove roots will be left in-situ where possible5. Training and competency6. Stability berm7. Trial works to verify deep soil mixing	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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			from failed stabilisation	methodology						
41	Erosion	Earthworks	Increased erosion of disturbed batters during a storm surge	1. Staged earthworks, where practicable, to minimise the area of exposed soil 2. Accelerated work program to minimise time disturbed batters will be exposed	F-Insignificant	4-Unlikely	Low	F-Insignificant	4-Unlikely	Low
42	Erosion	Exposure of soil to erosive forces during construction activities, including construction of the module offloading facility (MOF) and the Jetty Modification of natural overland flow velocities/volumes as a result of site preparation, material removal from the EMA and infrastructure construction activities and vegetation clearing	Soil erosion and sediment transport during construction activities resulting in: • increased nutrient, sediment, salt and other contaminant concentrations in receiving waters • deterioration of onshore and nearshore water quality and of aquatic environmental health • an increase in sediment loads on the fringing vegetation community, smothering the vegetation and invertebrate fauna and resulting in damage or death (e.g. of mangroves) • deterioration of soil quality and fertility due to increased erosion.	1. Soil stabilisation of long-term stockpiles and exposed areas which may include re-seeding and planting of vegetation 2. Designed and constructed in accordance with IECA guidelines 3. Monitoring and visual inspections 4. Staged earthworks, where practicable, to minimise the area of exposed soil 5. Accelerated work program (large–scale clearing) to be conducted in the dry season 6. Vegetation health monitoring 7. Training and induction 8. Staging of earthworks 9. Sealing/hardstands	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low

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43	surface water	Construction and earthworks related traffic movements	Physical disturbance of soil such as compaction Addition of sediment onto access and/or public roads by construction related traffic resulting in sediment transport in stormwater on roads causing: • increased nutrient, sediment, and other contaminant concentrations in receiving waters • deterioration of nearshore water quality and of aquatic environmental health.	1. Use of vehicle wash, wheel wash, rumble grids and other suitable measures to remove excess soil from vehicles 2. The loads of all trucks entering and leaving Site must be covered. 3. Street sweeping as required 4. Daily visual inspections of work area 5. Training and education 6. The site intersection works on the roads are to be completed prior to start-up 7. Designated access tracks 8. Monitoring 9. Limit number of vehicles 10. Training and site induction 11. Erosion and sediment control plan	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
44	Physical Disturbance	General construction activities	Vehicle/fauna interaction to/from site causing injury or death	1. Speed limits 2. Reduction in the number of vehicles 3. Cleared site 4. Fauna spotters/catchers 5. Reporting of accidents 6. Pre-start vehicle checks for trapped/deceased fauna 7. Food waste disposal management 8. Training and site induction 9. Obey road rules, be extra vigilant during high risk periods (sunrise / sunset). 10. Deliveries only received during daylight hours 11. Work away from areas where fauna are present	F-Insignificant	4-Unlikely	Low	F-Insignificant	4-Unlikely	Low

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45	Physical Disturbance	General construction activities such as grinding, welding, gas cutting, vegetation clearing during site preparation, other hot works, ignition sources	Bushfire and subsequent loss of flora and fauna	1. Emergency response Team prepared for response if required 2. Cleared vegetation will be mulched and stockpiled in designated areas for reuse 3. Establish firebreaks around the Site with advice from NT Bushfires Council. Workshop established with no vegetation in close proximity. 4. Control fuel load in grassed and vegetated areas to minimise risk of intense bushfires through weed control 5. Establish fire fighting capability on site 6. Maintain two 10,000 L water tanks on site for fire control 7. Hot work permit requirement 8. Vehicle pre start checks to include vegetation check 9. Designated smoking areas 10. Dangerous and hazardous substance management 11. Waste management 12. Monitoring and inspection to identify fire hazards and activities, and any un-reported fires 13. Training and induction 14. Stockpiled vegetation will not be burned, and will be reused where possible 15. Welding screens used to restrict sparks being airborne. 16. Fires to be reported as an incident 17. Timing of work	E-Minor	6-Remote	Low	E-Minor	6-Remote	Low

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46	Physical Disturbance	General construction activities such as storage of flammable and combustible materials, excavation near utilities resulting in ruptured pipeline, transporting fuel and other flammable dangerous goods	Bushfire and subsequent loss of flora and fauna	1. Emergency response equipment and procedures 2. Cleared vegetation will be mulched and stockpiled in designated areas for reuse 3. Establish firebreaks around the Site with advice from NT Bushfires Council 4. Control fuel load in grassed and vegetated areas to minimise risk of intense bushfires through weed control 5. Establish fire fighting capability on site 6. Maintain two 10,000 L water tanks on site for fire control 7. Hot work permit requirement 8. Vehicle pre start checks to include vegetation check 9. Designated smoking areas 10. Dangerous and hazardous substance management for transport, storage and handling 11. Waste management 12. Monitoring and inspection 13. Training and induction 14. Stockpiled vegetation will not be burned, and will be reused where possible 15. Dial Before You Dig for positive location of services / utilities prior to excavation 16. Excavation and Penetration certificate and Permit to work process in place 17. Design drawings 18. Australian Standards 19. Stakeholder liaison 20. Fire reported as an incident. 21. Spotter for excavations around existing services	E-Minor	6-Remote	Low	E-Minor	6-Remote	Low
47	Physical Disturbance	Uncontrolled events such as lightning strike and arson	Bushfire and subsequent loss of flora and fauna	1. Provide proper grounding prior to tower erection 2.Use of lightening detectors 3.Monitor weather conditions	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low
48	Physical Disturbance	Clearing of vegetation	Death or injury of threatened/protected fauna species (e.g. crocodiles, migratory birds)	1. Training and induction 2. Clearing activities will be staged to encourage fauna relocation 3. Wildlife handlers (or fauna spotters) will relocate animals to adjacent vegetation outside of the clearing boundary 4. Fauna register 5. Habitat relocation and rehabilitation	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low
49	Physical Disturbance	Clearing of vegetation	Localised reduction in biodiversity due to removal of Cycas armstrongii (cycads), which are classed as "vulnerable" under the TPWC Act	1. Minimise clearing footprint, subject to design, construction and safety requirements 2. Use of a Cycad removal permit 3. Vegetation and clearing earthworks method statement.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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50	Physical Disturbance	Clearing of vegetation	Localised reduction in biodiversity due to loss of Eucalypt woodland, Melaleuca communities and habitat	1. Minimise clearing footprint, subject to design, construction and safety requirements 2. Stockpile topsoil from cleared areas for use in rehabilitation 3. Cleared vegetation will be mulched and stockpiled, and used for rehabilitation and soil stabilisation. 4. Temporarily disturbed areas will be revegetated and rehabilitated following the completion of works	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
51	Physical Disturbance	Clearing of vegetation	Localised reduction in biodiversity due to loss of mangrove and monsoon vine forest communities and habitat	1. Minimise clearing footprint, subject to design, construction and safety requirements 2. Stockpile topsoil from cleared areas for use in rehabilitation 3. Cleared vegetation will be mulched and stockpiled, and used for rehabilitation and soil stabilisation. 4. Temporarily disturbed areas will be revegetated and rehabilitated following the completion of works 5. Approved and delineated clearing boundaries 6. Training and induction 7. Pre-clearing survey	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low
52	Physical Disturbance	Clearing of vegetation	Potential loss of unidentified threatened/protected species of lower abundance and restricted to more specialised habitats	1. Major clearing activities undertaken to allow animals to move into the remaining vegetation in the vicinity 2. "High-risk" entrapment areas (e.g. trenches or pits) will have sloping egress ramps. Targeted inspections will be undertaken and any trapped animals will be removed and released.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
53	Physical Disturbance	Clearing of vegetation	Disruption/injury/displacement of fauna species e.g. migratory birds using the EMA, and birds reliant upon the monsoon vine forest	1. Major clearing activities undertaken to allow animals to move into the remaining vegetation in the vicinity 2. "High-risk" entrapment areas (e.g. trenches or pits) will have sloping egress ramps. Targeted inspections will be undertaken and any trapped animals will be removed and released. 3. Minimise clearing footprint, subject to design, construction and safety requirements 4. Maximise revegetation of future expansion areas, buffer zone and storm protection barrier with native flora species 5. Training and induction 6. Fauna and habitat relocation 7. Attend to injured fauna if required	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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54	Physical Disturbance	Clearing of vegetation and general construction	Unauthorised clearing/impacts outside of the Site boundary destruction of vegetation (including mangroves) and/or injury or death to fauna.	1. Clearing permits 2. Obtain additional permits for clearing, as required 3. Incorporate any additional areas approved for clearing in JKCs clearing boundary drawing 4. Apply good practice clearing principles (e.g. mark out on site extent of new permitted clearing area) 5. Deliveries to be escorted to locations of receival. 6. Location for facilities establishment to be pegged out prior to receipt of items and be adequately sized to cater for storage and movement of all items. 7. Weekly inspections to identify impacts external to Site boundary and incident reported. 8. Ensure survey markers are visible prior to rehabilitation and recovery of stockpiles commence as per the Clearing Permit. 9. Re-mark boundaries if survey markers are not visible. 10. Fire breaks will be utilised to tie in with pre-existing vegetation. 11. GEP pipe string anchored to prevent lateral movement outside of cleared area when tidal influence is present. Daily inspection to ensure guide posts still in place	E-Minor	6-Remote	Low	E-Minor	6-Remote	Low
55	Physical Disturbance	Earthworks	Disturbance of soil (e.g. mudwave) during ground improvement activities has the potential to change elevations and consequently cause mangrove damage or mortality due to changed groundwater levels and erosion impacts.	1. Works design, modelling and reporting within design reports 2. Develop mangrove community health monitoring program 3. Soil monitoring 4. Mangrove roots will be left in-situ 5. Training and competency 6. Stability berm 7. Include in the design report a dedicated section for predicted soil disturbance, with a monitoring program to validate the model 8. Installation sequence and pre-boring to limit squeeze on columns and soil displacement 9. Selection of methodology	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low
56	Physical Disturbance	General construction activities including bulk earthworks and vehicle movements	Dust deposition smothering surrounding vegetation, and reducing growth.	1. Visual inspection and real-time monitoring to identify areas requiring additional dust management. 2. Dust control measures, including wetting down exposed surfaces 3. Roads required for the operations phase to be sealed during construction 4. Drive to the conditions and posted speed limits. 5. Reduce speeds if operators notice increased dust generation. 6. Daily inspections by Supervisors 7. Monitoring undertaken in response to complaints from the community. 8. Complaints recorded as an incident	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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57	Physical disturbance	Creation of topsoil stockpiles	Topsoil contaminated with weeds derived from site	1. Topsoil containing high densities of weed seeds will not be used in rehabilitation 2. Any topsoil from cleared areas where the vegetation was recorded as having been infested by a listed weed and where weed control has not been applied will be used as fill at a designated location and capped to at least 2 m depth to prevent emergence of vegetative shoots or seedlings. 3. Trucks carrying topsoil from the weed-infested areas will be covered to prevent material blowing into weed-free areas. Truck routes for transporting material with weeds will be selected to avoid contaminating weed-free areas 4. Vegetation debris, mulch or topsoil will not be stockpiled in areas where declared weeds are known to exist	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
58	Physical disturbance	Creation of topsoil stockpiles	Native seed not viable due to long storage of topsoil or poor storage procedures	1. A register of topsoil stockpiles will be maintained to record the stockpile number, the date placed, the source location, the type and comments (including rehandling/ relocation, seeding etc.) 2. Seeding of long-term topsoil stockpiles may be carried out with an appropriately designed seed mix to limit stockpile erosion if required 3. Where possible, provenance seed will be purchased and used in rehabilitation	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
59	Physical disturbance	Creation of topsoil stockpiles	Unstable topsoil stockpiles eroding and causing sedimentation runoff	1. Cleared vegetation will be mulched and stockpiled within the Site boundaries. Where possible, the mulch will be used for both rehabilitation and soil stabilisation to prevent erosion. 2. Seeding of long-term topsoil stockpiles may be carried out with an appropriately designed seed mix to limit stockpile erosion if required 3. Stockpiles will be located a minimum of 30 m from water bodies and drainage lines 4. All soil stockpiles will be surrounded by appropriate sediment and erosion control devices to prevent storm water run-on and sediment transport via run-off from the stockpile. 5. Short-term stockpiles (<1 month) will be stabilised if warranted by site-specific risks. Stabilisation techniques include compaction, use of matting or other slope stabilisation products. Long-term stockpiles (>1 month) will be stabilised using short term stabilisation measures	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low
60	Resource Use	General construction activities	Increasing levels of greenhouse gas emissions	1. Adhering to the transport strategy, including scheduled bus movements from the workforce accommodation village to Site 2. Recycling and reusing construction materials 3. Selection of materials and consumables with a lower greenhouse gas footprint	E-Minor	5- Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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61	Resource Use	General construction activities	Excessive consumption of water leading to non-compliance with best practice water conservation methods	1. Capture rainwater 2. Utilising sedimentation ponds as construction water 3. Monitoring water use 4. Training 5. Construction methods to minimise water use 6. Sealing roads 7. Reuse construction water 8. Use alternatives to water for dust suppression, such as dust prevention products	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
62	Resource Use	Earthworks	Over-excavation of the Extractive Material Area (EMA) leading to non-compliance with approval conditions	1. Sourcing the product through the marketplace 2. Construction methodology 3. Prepare and implement a Mine Management Plan 4. Survey control points 5. Define limit of excavation 6. Training and competency 7. Regular inspections 8. Compliance review 9. Record and monitor monthly extraction volumes 10. Conduct an external review for the impact of over-excavation of the EMA.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
63	Resource Use	General construction activities	Excessive removal of topsoil and mulch - waste of valuable resources	1. Rehabilitation of the old borrow pit (off-site) 2. Reuse of mulch on-site for environmental controls (e.g. soil stabilisation, rehabilitation)	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
64	Visual Impact	General onshore construction activities	Night-time work impacting on local navigations and flora/fauna behaviour	1. Work lighting will be task specific (directional) 2. Night work planning/scheduling 3. Lighting type 4. Training and induction 5. Monitoring and inspection	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
65	Visual Impact	General construction activities	Dropping and tracking of fill material and mud on public roads from trucks	1. Load constraining/covering as per the development permit conditions 2. Street sweeping as required 3. Daily visual inspections 4. Training and education 5. Washdown facility for trucks leaving the site (including capture basin 6. The site intersection works on the roads are to be completed prior to start-up 7. Wheelwashes and rumble strips in strategic locations 8. Mitigate at source i.e. can road or area be sealed to prevent mud tracking in the first place.	E-Minor	4-Unlikely	Moderate	E-Minor	4-Unlikely	Moderate

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66	Air Emissions	General construction activities including earthworks, vehicle movements, abrasive blasting	Dust generation, resulting in: • nuisance, amenity and health impacts on nearby communities • health impacts on the workforce (e.g. respiratory and impaired vision) • decreased vegetation health	1. Avoid excavation during windy times 2. Use of moisture conditioning – water carts for dust suppression 3. Road sealing 3. Restrict vehicles to designated roads and tracks 4. Observe site speed limits, and reduce speed where possible. 5. Stabilisation of cleared areas 6. Monitoring and visual inspections 7. Covering of stockpiles and truck loads 8. Provide shroud around/encapsulate abrasive blasting areas to minimise loss of spent media and generation of dust 9. No recycling of abrasive blast media without treatment for fines 10. Community complaints recorded as an incident 11. Minimise vegetation clearing (applicable to GEP scope).	F-Insignificant	4-Unlikely	Low	F-Insignificant	4-Unlikely	Low
67	Air Emissions	General construction activities	Generation of smoke resulting in decreased visibility and community complaints	1. Obtain permit to undertaken prescribed burns from NT Fire and Rescue Service 2. Notification to the community and government agencies where required 3. Vehicle maintenance and emission control	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
68	Air Emissions	General construction activities	Energy consumption and generation of combustion emissions, gas release increasing levels of atmospheric pollution (NOx, SOx) and increasing levels of greenhouse gases (above acceptable limit?)	1. Energy saving mitigation measures through all site offices 2. Scaling down lights and activities for night shift 3. Recording all energy consumption 4. Vehicle maintenance and emission control 5. All generators/engines on MOFTP to be international Maritime pollution control certification requirements 6. Organisation Tier II compliant for greenhouse gas emissions 7. Provide regular inspections and services to all engines, fittings and prior to use. 8. Communication and training 9. Size of equipment/plant matched to task/demand 10. Approved work method statements	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
69	Air Emissions	Storage, handling or transport of dangerous goods	Incorrect storage of dangerous goods leading to fire/explosion event.	1. MSDSs2. Design of DG storage area3. Designated smoking areas4. Spark-arrestors5. Use of diesel vehicles6. Training and induction7. Monitoring and maintenance of stockpiles8. Material selection	F-Insignificant	4-Unlikely	Low	F-Insignificant	4-Unlikely	Low

