Attachment 3A

Environmental Commissioning Plan

Project Ceres

Burrup Peninsula, Western Australia

Proponent:
Perdaman Chemicals and Fertilisers Pty Ltd.
ABN 31 121 263 741

Date: 16 May 2025

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by	Approved by
Preliminary Draft	25 October 2023	Preliminary for Client Review	SCJV	Perdaman	SCJV
Final	16 May 2025	Final for submission	SCJV	Perdaman	Perdaman

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1 Introduction

1.1 Background

Perdaman Chemicals and Fertilisers Pty Ltd (Perdaman, the Owner) proposes to establish a state-of-the-art urea production plant, namely Project Ceres, within the Burrup Strategic Industrial Area (BSIA), approximately 8 km from Dampier and 20 km north-west of Karratha on the north-west coastline of Western Australia.

Project Ceres will manufacture ammonia from natural gas and air through an autothermal reforming process. The ammonia will be used to manufacture 6,200 tonne of urea per day in a process that involves reacting ammonia and carbon dioxide.

Natural gas will be sourced from the nearby Woodside Liquid Natural Gas (LNG) facility. Seawater will be provided by the Water Corporation to meet water requirements; used for cooling purposes and generation of demineralised water. The urea will be stored in purpose-built storage sheds and will be exported through the Dampier Port. Ammonium nitrate is a by-product of the scrubbing system in the urea granulators; this will be stored in tanks and exported offsite as a fertiliser.

Perdaman has engaged Saipem Australia Pty Ltd. (Saipem) and Clough Project Pty Ltd. (Clough) in a Joint Venture (SCJV) as the Engineering Procurement Construction (EPC) contractor.

Most of the plant infrastructure will be fabricated offshore (mainly India, China and Vietnam) in modules for onsite installation. The larger modules will be brought to site via the Dampier Port.

1.2 Purpose

Works Approval W6875/2023/1 currently provides the authorisation to construct the facility, but it does not provide authorisation for commissioning nor operation.

The Environmental Commissioning Plan (ECP), being this plan, supports the W6875/2023/1 amendment application to enable the commissioning of the Project Ceres and undertake time limited operations (TLO) while the licence application is being prepared, submitted and assessed. The ECP is a subplan of the Project Ceres commissioning plan. Some commissioning activities will also require approval under dangerous goods legislation which is separate to this plan.

1.3 Objectives of the plan

The ECP provides information on the proposed activities associated with the start-up, commissioning and operation of the facility, demonstrating safe operation at its designed nameplate capacity within established design criteria for emissions.

2 Acronyms and Abbreviations

Acronym / Abbreviation	Meaning
ASU	Air separation unit
ATR	Autothermal reforming
BOG	Boil off gas
BSIA	Burrup Strategic Industrial Area
BWRO	Brackish water reverse osmosis
CCIR	Critical containment infrastructure report
CEB	Chemically enhanced backwash
CO	Carbon monoxide
CO_2	Carbon dioxide
DMW	Demineralised water
DWER	Department of Water and Environmental Regulation
ECP	Environmental Commissioning Plan (this plan)
EDG	Emergency diesel generator
EDI	Electro-de-ionisation
EPA	Environmental Protection Authority
EP Act	Environmental Protection Act 1986 (WA)
EPC	Engineering, procurement and construction
ESD	Emergency shut down
GTG	Gas turbine generator
HRSG	Heat recovery steam generator
HP	High Pressure
ITR	Inspection test register
MC	Mechanical completion
MS1180	Ministerial Statement 1180
MUBRL	Multi-user brine return line
NO_X	Oxides of nitrogen
NH_3	Ammonia
NWU	Nitrogen wash unit
Owner / Perdaman	Perdaman Chemicals and Fertilisers Pty Ltd (project owner)
P&ID	Piping and instrument diagram
PCWS	Potentially contaminated stormwater
PGTR	Performance guarantee test run
ppm	Parts per million (volume)
PSSR	Pre-startup safety review
SCJV	Saipem Clough Joint Venture, EPC contractor for the project
SCR	Selective catalytic reduction
SO_2	Sulphur dioxide
SWRO	Sea water reverse osmosis
STP	Sewage treatment package
TDS	Total dissolved solids
The Facility	Project Ceres
TLO	Time-limited operations
TRH	Total recoverable hydrocarbons
TSS	Total suspended solids
UF	Ultrafiltration
UPS	Uninterruptable power supply

3 Regulatory Context

The Project Ceres development has been assessed (EPA Report 1705) by the Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986* (WA) (EP Act) with Ministerial approval granted on 24 January 2022 (Ministerial Statement 1180, [MS1180]). The project also triggers licensing requirements under Part V of the EP Act.

The Government of Western Australia's Department of Water and Environmental Regulation (DWER) regulates industry emissions and discharges to the environment through a works approval and licensing process under Part V of the EP Act. Premises with potential to cause emissions and discharges to air, land or water may be considered prescribed premises and trigger regulation under the EP Act. Prescribed premises categories are outlined in Schedule 1 of the *Environmental Protection Regulations 1987*. Under the Act, a works approval provides authority to construct a facility that causes the premises to become prescribed, and a licence provides the authority to operate the facility subject to regulatory controls. Works Approval W6875/2023/1 was granted on 25 June 2024 for the construction of the facility.

Post-construction, and upon DWER acceptance of the Environmental Compliance Report (ECR) and Critical Containment Infrastructure Report (CCIR), the Project will move into the commissioning phase. Plant start-up and wet commissioning (introduction of feedstock) of the functional units will allow optimising plant and equipment systems to meet specifications.

Environmental commissioning is testing undertaken to validate actual environmental performance relative to predicted performance. Environmental commissioning may include testing the integrity of containment such as pipelines, liners, or barrier systems, testing the performance of emission controls such as baghouses or filters, etc.

During environmental commissioning, emissions or discharges of waste may be permitted, subject to the works approval conditions. DWER recognises that in optimising operations, emissions higher than normal operation may occur in the short term until the plant is stabilised. The Department's assessment will consider these emissions and discharges and ensure that during the proposed environmental commissioning phase they do not present an unacceptable risk to the environment, public health, or public amenity.

W6875/2023/1 (W6875) does not currently authorise commissioning or any TLO. The Decision Report supporting W6875 stated in its reasoning that it would not consider authorising commissioning in the works approval until the MS1180 pre-condition was resolved.

Condition 2-4 of MS1180 specifies that "*The proponent must not undertake the commencement of operations until the CEO has confirmed in writing that the Air Quality management Plan submitted under condition 2-3 addresses the requirements of condition 2-3*". MS1180 condition 2-3 requires a revised version of the Air Quality Management Plan (AQMP) to be submitted within six months of proposed commencement of operations, or such time approved in writing by the CEO.

Perdaman subsequently requested the CEO accept the submission of the AQMP outside the specified timeframe to enable the works approval to be amended to allow for commissioning. The CEO approved the request for earlier submission on 14 March 2025. A revised AQMP is being submitted to the CEO in May 2025.

An application to amend W6875 to allow for commissioning requires an ECP (this plan).

DWER expect the ECP to identify:

- the sequence of commissioning activities to be undertaken, including details on whether they will be done in phases.
- a summary of the timeframes associated with the identified sequence of commissioning activities.
- the inputs and outputs that will be used in the commissioning process.
- the emissions and/or discharges expected to occur during commissioning.
- the emissions and/or discharges that will be monitored and/or confirmed to establish or test a steady-state operation (e.g. identifying emissions surrogates, etc.), including a detailed emissions monitoring program for the measurement of those emissions and/or discharges.
- the controls (including management actions) that will be put in place to address the expected emissions and/or discharges.

- any contingency plans for if emissions exceedances or unplanned emissions and/or discharges occur; and
- how any of the above would differ from standard operations once commissioning is complete.

4 Project Ceres location and site plan

Project Ceres leases Site C and Site F within the BSIA from Development WA. Site C and F are separated by supratidal flats and Hearson Cove Road. Site F will be occupied by non-process infrastructure, and include administration, workshops, the package sewage treatment plant, laydown and solar panels (solar power generation, as approved under the amended MS1180) while Site C will accommodate the urea manufacturing plant infrastructure. The export loading infrastructure is located within the Port of Dampier (Pilbara Port Authority (PPA) tenure), connected to Site C via a product conveyor system through the East West Service Corridor.

Yara Pilbara Fertilisers is located to the east of Site C and separated by an infrastructure corridor. The area to the north and south of the premises is Crown land (which includes the Murujuga National Park), as is the area east of Site F, while Burrup Road is to the west. The Woodside Pluto LNG expansion project is located approximately one kilometre to the north-west. The general location of Project Ceres is presented in Figure 1.

The indicative layout of the Project Ceres plant key infrastructure in Site C is presented in Figure 2.