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70	Air Emissions	General construction including operating heavy machinery for clearing, undertaking "hot work"	Bushfire resulting in reduced air quality Emissions to atmosphere by: Use of products containing VOCs including paint and spray painting . "Hot work" including welding, grinding, cutting releasing pollutants/contaminants to atmosphere	1. Emergency response equipment and procedures 2. Cleared vegetation will be mulched and stockpiled in designated areas for reuse 3. Establish firebreaks around the Site with advice from NT Bushfires Council 4. Control fuel load in grassed and vegetated areas to minimise risk of intense bushfires through weed control 5. MSDSs 6. Training and induction 7. Monitoring 8. Provide shroud around/encapsulate abrasive blasting and spray painting areas to minimise loss of abraded materials and paint overspray 9. Material/chemical selection 10. Emission controls on dedicated abrasive blasting/paint areas 11. Fume extractors	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
71	Vibration and Noise	General construction activities (including onshore pile driving, drilling, blasting, abrasive blasting, pipeline cleaning/pigging and equipment, vessel and pipeline drying	Noise and vibration causing nuisance, disturbance or health impacts to local community	1. Training and induction 2. Noise monitoring including baseline 3. Comply with Australian Standard for managing noise on construction sites 4. Community notifications prior to works of 24 hour, 6 day week working schedule 5. Publication of community hotline for feedback and grievances 6. here possible day time operations preferred	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
72	Vibration and Noise	General construction activities (including onshore test piles and blasting)	Noise and vibration impact displacing terrestrial fauna	1. Training and induction 2. Obtain baseline data 3. Piling during daylight hours only	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low
73	Vibration and Noise	Construction of the MOF causeway	Noise and vibration impact to marine fauna due to the construction of the MOF Causeway	1. Monitoring 2. Demonstrate that the ground improvement and construction works do not have any adverse effects on marine fauna.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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74	Vibration and Noise	Pile driving activities (impact piling) in the nearshore environment during MOF and Jetty construction	Underwater noise, potentially leading to Permanent Threshold Shift (PTS), physiological damage (injury) to, or death of, marine megafauna	1. Piling will commence with the "soft-start" procedure, except for re-strike tests which must be conducted at full hammer energy 2. Dedicated and trained marine megafauna observers (MMOs) will be located mainly on work boats to watch for marine megafauna (e.g. dolphins, turtles, dugongs and crocodiles) during piling operations. MMOs may also utilise other vantage points such as the CLB, JUB, barges and other work vessels. 3. Marine megafauna's observers will commence "watch" 30 minutes prior to the "soft start" of pile driving. If any animal is observed within the dynamic Exclusion Zone (minimum 500 m) around the piling location, piling will not commence until the animal has been observed to have moved outside the zone or is not sighted for 30 minutes within the zone. Visual monitoring will continue during pile driving activities and for 10 minutes after stoppage. 4. Piling will temporarily cease if marine megafauna are observed to approach within the dynamic Shutdown Zone (minimum 100 m) and will not recommence until the animal has been observed to have moved outside the Exclusion Zone, or is not sighted for 30 minutes within the Exclusion Zone. 5. The dynamic Shutdown and Exclusion Zones will be progressively adjusted to avoid PTS impacts from both instantaneous and cumulative noise. 6. Underwater noise monitoring will be conducted to verify noise levels. 7. Comply with NMP	E-Minor	4-Unlikely	Moderate	E-Minor	4-Unlikely	Moderate
75	Vibration and Noise	Pile driving activities (impact piling) in the nearshore environment during MOF and Jetty construction	Underwater noise, potentially leading to Temporary Threshold Shift (TTS) and adverse behavioural response	1. Piling will commence with the "soft-start" procedure, except for re-strike tests which must be conducted at full hammer energy2. Dedicated and trained marine megafauna observers (MMOs) will be located mainly on work boats to watch for marine megafauna (e.g. dolphins, turtles, dugongs and crocodiles) during piling operations. MMOs may also utilise other vantage points such as the CLB, JUB, barges and other work vessels.3. Implement ongoing observation of marine megafauna to a distance of 1.5 km from operations4. Piling during daylight hours.5. Keep records of marine megafauna's observations.	E-Minor	4-Unlikely	Moderate	E-Minor	4-Unlikely	Moderate
76	Vibration and Noise	General nearshore construction activities (including bulk fill and conveyors, piling, MOFTP operation)	Airborne noise or vibration causing nuisance, disturbance or health impacts to local community	1. Noise monitoring including baseline 2. Comply with Australian Standard for managing noise on construction sites 3. Community notifications prior to works of 24 hour, 6 day week working schedule 4.Publication of community hotline for feedback and grievances	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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77	Vibration and Noise	Ballasting operation of the MOFTP	Underwater noise causing temporary disturbance to marine megafauna	1. Undertake marine megafauna's observation for any abnormal behaviour 2. Undertaken noise assessment for MOFTP operation	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
78	Vibration and Noise	Bulk earthworks and ground improvement	Noise impacts on marine and terrestrial fauna	1. Visual inspections for marine fauna during GI works	F-Insignificant	4-Unlikely	Low	F-Insignificant	4-Unlikely	Low
79	Biological Hazards	General clearing, earthworks and construction activities	Exposed soil and water-pooling habitats around the Site/office areas encouraging a breeding ground for biting midges and mosquitoes	1. Minimise pooling of water 2. Insect spraying and personal repellent provided 3. Develop weed register 4. Induction and training 5. Drainage design 6. Grading of sites 7. Visual inspections 8. Develop a strategy to manage the Turkey's Nest in terms of insect population 9. Confirm if the fogging of mangroves for insect control is permitted 10. Personal Protective Equipment (PPE)	E-Minor	4-Unlikely	Moderate	E-Minor	4-Unlikely	Moderate
80	Quarantine	Foreign marine vessels entering from outside Australian waters; infestation of the vessel, ballast water, plant and equipment, or packaging	Accidental introduction of terrestrial or marine pest animal species to Bladin Point and Middle Arm Peninsula, displacing native species and altering and degrading habitats and ecosystem function. Adverse effects on Australian terrestrial fauna and flora. Adverse effects on biodiversity of Darwin Harbour.	1. Training and induction 2. Use Port of Darwin East Arm Wharf AQIS facilities for import of equipment and machinery to site 3. Quarantine specifications will form part of suppliers' tenders and contracts 4. No personnel, modules or cargo will leave the vessel until an AQIS officer has given clearance 5. Comply with DAFF requirements 6. Develop Biosecurity Management Plan 7. Carry out risk assessment and inspections for compliance with all DAFF requirements prior to shipment	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
81	Weed and Pest Management	Marine vessels entering the nearshore development area from elsewhere in the Northern Territory or Australia	Accidental introduction of terrestrial or marine pest animal species to Bladin Point and Middle Arm Peninsula, displacing native species and altering and degrading habitats and ecosystem function. Adverse effects on Australian terrestrial fauna and flora. Adverse effects on biodiversity of Darwin Harbour.	1. Training and induction 2. Use Port of Darwin East Arm Wharf AQIS facilities for import of equipment and machinery to site 3. Quarantine specifications will form part of suppliers' tenders and contracts 4. No personnel, modules or cargo will leave the vessel until an AQIS officer has given clearance 5. Comply with DAFF requirements 6. Develop Biosecurity Management Plan 7. Carry out risk assessment and inspections for compliance with all DAFF requirements prior to shipment	D-Moderate	5-Highly unlikely	Moderate	D-Moderate	5-Highly unlikely	Moderate

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82	Weed and Pest Management	Plant, vehicles, foot access, and materials entering and exiting the Site from elsewhere in the Northern Territory or AustraliaMobilisation of equipment	Accidental introduction of weed species as a result of vehicle movement and walking at Bladin Point and Middle Arm Peninsula, displacing native species, altering ecosystem function and leading to non-compliance	1. Weed survey 2. Identification of weed areas 3. Leaving any weed-affected materials on-site (buried) 4. Pre-Mobilisation checklist and pre-inspections 5. Washdown facility for vehicles and plant leaving the site (including capture basin) 6. Boot cleaning 7. Incorporate the weed map into the schedule and program for site clearing 8. Training and inductions 9. Designated access tracks 10. All materials, plant, and equipment are to have a weed free certification undertaken prior to entry to site. 11. All items are captured on the Weed Free Inspected Vehicle / Equipment Register	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low
83	Weed and Pest Management	Plant, vehicles, and materials entering and exiting the Site from elsewhere in the Northern Territory or Australia	Accidental introduction of pest animal species as a result of vehicle movement to Bladin Point and Middle Arm Peninsula and displacing native species, altering ecosystem function and leading to non-compliance	1. Pre-mobilisation checklist and pre-inspections 2. Inspections upon arrival 3. Pest control mesh around the base of temporary buildings 4. Training and inductions	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
84	Weed and Pest Management	Stockpiling of cleared vegetation mixed with weeds	Improper revegetation using vegetation mixed with weeds or non-endemic species	1. Training and inductions 2. Areas containing weeds are visually identified in the field prior to clearing and included on the Clearing Permit mapping. These areas are to be cleared separately and / or treated with pesticides prior to clearing, and collected for disposal off site at an approved licence landfill. 3. Regular inspections identify new outbreaks of weeds	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
85	Weed and Pest Management	Earthworks utilising imported fill	Importation of weeds and weed seeds as a result of transportation of fill and gravel from quarries in the region	1. Training and inductions 2. Areas containing weeds are visually identified in the field prior to clearing and included on the Clearing Permit mapping. These areas are to be cleared separately and / or treated with pesticides prior to clearing, and collected for disposal off site at an approved licence landfill. 3. Regular inspections identify new outbreaks of weeds 4. Source material from approved supplier 5. Imported fill conforms to specification and is weed free.	E-Minor	6-Remote	Low	E-Minor	6-Remote	Low

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86	Weed and Pest Management	Construction of roads and embankments Surface-water diversion into sediment basins	Blockage of tidal and surface-water flows by roads, embankments and the sediment basins, providing mosquito and biting midge habitats	1. Natural drainage maintained around roads 2. Install suitable drainage channels (e.g. drains, culverts and sedimentation basin)	F-Insignificant	5-Highly unlikely	Low	F-Insignificant	5-Highly unlikely	Low
87	Weed and Pest Management	Reinstate/rehabilitation /stabilisation landscaping utilising imported topsoil	• Disturbance of rehabilitated areas, long term unstabilised areas with erosion and sediment control issues, potential weed infestations • Inadequate planning and/or disturbance of rehabilitated areas • Weed infestation from imported soil • Increased nutrient, sediment in surrounding areas and receiving waters due to topsoil runoff • Topsoil contaminated with weeds derived from site • Introduction of weed species to site in imported topsoil	1. Ensure survey markers are visible prior to rehabilitation and recovery of stockpiles commence as per the Clearing Permit. 2. Re-mark boundaries if survey markers are not visible. 3. Fire breaks will be utilised to tie in with pre-existing vegetation. 1. Topsoil containing high densities of weed seeds will not be used in rehabilitation 2. Topsoil sourced from external locations will be certified as weed free prior to being brought to Site 3. Stockpiles will be located a minimum of 30 m from water bodies and drainage lines 4. Apply appropriate sediment and erosion control devices 5. Short and long term stockpiles (<1 month) managed as per current site controls	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
88	Liquid Wastes	Storage, transport or disposal of non-hazardous waste (including domestic waste), incorrect assessment and classification and/or cross contamination	• Pollution of the marine environment and waterways, including eutrophication• Attraction of native and pest animals (e.g. seagulls) to waste-collection sites and buildings• Odours• Increased fire risk• Reduced visual amenity	1. Training and inductions 2. Regulated wastes must be disposed of at registered/licensed facilities 3. Waste disposal at licensed facilities 4. Work procedures/instructions developed for workshop activities 5. Major repairs to equipment are performed offsite 6. Licensed and certified transporters 7. Source a local certified oil recycling company 8. Minimise waste (avoidance and reuse/recycle) 9. Provide appropriate bins for segregation and storage of waste	D-Moderate	6-Remote	Low	D-Moderate	6-Remote	Low

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89	Liquid Wastes	Storage, transport or disposal of hazardous and listed waste, incorrect assessment and classification and/or cross contamination	• Pollution of the marine environment and waterways, including eutrophication • Attraction of native and pest animals (e.g. seagulls) to waste-collection sites and buildings • Odours • Increased fire risk • Reduced visual amenity	1. Training and inductions 2. Regulated wastes must be disposed of at registered/licensed facilities 3. Work procedures/instructions developed for workshop activities 4. Major repairs to equipment are performed offsite 5. Licensed and certified transporters 6. Source a local certified oil recycling company 7. Engage a certified hazardous waste disposal company for the handling and removal of hazardous waste materials 8. Minimise waste (avoidance and reuse/recycle) 9. Ensure workshop is constructed with a hardstand surface large enough to cater for equipment to be serviced on site. 10. Ensure the perimeter is bunded to prevent runoff of hydrocarbon impacted materials. 11. Ensure storage areas for hazardous substances is compliant with site requirements, and applicable AS/NZS standards. 12. Ensure storage areas (or bins) are covered with impermeable tarps or roof to prevent water ingress and potential disposal as contaminated water. 13. Waste receptacles and waste oil storage areas available to suit quantities generated. 14. Weekly inspections for waste management / housekeeping related issues. 15. Fit for purpose/leak proof bins to be provided for storage of contaminated soils (soils containing unknown hazardous and/or listed wastes). 16. Waste manifest, waste profile, and analytical data or SDS to be provided to the Waste Service Provider for each consignment of hazardous and listed waste. 17. Waste tracking certificates (WTC) and Consignment Authorisation (CA) forms to be obtained and retained onsite to demonstrate life cycle and compliant disposal of hazardous and listed waste (for interstate transport and disposal only).	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
90	Liquid Wastes	Incorrect reporting of waste disposal, including sewage	Breach of permit conditions due to incorrect reporting	1. Regulated wastes must be disposed of at registered/licensed facilities 2. Waste tracking 3. Training 4. Chemical selection procedure prior to chemical use on-site 5. Engage a certified hazardous waste disposal company for the handling and removal of hazardous waste materials	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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91	Hazardous solid and semi-solid wastes	Generation of construction waste material	• Contamination of recyclable items • Pollution of non-waste items • Excessive disposal to landfill • Excessive resource consumption	1. Minimise construction material requirements through design 2. Waste management plans, and procedure 3. Approved waste disposal contractors 4. Waste disposed of to a licensed landfill. 5. All hydrocarbon contaminated waste is disposed of in correct skip bins 6. Ensure skips are serviced at regular interval to ensure adequate storage space is available. Ensure a contaminated waste bin is available for the workshop. 7. Ensure skips are serviced at regular interval to ensure adequate storage space is available 8. Weekly inspections for waste management / housekeeping related issues. 9. Implement the waste hierarchy of control. I.e. encourage waste avoidance, reuse, and recovery initiatives over disposal.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
92	Hazardous solid and semi-solid wastes	Incorrect reporting of waste disposal	Breach of permit conditions due to incorrect reporting	1. Regulated wastes must be disposed of at registered/licensed facilities 2. Waste tracking 3. Training 4. Chemical selection procedure prior to chemical use on-site 5. Engage a certified hazardous waste disposal company for the handling and removal of hazardous waste materials	E-Minor	4-Unlikely	Moderate	E-Minor	4-Unlikely	Moderate
93	Hazardous solid and semi-solid wastes	Storage, transport or disposal of hazardous waste (including sewage and construction waste) to the environment, incorrect assessment and classification and/or cross-contamination	Localised, low-to-medium-level contamination of soils, groundwater and surface water Pollution of the marine environment and waterways, including eutrophication Toxic effects on marine biota Odours Increased fire risk Risk to human health Reduced visual amenity Contamination of recyclables Pollution of non waste items	1. Regulated wastes must be disposed of at registered/licensed facilities 2. Training and experienced operators used 3. Waste segregation 4. Assessment procedure (National Association of Testing Authorities (NATA) lab) 5. Chemical selection procedure prior to chemical use on-site 6. Engage a certified hazardous waste disposal company for the handling and removal of hazardous waste materials 7. Approved disposal location for removed sediment 8. Surplus stockpiled material to be removed from site for reuse elsewhere 9. Permit to work in place 10. Dial before you dig in place 11. Compliance with PASS/ASS disturbance permits will be required 12. Disposal of used chemical containers as per local legislation and SDS. 13. Signage and labelling of bins 14. Ensure workshop is constructed with a hardstand surface large enough to cater for equipment to be serviced on site.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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				15. Ensure the perimeter is bunded to prevent runoff of hydrocarbon impacted materials. 16. Ensure storage areas for hazardous substances is compliant with site requirements. 17. Ensure storage areas are covered to prevent water ingress and potential disposal as contaminated water. 18. Waste receptacles and waste oil storage areas available to suit quantities generated. 19. Weekly inspections for waste management / housekeeping related issues.						
94	Non-hazardous solid and semi-solid wastes	Storage, transport or disposal of non-hazardous waste (including domestic waste)	• Attracting fauna and insects • Contamination of recyclables • Pollution of non waste items	1. Covered industrial bins onsite for food waste 2. Waste segregation 3. Design and procurement 4. Chemical selection procedure prior to chemical use on-site 5. Visual inspections	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
95	Non-hazardous solid and semi-solid wastes	Storage, transport or disposal of non-hazardous waste (including domestic waste)	Improper waste collection and disposal methods causing spill or leak, odours, cross contamination of waste, disposal at unlicensed facility, land / water contamination, transported by unlicensed vehicle Potential contamination of soils and/or water as a result of incorrect disposal of construction waste (e.g. packaging materials i.e. plastic end caps, spacers etc. fall off truck or are left behind not in skip bins)	1. Covered industrial bins onsite for food waste 2. Waste segregation 3. Design and procurement 4. Chemical selection procedure prior to chemical use on-site 5. Visual inspections 3. Order quantities calculated as required. 4. Waste materials to be reused on site where possible. When this is not possible investigate recycling options. 5. Ensure all materials are either removed or put into waste receptacle. 6. Site inspection before delivery trucks leave site. 7. Secure all materials being transported correctly. 8. Recover all materials lost during transportation and along public roads. 9. Weekly inspections to identify need for skips on site and status of level of waste in them. 10. Monitor bin utilisation, and reallocate bins based on demand vs supply, and backlog.	F-Insignificant	4-Unlikely	Low	F-Insignificant	4-Unlikely	Low

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96	Hazardous solid and semi-solid materials/wastes	Storage, transport or disposal of hazardous materials/waste to the environment	Improper waste collection and disposal methods, or overuse of materials causing spill or leak, odours, cross contamination of waste,disposal at unlicensed facility, land / water contamination, transported by unlicensed vehicle	1. Covered industrial bins onsite for food waste 2. Waste segregation 3. Design and procurement 4. Regular disposal 5. Chemical selection procedure prior to chemical use on-site 6. Licensed waste contractor engaged to deal with waste streams. 7. Skip bins available and clearly labelled for type of waste. 8. Regular servicing of skips coordinated. 9. Controlled Waste tracking dockets received for all hazardous waste disposals. 10. Waste register captures details of each load removed from site 11. Materials to be reused on site where possible. When no longer possible to reuse investigate recycling options for removal from site. 12. Dispose of materials in appropriate skip for recycling / disposal if no other option for reuse is available. 13. Weekly inspections for waste management / housekeeping related issues.	F-Insignificant	4-Unlikely	Low	F-Insignificant	4-Unlikely	Low
97	Waste	On site generation and storage of raw sewage at ablutions facilities	Spills or leaks of raw sewage resulting in: • Localised, low-to-medium-level contamination of soils, groundwater and surface water • Pollution of the marine environment and waterways, including eutrophication • Odours	1. Design and installation as per Australian Standard and by a licensed plumber 2. Regular disposal 3. Waste tracking 4. Training and induction 5. Spill kits 6. Use of contained mobile facilities (not portaloos) in areas where it is not possible to connect to site sewerage.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
98	Land/Sea Contamination	Operation of on-site vehicle washdown bay	Contamination of surface waters with hydrocarbons and other chemicals Deterioration of aquatic environmental health	1. Washdown bays designed to prevent contamination, including bunding, oily water separator etc.	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low

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99	Land/Sea Contamination	Temporary storage of wastewater from ablution facilities	• Increased nutrient and other contaminant concentrations in receiving waters resulting from leaking wastewater storage tanks • Deterioration of aquatic environmental health including decline in water quality and seabed impacts	1. Appropriate storage tanks used. 2. Training and experienced operators 3. Ensure storage areas for hazardous substances compliant with site requirements. 4. Ensure storage areas are covered to prevent water ingress and potential disposal as contaminated water. 5. Waste receptacles and waste oil storage areas available to suit quantities generated. 6. Weekly inspections for waste management / housekeeping related issues.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
100	Land/Sea Contamination	Transport of sediment from Site onto Site access and/or public roads beyond Site boundary by construction-associated traffic	• Increased nutrient, sediment, salt and other contaminant concentrations in receiving waters • Deterioration of aquatic environmental health	1. Site ESCP. 2. Road cleaning and/or street sweeping if monitoring identifies mobilisation of material onto roads. 3. Monitoring of surface and groundwaters.	F-Insignificant	3-Possible	Low	F-Insignificant	3-Possible	Low
101	Land/Sea Contamination	Vessel movement and nearshore operations in Darwin Harbour	Uncontrolled release of solid and liquid waste contaminating harbour	1. Waste management mitigations. 2. All sewage generated to be disposed of onshore. 3. Appropriate containment. 4. Emergency shut off / alarms.	F-Insignificant	4-Unlikely	Low	F-Insignificant	4-Unlikely	Low
102	Land/Sea Use	Discharge of treated effluent from temporary sewage treatment plant to the nearshore development area	• Increased nutrient, sediment, salt and other contaminant concentrations in receiving waters • Deterioration of aquatic environmental health	1. Selection of outfall location 2. Monitoring regulatory mixing zone 3. Waste Discharge Licence conditions	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
103	Land/Sea Contamination	Mixing of cement/lime into the soil during ground improvement as part of stabilisation trials	Change in surface water quality through sedimentation and runoff from the foreign introduction of materials	1. Ensure suitable protection of groundwater from spills and avoidance of pollution through recovery process. 2. Locations of trials from 'firm' ground into targeted area 3. Consider transfer from stable area to target area with hose 4. Trial site selection 5. Induction and training 6. Environmental monitoring and supervision 7. Specialist subcontractor engagement 8. Sediment management 9. Implement schedule and timing	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
104	Physical Disturbance	Mixing of cement/lime into the soil during ground improvement	• Introduction of foreign materials impacting on flora/fauna	1. Environmental monitoring and supervision 2. Induction and training 3. Specialist subcontractor engagement 4. Premix of cement/lime mix not on ROW 5. cement/lime mixing/storage and refilling is within	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

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				a bunded area, hard stand, outside of mangrove area						
105	Physical Disturbance	Clearing mangroves and excavation of root stock to enable deep soil mixing within the soil profile.	Potential exposure of ASS/PASS during clearing and exposure of PASS during mangrove root stock removal and stockpiling or during disposal at offsite facility.	1. ASS management plan 2. Inductions and training 3. Mangrove roots to be dusted with lime post extraction. 4. Stockpiled for max 48hrs prior to removing off site via truck to approved landfill. 5. Location of temporary stockpiling to be lime guarded. 6. Disposal records to be captured in the waste register. 7. Soils may need ASS treatment	E-Minor	5-Highly Unlikely	Low	E-Minor	5-Highly unlikely	Low
106	Surface water drainage and sedimentation impacts	Trenching/ground improvement (deep soil mixing and compaction using surcharge material)/backfilling	The placement and backfill of trench spoil material may cause change the topography causing the following impacts: • Block the natural cross surface drainage • Alter surface water drainage and directions • Reduce the health of mangrove communities, due to reduced flow through of fresh surface water	1. Allowance for sections of the surcharge material and bulked areas to be opened at pre-existing ground surface level to allow for cross flow of water during tides and rainfall events. 2. Removal of berm 3. Weekly inspections to identify mangrove health concerns, pooling water, and cross flow drainage impacts.	E-Minor	4-Unlikely	Moderate	E-Minor	4-Unlikely	Moderate
107	Land/Sea Contamination	Clearing, earthworks, ground improvement	Excessive alkalinity from deep soil mixing ground improvement or management of wastewater from concrete production process to soils, surface water, groundwater, and the marine environment. This has the potential to reduce water quality, soil condition, soil productivity and plant health.	1. Ensure suitable protection of groundwater from spills and avoidance of pollution through recovery process. 2. Locations of trials from 'firm' ground into targeted area 3. Consider transfer from stable area to target area with hose 4. Trial site selection 5. Induction and training 6. Environmental monitoring and supervision 7. Specialist subcontractor engagement 8. Sediment management 9. Implement schedule and timing 10. Deep soil mixing campaign will be initially verified during a trial period and continually monitored. 11. Pre-defined binder mix calculated from QASSIT compliant sampling and tested through a ground improvement trial on site to achieve soil	E-Minor	4-Unlikely	Moderate	E-Minor	4-Unlikely	Moderate

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
				neutralisation.						
108	Land/Sea Contamination	Precommissioning activities other than hydrotesting (cleaning, testing, lubricant oil flushing, motor run tests, first fills of fuels and lubricants, charging of catalysts, operational tests of emergency utilities including fire water pumps and emergency diesel generators.	Uncontrolled release of dangerous goods or hazardous materials, hydrocarbons and other chemicals resulting in surface water contamination and impacts to Darwin Harbour and deterioration of aquatic environmental health	1. Selection of chemicals 2. Follow SDSs for appropriate handling 3. Minimise chemical use 4. Appropriate storage and bunding in accordance with Australian Standards, guidelines and SDSs 5. Licensed deliveries 6. Spill kits readily available 7. Training and induction 8. Progressive use of Project's lessons learned 9. Spill response procedures	F-Insignificant	4-Unlikely	Low	F-Insignificant	4-Unlikely	Low
109	Land/Sea Contamination	Precommissioning activities other than hydrotesting (cleaning, testing, lubricant oil flushing, motor run tests, first fills of fuels and lubricants, charging of catalysts, operational tests of emergency utilities including fire water pumps and emergency diesel generators.	Inappropriate handling and disposal of chemicals and hydrocarbons resulting in soil, surface water and groundwater with potential migration to Darwin Harbour and deterioration of aquatic environmental health	1. Selection of chemicals 2. Follow SDSs for appropriate handling 3. Minimise chemical use 4. Appropriate storage and bunding in accordance with Australian Standards, guidelines and SDSs 5. Licensed deliveries 6. Spill kits readily available 7. Training and induction 8. Progressive use of Project's lessons learned 9. Verification of spill clean up 10. Adhere to Waste Management Procedure 11. Limited volumes of materials stored in field.	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
110	Land/Sea Contamination	Precommissioning activities other than hydrotesting (Storage, handling and disposal of hydrocarbons and other chemicals associated with lube oil flushing, filling of diesel and lubrication systems, operational testing of fire water pumps, emergency diesel generators and air compressors and demin water system).	Uncontrolled release of liquid and solid wastes, contaminants, dangerous goods or hazardous substances resulting in: • Atmospheric contamination • Surface water pollution • Odours • Effects on marine flora/ fauna • Fire/explosion event.	1. Appropriate hazardous substances storage and handling 2. Training and induction (Emergency response competency) 3. Notification NT WorkSafe 4. Chemical selection (through ChemAlert) 5. Maintain dangerous goods and hazardous substance register (through Chemalert) 6. Safety Data Sheets (SDSs) 7. Communication with emergency services 8. Design and monitoring to include containment of contamination in the environmental controls (e.g. bunding, booms) 9. Liquid wastes from precommissioning to be contained and transferred to be trucked off site by a licensed waste service provider for offsite disposal. 10. Approved transport and equipment 11. Approved chemicals only 12. Regular Hazchem audits 13. Wastewater management plans 14. Maintain general good housekeeping. 15. Use biodegradable products where possible 16. Refuelling/fuel transfer procedures 18. Precommissioning procedures and specifications	E- Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
111	Land/Sea Contamination	Hydrostatic testing	Uncontrolled release of dangerous goods or hazardous materials, hydrocarbons and other chemicals resulting in surface water contamination and impacts to Darwin Harbour and deterioration of aquatic environmental health	1. Selection of chemicals 2. Follow SDSs for appropriate handling 3. Minimise chemical use 4. Appropriate storage and bunding in accordance with Australian Standards, guidelines and SDSs 5. Licensed deliveries 6. Spill kits readily available 7. Training and induction 8. Progressive use of Project's lessons learned (i.e. from one tank to another)	D-Moderate	5-Highly Unlikely	Moderate	D-Moderate	5-Highly unlikely	Moderate
112	Land/Sea Contamination	Hydrostatic testing	Inappropriate handling and disposal of water resulting in soil, surface water and groundwater with potential migration to Darwin Harbour and deterioration of aquatic environmental health	1. Observe Darwin Harbour water quality discharge criteria 2. Obtain the relevant discharge approvals 3. Demonstrate compliance with 1) through monitoring and/or hydrodynamic modelling 4. Use potable water where possible 5. Minimise duration of hydrotesting as much as possible 6. Provide appropriate treatment/testing prior to use 7. Flush pipes/equipment prior to hydrotest, where possible, to remove contaminants 8. Maximise reuse where possible 9. Aid aeration of oxygen deficient water by spray bars, splash plates or similar 10. Provide other treatment to achieve compliance with 1) prior to discharge	D-Moderate	5-Highly Unlikely	Moderate	D-Moderate	5-Highly unlikely	Moderate