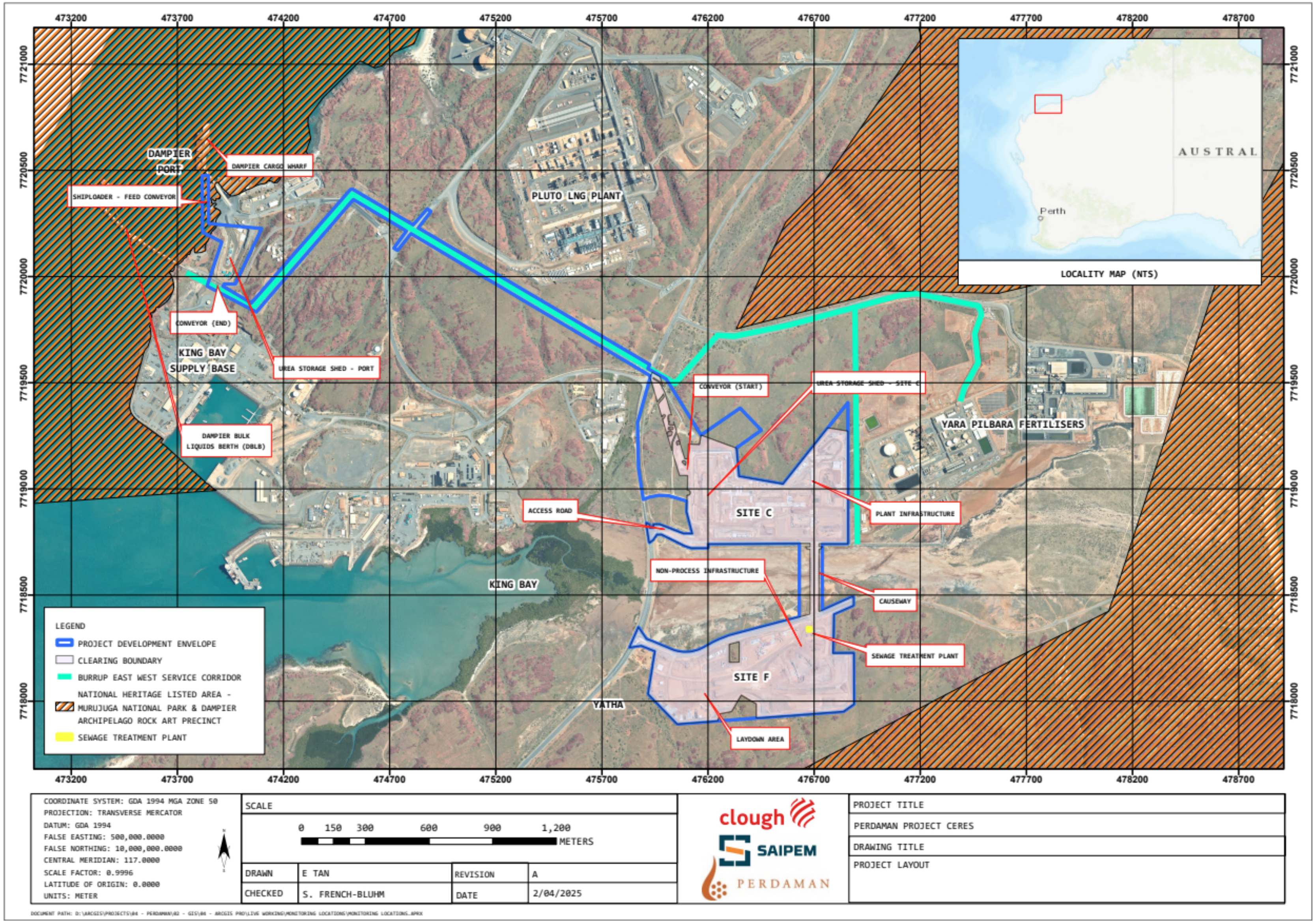

Figure 1: Location of Project Ceres

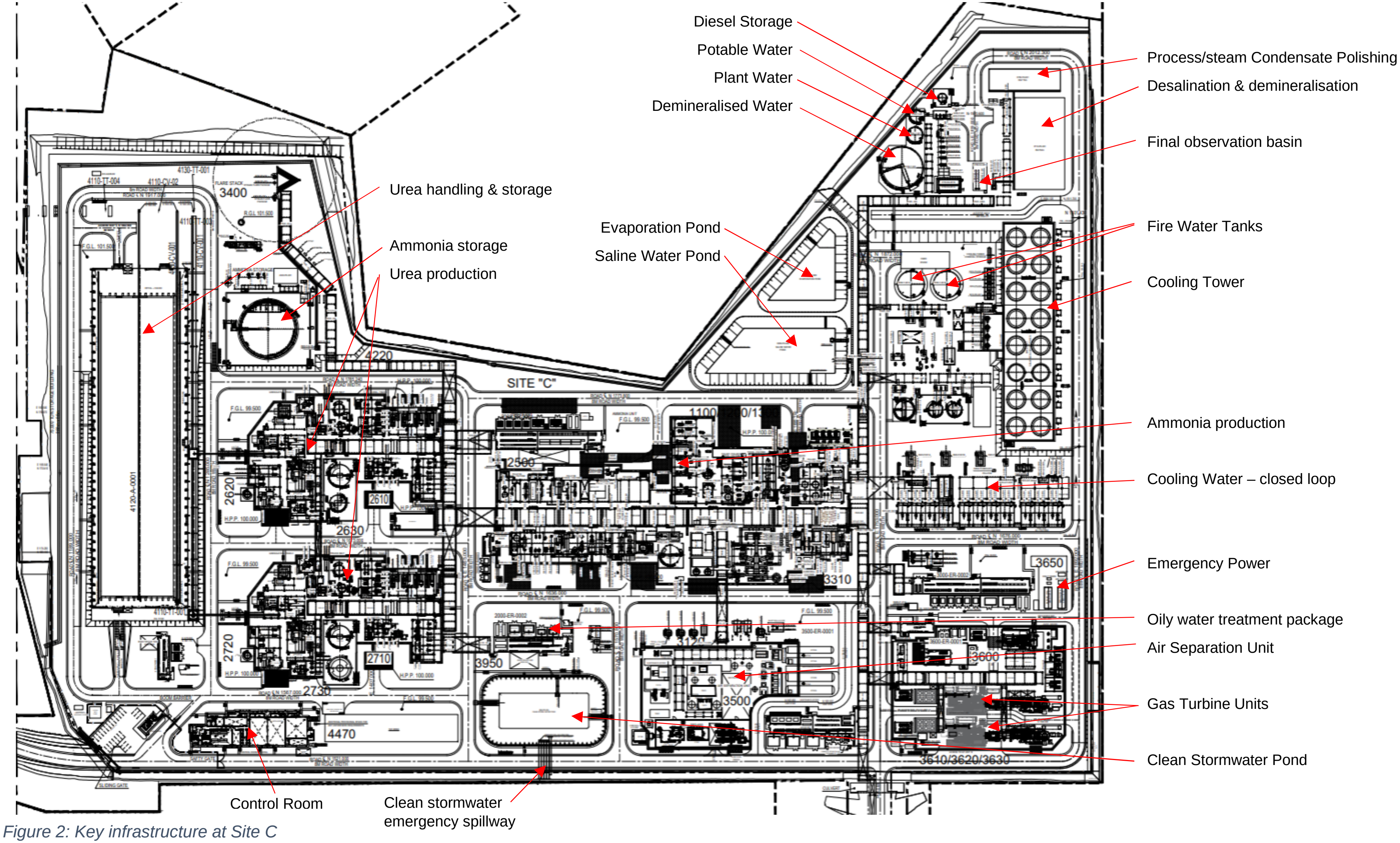

Figure 2: Key infrastructure at Site C

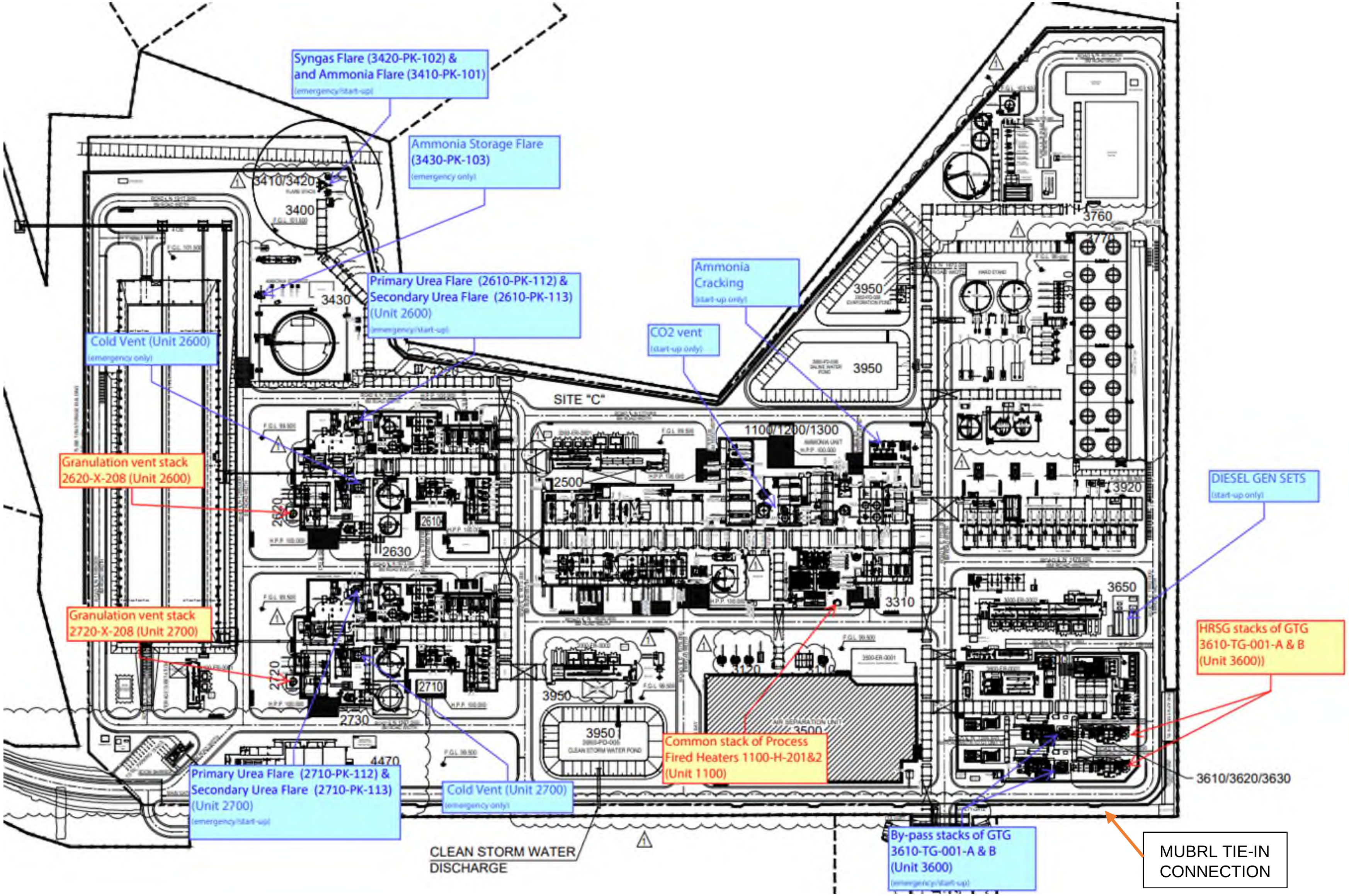

Figure 3: Emission / discharge locations (yellow descriptions reflect emission points during normal operations)

5 Process Description

The urea manufacturing process involves the reaction of ammonia (NH_3) with carbon dioxide (CO_2) to produce urea. The ammonia and carbon dioxide feedstock are produced on site from the ammonia plant by reacting hydrogen and nitrogen. Hydrogen is produced in the ammonia plant from natural gas feedstock through an autothermal reforming (ATR) (SynCOR Ammonia™ technology) process. Nitrogen for the ammonia production is obtained from air.

The manufacturing process of urea involves a five-step process, simplified in Figure 4:

1. Gas reforming (converts the natural gas to a high purity syngas suitable for conversion to ammonia)
2. Ammonia synthesis from syngas
3. Urea synthesis by reaction of carbon dioxide (recovered from the CO_2 removal in the syngas preparation) with ammonia.
4. Urea granulation
5. Storage, conveying and warehousing

Project Ceres is being constructed to a design capacity of approximately 3,500 tonnes of ammonia production per day. Each urea melt and granulation plant (parallel identical trains) is designed to produce 3,100 tonnes per day (tpd) of granulated urea.

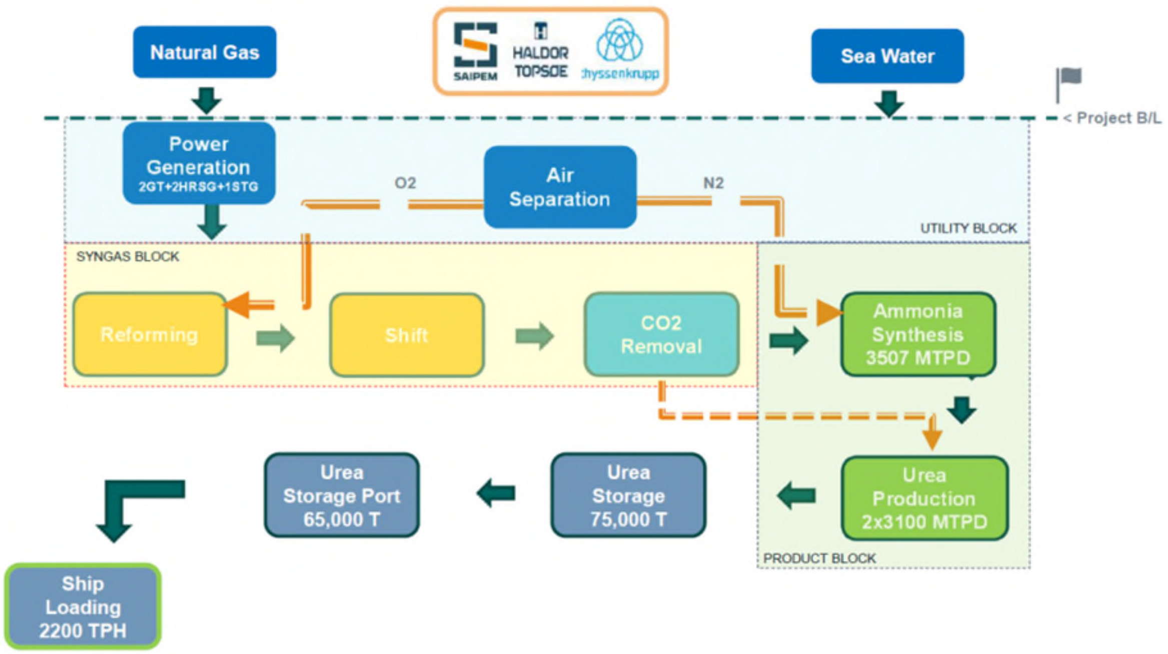

Figure 4: Simplified manufacturing process block diagram

The urea production plant will largely be automated with a central control system to manage the safe operation and fluid flowrates within the plant. Operator visibility and adjustment control over plant operations is enabled through human interface devices, primarily located in the Control Room (refer to Figure 2). The plant design enables Operators to isolate process fluid systems as and when required.

Utilities provide power, oxygen, nitrogen, steam and water into the plant.

The principal emissions associated with the operation of the facility include discharges to the atmosphere from designated stacks associated with power generation, ammonia synthesis and urea production. Waste gases from urea production (granulation) will be treated by scrubbing. The gas turbine generators (GTGs) waste heat recovery unit has a selective catalytic convertor for NO_X treatment. The air emissions will form a very small component of emissions within the airshed and remain well within air quality criteria at assessed receptors.

Water requirements will be met by sea water supplied by the Water Corporation with effluents discharged to the Multi-user brine return line (MUBRL). The MUBRL is managed by the Water Corporation with authorisation provided under MS594.

Uncontaminated stormwater from within the site is collected in designated retention basins in Site C and Site F from where water will be recovered for potential reuse or discharged to the environment (King Bay supratidal flats) via constructed spillways when overtopping.

All emissions have been assessed by the EPA under Part IV of the EP Act. The premises will be subject to regulatory controls imposed under Part V of the EP Act with alignment to existing related Part IV EP Act requirements.

It is expected that commissioning emissions will not exceed design levels and not vary significantly from normal operations. Commissioning emissions above normal levels may occur intermittently for short periods during process upsets during testing, tuning and process optimisation.

The Plant will have a state-of-the-art Process Control System (PCS) to provide continuous process control, and Safety Instrumented System (SIS) to provide safe shutdown of process in case of abnormal operations and process upsets. A Fire and Gas System (FGS) will independently monitor for gas leaks and fire detection and provide relevant information to the control room to take remedial action and initiate emergency response. All machines will have dedicated control systems to control and monitor machinery operations.

Control systems will be operational to provide process data and information online for any measurement and monitoring requirements

6 Environmental Commissioning Roles and Responsibilities

The SCJV is responsible for the engineering and site activities necessary for the execution of the mechanical completion, commissioning, start-up, performance test and transfer of the facility to the Owner, in compliance with the scope of work as defined in the contract.

The commissioning team, under the direction of the commissioning manager will be an integrated group of experienced discipline engineers, specialists and supervisors, who as required, will perform the pre-commissioning, commissioning and performance test activities. The Owner will provide skilled operation and maintenance staff who will be integrated with the SCJV team during commissioning, start-up, and operations phases to ensure a smooth transition of responsibility.

The Project Commissioning Execution Plan (0000-ZA-E-09050) outlines the scope of work, the documentation, the resources and the strategy put in place for safely executing the pre-commissioning, commissioning, start- up and performance test of the Perdaman Chemicals and Fertilisers Pty Ltd facilities up to Practical Completion (PC).

This includes planning, control and monitoring as well as interfaces relative to other contractors and functions within the project.

Moreover, the Commissioning Execution Plan defines the roles and responsibilities of the SCJV commissioning team and owner (with particular focus during the early operation period) and their interfaces during the transfer of responsibility/ownership throughout the process leading to the acceptance of the works, to meet the required PC date for the Project without compromising safety, the environment, quality, and/or statutory requirements.

As part of the commissioning strategy, the SCJV will engage specialised subcontractors to undertake the following work:

- High pressure leak test (including final dry-out and purging before hydrocarbon-in) of all lines/systems in hydrocarbon service with nitrogen/helium mixture.
- Transformer oil filtration for transformers rated 415 V and above.
- Cleaning and/or high-pressure water jetting.
- Disposal of chemical waste generated from the cleaning processes, including providing suitable containment and treatment of chemical wastes.
- Sampling and analysing during the performance test.

7 Commissioning Activities

The overall project and commissioning schedules, subject to environmental approvals, are detailed below.