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
				11. Discharge or disposal offsite depending on volume and water quality 12. Progressive use of Project's lessons learned (i.e. from one tank to another)						
113	Land/Sea Contamination	Hydrostatic testing	Erosion from discharge from hydrotest water	1. Controlled discharge 2. Minimise duration of hydrotesting as much as possible 3. Provision of appropriately engineered infrastructure for discharge 4. Design and planning 5. Use of rated equipment 6. Erosion protection where necessary 7. Progressive use of Project's lessons learned (i.e. from one tank to another)	E-Minor	5-Highly unlikely	Low	E-Minor	5-Highly unlikely	Low
114	Dust	Loading of new Catalyst, Desiccant and Absorbent Tr-1/2, Inlet, Utilities/CCPP (Air Dryer) Transfer and handling of product	Loss of containment resulting in a release of dust to the environment	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor				F-Insignificant	6-Remote	Low
115	Land/Sea Contamination	Loading of new Catalyst, Desiccant and Absorbent Tr-1/2, Inlet, Utilities/CCPP (Air Dryer) Transfer and handling of product	Spills resulting in a release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - within AOC/COC drainage area				F-Insignificant	6-Remote	Low
116	Land/Sea Contamination	Filling of process chemicals- AMINES Tr-1/2, Inlet, Offsite, Utilities Transfer of AMINES from transport to storage tank	Spills resulting in a release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Specialised subcontractor with demonstrated technical knowledge and experience 4. Design - within AOC/COC drainage area 5. High level indicator 6. Implement emergency response plan for responding to high volume chemical spills.				E-Minor	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
117	Land/Sea Contamination	Filling of process chemicals, refrigerants Tr-1/2, Inlet, Offsite, Utilities Transfer of other refrigerants.	Spills resulting in a release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Specialised subcontractor with demonstrated technical knowledge and experience 4. High level indicator and isolation valves 5. Design - within AOC/COC drainage area 6. Vacuum truck service will be available to be called out to respond to spills				F-Insignificant	5-Highly unlikely	Low
118	Land/Sea Contamination	Filling of process chemicals, refrigerants Tr-1/2, Inlet, Offsite, Utilities Transfer of chemicals.	Spills resulting in a release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - within AOC/COC drainage area				E-Minor	5-Highly unlikely	Low
119	Land/Sea Contamination	Filling of process chemicals, refrigerants Tr-1/2, Inlet, Offsite, Utilities Temporary Onsite Storage	Loss of containment resulting in a release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Implement temporary storage risk assessment 4. Isolated/drainage/localised treatment options				F-Insignificant	5-Highly unlikely	Low
120	Noise	Uncoupled runs of machinery Tr-1/2, Inlet, Offsite, Utilities Onsite commissioning	Noise emission causes community complaint.	Refer to related measures in item 71, 72, 76 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Engineering design - covers noise levels				F-Insignificant	6-Remote	Low
121	Land/Sea Contamination	Uncoupled runs of machinery Tr-1/2, Inlet, Offsite, Utilities Onsite commissioning	Spills resulting in a release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - within AOC/COC drainage area 4. Vacuum truck service will be available to be called out to respond to spills				F-Insignificant	6-Remote	Low
122	Noise	Hot alignment and coupled operation of machinery Tr-1/2, Inlet, Offsite, UtilitiesOnsite commissioning	Noise emission causes community complaint	Refer to related measures in item 71, 72, 761. System relevant commissioning procedures, PTW, JHA, SWMS2. All commissioning SWMS prepared by Contractor 3. Engineering design - covers noise levels				F-Insignificant	6-Remote	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
123	Land/Sea Contamination	Hot alignment and coupled operation of machinery Tr-1/2, Inlet, Offsite, Utilities Onsite commissioning	Loss of containment resulting in a release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - within AOC/COC drainage area 4. Vacuum truck service will be available to be called out to respond to spills				F-Insignificant	6-Remote	Low
124	Land/Sea Contamination	HVAC system pressurisation Transfer of other refrigerants	Loss of containment resulting in a release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Licensed operators 4. Shut off valves to limit release volumes				F-Insignificant	5-Highly unlikely	Low
125	Land/Sea Contamination	Start-up of Demineralized water system Onsite Transfer/Handling	Loss of containment resulting in a release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor				F-Insignificant	6-Remote	Low
126	Land/Sea Contamination	Start-up of Demineralized water system Temporary Storage	Loss of containment resulting in a release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Smaller volume chemical storage in 1m3 IBC modules on bunded pallets				E-Minor	5-Highly unlikely	Low
127	Land/Sea Contamination	Start-up of Demineralized water system Onsite Storage and transfer of chemicals	Loss of containment resulting in a release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Smaller volume chemical storage in 1m3 IBC modules on bunded pallets				E-Minor	5-Highly unlikely	Low
128	Land/Sea Contamination	Start-up of Demineralized water system Rejection water generated by the demin plant for blowdown and steam cleaning	Spills resulting in a release of waste water to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 88, 89, 90 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Waste Discharge Licence 211 4. Design - within AOC area 5. Water collection - S750 holding basin 6. Water quality monitoring and analyses				F-Insignificant	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
129	Waste	Start-up of Demineralized water system Rejection water generated by the demin plant for blowdown and steam cleaning	Spill of spent resin from the demin system resulting in soil pollution	Refer to related measures in item 91, 92, 93, 96 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Collected separately in container when changed out and disposed offsite as waste				F-Insignificant	5-Highly unlikely	Low
130	Air Emissions	Start-up of Nitrogen system Onsite Storage and transfer of chemicals	Release of nitrogen to environment resulting in air emissions	1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - purpose build and designated storage area				F-Insignificant	3-Possible	Low
131	Air Emissions	Start-up of Nitrogen system Onsite Storage / commissioning	Release of nitrogen to environment resulting in air emissions	1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - purpose build and designated storage area				F-Insignificant	3-Possible	Low
132	Land/Sea Contamination	Start-up of Compressed Air systemCommissioning of air compressor	Loss of containment resulting in a release of chemicals to environmentBreach of CEMP criteriaUnanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 1101. System relevant commissioning procedures, PTW, JHA, SWMS2. All commissioning SWMS prepared by Contractor3. Waste Discharge Licence 211+F1385. Water collection - S750 holding basin6. Water quality monitoring and analyses7. Vacuum truck service will be available to be called out to respond to spills				E-Minor	6-Remote	Low
133	Land/Sea Contamination	CCP Water treatment- Blow Down Water Onsite Transfer/Handling of caustic and acids	Spills of caustic or acids resulting in a release of chemicals to environment Unanticipated pollution event with regulatory reporting. Breach of CEMP criteria Progress of drainage and seasonality.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS, Area work clearance 2. All commissioning SWMS prepared by Contractor 3. Design - within AOC/COC drainage area 4. Secondary containment for IBCs 5. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low
134 a	Land/Sea Contamination	CCP Water treatment- Blow Down Water Onsite Storage	Loss of containment resulting in release of blow down water to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 88, 89, 90 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - the use of permanent WWTP and outfall for discharge and dilution to required surface water criteria 4. Double skinned 10m3 storage Isotainers will be used for storage of wastewater 5. Blow down water management strategy dependable on water quality - either contained and removed off site or treated on site				E-Minor	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
134 b	Land/Sea Contamination	CCP Water treatment- Blow Down Water Commissioning- blowdown water	Discharge of off spec water resulting in surface water pollution. Water has added ammonia and also potentially phosposate. Breach of CEMP criteria. Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 88, 89, 90 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - the use of outfall for discharge and dilution to required surface water criteria 4. Double skinned 10m3 storage Isotainers will be used for storage of wastewater 5. Blow down water will either be treated on site to improve water quality and reused or discharged; or sent offsite for licensed disposal 6. Waste Discharge Licence 211				E-Minor	5-Highly unlikely	Low
135	Land/Sea Contamination	Start-up of Waste water treatment plant Onsite Storage and transfer of chemicals - De emulsifier, HCl, FeCl, anionic polymer [floc] - max 1m3 each volume.	Loss of containment resulting in a release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Provision of purpose built Dangerous Goods and Hazardous Materials warehouse and laboratory facilities with isolation sumps and drainage containment. 4. Smaller volume chemical storage in 1m3 IBC modules on bunded pallets				E-Minor	5-Highly unlikely	Low
136 a	Land/Sea Contamination	Start-up of Waste water treatment plantOnsite commissioning	Loss of containment resulting in a release of chemicals/waste water to environmentBreach of CEMP criteriaUnanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - online sensor monitoring of basin downstream of the WwTP (turbidity, pH and TOC) 4. S750 holding basin - water quality monitoring and analyses results 5. Waste Discharge Licence 211 6. Volume - small quantities 7. Design - purpose build and designated storage area 8. EIMP 9. Implement emergency response plan for responding to high volume chemical spills. 10. Waste management plan for clean-up and disposal of chemicals 11. Training and competency of personnel 12. Provision of appropriate chemical storage systems (e.g. temporary bunding, permanent bunding) 13. AOC /COC drainage system 14. System design to produce effluent within performance parameters 15. Isolate section of system that is contaminated e.g. close valve or sand bags 16. Pump out contaminated waste water 17. Routine inspection and maintenance program				E-Minor	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
				18. Alarm system for exceedances						
136 b	Waste	Start-up of Waste water treatment plant Onsite commissioning	Inadequate water treatment resulting in 1) increased sludge generated, or 2) release of surface water pollution. Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 88, 89, 90 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - online sensor monitoring of basin downstream of the WwTP (turbidity, pH and TOC) 4. Process alarm system for exceedances 6. Specialised WWTP operators/contractor 7. S750 holding basin - water quality monitoring and analyses results 8. Waste Discharge Licence 9. Monitoring - sludge build up and removal				E-Minor	5-Highly unlikely	Low
137	Land/Sea Contamination	Start-up of Waste water treatment plant Temporary waste handling- solid and liquid wastes	Loss of containment resulting in the release of wastes to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 88, 89, 90, 91, 92, 93, 94, 95, 96 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Sewage equalisation tank with high level alarm 4. Smaller volume chemical storage in 1m3 IBC modules on bunded pallets				E-Minor	5-Highly unlikely	Low
138	Land/Sea Contamination	Start-up of Waste water treatment plant Testing of outfall diffuser	Outfall diffusion not achieved resulting in surface water pollution Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 88, 89, 90 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Waste Discharge Licence 211 4. Commissioning methodology with field verification of nearfield dilution				E-Minor	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
139	Air Emissions	Refrigeration equipment commissioning - Storage Area Onsite Transfer / Handling of Propane	Spills resulting in air pollution. Air quality impacts from leaks and fugitive emissions.	Refer to related measures in item 67, 68 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - within AOC area 4. Design - quick close valves limits the volume of possible loss				F-Insignificant	3-Possible	Low
140	Land/Sea Contamination	Hazardous Material Storage (including solvents) at the permanent storage areaOnsite storage-Heating medium-oilAminesOther chemicals (Temporary storage at commissioning locations are dealt with in risk 119.)	Loss of containment resulting in release of chemicals to environmentBreach of CEMP criteriaUnanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Provision of purpose built Dangerous Goods and Hazardous Materials warehouse and laboratory facilities with isolation sumps and drainage containment. 4. Just in time delivery for large volume chemicals 5. Inspection program for warehouse, laboratory, sumps and drainage basin 6. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low
141	Land/Sea Contamination	Hazardous Material Storage (including solvents) at the permanent storage area Onsite transfer of chemicals (Transfer at commissioning locations are dealt with in risk 118.)	Loss of containment resulting in release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Transfer occurs the Dangerous Goods and Hazardous Materials warehouse and laboratory facilities with isolation sumps and drainage containment. 4. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low
142	Waste	Hazardous Material Storage (including solvents) at the permanent storage area Waste management	Non-compliant disposal of waste, either residual product in containers disposed, or disposed on wrong waste stream.	Refer to related measures in item 21, 89, 90, 91, 92, 93, 96, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Empty containers - sent back to the supplier				E-Minor	5-Highly unlikely	Low
143	Land/Sea Contamination	AGRU degreasing Onsite Transfer/Handling -Caustic at 3% NaOH	Loss of containment resulting in release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Specialised operators/contractors 4. Just in time delivery 5. Design - within AOC/COC drainage area 6. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
144	Land/Sea Contamination	AGRU degreasing Degreasing -Caustic at 3% NaOH -Water rinse x 3 -Demin water rinse	Loss of containment resulting in release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Circulation line pressure test 4. Recirculation at low pressure 5. Design - within AOC/COC drainage area 6. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low
145	Land/Sea Contamination	AGRU degreasing Waste management	Non compliant disposal of waste, either residual product in containers disposed, or disposed on wrong waste stream.	Refer to related measures in item 21, 88, 89, 90, 91, 92, 93, 94, 95, 96, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Sampling - contaminant levels prior to disposal 4. Neutralisation of water 5. Captured in amine tank 6. Disposal method based on water quality 7. Reuse, discharge water or licensed offsite disposal depending on water quality				E-Minor	6-Remote	Low
146	Land/Sea Contamination	Cooling system (Charging passivation / anti corrosive / biocide chemical) Onsite Transfer/Handling	Loss of containment resulting in release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Specialised operators/contractors 4. Just in time delivery				E-Minor	5-Highly unlikely	Low
147	Land/Sea Contamination	Cooling system (Charging passivation / anti corrosive / biocide chemical)Onsite Storage	Loss of containment resulting in release of chemicals to environmentBreach of CEMP criteriaUnanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Circulation line pressure test 4. Design - within AOC/COC drainage area 5. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low
148	Land/Sea Contamination	Cooling system (Charging passivation / anti corrosive / biocide chemical) Commissioning-water circulation and flushout -add passivation chemicals and circulate and discharge -add corrosive and biocide.	Release of off spec water to environment resulting in surface water pollution. Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Circulation line pressure test 4. Design - within AOC/COC drainage area 5. Specialised operators/contractors for works and also treatment to improve water quality 6. Water reused, discharge via outfall depending on the final water quality achieved. Water with biocide and / or corrosion inhibitor subject to licensed offsite disposal 7. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
149	Land/Sea Contamination	Cooling system (Charging passivation / anti corrosive / biocide chemical) Waste management	Non compliant disposal of waste, either residual product in containers disposed, or disposed on wrong waste stream.	Refer to related measures in item 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS, Area clearance 2. All commissioning SWMS prepared by Contractor 3. Collection in the holding basin 4. Sampling - contaminants prior to disposal 5. Offsite licensed disposal				E-Minor	6-Remote	Low
150	Land/Sea Contamination	Chemically contaminated water from various activities at site. Waste Management	Non compliant disposal of waste, either residual product in containers disposed, or disposed on wrong waste stream.	Refer to related measures in item 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS, Area clearance 2. All commissioning SWMS prepared by Contractor 3. Collection in the holding basin 4. Sampling - contaminants prior to disposal 5. Offsite licensed disposal				E-Minor	6-Remote	Low
151	Land/Sea Contamination	Boiler Cleaning – Chemically contaminated water Temporary Equipment/Piping	Loss of containment resulting in release of contaminated water to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Subcontractor will specify clean equipment and piping 4. Use of suitable pipe 5. Leak test using demineralised water 6. Specialised operators/contractors for works and also treatment to improve water quality 7. Water reused, discharge via outfall depending on the final water quality achieved. Water with biocide and / or corrosion inhibitor subject to licensed offsite disposal. 8. Vacuum truck service will be available to be called out to respond to spills				F-Insignificant	5-Highly unlikely	Low
152	Land/Sea Contamination	Boiler Cleaning – Chemically contaminated water Onsite Storage	Loss of containment resulting in release of contaminated water to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS, Area work clearance 2. All commissioning SWMS prepared by Contractor 3. Design - within AOC/COC drainage area 4. Implement temporary storage risk assessment for areas outside the AOC/COC 5. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low
153	Land/Sea Contamination	Boiler Cleaning – Chemically contaminated water Injecting chemicals	Loss of containment resulting in release of contaminated water to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Frac tanks individually double skinned 4. Inspections for leaks and use of drip trays 5. Attended transfer of liquids				E-Minor	6-Remote	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
				6. Vacuum truck service will be available to be called out to respond to spills						
154	Land/Sea Contamination	Boiler Cleaning – Chemically Pressurising / circulating / flush and rinse	Loss of containment resulting in release of chemicals/waste water to environmentBreach of CEMP criteriaUnanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Frac tanks individually double skinned 4. Inspections for leaks and use of drip trays 5. Attended transfer of liquids6. Vacuum truck service will be available to be called out to respond to spills				E-Minor	6-Remote	Low
155	Noise	Steam Blowing Onsite commissioning	Noise emission results in community complaints Assumes silencers and modelled cumulative noise for Project	1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Site notification 4. Community awareness / bulletin 5. Design - silencers 6. Community awareness / bulletin				E-Minor	5-Highly unlikely	Low
156	Air Emissions	Steam Blowing Onsite commissioning	Ammonia fumes released results in community complaints	1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Site notification 4. Community awareness / bulletin				F-Insignificant	3-Possible	Low
157	Visual impact	Steam Blowing Onsite commissioning	Visual impact from steam blowers and HRSG result in community complaints.	Refer to related measures in item 66 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Site notification 4. Community awareness / bulletin 5. Specify night time operations for first steam blow and HRSG burn off when colours are expected to be most visible.				F-Insignificant	3-Possible	Low
158	Land/Sea Contamination	Fuel Storage and Handling- diesel for EDG and firewater system Onsite Transfer/Handling	Loss of containment resulting in release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2.All commissioning SWMS prepared by Contractor 3. Attended transfer inside bunded area 4. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
159	Air Emissions	Nitrogen purging Offsite storage and transport	Loss of containment resulting in air release.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Compliant storage				E-Minor	5-Highly unlikely	Low
160	Air Emissions	Nitrogen purging Onsite Transfer/Handling	Loss of containment resulting in air release.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor				E-Minor	5-Highly unlikely	Low
161	Air Emissions	Nitrogen purging Onsite Storage / commissioning	Loss of containment resulting in air release.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor				E-Minor	5-Highly unlikely	Low
162	Air Emissions	Flaring and Venting (Not Risk assessed as excluded from Contractor scope)	Uncontrolled release to air- heat, light, particulates and gases. Air quality impacts from leaks and fugitive emissions Greenhouse gas emissions arising from combustion of fossil fuel energy source Visual impacts/ public perception of visible plume Light emissions Noise	Not in Contractors SoW						
163	Land/Sea Contamination Visual impact	CCPP Start-upCombustion tuning GTG / HRSG / Utility boilers	Potential visible plume from the heat haze from stacks.	Refer to related measures in item 21, 66, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Community awareness / bulletin if required				F-Insignificant	3-Possible	Low
164	Air Emissions	CCPP Start-up Combustion tuning GTG / HRSG / Utility boilers	Greenhouse gas emissions(NOx) arising from combustion of fossil fuel energy source Air quality impacts from emissions through turbine stacks	Refer to related measures in item 67, 68 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - emission controls system installed as design specification 4. Air modelling undertaken for EIS and approval obtained				F-Insignificant	3-Possible	Low
165	Noise	CCPP Start-up Combustion tuning GTG / HRSG / Utility boilers	Noise from operating turbines resulting in community complaints.	Refer to related measures in item 71, 72, 76 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - enclosure 4. Community awareness / bulletin if required				F-Insignificant	3-Possible	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
166	Land/Sea Contamination	CCPP Start-up Onsite Transfer/Handling of fuels	Loss of containment resulting in release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2.All commissioning SWMS prepared by Contractor 3. Attended transfer inside bunded area 4. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low
167	Land/Sea Contamination	Fire Water and Foam system Flushing of fire water system	Loss of containment resulting in discharge of contaminated firewater to land and surface water. Breach of CEMP criteria Unanticipated pollution event with regulatory reporting. Non compliant disposal of waste.	Refer to related measures in item 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Flush activity - no added chemicals 4. Chemical analyses - contaminant levels 5. Quality determines the end use: - discharge - reuse onsite				E-Minor	5-Highly unlikely	Low
168	Land/Sea Contamination	Fire Water and Foam system Deluge spray monitoring	Loss of containment or release of contaminated firewater to land and surface water. Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Flush activity - no added chemicals 4. Post flush activity 5. WDL 211 6. Deluge testing broken up by area to allow for containment and reuse / discharge via outfall				F-Insignificant	5-Highly unlikely	Low
169	Land/Sea Contamination	Site Construction readiness for commissioning structures The Hazardous Materials Storage Warehouse is not ready. Commissioning, storage of material and trouble shooting.	Storage in other areas results in loss of containment and spill of chemicals to the soils, ground and surface waters.	Refer to related measures in item 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Individual AOC system specific areas 4. Block drainage lines using inflatable line plug or alternative. 5. Implement temporary storage and commissioning risk assessments for each area with additional controls per CEMP requirements. 6. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
170	Land/Sea Contamination	Site Construction readiness for commissioning structures AOC/COC drainage not linked to the basins.Commissioning, and trouble shooting.	Loss of containment or spills resulting in the release of contaminated water to soil, groundwater or surfacewaters Inability to drain or segregate clean and contaminated water.	Refer to related measures in item 21, 108, 109, 110 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Implement temporary storage risk assessments for each area with additional controls per CEMP requirements 4. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low
171	Liquid Wastes	Lube/seal oil flushing and waste oil disposal	Non compliant disposal of waste, either residual product in containers disposed, or disposed on wrong waste stream.	Refer to related measures in item 88, 89, 90 1. Appropriate hazardous substances storage and handling 2. Training and induction (Emergency response competency) 3. Notification NT WorkSafe 4. Chemical selection (through ChemAlert) 5. Maintain dangerous goods and hazardous substance register (through Chemalert) 6. Safety Data Sheets (SDSs) 7. Communication with emergency services 8. Design and monitoring to include containment of contamination in the environmental controls (e.g. bunding, booms) 9. Liquid wastes from precommissioning to be contained and transferred to be trucked off site by a licensed waste service provider for offsite disposal. 10. Approved transport and equipment 11. Approved chemicals only 12. Regular Hazchem audits 13. Wastewater management plans 14. Maintain general good housekeeping. 15. Use biodegradable products where possible 16. Refuelling/fuel transfer procedures 18. Precommissioning procedures and specifications				E-Minor	5-Highly unlikely	Low
172	Land/Sea Contamination	Initial filling of final lube/seal oil	Loss of containment resulting in release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. Procedures, PTW, JHA, SWMS approved by SMEs 2. Maximum container size - 1000L IBC 3. Not conducted over water 4. Skids 5. Spotter 6. System control - high level alarms 7. Design - within AOC/COC drainage area 8. Vacuum truck service will be available to be called out to respond to spills				D-Moderate	4-Unlikely	Moderate