7.1 Project Schedule

Subject to the receipt of approvals, the following indicative schedule in Table 1 has been developed for the Project.

Table 1: Project Schedule (indicative)

CONSTRUCTION AND COMMISSIONING ASPECT	SCHEDULE
Bulk earthworks mobilisation to site	September 2023 (commenced)
Construction	
Syngas block commence underground services, foundations Ammonia unit commence underground services, foundations Urea & granulation train commence underground services, foundations Utility block commence underground services, foundations Power generation commence underground services, foundations STP underground services and foundations	June 2024 (commenced)
Install steam and condensate Install syngas flares Install liquid chemical storage tanks	February 2025 (commenced)
Install power generation Install STP Install ship loader	April 2025 (commenced)
Install ammonia flares Install tank flares	June 2025 (to commence)
Install urea & granulation train	July 2025 (to commence)
Install syngas module	August 2025 (to commence)
Install ammonia unit	November 2025 (to commence)
Commissioning	
Utilities	July 2026 – April 2027
Ammonia Unit	November 2026 – April 2027
Urea Units	February – May 2027
Start-up / Performance Test	June 2027
Operation	**June 2027**

The main pre-commissioning and commissioning activities are presented below (Figure 5).

Phase	Group	Activity	Unit 3110 Emergency Air system	Unit 3120 Emergency Air drier package	Unit 3310 Deaerator, BFW, Blow down, Dosing Packages	Unit 3410/3420 Ammonia Flare/ Synthesis Gas Flare	Unit 3430/4210 Ammonia storage Flare /Ammonia storage	Unit 3500 ASU Package	Unit 3600 Power Block	Unit 3650/3950 Emergency Diesel Generator/Diesel system	Unit 3710/3730 Desalination/Demineralization/ DMW pumps	Unit 3720 Potable Water and Utility Water system	Unit 3760 waste water final observation pit Observation	Unit 3910 CW system, chemical dosing	Unit 3920 Closed Cooling water system	Unit 3980 Contaminated oily water	Unit 3990 NG system
PRE-COMMISSIONING	Conformity Checks	Vessels/Columns Inspection & Box-up	X	X		X	X	X	X	X	X	X			X	X	X
		Storage Tank Final Inspection & Box-up			X		X		X	X	X	X	X				
		P&ID's Conformity Checks	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Visual Inspections	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Machinery cold alignment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Static/ De-Energized Tests	Setting of safety valves	X	X	X		X	X	X	X	X	X	X	X	X		X
		Instrument Calibration	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Cable continuities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Measurements (e.g. earthing resistance)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Piping and Vessels Works	Blowing/ Flushing (after pressure testing)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Piping Final Bolt Torquing	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Pipeline Works	Cleaning, Drying and Preservation	X	X	X	X	X	X	X								X
	Specific Pre-commissioning Works	Process Piping special cleaning							X								
		Leak Test (with air and/or nitrogen)	X	X		X	X	X	X	X							X
		Lube Oil Flushing	X		X		X	X	X								
		Site Acceptance Tests (SAT)							X		X						
COMMISSIONING	Functional Tests	Checks and Tests after Energization	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Dynamic Loop Functional Check	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
		Analyzer commissioning	X	X	X			X	X		X	X	X	X	X	X	X
	Operational Test	Air Cooler Run-in							X	X	X			X			
		Centrifugal Compressor Run-in															
		Reciprocating Compressor Run-in									X						
		Centrifugal Pumps Run-in	X		X		X	X	X	X	X	X	X	X	X	X	
		Reciprocating Pumps Run-in			X				X		X	X	X	X	X		
		Diesel Generator Run-in								X							
		Utilities Start-up and Service Test	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Pre-Start-up Works	Leak Test with N2/with process fluid				X	X	X	X								X
		Purging & Inerting (with nitrogen)				X	X	X	X								
		Chemical Loading			X				X		X	X	X	X	X		
		Furnace Dry-Out															

Phase	Group	Activity	Unit 1100 Ammonia reforming	Unit 1200 Shift Conversion	Unit 1300 CO2 removal/Nitrogen wash	Unit 2500 Synthesis	Unit 2610 Urea-1	Unit 2710 Urea-2	Unit 2630 Common Off spec	Unit 2620 Granulation-1	Unit 2720 Granulation-2	Unit 2730 Ammonium Nitrate	Unit 4120 Urea storage	Unit 4140 Urea storage at Port	Unit 4150 Ship loading
PRE-COMMISSIONING	Conformity Checks	Vessels/Columns Inspection & Box-up	X		X	X	X	X	X	X	X	X			
		Storage Tank Final Inspection & Box-up			X		X	X	X	X	X	X			
		P&ID's Conformity Checks	X	X	X	X	X	X	X	X	X	X	X	X	X
		Visual Inspections	X	X	X	X	X	X	X	X	X	X	X	X	X
		Machinery cold alignment	X	X	X	X	X	X	X	X	X	X	X	X	X
	Static/ De-Energized Tests	Setting of safety valves	X	X	X	X	X	X	X	X	X	X			
		Instrument Calibration	X	X	X	X	X	X	X	X	X	X	X	X	X
		Cable continuities	X	X	X	X	X	X	X	X	X	X	X	X	X
		Measurements (e.g. earthing resistance)	X	X	X	X	X	X	X	X	X	X	X	X	X
	Piping and Vessels Works	Blowing/ Flushing (after pressure testing)	X	X	X	X	X	X	X	X	X	X			
		Piping Final Bolt Torquing	X	X	X	X	X	X	X	X	X	X			
	Pipeline Works	Cleaning, Drying and Preservation	X	X	X	X	X	X	X	X	X	X			
	Specific Pre-commissioning Works	Process Piping special cleaning			X										
		Leak Test (with air and/or nitrogen)	X	X	X	X									
		Lube Oil Flushing	X		X	X	X	X							
		Site Acceptance Tests (SAT)				X	X	X							X
COMMISSIONING	Functional Tests	Checks and Tests after Energization	X	X	X	X	X	X	X	X	X	X	X	X	X
		Dynamic Loop Functional Check	X	X	X	X	X	X	X	X	X	X	X	X	X
		Analyzer commissioning	X	X	X	X	X	X	X	X	X	X			
	Operational Test	Air Cooler Run-in													
		Centrifugal Compressor Run-in													
		Reciprocating Compressor Run-in	X		X										
		Centrifugal Pumps Run-in	X	X	X	X	X	X	X	X	X	X			
		Reciprocating Pumps Run-in	X			X	X	X		X	X	X			
		Diesel Generator Run-in													
		Utilities Start-up and Service Test													
	Pre-Start-up Works	Leak Test with N2/with process fluid	X	X	X	X	X	X							
		Purging & Inerting (with nitrogen)	X	X	X	X	X	X							
		Chemical Loading	X		X	X						X			
		Furnace Dry-Out	X												

Figure 5: Main pre-commissioning and commissioning activities (not sequenced by unit)

7.2 Phased Commissioning

The commissioning process is summarised by the time-based sequence of activities defined as the phases described below:

- Phase 1 – Mechanical Completion (equipment installation completed)
- Phase 2 – Dynamic Commissioning (dry commissioning)
- Phase 3 – Start-up planning and execution (wet commissioning – introduction of feedstock)
- Phase 4 – Performance Testing (validation of nameplate throughput and emissions in accordance with design specification)
- Phase 5 – Time Limited Operations (operation following commissioning while the licence application is being prepared and are being considered by DWER).

The dates and durations are estimated as per the construction schedule baseline (Table 1) and may vary depending on the date of received approvals and site conditions.

Phasing of mechanical completion and commissioning activities of the ammonia, urea and utility infrastructure will be based on a systems approach. Each system (smallest, multidisciplinary, and most practical portion of the scope of work that can be operated independently) will be completed and transferred from the construction team to the commissioning team, according to a defined sequence and priorities. Once all the subsystems of a certain system have been mechanically completed and successfully commissioned, each system will be ready for the start-up.

All utilities such as plant and instrument air, nitrogen, steam, water etc. will be completed, as will the blowdown and flare systems be fully commissioned and operative before any hydrocarbon is let into the process systems. Consequently, compliance information will likely be presented to the CEO in a staged and sequenced manner, where appropriate, to manage assessment workloads.

The phasing of works against contractual requirements is presented in Figure 6.

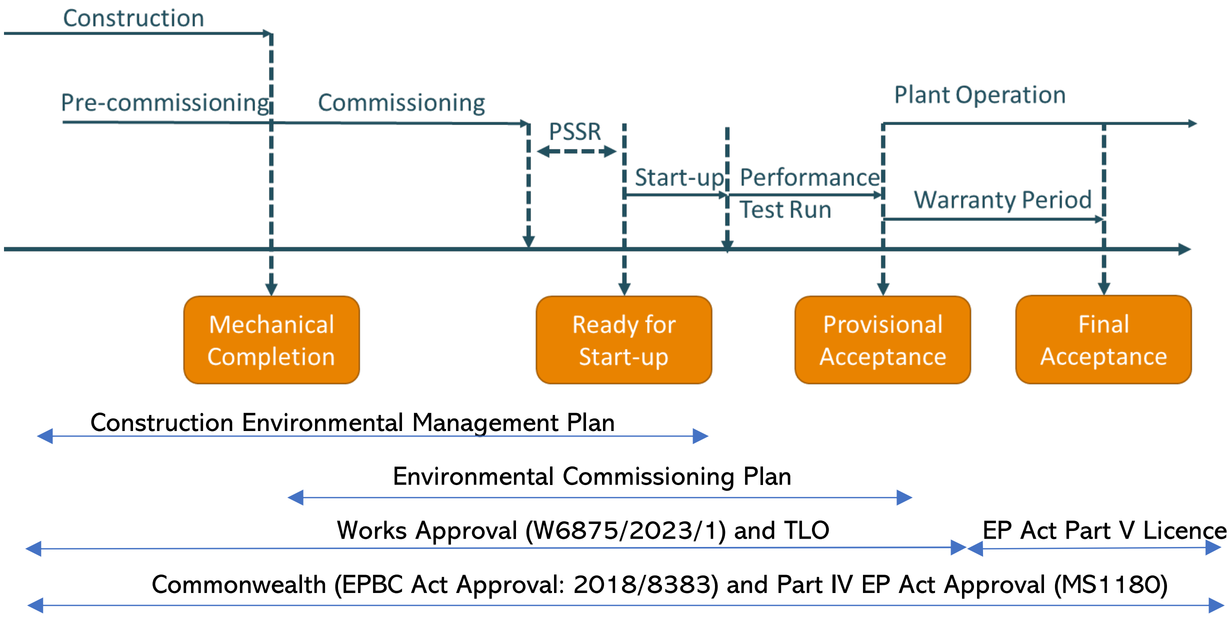

Figure 6: Phased commissioning within environmental regulatory context, as aligned to the W6875 amendment application

7.2.1 Phase 1 – Mechanical Completion

Mechanical completion (MC) is the execution of inspection and testing to verify compliance with design, specification, regulation, quality, and certification of each system, which includes pre-commissioning works. Pre-commissioning involves checking construction completion (conformity checks) and carrying out static/de-energized tests on all items of the system/sub-system as required to reach the status of 'ready for commissioning' (i.e., ready for dynamic testing). All inspections and testing shall be carried out on a discipline basis, without the introduction of permanent process fluids.

MC includes but is not limited to, equipment installation, hydrostatic (pressure) testing, cleaning of piping and equipment and reinstatement of pipe work. Cleaning will include mechanical cleaning, chemical cleaning, flushing with water, blowing with steam, and blowing with air, depending on the system.

Leak testing will also be undertaken to check for tightness of flange gaskets, valve packing, and screw connections of the relevant systems. These tests may be performed either with water or air, or nitrogen, by pressuring the system through visual detection and instrumentation, posing no risk to the environment. Pre-commissioning works will, to the maximum extent possible, be undertaken at module fabrication yards to minimise onsite works.

Some equipment will be subject to multiple cleaning strategies. With the modules being imported, much of the preparation and cleaning will take place offshore at the fabrication yards prior to import.

The proposed onsite cleaning methods for the plant modules are presented in Table 2. The cleaning will be executed by a third party as per approved procedures and in compliance with Australian Standards. Cleaning of process lines and systems (removal of foreign matter that could damage equipment or compromise manufacturing processes) will be done as defined by process engineers. The cleaning subcontractor will also be responsible for removing associated cleaning chemicals and waste. Systems will be thoroughly drained, neutralised and dried, by blowing with warm nitrogen gas.

Table 2: Proposed environmental aspects of mechanical onsite commissioning.

Equipment	Cleaning method	Chemicals and consumables Management
HRSG 1 & 2, and Oxygen lines.	Chemical cleaning as per vendor requirement.	Emission control measures stipulated in Section 8 will be implemented.
Waste heat boilers.	Alkali wash – for waste heat boilers. Soda ash and wetting agents will be used as per regular practices. Expected effluent generated will be ~ 500 m^3.	Consumable materials used for mechanical cleaning will be stored in bins and disposed of through an authorised waste contractor. Cleaning of equipment will be undertaken within contained (impervious) areas to prevent environmental discharges
Methyldiethanolamine (MDEA) system	Degreasing with hot potassium carbonate solution. Expected effluent generated with rinsing (twice) will be approximately 6,500 m^3.	Hardstands will have been established below the plant area to reduce risk of spillages entering the environment. Effluents to be collected in a temporary disposal tank and removed from site by an authorised operator.
Syn gas compressor, Refrigeration Compressor, CO_2 Compressors Urea 1 and 2, GTG 1 and 2, STG, HP Ammonia pumps, HP Carbamate Pumps, BFW turbine, ASU Main air compressor, ASU Booster compressor, ASU Nitrogen Compressor, ASU Expansion turbine, Fluidisation fans, Scrubber Fans and Atomising air compressors.	Lube oil flushing	Any spills will be immediately contained and recovered for disposal
Urea 1 and 2, Fire network, water network	Water Flushing	Flushing water will be routed to saline water pond through potentially contaminated stormwater (PCWS) trench pumps located at different strategic locations within the plant boundary. The flushing water would mainly comprise of suspended solids only. During commissioning/ first start-up PCWS/ saline pond will be used for on

Equipment	Cleaning method	Chemicals and consumables Management
		site management comprising the 9000 m^3 saline pond, with the 5,000 m^3 evaporation pond available, if needed. Water effluent generated during commissioning will be approximately 11,858 m^3.
All process lines	Air Blowing.	Flushing with air and steam presents no material risk to the environment. The air will disperse, and steam will evaporate.

Inspection and testing scope and results are recorded on a discipline inspection test register (ITR). The construction team will be responsible for achieving MC. MC includes construction and static commissioning or pre-commissioning activities.

Static (de-energised or dry/cold) commissioning is the execution of tests on individual items of equipment on which checks, and tests are required to prove functionality. The checks are recorded on static commissioning check sheets (SC Check Sheets) which are entered into the completion management system (CMS) database on completion of activities. On completion of all SC Check Sheets within a sub-system, mechanical completion is achieved for that sub-system and the next phase of dynamic commissioning for that sub-system can commence.

Static commissioning checks include the following:

- Instrument loop checks and safety functions
- Motor Uncouple Test Run
- Lube Oil Flushing
- Final Vessel Inspections/final closure (Verification of MC closure)
- Final Pump Alignment checks
- Mechanical equipment checks
- Process piping and instrumentation diagram (P&ID) checks.

Within 30 days of completion of Phase 1, an Environmental Compliance Report (ECR) (and Critical Containment Infrastructure Report (CCIR)) will be submitted to DWER, confirming that the key infrastructure has been constructed in accordance with the specific requirements of the Works Approval W6785. Partial compliance reports for specific systems may be submitted progressively for constructed components to manage workloads and assessments.

7.2.2 Phase 2 – Dynamic commissioning

Dynamic commissioning are activities that follow static commissioning to verify the functioning of systems and subsystems is in accordance with specified requirements, and to verify as accurately as possible that the system is ready for start-up.

Dynamic commissioning activities involve:

- Demonstrating, as far as reasonably practicable, that the system meets the design intent. This will be carried out on a subsystem/system, comprising more than one item of equipment.
- Bring the feed stock (hydrocarbon) processing systems to a state of operational readiness pending start-up activities.
- Documentation in the turnover and completion package (TCP), which captures appropriate approvals required to confirm completion.

7.2.2.1 Pre-Start-Up Safety Review (PSSR)

The objective of the PSSR is to outline the final check actions to be performed prior to initial start-up of each portion of the new facilities to prevent process related incidents due to inadequate, incomplete, or unapproved design and/or installation.

A PSSR is conducted by the SCJV with the participation of Perdaman for each system/commissioning package of the facilities, before startup of each system/commissioning of the package, to ensure that the following items are complete before initiating the startup:

- All process hazards analysis recommendations have been addressed, all action items necessary for start-up have been completed, and a program for the implementation of outstanding items is established.
- All safety deficiencies found during the PSSR are corrected.
- All equipment is in accordance with design specifications.
- HSE, operating, maintenance and emergency procedures and training material are available and are adequate.
- Employees have been trained on the new system or subsystem.
- Process safety information is updated and properly communicated.

Each PSSR will include both documentation checklists and field inspections.

7.2.3 Phase 3 – Start-up planning and execution

Start-up of systems will be sequenced and executed. Once all the systems and subsystems have been commissioned, where feasible in isolation, the production of granular urea will be initiated.

Start-up execution refers to the introduction of first fluid (feedstock) into the facility systems/functional units. The primary objectives are to achieve safe, incident-free, integrated start-up of the facilities while also testing emergency shutdown systems. This phase will also allow for system monitoring and adjustment to achieve steady-state operations. Access control will be implemented on commissioning restricted areas to manage safety.

The CEO will be notified seven days before the start-up is proposed.

During commissioning and start-up phase, analogous to the normal operation phase, the main raw materials for the entire process are natural gas and sea water to initially produce ammonia as a feedstock for granulated urea production, which is then exported through the Dampier Port.

During commissioning and start-up phase, the main output from the fertiliser production process is urea product and a weak ammonium nitrate solution by-product; their production quantity will gradually increase up to the Normal Operating level value.

7.2.3.1 Plant start-up

Start-up refers to the following cases of plant operations:

- First start-up, after mechanical completion (i.e. environmental commissioning)/complex restart after a planned shutdown for maintenance
- Start-up after long term shutdown
- Start-up after short term shut down

Plant start-up loading will be as follows:

1. Up to 30 % nameplate capacity for ATR line up
2. Up to 60 % nameplate capacity for Ammonia back end start up and Urea 1st train start-up
3. Up to 80 % nameplate capacity for Urea 2nd train start-up
4. Stabilisation and incremental (5 % plant load per hour) increase to reach 100% nameplate capacity.