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
173	Land/Sea Contamination	Maintain/replenish lube after initial fill of final oil	Loss of containment resulting in release of chemicals to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 21, 108, 109, 110 1. Procedures, PTW, JHA, SWMS approved by SMEs 2. Maximum container size - 1000L IBC 3. Not conducted over water 4. Skids 5. Spotter 6. System control - high level alarms 7. Design - within AOC/COC drainage area 8. Vacuum truck service will be available to be called out to respond to spills				D-Moderate	4-Unlikely	Moderate
174	Land/Sea Contamination	Pressure testing of vessels and pipework for MEC1 and GEP.	Loss of containment resulting in release of chemicals to environmentBreach of CEMP criteriaUnanticipated pollution event with regulatory reporting.	Refer to related measures in 111, 112, 113 1. Bunding around hydro test spread. 2. Erosion protection / control. 3. Water captured in tanks and pumped to water trucks. Water quality testing andoffsite disposal. 4. Attended monitoring. 5. Timing of pigging to ensure capacity available to handle flush water 6. Use of potable water. 7. No chemical additives / approved chemical additives. 8. Pressure release values. 9. Pressurising in increments Procedures 10. Water reused, discharge via outfall or licensed offsite disposal depending on the final water quality achieved.				E-Minor	5-Highly unlikely	Low
175	Land/Sea Contamination	Carry out initial flushing of vessels and piping	Loss of containment resulting in release of contaminated water to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Covered under hydrotest/flushing water 111, 112, 113						
176	Land/Sea Contamination	Operational testing of water treatment units	Loss of containment resulting in release of contaminated water to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Covered under hydrotest/flushing water 111, 112, 113						

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
177	Land/Sea Contamination	Soda boiling for Boilers	Release of contaminated water/waste to environment Unanticipated pollution event with regulatory reporting. Discharge of off spec water. Breach of CEMP criteria.	Refer to related measures in item 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Specialised operators/contractor 4. Individual waste disposal assessment - based on volume 5. By design 6. TWTP 7. MOF/JTY outfall 8. Small volumes - transportable 9. Specialised experienced subcontractor 10. Waste Discharge Licence 211				E-Minor	5-Highly unlikely	Low
178	Land/Sea Contamination	Chemical cleaning of the boilers with water containing oxygen scavengers	Release of contaminated water/waste to environment Non compliant disposal of waste. Contaminated water coming from various activities at site. Breach of CEMP criteria. Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 108, 109, 110, 111 1. Design - within AOC/COC drainage area 2. Specialised operators/contractors for works and also treatment to improve water quality 3. Water with biocide and / or corrosion inhibitor subject to licensed offsite disposal 7. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low
179	Land/Sea Contamination	Chemical cleaning of the boilers with water NOT containing oxygen scavengers and/or biocides and/or corrosion inhibitors.	Release of contaminated water/waste to environment Non compliant disposal of waste. Contaminated water coming from various activities at site. Breach of CEMP criteria. Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - within AOC/COC drainage area 4. Specialised operators/contractors for works and also treatment to improve water quality 5. Water reused, discharge via outfall offsite via licensed facility depending on the final water quality achieved. 6. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low
180	Dust Noise	Flushing and air blowing using permanent pumpand compressor, and reinstatement	Air quality or noise levels generates community complaints	Refer to related measures in item 66, 71, 72, 76 MEC-1 - Pre cleaning of pipe, filtration of air as required, completion of testing ofsections, visual monitoring, dust monitoring. MEC-2 -Pre cleaning of pipe, filtration of air as required, completion of testing ofsections, visual monitoring, dust monitoring. GEP-1 - Filtration of air, completion of testing of sections, visual monitoring, dustmonitoring.				F-Insignificant	4-Unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
181	Land/Sea Contamination	Fire Water system	Potential discharge of potable water with elevated copper concentrations. Pollution event with regulatory reporting. Discharge of off spec water. Breach of CEMP criteria.	1. Potable water will be tested during filling activity 2. No fire fighting foam is to be used for commissioning 3. Individual management strategies for each area so that water can be contained 4. Reuse as first preference strategy then discharge under Waste Discharge Licence 211 5. Provide brief to NT EPA on risk assessment of copper water release demonstrating negligible impacts and any additional monitoring proposed to validate risk assessment findings. 6. Liaison with NT EPA providing advanced notification and discharge to the regulating reservoir.				E-Minor	2-Likely	Moderate
182	Land/Sea Contamination	System drying for start-up requirement	Loss of containment resulting in release of contaminated water to environment Breach of CEMP criteria Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 108, 109, 110, 111 MEC-1, MEC2 and GEP1 1. Small volume of water anticipated 2. Visual monitoring of the activity				F-Insignificant	5-Highly unlikely	Low
183	Air Emissions	Air freeing (oxygen purge with nitrogen etc.) for start-up	Release of gas to atmosphere	No environmental impact and not risk assessed.						
184	Planned Air Emissions	Commissioning and start-up of various systems including gas turbines, diesel storage, fuel gas, acid gas removal, stand by power generation, firewater system etc.	Release of gas to atmosphere	No environmental impact and not risk assessed.						
185	Land/Sea Contamination	Commissioning and start-up of various systems which require storage, loading and transfer of chemicals, flushing and cleaning of equipment, wastewater management and discharge, stormwater runoff and discharge, commissioning and use of ship loading facilities over water.	Loss of containment resulting in contaminated water to environment Unanticipated pollution event with regulatory reporting. Breach of CEMP criteria.	1. System fully designed and controls in place 2. System relevant commissioning procedures, PTW, JHA, SWMS 3. All commissioning SWMS prepared by Contractor 4. Design - shut down mechanism with sensors 5. Spill response- Marine Emergency Response Vessel				F-Insignificant	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
		Transfer of chemicals.								
186	Land/Sea Contamination	Commissioning and start-up of various systems which require storage, loading and transfer of chemicals, flushing and cleaning of equipment, wastewater management and discharge, stormwater runoff and discharge, commissioning and use of ship loading facilities over water. Storage of chemicals.	Spill resulting in release of contaminated water to environment Unanticipated pollution event with regulatory reporting. Breach of CEMP criteria.	Refer to related measures in item 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Covered industrial bins onsite for food waste 4. Waste segregation 5. Design and procurement 6. Chemical selection procedure prior to chemical use on-site 7. Visual inspections 8. Volume of liquid stored on the vessels will be limited. 9. Liquids will be stored in bunded areas with sufficient capacities. 10. Spill response plan to be in place, reviewed and training will be provided. 11. Spill kits will be on each vessels to suit the materials onboard. 12. Double skin fuel storage tanks 13. Biodegradable hydraulic fluid				F-Insignificant	5-Highly unlikely	Low
187	Air Emissions	Furnace drying operation	Reduced air quality from point source and fugitive emissions of gases and particulates	Refer to related measures in item 67, 68 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. PWC gas combustion				F-Insignificant	5-Highly unlikely	Low
188	Waste	Potential commissioning and start up specific waste generation (in addition to waste streams already identified in the CEMP): *Emissions to atmosphere; *Oily- waste water; *Amine water waste; *Potash wash effluent; *Chemical cleaning solution *Pigging waste (scale/sludge); *Inorganic sludge from	Non compliant disposal of waste, either residual product in containers disposed, or disposed on wrong waste stream.	Refer to related measures in item 67, 68, 91, 92, 93, 96, 108, 109, 110, 111 1. System relevant commissioning procedures, PTW, JHA, SWMS 2. All commissioning SWMS prepared by Contractor 3. Design - within AOC/COC drainage area 4. Specialised operators/contractors for works and also treatment to improve water quality 5. WDL211 6. Water reused, discharge via outfall offsite via licensed facility depending on the final water quality achieved. 7. Vacuum truck service will be available to be called out to respond to spills				E-Minor	5-Highly unlikely	Low

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
		demineralisation unit.								
189	Land/Sea Contamination	Hydrotesting	Release of contaminated water to environment Unanticipated pollution event with regulatory reporting. Breach of CEMP criteria.	Refer to related measures in item 111, 112, 113 1. Waste Discharge Licence. 2. Water quality monitoring. 3. Dewatering Permits with auditable tracking system. 4. Attended monitoring of the discharge. 5. Stabilisation of discharge points to protect against scouring. 6. Dewatering procedure and SWMS.				C-Significant	5-Highly unlikely	Moderate
190	Liquid Wastes	Hydrotesting	Inappropriate handling and disposal of water/leak or spill Unanticipated pollution event with regulatory reporting.	Refer to related measures in item 110, 111, 112, 113 1. No chemical additives / approved chemical additives. 2. Continuous monitoring of the activity. 3. Characterisation of spent hydro test water quality. 4. Procedures and SWMS GEP to remove hydro test water and store offline to prevent water quality deterioration. 5. Use of potable water. 6. No chemical additives / approved chemical additives. 7. Continuous monitoring. 8. Pressure release values. 9. Pressurising in increments 10. Procedures				D-Moderate	6-Remote	Low
191	Biofouling	Intake of sea water pumps	Fire water contamination	1. Purging with water to prevent marine growth 2. Delaying commissioning of pumps 3. Mechanical or cleaning with chlorine, or brine on predetermined frequency. Duration and concentration will be risk assessed and have negligible impact on receiving environment. 4. Inspections 5. Frequent start-up 6. Consideration of WDL if required				F-Insignificant	3-Possible	Low
192	Demobilisation activities - waste management, spills, handling/transfer/storage of chemicals/interface	Demobilisation/deconstruction of temporary facilities	Water (surface water and groundwater) contamination from inappropriate storage, handling and disposal of wastewater.	Refer to current CEMP mitigation measures for demobilisation associated activities				N/A	N/A	N/A

#ID	Aspect	Activity	Environmental Impact	Mitigation measures	CEMP Rev 17 C	CEMP Rev 17 L	Residual Risk CEMP Rev 17	CEMP Rev 18 C	CEMP Rev 18 L	Residual Risk CEMP Rev 18
193	Rehabilitation - plan, process, outcome	Rehabilitation/Landscaping	Contamination and/or sedimentation of stormwater discharged to Darwin Harbour that may degrade aquatic and marine habitat and water quality.	Refer to current CEMP mitigation measures for rehabilitation associated activities				N/A	N/A	N/A

COMPANY OPERATIONS ENVID - FLARING DURING COMMISSIONING

Aspect	Source	Emission / Discharge	Potential Social and Environmental Interaction	Key Controls	C	L	Residual Risk
Flaring (planned and unplanned) Planned during import of LNG/LPG from ships and during import of PWC commissioning gas Unplanned from trips of fuel burning equipment	Three ground flares. Three tankage flares. One liquid flare.	NO_X, SO_X, greenhouse gases, particulates (PM_{10}). Dark-smoke. O_3 (as a secondary pollutant, not a primary emission)	Reduction in ambient air quality. Reduction in visual amenity. Adverse effects on the natural environment and human health. Note: air modelling results indicate that air pollutants are not expected to exceed NEPM standards (Section 2.3.3)	Engineering (as-built) controls. Process monitoring, detection and alarm systems. Design requirements. Technology, equipment and/or materials selection. Procedural controls. Operating targets and standards. Management plans/systems. Operating procedures. Inspections and preventative maintenance. Visual monitoring. Community/regulator engagement.	Planned Flaring F		This is a planned activity, therefore likelihood and residual risk are not applicable.
					Unplanned Flaring E	2	Moderate

APPENDIX D: DISCHARGE TRIGGER VALUES FOR COPPER AND ZINC

To support the proposed increase in (filtered) copper and zinc discharge trigger values for discharge of construction water to the perimeter regulating drain as outlined in Section 6.4, the following provides:

- a summary of the constraints for managing discharge of construction waters on Site as the Site reaches final design
- an overview of copper and zinc in sediments, receiving environment water and PWC water, based on monitoring undertaken to date and published literature
- a description of sensitive receptors and the existing environment surrounding Bladin Point
- the potential impact pathway for copper and zinc to have an adverse environmental impact
- a review of acute toxicity data as it relates to copper and zinc in subtropical marine environments, and derivation of a chronic trigger value
- a summary of proposed construction water discharges (focused on commissioning streams) during the final phase of the construction program, including locations and durations
- an overview of relevant receiving environment monitoring to detect adverse impacts
- the proposed approach for managing discharge of construction water to the perimeter regulating drain.

The assessment has come about as a result of supply of PWC potable water to Site with elevated levels of copper and zinc, that meet drinking water guidelines but do not meet ANZECC (2000a) guideline trigger values for moderately to slightly disturbed ecosystems, and the need to discharge this water as part of construction activities. Attached to this Appendix D is a letter from an aquatic ecotoxicology specialist, who was commissioned to undertake an independent review of the copper and zinc issue on Site and to provide advice on an approach that would result in least potential for adverse impact to the receiving environment.

D.1 Constraints to discharge of construction water on Site

As construction activities on Site move towards completion, the capacity to transport water around the Site is diminishing as temporary construction roads are closed, and permanent plant is installed. As such, any movement of water on Site by truck will be increasingly diverted to fewer roads, creating a greater impact on road surfaces, and requiring increased maintenance. Similarly, as commissioning will occur at numerous locations on Site, the logistics of capturing all resultant wastewaters, treating and discharging offsite (where trigger values are met) or through limited locations (as per CEMP Revision 17) becomes increasingly difficult and not practical. In addition, there are significant workforce numbers located in very small areas, and increased movement of trucks around Site increases safety risks for personnel. As such, use of the perimeter regulating drain for discharge of water that meets discharge trigger values is considered an important part of Site construction water management for the remainder of the construction phase.

D.3 Overview of available copper and zinc data

In addition to logistical constraints described above, water supplied by PWC to Site has created an additional management challenge, as the mains water supplied to Site has fluctuating levels of copper and zinc, which, although meeting drinking water guidelines, do not meet ANZECC (2000a) guidelines for copper and zinc discharge.

Table D1 provides a summary of copper and zinc measured in sediments and surface water of Darwin Harbour (collected as part of receiving environment monitoring) and copper and zinc measured in PWC-supplied mains water, prior to use on Site. Initially, copper in PWC-supplied mains water was only measured as total copper. Subsequent to this, analyses were undertaken to also include filtered (bioavailable) copper, and this was used to derive a correction factor for total copper. Whilst this is not ideal, all analyses now include both filtered and unfiltered copper. Regardless, the data show elevations of copper well above ANZECC (2000a) recommended guidelines values. Until recently, data for zinc has only been measured as total, but all samples are now being analysed for both filtered and unfiltered zinc. Again, the data available show elevated levels of zinc above ANZECC (2000a) recommended guidelines values.

Table D-1: Summary of available copper and zinc data

Copper and zinc in mangrove sediments Collected over nine sampling events, between December 2013 and December 2015 (53 samples) * HCl extract method				
	Bioavailable Copper * mg/kg	Total Copper mg/kg	Bioavailable Zinc * mg/kg	Total Zinc mg/kg
Minimum	1	1	1.1	1.1
Maximum	11	33	19	90
Average	2.8	6.3	7.0	16.5
Copper and zinc in receiving environment surface water (Darwin Harbour) Collected over 28 sampling events, between October 2013 and February 2016 (426 samples)				
	Filtered Copper µg/L	Total Copper µg/L	Filtered Zinc µg/L	Total Zinc µg/L
Minimum	1	1	5	5
Maximum	18	20	49	210
Average	1.1	1.3	5.4	6.4
Copper and zinc in PWC mains water Copper: 23 sampling events, between Mar 2014 and Feb 2016 (19 samples) Zinc: 17 sampling events, between Jul 2014 and Aug 2015 (17 samples) # Derived by multiplying Total Copper by 0.4 (ratio based on analyses to date), apart from April and May 2016, which were filtered prior to analysis				
	Filtered Copper	Total Copper	Filtered Zinc	Total Zinc

	# μg/L	μg/L	μg/L	μg/L
Minimum	0.4	1	not available	4.9
Maximum	47.2	118	not available	27
Average	9.3	22.5	not available	10.9

The approved EIMP includes monitoring mangrove community health, sediment quality and bioaccumulation of metals. Low concentrations of filtered (bioavailable) copper, manganese, nickel and zinc exceedances have been encountered on occasion in receiving environment monitoring locations from 2012 to 2015 but no trends or patterns can be established that link to construction activities. As reported to the NT EPA in the 2015 Annual Environmental Monitoring Report (AEMR):

- There were no exceedances of the 20% trigger value (i.e. a 20% decrease in canopy cover compared to June 2012 baseline data) at any transects during the annual monitoring period. In general, total canopy cover increased in comparison to the June 2012 results by around 10% in the assemblages present at each transect and decreased by around 5% in total during the annual monitoring period. Specifically differences were noted near to the location of a mud wave occurrence, and it was noted that the health at these locations had improved, or shown no change, indicating that these sites may be stabilising and/or recovering.
- Exceedances of total metals in sediments, recorded during this annual monitoring period, were below the ISQG high trigger values with the exception of total arsenic at two monitoring locations. Arsenic is recognised in Darwin Harbour as occurring at naturally elevated levels. After consideration of bio-availability, all of the exceedances dropped below the ISQG low trigger values.
- Sediment height data from the annual monitoring period indicated minor changes which were generally similar at impact sites and reference sites. No distinct trends were observed from the 23 monitoring locations surrounding the Site, indicating civil works within the area have not significantly contributed to elevated rates of sedimentation or erosion in mangrove forests. Consistent with the 2014 AEMR 2014, all notable changes in sediment height were caused by bioturbation by crabs and mud-lobsters and where significant ground level variation was recorded it was generally associated with known site conditions resulting from the mud wave.