Sequencing for initial Start-up

The main steps of the initial start-up sequence are shown on a unit-by-unit approach in Table 3.

Table 3: Start-up sequencing

Step	Unit ID	Description
1	3730	Demineralised water (DMW) tanks first filling
	3560	Liquid nitrogen back up storage and vaporization facilities
	4320	Diesel storage
	3650	Emergency Power (Diesel Generator Sets)
	3100	Plant and Instrument Air
	3720	Potable Water
	3930	Fire water
	3970/1/2	Sanitary sewage management and treatment
	3940/50/60/80	Drainage system (wastewater and stormwater)/ponds
2	3710/3730	Desalination & Demineralisation
	3740	Plant Water
	3760/70	Wastewater Treatment / Salt Collection
	3910	Seawater evaporating cooling tower – once through seawater
	3920	Cooling Water – Closed Loop
3	3400	LPG Storage/ Flares
	3990	Natural Gas and Fuel Gas system and distribution
	3610/3620	Gas Turbine n.1/ HRSG n.1
	3510	Main Air Compressor
4	3750	Process/steam Condensate Polishing
	3300	Steam and Condensate
	3500	Air Separation Unit
	3610/3620	Gas Turbine n.2/ HRSG n.2
	3630	Steam Turbine generator
	4210/4220	Ammonia Storage Tank & Boil-off Unit
5	1100	Reforming and pre-treatment
	1200	CO shift
	1300	Syngas Purification (CO_2 recovery and Nitrogen Wash Unit (NWU)
	2500	Ammonia Synthesis
	2600	Urea Train 1
	2610	Urea Melt Train 1 (including CO_2 compressor train)
	2620	Urea Granulation Train 1
	2630	Common item for both Urea Melt Trains
	2700	Urea Train 2
	2710	Urea Melt Train 2 (including CO_2 compressor train)
	2720	Urea Granulation Train 2
	2730	Common item for both Urea Granulation Trains
6	4100	Urea Handling (conveyor, storages export facilities)

The commissioning and start-up phase of the plant consists of a sequential start-up of the different functional units of the plant.

At the initial start-up, an external source of DMW will be needed for the first filling of the DMW tank and emergency cooling unit. The liquid nitrogen and liquid ammonia will be also externally sourced for commissioning and the initial start-up phase. Urea as granulation seed will also be sourced externally for commissioning of the first urea plant.

Temporary diesel generators (3 x 100 kVA) will be utilised for performing the various electrical pre-commissioning tests in different substations. For commissioning the uninterruptible power supply (UPS) in the control room, two temporary generators (500 kVA each) will be used until the emergency diesel generators (EDG) come into service. The use of temporary diesel generators is expected to last less than 100 days and will end once the first Gas Turbine Generator (GTG) is commissioned.

Once the power block (two GTGs and a steam turbine) is fully operative and all utilities are lined up, the start-up of the ammonia plant will proceed. The ammonia cracking unit will be operated only during initial start-up or in case of restart after long-term shutdown. The furnace of the ammonia cracker unit (package essentially made up of small duty fired heaters fed by natural gas) and fired heater will be operated simultaneously for a maximum period of 24 hrs. The emissions generated by the ammonia cracking unit are expected to be low when compared with the process fired heater; the vendor indicates that the emission levels for NO_X and SO_X to be ~0.15 g/s and ~0.002 g/s respectively.

As soon as the ammonia unit reaches its stable conditions, the urea melt, and urea granulation plants (first train) will be put into operation too. The start-up of the second urea melt and granulation train will follow the alignment of the first. The start-up sequence is illustrated in Figure 7. The alkali boil-out and refractory dry out referenced below are performed with permanent equipment just before startup. For boil out, Tri-sodium Phosphate (TSP), Oxygen scavenger and ammonia will be used. No fumes are generated through this process.

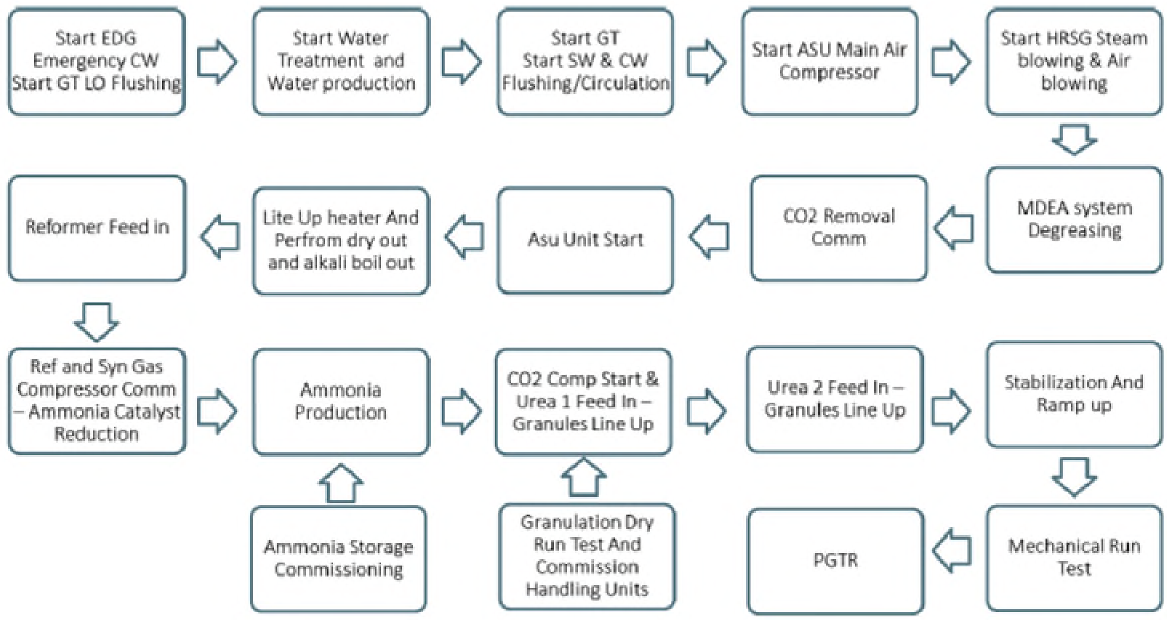

Figure 7: Start-up sequence diagram

7.2.3.2 Wastewater management commissioning

Seawater consumption and brine disposal will increase as the plant units commence operation in a proportionate relationship, noting that losses will be experienced with cooling duties (evaporation).

7.2.3.2.1 Sewage treatment package commissioning

After assembly / installing the STP components on site, commissioning will involve anticipated steps outlined in Table 4.

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Table 4: STP commissioning stages

Stage	Timeframe	Detail
Commissioning and operator training	3~5 days	Testing the programmable logic controller (PLC) and motors and verify the plant is ready for wet commissioning. Influent is then introduced into the plant. Operator training will also be provided.
Stabilisation	~12 weeks if using raw sewage only	The bioreactor tank is seeded with microbiology (sewage material). The type of seed used will impact the duration of the stabilisation period. During the stabilisation period, the microbiology in the bioreactor is grown until the suspended solids and other levels such as Total Kjeldahl Nitrogen (TKN), pH and dissolved oxygen (DO) are stable/sufficient. This is verified by laboratory tests of water samples taken from the influent sewage, bioreactor tank and treated effluent.
Commissioning validation	~6 weeks	Commissioning validation is to be approximately six weeks (and achieving 100 % capacity). Samples will be collected from both the sewage influent and treated effluent discharged from the plant for analysis.

7.2.3.2.2 Oily Water Separation Unit

The oily water separation unit will have minimal moving parts. The infrastructure will be tested to ensure it does not leak. Performance of the oily water separation unit will be tested through sampling of treated water and visual inspection.

7.2.3.2.3 Cooling Water

Leak testing of the basin will be performed as part of the commissioning process. Commissioning of the cooling towers will also involve adjusting fan blade pitching and fan testing prior to slowly adding water to the rated levels through valve adjustments to ensure stability of operation, which will then be followed by system checks.

7.2.3.2.4 Desalination and demineralised water units commissioning

Hydrotesting and performance testing of the units will be completed prior to arrival on site to meet the required specifications. The functional tests of the desalination and demineralised system will be performed with in-line instruments. Brine generated during commissioning will be transferred to MUBRL (blowdown) once identified target characterisation criteria have been achieved.

The system will operate under full automation with minimal manual intervention with all sequences controlled by a PLC.

7.2.3.3 Inputs

The inputs and outputs used in the start-up and execution will essentially be that used during normal operations with some refinement for optimisation. As stated previously, the main raw materials for the entire complex are natural gas and seawater.

7.2.3.3.1 Urea Production inputs

The inputs to produce urea have been described in Section 5 with natural gas used for power generation and ammonia production within the natural gas specification provided by Woodside. Diesel used in the temporary and emergency diesel generators (to be used until the GTG are commissioned) will meet the relevant Australian Standards.