The bio-indicator data collected at 15 monitoring sites over the annual monitoring period were broadly consistent with background data collected in June 2012 (as reported in the 2013 AEMR). The exception was elevated arsenic concentrations detected at impact and reference sites, which may indicate a natural temporal/seasonal variation and/or a regional source.

An assessment of Darwin Harbour water quality (Water Monitoring Branch 2005) found that 2000 kg of copper enters the harbour annually, based on treated sewage discharges and aquaculture. It was further stated that the copper loads from sewage were primarily from household plumbing.

Padovan et al. (2012) undertook further assessment of trace elements in sponges, seawater and sediment in Darwin Harbour to determine if metals were elevated in areas closer to sewage outfalls. They observed that metal levels in seawater were elevated at the sewage outfall site compared with reference sites, but these returned to background within a few hundred metres from the outfall. Metals were also elevated in sediment but not above sediment quality guidelines, and, despite the fact that water and sediment metals were elevated at the impacted site, metal levels were elevated in all sponge

(*Spheciospongia vagabunda*) samples tested, regardless of location, suggesting widespread ambient copper in sponges within Darwin Harbour.

D.4 Sensitive receptors and existing environment surrounding Bladin Point

Darwin Harbour experiences maximum tidal level variations of up to 8 metres with average spring tide variations around 7 metres, and mean neap tide variations around 3 metres. The large tidal ranges produce strong currents that peak at speeds of up to 2 – 2.5 m/s (Williams and Wolanski 2003). The greatest variability is found in tidal creeks during the wet season when tidal exchange results in changes in water quality on an hourly basis (Padovan 2003).

Figure D-1 shows typical zonation of mangrove communities in Darwin Harbour, in relation to Australian Height Datum (AHD) and mean sea level, mean high water spring tides, mean high water neap tides, mean low water neap tides, mean low water spring tides and LAT. The vertical reference datum for Darwin Harbour is Lowest Astronomical Tide (LAT). The Australian Tide Tables present tidal predictions and tidal constituents for Darwin Harbour based on many years of tidal observation from the principal tide gauge at Fort Hill Wharf. The Australian Tide Tables refer to the separation between mean sea level (MSL) and LAT as equal to 4.17 m. However, although it is assumed that MSL and AHD are more or less synonymous, the separation between LAT and AHD has been analysed by the National Tidal Centre in Adelaide and found to be 4.105 m. As a result of the inaccuracy in tidal measurement, the Ichthys Project is adopting the value of 4.1 m separation between LAT and AHD, and between LAT and MSL for inside Darwin Harbour.

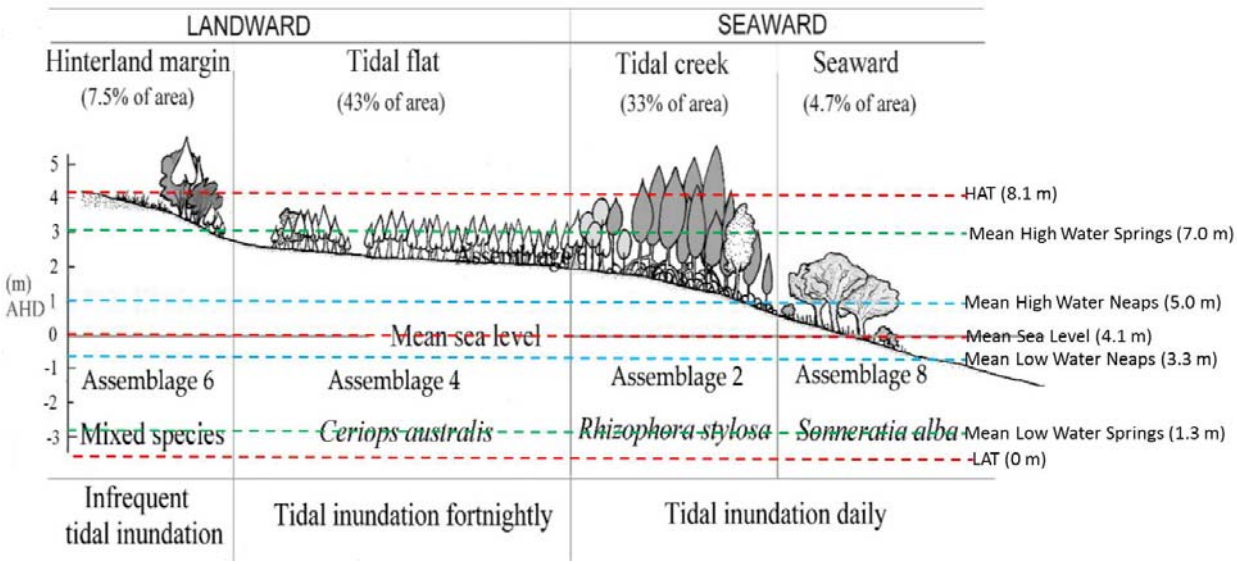

Figure D-1: Zonation of mangroves in Darwin Harbour in relation to mean tidal heights

As shown in the above schematic (Figure D-1), an average fortnightly tidal cycle extends from as low as *Sonneratia alba* communities (during mean low water neap tides) to as high as the fringes of the mixed communities hinterland margins (during mean high water spring tides). This is reflected in the actual mangrove communities around Bladin Point, where there are distinct areas of zonation, as well as transitional communities (refer to Figure D-2). Figure D-2 also shows the location of all of the permanent outfalls (shown in pink) exiting the perimeter regulating drain. In summary, parts of the Site experience regular tidal flushing to the rock armour surrounding the perimeter regulating drain (where *Rhizophora stylosa* communities dominate), whereas other parts (where

there are tidal mud flats and *Ceriops australis* growing) only receive tidal flushing on spring tides.

Depending on the route of discharge, and the state of the tidal cycle, the discharged water may drain through the intertidal area and fringing vegetation, or discharge from the permanent outfalls more or less directly into tidal water.

In a summary of mangrove monitoring in Darwin Harbour, and specifically referring to data collected on mangrove communities around Bladin Point from June 2012 to December 2014, Metcalf (2015) concluded:

- *The main taxonomic groups recorded were crustaceans, molluscs and worms, each accounting for approximately 25% of the total species recorded. The remaining species were predominantly ants and fish. The crustaceans included crabs, shrimp and smaller species including isopods and amphipods. Molluscs were the most numerous species and were mainly gastropods and bivalves with some specialised wood-boring forms (Teredinids). Worms were dominated by polychaetes and fish mainly comprised gobies.*
- *Seasonal variability in mangrove fauna was most evident in the Hinterland margin and Tidal flat, where overall species richness and abundance was highest during the wet season and least at the end of the dry season.*
- *Overall, species richness was greatest in the Seaward assemblage and decreased towards the Hinterland margin but abundance in the Tidal flat exceeded that for the Tidal creek which is lower down the shore.*

Mangrove communities provide roosting and feeding habitat for terrestrial bird species, as well as marine invertebrates. Mangrove muds around the Site were surveyed by URS (INPEX 2010) and found to show moderate bioturbation present (~20 burrows/m^2), with fiddler crabs (*Uca* spp.), alpheid shrimp and mudskippers (*Periopthalmus* sp.) associated with many of the burrows. Benthic infauna collected from grab samples covering the nearshore habitat from the mouth of Cossak Creek past the jetty and in the vicinity of the Module Offloading Facility, showed that amphipods were the most abundant taxon, with Polychaetes the second most abundant taxon. Turtles and fish also forage within the mangrove communities in periods of high tide. The mud whelk (*Telescopium telescopium*) located in mangrove communities is also a potential food source for humans and is used as a bioindicator species for the EIMP.

Threatened marine species that may be present in the nearshore development area include the ray-finned fishes and cartilaginous fish. Other threatened species such as dolphins, dugongs, turtles, sea snakes and saltwater crocodiles may potentially occur in the vicinity of the Project Site; however, this area is unlikely to provide nesting or significant habitat for these species as indicated in the EIS (INPEX 2010).

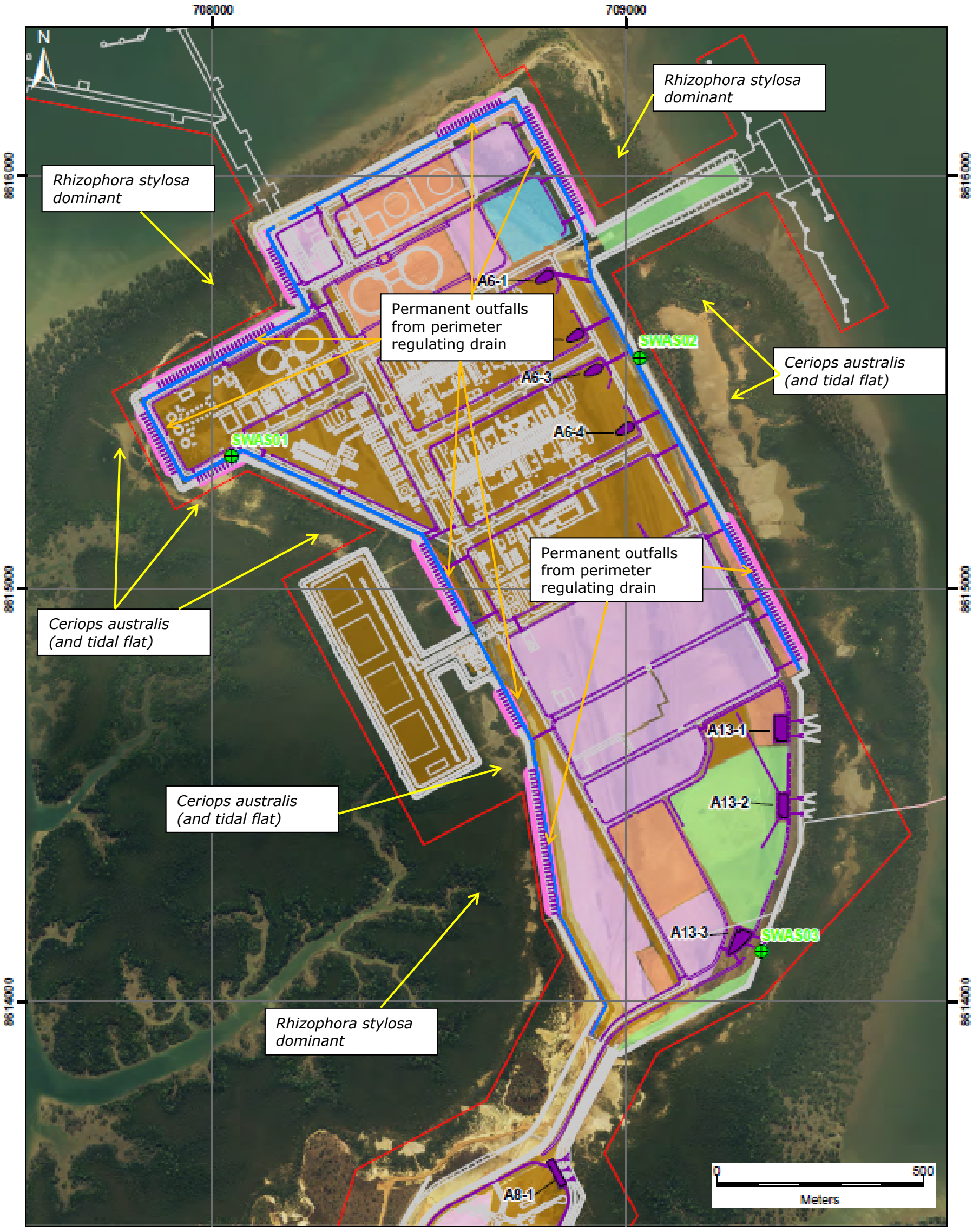

Figure D-2: Site plan showing mangrove zonation around Bladin Point in relation to the location of permanent outfalls leaving the perimeter regulating drain

D.5 Impact pathway and fate of copper and zinc in the receiving environment

Figure D-3 provides a schematic of the flow pathway of discharged construction water at high tide (top) and low tide (bottom).

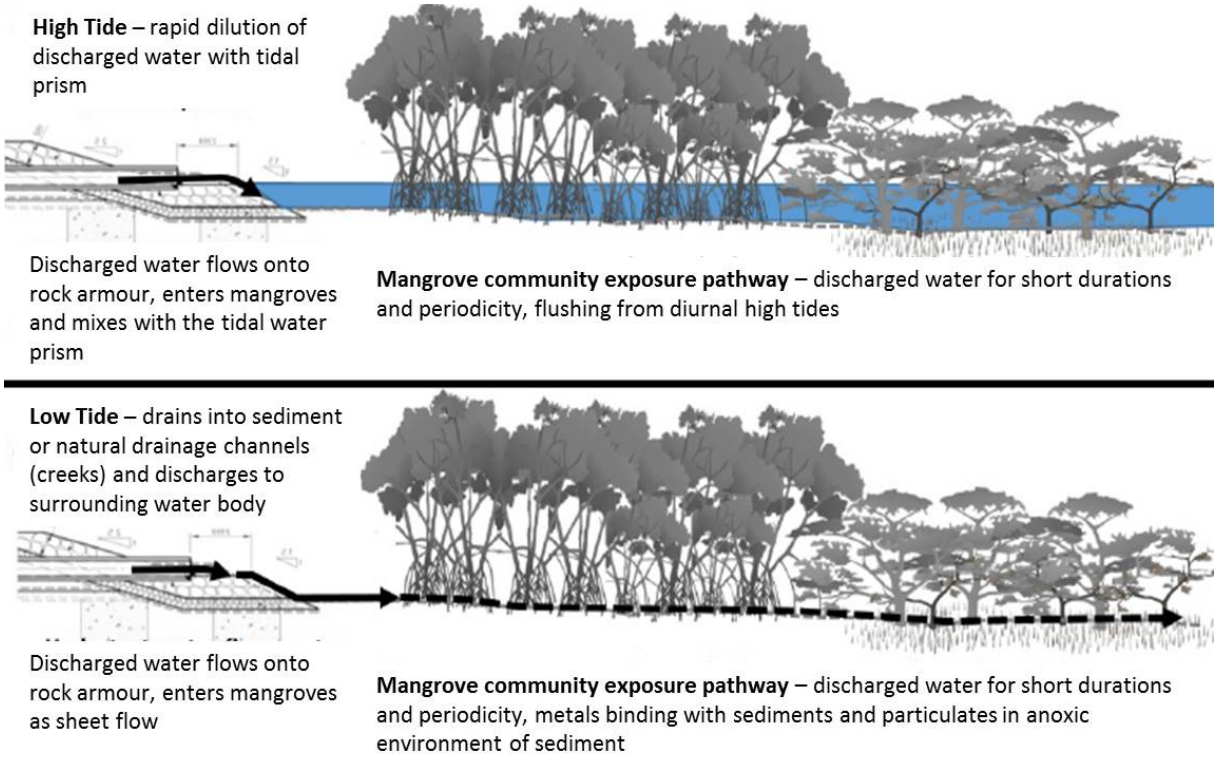

Figure D-3: Flow pathway for discharge of construction water from the perimeter regulating drain with elevated copper and zinc

The two scenarios illustrated in Figure D-3 create two risk pathways; one associated with discharge to water, and one associated with discharge to sediments. During a diurnal tidal cycle, both pathways are present.

The independent advice received includes a conceptual site model (replicated in Figure D-4 below) to demonstrate the potential impact pathway of elevated copper and zinc in construction waters discharged into the mangrove communities, and considers both impact pathways to water and sediment. The advice discusses the potential pathways for elevated copper and zinc to have an adverse impact, the mechanisms by which organisms may depurate metals through metabolic and other natural processes. The data collected from sediment monitoring to date, which indicates a roughly 40% bioavailable fraction in the mangrove sediments surrounding Bladin Point.

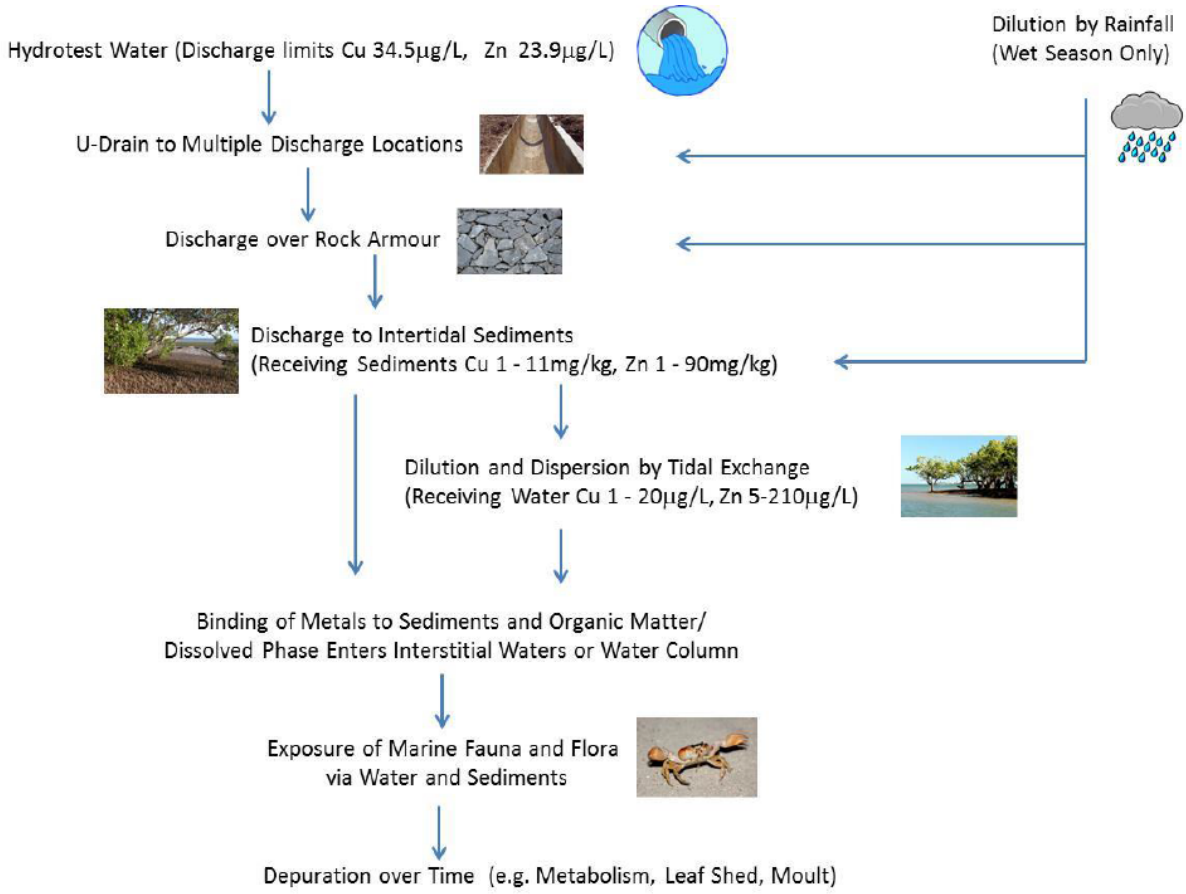

Figure D-4: Impact pathway and fate of construction water from the perimeter regulating drain with elevated copper and zinc

Discharge of surface water has the potential to interact with mangrove community sediments on low tides and Darwin Harbour water on high tides. Mangrove plant species are not considered to be overly sensitive to metal concentrations in the water column and any metal induced impacts are largely related to the uptake of metal-containing sediment particles via the roots and young leaves. MacFarlane and Burchett (2001) studied potential biological indicators of heavy metal stress in mangrove ecosystems and found that seedling emergence was inhibited for copper at exposures of 400 µg/L and for zinc at 500 µg/L. The paper recognises that adult mangroves are highly tolerant to copper, lead and zinc, before exhibiting signs of stress. Therefore, it is considered that there is only a low risk of adverse impact to the fringing mangrove communities at the discharge concentrations proposed.

Metals have a high affinity for fine-grained sediment and any metals in the compliant discharged water (e.g. copper) are expected to be quickly bound to particulate material in the receiving environment resulting in the concentrations of metals being controlled to a large extent by processes governing sediment transport and deposition. After initial adsorption to fine grained surficial sediments, most metals are bound more permanently as metal sulphides beneath the sediment surface. Metal sulphides are largely immobilised although under some conditions they may become available for mangrove root uptake (Youssef and Saenger 1996), or be released during physical or biological disturbance of the sediment (Clark 1998). Further, sediments with acid volatile sulfides rapidly bind metals into non-bioavailable forms. The handbook of sediment quality assessment (Simpson et. al. 2005) states that metals in sediments are generally believed to react with iron sulfide to form metal sulfides and that in general appreciable concentrations of

copper and zinc will not be observed until the reservoir of iron sulfide is exhausted.

D.6 Toxicity of copper and zinc

The published literature on toxicity of copper and zinc is mostly focussed on acute toxicity effects, rather than chronic effects from long term exposure. For discharges to the printer regulating drain, it could be argued exposures maybe short-term (acute) for short duration (low volume) discharges, as well as potentially chronic from large duration discharges (large volumes) and repeated exposure over time.

A review of published literature showed that most studies focus on acute toxicity, for example:

- Gissi et al. (2013) undertook a study of acute toxicity of copper on the marine copepod *Acartia sinjiensis*, commonly found in tropical coastal waters of northern Australia, and found *A. sinjiensis* was sensitive to bioavailable concentrations of copper with an EC50 value of 33 µg/L based on a constant exposure period of 48 hours.
- Howe et al. (2012) assessed copper toxicity on a tropical sea anemone (*Aiptasia pulchella*) and concluded that LC50 after 96 hours of exposure occurred at copper concentrations of 30 - 90 µg/L, and after 28 days of exposure the LC50 was at 26 µg/L.
- Nath et al. (2012) in a study on the biotic response of mangroves in the Sydney estuary to heavy metal contamination (including copper), concluded that the mangrove community was effective in acting as a filter for heavy metals and thereby protecting the ecosystem from point or non-point sources of heavy metal contamination.
- Howe et al. (2014) found a 96 hour no effect concentration (NOEC) for zinc of 38.4 to 49.4 µg/L for the sea anemone *Aiptasia pulchella*, and an EC50 of 63 µg/L was noted for effect on asexual reproduction after 29 days of exposure.
- Johnson et al. (2007) found a 72 hour NOEC of 97 µg/L zinc from four baseline tests on the marine diatom *Nitzschia closterium*, commonly found in Darwin Harbour.
- Dentona and Burdon-Jones (1982) reported a 96 hour NOEC range from 37 µg/L zinc in marine water salinity and 50 µg/L zinc in brackish water (20 ‰ salinity) for survival of juveniles of the marine prawn *Penaeus merguiensis* de Man.
- Dentona and Burdon-Jones (1986) studied zinc toxicity in two species of tropical marine fish - the glass perch (*Priopidichthys marinus*) and the diamond scale mullet (*Liza vaigiensis*) and reported a 96 hour NOEC of 1,920 µg/L for marine water and 1,700 µg/L in brackish water for juvenile glass perch, and a 96 hour NOEC of 1,850 µg/L for marine water and 1,250 µg/L for brackish water for juvenile diamond scale mullet.

The independent advice received notes a paucity of published literature on chronic effects of copper and zinc for subtropical environments, and so followed the method of Batley et al. (2014) to derive a chronic EC10 from acute LC50 values. The independent advice (attached to this Appendix) concluded that, based on a review of a range of 96-hour Cu_{total} and Zn_{total} acute toxicity data for studies on a variety of tropical marine species that included specific species from a range of taxa including algae, invertebrates and vertebrates, the most conservative and applicable estimate of discharge values that would not likely result in adverse ecological impacts would be estimated at 121 µg/L for Cu_{total} and 306 µg/L for Zn_{total}. It is noted in the report that these are based on total copper and zinc (not filtered), but nevertheless the independent advice concluded that current trigger values proposed by INPEX of 34.5 µg/L filtered copper and 23.9 µg/L filtered zinc would be *appropriately protective subject to the tidal conditions*.

D.7 Summary of proposed construction water discharges to the perimeter regulating drain

The perimeter regulating drain can be split into two sections – one adjacent to mangrove communities which receive regular diurnal tidal exchange, and the other where this only occurs on spring tides (approximately fortnightly). The specific locations of outfalls (and coordinates of the outfalls at each end) which would release construction water into diurnally flushed areas are shown in Figure D-5 (outfall area 2) and Figure D-6 (outfall area 1 and part of outfall area 3). There are 36 outfalls in outfall area 2 over a distance of 364.5 m, with each outfall pipe 710 mm in diameter. Outfall area 1 contains two sections, comprising 18 outfalls on the northern boundary, and 30 outfalls on the eastern boundary, with outfall pipes 800 mm in diameter. These are the locations currently approved for discharge of hydrotest waters under WDL 211-1. Outfall area 3 is on the western boundary, and again consists of two parts, but only the small part receives diurnal tidal flushing. This small section consists of 14 outfalls over a distance of 130 m, with outfall pipes 800 mm in diameter. Design of the perimeter regulating drain ensures that exit flow velocities from the outfall pipes can be achieved for the following flow conditions:

- Area 1: 28 m^3/s
- Area 2: 6 m^3/s
- Area 3: 20 m^3/s.

The size and number of outfall pipes ensure that exit flow velocities are moderate (i.e. smaller than 0.76 m/s in Area 1, smaller than 0.44 m/s in Area 2 and smaller than 0.67 m/s in Area 3), which avoids uncontrolled erosion in the receiving environment from draining water. Rock armour at the extremities of the outfall pipes provide scour protection to prevent erosion of the receiving environment.

The perimeter regulating drain was designed and sized based on a 1 in 5 year rainfall event and a design rainfall intensity of 149.6 mm/hr. The flow rate of construction water into the perimeter regulating drain is proposed to be limited to a maximum of 0.5 m^3/s, to ensure that the exit velocity remains within design limits (taking into account rainfall) and avoids scouring at the base of the rock armour. It is estimated the maximum discharge rate would be approximately 120 L/second.

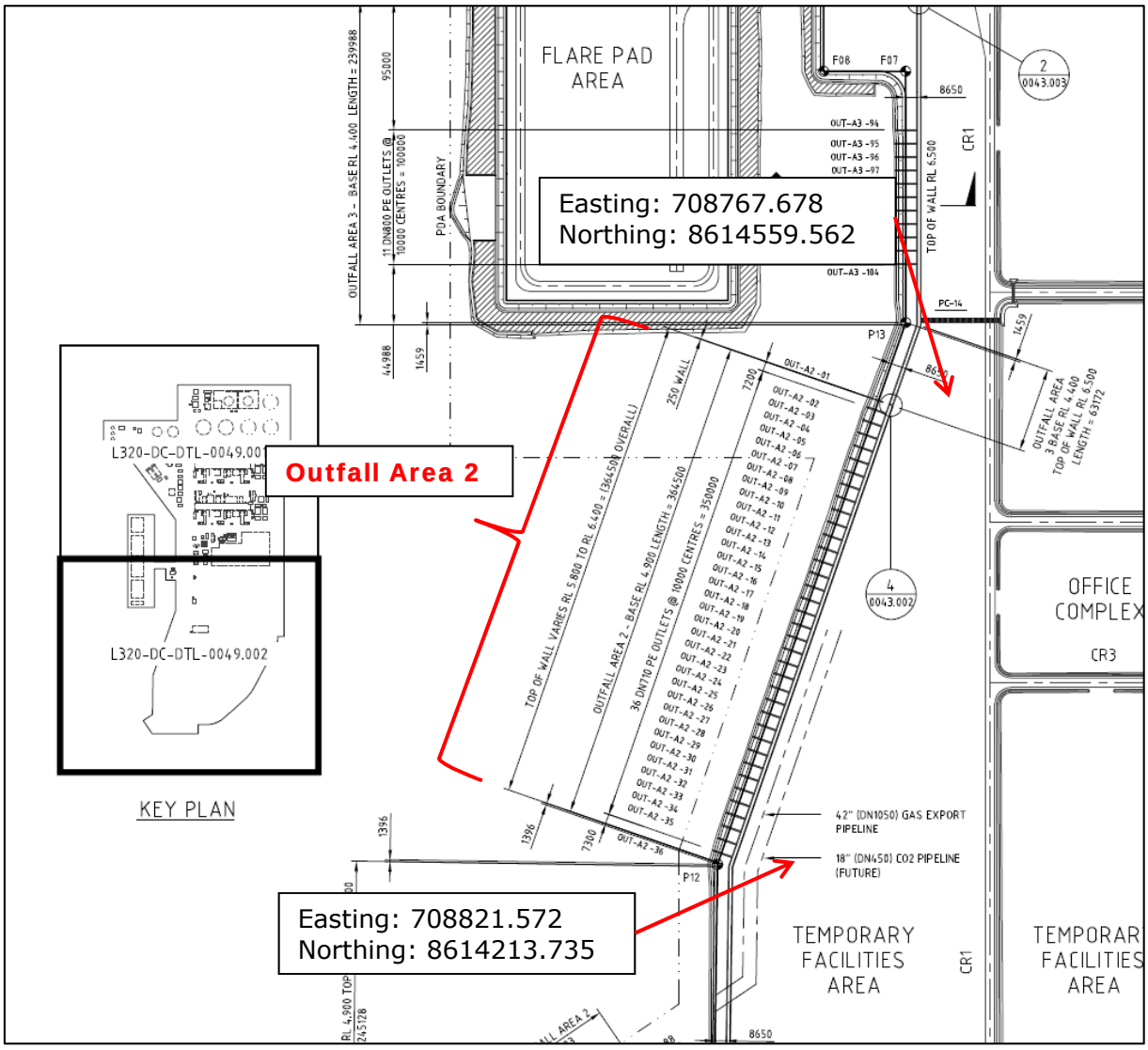

Figure D-5: Location of outfalls in outfall area 2

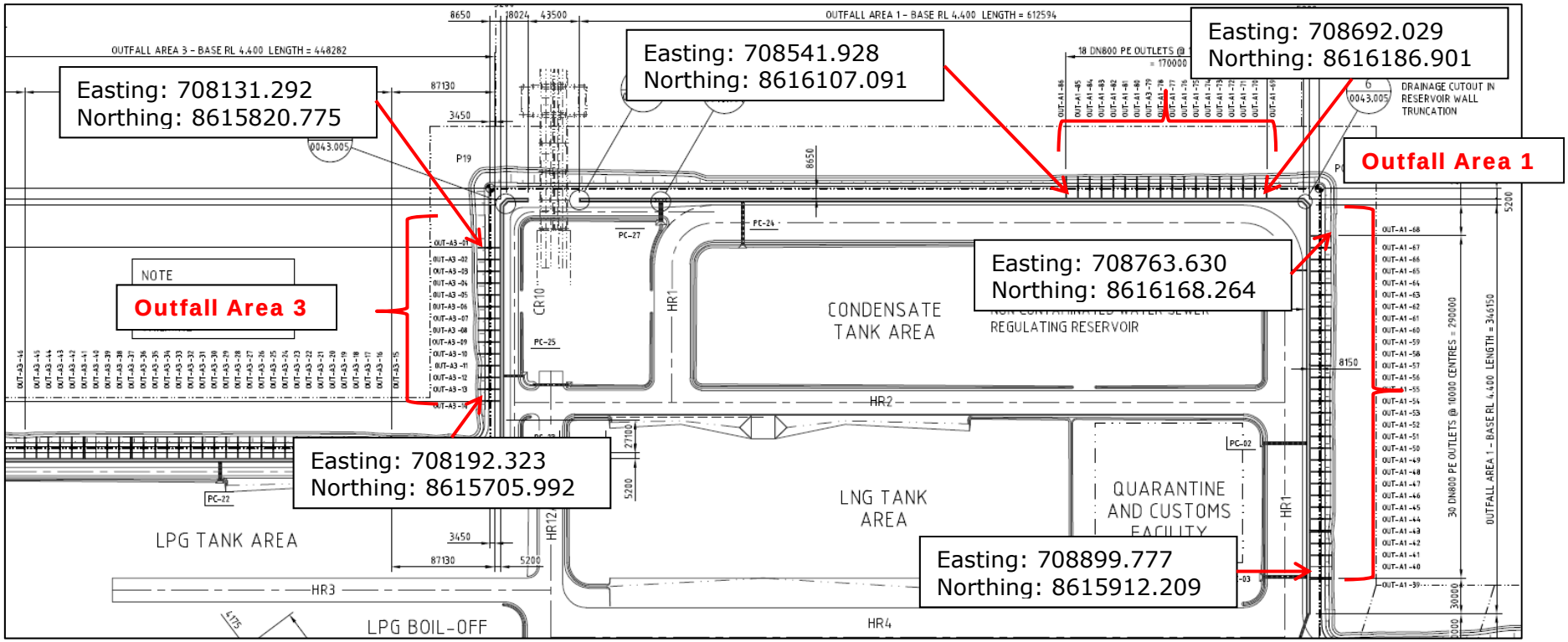

Figure D-6: Location of outfalls in outfall areas 1 and part of outfall area 3

The indicative volume and timing of proposed key discharges is shown in Table D-2. Based on the diameter of the outfalls and the maximum flow rate able to be achieved per outfall, Table D-2 also includes indicative discharge durations. It should be noted though, that these numbers are indicative only, and subject to change based on Site construction schedule. The information in Table D-2 also does not account for rainfall or other passive discharges through the outfalls but based on the flow rate above this is able to be accommodated. Note that only water that meets discharge criteria and is free of contaminants above discharge trigger values is proposed to be discharged, therefore volumes may change, with some water taken offsite for licensed disposal, and some water determined to be clean; not all streams indicated below will necessarily be discharged via the regulating drain and several streams are pre-treated. Of the 27 key discharges listed in Table D-2, nine are expected to occur during the wet season, making up 49% if the expected total volume of construction water to be discharged.