7.2.3.3.2 Chemicals used

During start-up and operation, the chemicals and reagents listed in Table 5 will mainly be used to support the urea production process (as outlined in the works approval W6875 application documents). Where applicable, chemicals will be managed in accordance with *Dangerous Goods*

Safety (Major Hazard Facilities) Regulations 2007 (with the chemical manufacturing plant being a Major Hazard Facility). The management of wastes is detailed in Section 8.

Table 5: Chemicals used within urea production process.

Chemical	Where used	For what purpose
Sulphuric acid	Water management system	Water quality (pH control)
Chlorine dioxide (ClO_2) precursor	Water management system	Water quality (Microbiological fouling control) control to protect infrastructure
Caustic soda	Water management system	Water quality (pH control) control to protect infrastructure
Corrosion inhibitor	Water management system	Water quality control to protect infrastructure (Closed cooling water system)
Non-oxidising biocide	Water management system	Water quality control (Microbiological fouling control) to protect infrastructure
Anti-scalant	Water management system	Water quality control to protect infrastructure (cooling tower)
Biocide	Water management system	Water quality control to protect infrastructure (cooling tower)
Anti-scalant	For Desal Plant	Water quality control to protect infrastructure
Dechlorination agent (Sodium meta bi sulphite / sodium bi sulphite)	Water management system / Treated Effluent discharge system	For maintaining residual chlorine levels in water/ treated water
Acid membrane cleaner	Water management system	For membrane cleaning in Desal/ Demin Plant
Caustic membrane cleaner	Water management system	For membrane cleaning in Desal/ Demin Plant
Preservation chemical for membranes	Water management system	For membrane preservation during Desal/ Demin Plant shutdown
Oxygen scavenger	Boiler Feed Water (BFW) System	To maintain dissolved oxygen levels in BFW (addition protection to Deaerator)
TSP (Tri sodium phosphate)	Steam Drums of Ammonia Plant and power block	To limit corrosion, deposits & carryover effects in steam generating equipment.
Disinfection agent	For Sewage Treatment Plant (STP)	To maintain residual chlorine levels in treated sewage effluent (ensures microbiological control)
Coagulant	For STP	Flocculation of suspended particles in sewage treatment process
Additive (Proprietary STP vendor chemical)	In STP	artificial seeding additive for sewage treatment package commissioning phase
Refrigerant R134A	In Air Separation Unit (ASU)	Refrigeration fluid in ASU
DMDS (Di methyl di sulfide)	Ammonia plant	Injected into Feed NG to maintain minimum 1 ppmv of sulphur for the sulphidation of Hydrogenator reactor R-201 catalyst and to prevent deactivation in case of low sulphur content in the feed.
Potassium carbonate	Ammonia plant	CO_2 removal section flushing during Commissioning
Soda ash	Ammonia plant	Degreasing / Flushing of Boiler package during Commissioning
Liquid nitrogen	Ammonia plant (NWU unit)	Nitrogen make-up in synthesis gas
OASE solution	Ammonia plant (CO_2 removal section) MDEA	Removal of CO_2 from progress gas
OASE solution enriched	Ammonia plant (CO_2 removal section)	Enhance the performance of MDEA solution for removal of CO_2 from progress gas
Antifoam	Ammonia plant (CO_2 removal section)	Reduction of foaming tendency in OASE solution when appears in CO_2 removal section
Wetting agent	Ammonia plant	Degreasing / Flushing of Boiler package during Commissioning

Chemical	Where used	For what purpose
Ammonia and carbon dioxide	Urea plant	Urea production
UF 80 (Urea Formaldehyde)	Urea plant	Optimisation of urea granule production
Nitric Acid	Granulation	Ammonia Scrubbing agent
Ammonium nitrate	Granulation	Product of waste gas scrubbing
Granulated urea	Granulation (Start-up Bin First Filling)	Seed material for Granulation
Diesel	Diesel generators	Fuel for temporary and emergency diesel generators, fire water pumps
Lube oils and greases	Equipment with movable parts	Plant maintenance

7.2.3.3.3 **Water Supplies**

The seawater provided by the Water Corporation seawater supply pipeline will have the typical characteristics detailed in

Table 6. Seawater will be filtered and mainly used as cooling medium. A portion of the filtered seawater is also used to produce desalinated and demineralised water used in manufacturing processes. Potable water will be imported from the Water Corporation network.

Table 6: Anticipated seawater supply characteristics

Parameters	Unit	Value
Temperature	°C	20 – 35 (28 mean)
pH	-	7.7 – 8.4
Conductivity range	µS/cm	49,000 – 59,000
TDS (design)	mg/l	39,600
Barium	mg/l	0.007
Calcium	mg/l	380
Chloride as Cl	mg/l	21,000
Copper	mg/l	< 0.005
Iron	mg/l	0.1
Magnesium	mg/l	1,400
Potassium	mg/l	400
Sodium	mg/l	13,000
Strontium	mg/l	9.4
Sulphate as SO_4	mg/l	3,000
Total Alkalinity as $CaCO_3$	mg/l	120
TSS	mg/l	5 – 7 [1]

Note 1: TSS size <3 mm. Plant design has considered TSS value is 20 mg/l.

The water and effluent pathways are depicted in Figure 8 schematic diagram.

Sea water will be used for plant cooling purposes with an evaporative cooling tower and recirculation of conditioned water. The cooling tower is sized to receive the total circulation design flowrate of about 67,215 m^3/h required by the process and auxiliary units. Water cooled in the tower is collected in a concrete basin located below the cooling tower itself and recirculated.

To cover water losses due to evaporation, drifting and blow-down, the sea water cooling tower basin is equipped with level measurement and control for adjusting the inlet Sea Water make-up flow rate (anticipated to be up to 3,000 m^3/h). In maximising water reuse (and reducing effluent discharge), the cooling tower basin may also receive water from water condensate (from the ASU package), blowdown from blowdown pit pumps, waste heat blowdown from the ammonia unit, and clean water from the clean stormwater ponds (after analysis).

The volumes for make-up seawater used and brine returned to MUBRL during the commissioning period is presented below in Table 7.

Table 7: Make-up seawater volumes and MUBRL discharge volumes during the commissioning period

Service	Make-up seawater (m^3)	Brine to MUBRL (m^3)
Month 1	13,860	0
Month 2	111,348	89,706
Month 3	104,234	53,680
Month 4	142,406	53,480
Month 5	119,120	53,480
Month 6	391,422	186,258
Month 7	658,010	305,480
Month 8	1,188,920	557,280
Month 9	1,188,920	557,280
Month 10	2,315,520	1,622,880
Month 11	2,315,520	1,622,880
Month 12	2,315,520	1,622,880

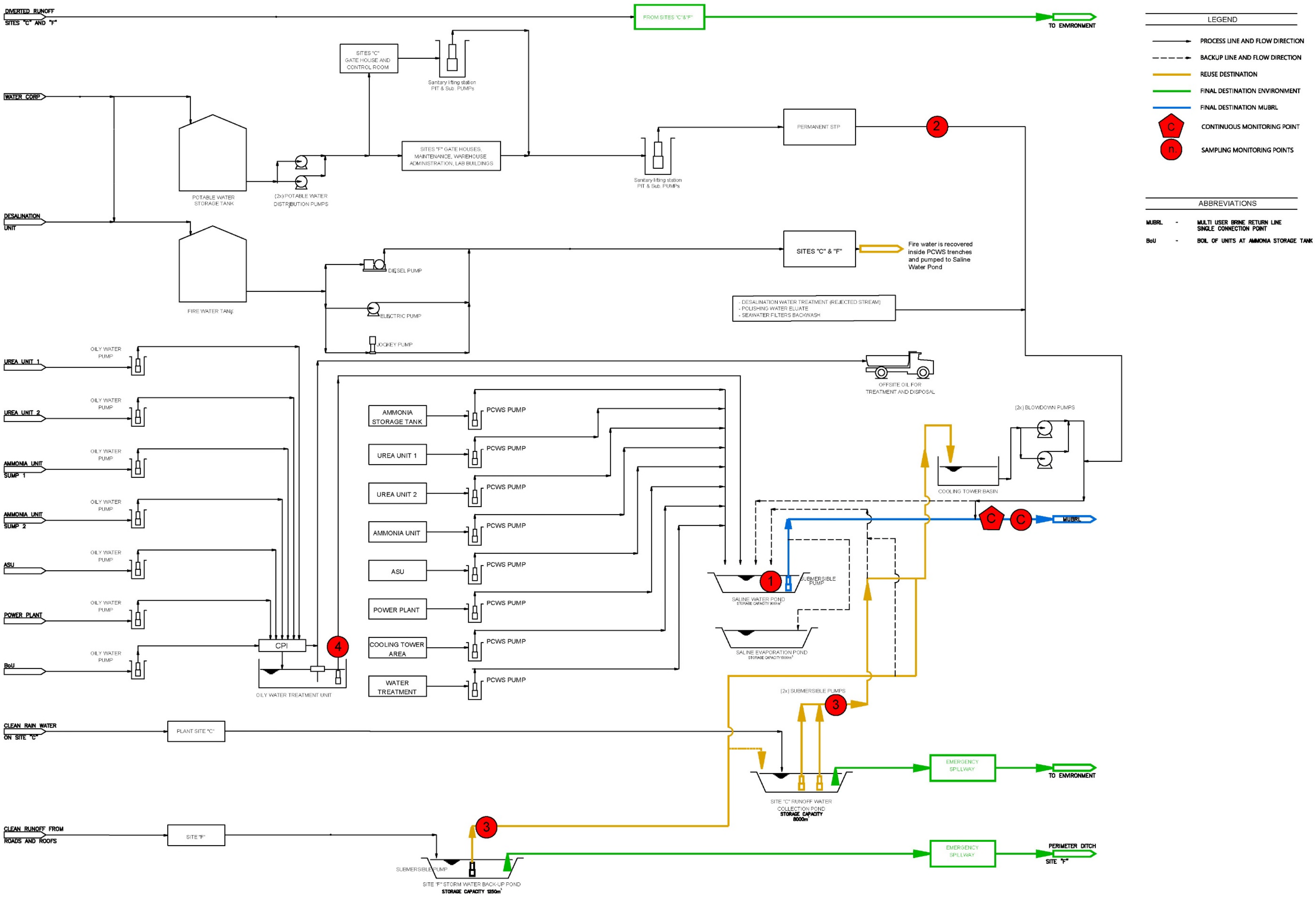

Figure 8: Water and effluent schematic diagram

A continuous blowdown is taken from the cooling tower basin to keep the concentration of dissolved salts in the circulating water at the desired level (roughly 1.4 cycles of concentration are anticipated) and to dilute the other saline effluents to match the required acceptance criteria at MUBRL at the tie-in point. The cooling tower make-up water will mainly be from filtered seawater.