Table D-2: Indicative volume, duration and timing of construction water discharge to the regulating drain

Source	Estimated Total Volume (kL)	Indicative Timing for Discharge	Estimated Duration of Discharge (hours)
CCPP – Heat recovery steam generator and utility boiler commissioning	45	Jun 2016	0.1
	430	Aug 2016	1
Blowdown neutralisation	100	Jun 2016	0.3
	310	Jul 2016	0.7
	340	Aug 2016	0.8
AGRU degreasing water Train 2	2000	Jan 2017	4.6
AGRU degreasing water Train 1	2000	Jul 2017	4.6
AGRU Rinsing water Train 2	6000	Jan 2017	13.9
AGRU Rinsing water Train 1	6000	Jul 2017	13.9
Cooling System Initial Flushing Water AC	25	Jun 2016	0.5
	25	Jul 2016	0.5
Cooling System Initial Flushing Water Train 2	250	Oct 2016	0.6
Cooling System Initial Flushing Water Train 1	250	Feb 2017	0.6
Cooling System Passivation Water AC	22	Jun 2016	0.05

Source	Estimated Total Volume (kL)	Indicative Timing for Discharge	Estimated Duration of Discharge (hours)
	22	Jul 2016	0.05
Cooling System Passivation Water Train 2	250	Oct 2016	0.6
Cooling System Passivation Water Train 1	250	Feb 2017	0.6
Firewater system testing Utilities and Operations	1420	Aug 2016	3.3
	444	Sep 2016	1
	1042	Oct 2016	2.4
	1204	Nov 2016	2.8
	743	Dec 2016	1.7
	1718	Jan 2017	4
	774	Feb 2017	1.8
Firewater system testing Jetty	900	Jun 2017	2.1
Firewater system testing Train 2	3400	Apr 2017	7.9
Firewater system testing Train 1	3400	Sep 2017	7.9

In summary, the duration of surface water discharges to the regulating drain (and the MOF outfall) are expected to be intermittent, rather than continuous, and therefore exposure to sensitive receptors at the point of discharge is also expected to be intermittent.

During the wet season, stormwater will move from the Site after rainfall events. Non-contaminated potable water associated with commissioning activities will be discharged periodically at different times of night or day, and during different tidal stages. Construction water will also be released at different times of day and night, and on different tidal cycles, if water quality testing indicates it is suitable for release. The independent advice received noted that:

- during the wet season, it is more likely that mixing could occur in the regulating drain, and
- the monitoring done to date demonstrates that the concentrations of copper and zinc in the receiving waters typically increase during the wet season thus reducing the sensitivity of the receiving environment and increasing mixing and assimilation due to increased stormwater flux in the surface drainage system, and
- during the wet season the areas of discharge from the regulating drain could therefore be expanded.

Given this recommendation, if it is proposed to discharge construction water to the perimeter regulating drain during the wet season, on the premise that rainfall provides dilution of elevated copper and zinc and therefore more locations in the perimeter regulating drain could be used, consideration would be given to weather forecasts and tidal state, prior to making such a decision. A decision on whether to pursue this option would depend on the degree of (temporary) infrastructure required to be established to deliver construction water to the perimeter regulating drain, for what may be short term use only and so would be determined on a case-by–case basis, considering cost versus benefit.

D.8 Receiving environment monitoring

The activities undertaken under this CEMP are subject to receiving environment monitoring to detect adverse environmental impact. In relation to discharge of construction water with elevated levels of copper and zinc, the key monitoring programs are the receiving environment water quality and mangrove community health (including sediment and bioaccumulation) monitoring programs. Water quality is monitored monthly at impact and reference sites (refer to Figure D-7 for water quality monitoring sites). Mangrove health is monitored quarterly, and sediment quality and bioaccumulation monitoring are required to be undertaken bi-annually, but are, in practice, also monitored quarterly (refer to Figure D-8 for monitoring locations). The proposed discharge locations are in proximity to the existing monitoring locations.

There are seven water quality monitoring sites surrounding outfall areas 1 (BPSW20, BPSB03, BPSW30), 2 (BPSW29) and 3 (BPSW28, BPSW27 and BPSB05). Mangrove health transects (in which sediment quality is also assessed) are similarly already located within the communities surrounding outfall areas 1, 2 and 3 (BPMC10, BPMC11, BPMC26 and BPMC24).

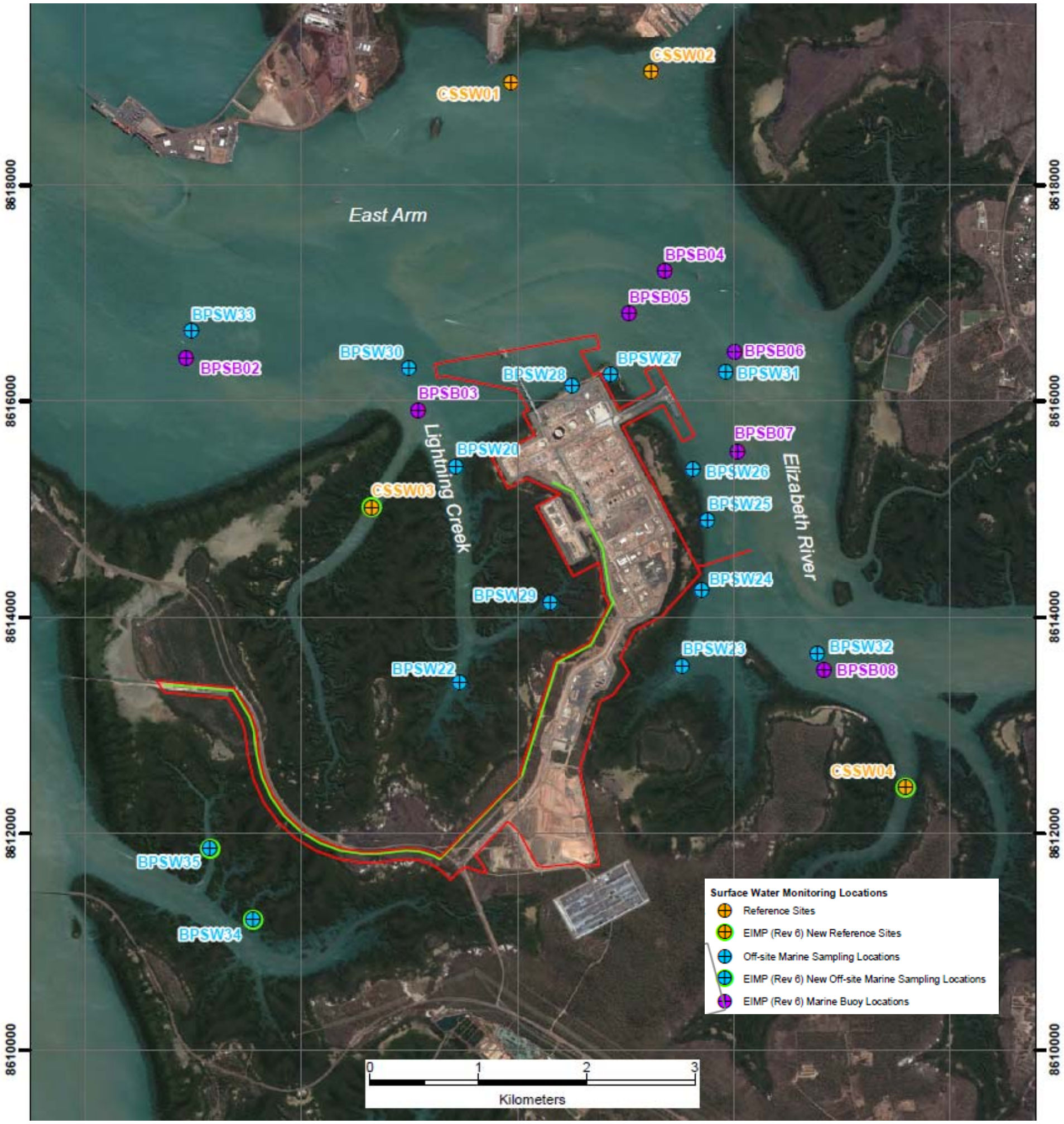

Figure D-3: Location of receiving environment monitoring in Darwin Harbour waters (EIMP Rev 6)

Figure D-4: Location of mangrove health monitoring, including sediments and bioaccumulation (EIMP Rev 6)

D.9 Risk assessment

The assessment of potential for adverse environment impact to the receiving environment, conducted as part of the ENVID for commissioning, is based on a logical 'weight-of-evidence' process to evaluate whether significant risk of harm is posed to the environment. The following aspects have been considered:

- The only stressors that are proposed to be increased are copper and zinc; all other potential toxicants are as per DHWQO or ANZECC (2000a) guidelines.
- All waters proposed to be discharged are to be tested prior to discharge to confirm no exceedances of analytes are present in the water to be discharged. Provision is made for on-site treatment and/or offsite disposal at licensed facilities in the event that discharge criteria cannot be met.
- The proposed discharge trigger values for copper and zinc are sufficiently protective to avoid adverse environmental impact to mangrove communities, including mangroves themselves, invertebrates and vertebrates.
- Discharge limitations to only those parts of the perimeter regulating drain that are subject to diurnal tides assists in rapid dilution and dispersion of dissolved copper and zinc in the water column to prevent impact to transient pelagic species. Further the diurnal periodicity of the tides reduces the potential for accumulation of copper and zinc in the intertidal zone at low tide.
- The short duration of discharges (expected to be no more than approximately 14 hours at full flow rate) over a period of several months (with almost 50% of the discharges expected to occur during the wet season) decreases the likelihood of a chronic effect of copper or zinc toxicity. The expected duration of discharges is much lower than the 96 hour acute toxicity tests reported in the literature.
- Organisms that do take up copper or zinc from the discharge will depurate this over time. In the case of mangroves and other vegetation this may occur through seasonal leaf fall. Fauna including vertebrates and invertebrate species will gradually depurate metals through metabolic processes, and crustaceans will also depurate metals during when animals moult their exoskeleton during growth).
- The existing environmental impact monitoring program specifically tests for filtered copper and zinc in Darwin Harbour water and mangrove sediments. The current quarterly frequency of monitoring mangrove health, sediments and bioaccumulation provides suitable resolution for the detection of any impacts associated with construction and is also suitable for active discharge of construction waters. The risk of the monitoring sites and frequency not detecting discharge impacts to the mangrove community is considered to be low. Further the existing environmental impact monitoring program follows the ANZECC (2000a) decision tree during risk assessment for applying the guidelines to the protection of aquatic ecosystems, and as such, if concentration data from a monitoring site exceeds an associated trigger value, the decision trees quoted in ANZECC (2000a) will be used to determine if there is a real risk of impact and a management action is required.
- There is literature evidence of periodic spikes in copper and zinc in the receiving environment, without any apparent corresponding impact to Darwin Harbour environs, suggesting a level of resilience exists.
- The perimeter regulating drain, discharge outlets and rock armouring have been designed in accordance with Best Practice Erosion and Sediment Control (IECA, 2008) guidelines. As a result, the existing engineering controls will be adequate to protect against scour and erosion for the landward side mangrove ecosystems. The perimeter regulating drain outlets discharge onto an armoured rock pad which extends approximately 5 m from the outside edge of the rock designed for hydraulic energy dissipation. As such the planned discharges will occur as pipe flow from the outlet onto the rock armour pad and then sheet flow off the pad and into

the mangroves. Discharge velocity through each individual pipe will be much less than the designed exit velocities therefore the discharge of the construction waters will not result any, erosion or sediment re-suspension. Further, the risk of construction waters exceeding the design capacity of the perimeter regulating drain and causing sediment re-suspension associated with scour or erosion is considered very low.

- Darwin Harbour experiences maximum tidal level variations of up to 8 metres with average spring tide variations around 7 metres, and mean neap tide variations around 3 metres. The large tidal ranges produce strong currents that peak at speeds of up to 2 – 2.5 m/s. (Williams and Wolanski 2003). The greatest variability is found in tidal creeks during the wet season when tidal exchange results in changes in water quality on an hourly basis (Padovan 2003).
- As per mitigation measures outlined in this CEMP, the perimeter regulating drain will be kept free of construction litter and debris.

Overall it is considered that discharge of construction water that meets discharge trigger values will not:

- change ambient water quality
- accumulate in mangrove community biota or sediments
- have an impact on pelagic fauna in the water column
- will not affect beneficial uses of Darwin Harbour
- will not create a visual impact for other Harbour users.

D.10 Proposed approach

This CEMP includes consideration of a full range of controls to minimise impacts (refer to Section 6.4.8) and water quality trigger values aligned with DHWQO and ANZECC (2000a; 2000b) where possible. Further, the CEMP proposes a surface water TARP for sediments and biomonitoring which triggers management actions prior to environmental harm being caused in the receiving environment.

For copper, it is proposed to adopt a discharge trigger value that is two standard deviations from the mean of PWC water quality, that is 34.5 µg/L. For zinc, it is proposed to adopt a discharge trigger value that is two standard deviations from the mean of PWC water quality, that is 23.9 µg/L. The approach taken means that any reported value below the criteria would have a 95% change of being resulting from PWC water supply. A value above the criteria would be 5% chance of being water supply and more likely to be associated with Site activities. Use of an elevated discharge trigger value for copper and zinc reflects the quality of water received on Site, not a contamination process resulting from Site activities.

Only surface water that meets discharge trigger values can be discharged to the perimeter regulating drain and temporary MOF outfall. Discharge of all surface water from Site is subject to Contractor's Water Discharge Procedure, which includes detailed steps for subcontractors to follow for discharge of surface water from Site, as well requirements to obtain dewatering permits and verify discharge trigger values have been met, prior to discharge.

The duration of proposed discharges are relatively short, with almost 50% of discharges expected to occur during wet season rainfall periods. The trigger values proposed for copper and zinc are considered *appropriately protective subject to the tidal conditions*. As such, it is not expected that there will be an adverse environmental impact to the sensitive receptors as a result of use of the perimeter regulating drain, for surface water discharge that meets discharge trigger values.

The EIMP will continue to be implemented to demonstrate no adverse environmental

impact to the receiving environment and a trigger-action-response plan (TARP) will be used to trigger management responses if elevation of copper and zinc resulting from Site activities is detected in the receiving environment. The surface water TARP provides both an early warning (level 1) and an exceedance (level 2) management response to ensure preventative action is undertaken prior to actual environmental harm occurring.

D.11 References

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D.13 Attachment to Appendix D-Independent Advice

APPENDIX E: LISTED WASTES

The "listed wastes" as per Schedule 2 of the Waste Management and Pollution Control Regulations (NT) are set out below.

Listed Wastes
Acidic solutions or acids in solid form
Animal effluent or residues (including abattoir effluent, poultry and fish processing waste)
Antimony; antimony compounds
Arsenic; arsenic compounds
Asbestos
Barium compounds other than barium sulfate
Basic solutions or bases in solid form
Beryllium; beryllium compounds
Boron compounds
Cadmium; cadmium compounds
Ceramic-based fibres with physic-chemical characteristics similar to those of asbestos
Chlorates
Chromium compounds that are hexavalent or trivalent
Clinical and related wastes
Cobalt compounds
Containers that are contaminated with residues of a listed waste
Copper compounds
Cyanides (inorganic)
Cyanides (organic)
Encapsulated, chemically fixed, solidified, or polymerised wastes
Ethers
Filter cake
Fire debris and fire wash waters
Fly ash
Grease-trap waste
Halogenated organic solvents
Highly odorous organic chemicals (including mercaptans and acrylates)
Inorganic fluorine compounds excluding calcium fluoride
Inorganic sulfides
Isocyanate compounds
Lead; lead compounds
Mercury; mercury compounds
Metal carbonyls
Nickel compounds
Non-toxic salts
Organic phosphorus compounds
Organic solvents excluding halogenated solvents
Organohalogen compounds that are not otherwise specified in this Schedule
Perchlorates
Phenols; phenol compounds including chlorophenols
Phosphorus compounds other than mineral phosphates
Polychlorinated dibenzo-furan (any congener)
Polychlorinated dibenzo-p-dioxin (any congener)
Residue from industrial waste treatment or disposal operations
Selenium; selenium compounds

Listed Wastes
Sewerage sludge and residues including nightsoil and septic tank sludge
Soils contaminated with a listed waste
Surface active agents (surfactants) that contain principally organic constituents and that may contain metals and inorganic materials
Tannery wastes (including leather dust, ash, sludge and flours)
Tellurium; tellurium compounds
Thallium; thallium compounds
Triethylamine catalysts for setting foundry sands
Tyres
Vanadium compounds
Waste chemical substances arising from research and development or teaching activities, including those substances which are not identified and/or are new and the effects of which on human health and/or the environment are not known
Wastes containing peroxides other than hydrogen peroxide
Waste, containing cyanides, from heat treatment and tempering operations
Waste from the manufacture, formulation, and use of wood-preserving chemicals
Waste from the production, formulation and use of biocides and phytopharmaceuticals
Waste from the production, formulation and use of inks, dyes, pigments, paints, lacquers and varnish
Waste from the production, formulation and use of organic solvents
Waste from the production, formulation and use of photographic chemicals and processing materials
Waste from the production, formulation and use of resins, latex, plasticisers, glues and adhesives
Waste from the production and preparation of pharmaceutical products
Waste mineral oils unfit for their original intended use
Waste mixtures, or waste emulsions, of oil and water or hydrocarbon and water
Waste pharmaceuticals, waste drugs and waste medicines
Waste resulting from surface treatment of metals and plastics
Waste tarry residues arising from refining, distillation and any pyrolytic treatment
Waste substances and articles containing or contaminated by polychlorinated biphenyls (PCBs), polychlorinated naphthalenes (PCNs), polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs)
Wastes of an explosive nature not subject to the Dangerous Goods Act or the Work Health and Safety (National Uniform Legislation) Act (NT)
Wool scouring waste
Zinc compounds