Permeate generated from the seawater reverse osmosis unit (SWRO) will be used for plant uses and fire water supply. Indicative permeate quality provided in Table 8 and Table 9 are for description information only.

Table 8: Indicative expected water quality of desalinated permeate

Parameters	Unit	Value
Temperature	°C	20 – 35
pH	-	6.5 – 8.5
TSS	mg/l	nil
TDS	mg/l	< 500
Chloride as Cl	mg/l	< 250

As needed, the remaining part of SWRO permeate is fed to the brackish water reverse osmosis (BWRO) unit and BWRO permeate is fed in turn to the electro de-ionisation (EDI) unit in the demineralisation section to produce demineralised water.

Rejects from BWRO and EDI concentrates are recycled within the desalination and demineralisation package. Demineralised water from the EDI is sent to and collected in the demineralised water tank for plant uses.

Table 9: Indicative demineralised water parameters

Parameters	Unit	Value
Temperature	°C	20 – 35
Total Hardness as $CaCO_3$	ppm wt	Not detectable
$Na^+ + K^+$	ppm wt	0.01
Chloride as Cl^-	ppm wt	0.1 max
Silica	ppm wt	0.02
Total Iron	ppm wt	0.01
Total Copper	ppm wt	0.003
Sulphate as SO_4	ppm wt	0.02 max
pH @ 25°C	-	6.0 – 8.0
Conductivity	µS/cm	< 0.08
Mineral	ppm	< 0.01
Total Organic Carbon (TOC)	mg/l	< 0.1

7.2.3.4 Expected Emissions during Commissioning and Start-up (outputs)

7.2.3.4.1 **Air Emissions during operations**

During steady state operation, the principal air emissions are expected to be below the design values for the emission points (Table 10). Internal emission targets have been established to initiate management activities to avoid breaching design limits. An air quality impact assessment (Air Quality Study – See Attachment 8A in Works Approval amendment Application submission) for the project has been completed (based on final design) to verify that the worst-case emissions, do not exceed design limits or air quality standards, are not significant in the receiving airshed, and do not impact identified receptors. The management of air quality impacts will be managed through the MS1180-required Air Quality Management Plan (AQMP).

Table 10: Point Source emission design criteria with expected steady state operational emissions, and internal triggers to manage compliance risk. Emissions based on 60-minute averaging period

Equipment ID Tag	Emission source	Emission	average expected normal (g/s)	Design limit (g/s)	Proposed internal trigger (target) (g/s)
1100-H-201 & 1100-H-202	**Fired Process Heater & Fired Steam Super Heater Stack**	**CO**	To be verified	2.730	2.600 [1]
		NOx	To be verified	6.680	6.350 [1]
		SO_2	To be verified	0.048	0.046 [1]
		PM_{10}	To be verified	0.130	0.124 [1]
2620-X-208 (and 2720-X-208)	**Each granulation vent stack**	**Urea dust**	4.060	5.070 [2]	4.2630
		NH_3	3.670	4.060 [2]	3.8535
3610-TG-001-A (and 3610-TG-001-B)	**HRSG stack of each GTG**	**CO**	1.1550	1.4700	1.2128
		NOx	2.3560	2.4900	2.4738
		SO_2	0.0534	0.0575	0.0561
		PM_{10}	0.1920	0.2100	0.2016
		NH_3	0.3851	0.6000	0.4044

Note 1: Internal trigger is based on 95% of the design criteria in the absence of expected 'normal' / steady state emissions from the Vendor.

Note 2: The design was improved since the MS1180 and W6875 approvals were obtained, reducing the emission levels from 5.43 g/s for urea dust and 4.26 g/s for ammonia.

During upset conditions (e.g. start-up, planned and emergency shutdowns), the Project Ceres flare system is designed to ensure safe disposal of various process streams to atmosphere. No flaring is required during normal operations. The following flares are used during upset (abnormal operating) conditions:

- Syngas flare, located in a dedicated flare area, for the disposal of fluids (gases) containing mainly natural gas, syngas, carbon dioxide and water vapour mainly coming from the syngas block and power block. No ammonia is directed to the syngas flare.
- Ammonia Flare, located in a common derrick structure with syngas flare, for the disposal of ammonia vapours (to be segregated by other released stream potentially contaminated with CO_2 to minimise the risk of carbamate formation) coming from the ammonia synthesis loop and the ammonia refrigeration circuit. Cold relieves from the NWU will also be managed by the Ammonia Flare System.
- Ammonia storage tank flare, located in the ammonia storage area, is dedicated to ammonia release treatment from ammonia storage tank and relevant boil off gas (BOG).
- Primary urea flares (located inside urea trains area; one for each train), where the medium pressure section vent and the vacuum vent are routed in case of granulator shutdown. Emissions will include ammonia, methane, inert gases, carbon monoxide and water vapour.
- Secondary urea flares (located inside urea trains area; one for each train), for the disposal of process vent including those from various tanks as well as pure ammonia streams from safety valves in urea melt unit. Emissions will include ammonia, methane, inert gases, carbon dioxide and water vapour.

The flaring system does not cause emissions of significance during normal operations. The ammonia and urea manufacturing process are a closed system.

Flaring events during operation are expected to be infrequent and generally short-term and are a result of emergency release required for the safe operation of the plant. Consequently, it is not proposed to verify flare emissions as during commissioning.

A Flaring Air Quality Study (0000-ZA-E-85966 – see Works Approval W6875/2023/1 amendment application Attachment 8B) has been completed in addition to an updated air quality study completed by Ramboll Australia (air quality consultant) (provided as Attachment 8A in works approval amendment application), to assess potential impacts to air quality.

The seven single release scenarios deemed most critical by DWER during the works approval assessment, along with five credible additional simultaneous flaring scenarios, were analysed in the assessment. Table 6 and 7 of the Flaring Air Quality Study report provides the stream composition of air emissions for the modelled flaring scenarios.

The study concluded that all flaring scenarios analysed comply with Emergency Response Planning Guideline level 2 (ERPG-2) set for nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO) and with the air quality criteria level (24-hour average) for PM_{10}. ERPG-2 is the maximum airborne concentration level below which nearly all the individuals could be exposed for up to an hour, without experiencing or developing irreversible or other serious health effects or symptoms, which could impair an individual's ability to take preventative action. ERPG-2 is widely regarded as a critical tool for safeguarding public health and enhancing the safety of industrial operations and provides a benchmark for evaluating the potential health impacts of airborne chemical releases.

Emergency shutdown systems will also be tested during commissioning. All flares will be equipped with instrumentation for measuring the quantity of gas flow (kg/hr). Flaring through the ammonia plant will be limited to the threshold value of 60% plant load during start-up phase.

7.2.3.4.2 Start-up and commissioning air emissions

Overall air emissions generated during the commissioning and start-up phase are expected to rise gradually up to the emission level associated with the normal operation of the plant. Nonetheless, it is possible that individual emission sources may temporarily have a higher emission level, until its operation is stabilised and optimised, and until the foreseen abatement systems are fully online.

During the commissioning phases of ammonia and urea units, process gas will be routed to the project flare system, to completely combust them. It is therefore expected that project flares may be operated for a limited period during these phases, with emission of pollutants typically related to combustion (e.g. oxides of sulphur (SO_X), oxides of nitrogen (NO_X), CO and CO_2).

Temporary venting of steam and/or process gas flaring is expected during startup. For first start-up of ammonia, it will take three weeks of flaring at reduced load (30-60%) for catalyst reduction and commissioning of compressors.

Key pollutant emissions during commissioning are detailed in the following sections.

Oxides of Nitrogen

Emissions of NO_x result from the combustion of hydrocarbons, especially at high temperatures. Commissioning activities, including tuning, will help to keep NO_X emissions to a minimum during future normal operations.

NO_X emissions from combustion sources are expected to be generated mainly during the first phases of commissioning up to when the first GTG will be commissioned and operated, when electrical power will be provided by temporary or emergency diesel generators (EDGs). During this phase, NO_X emissions are expected to reach an overall level of about 30 g/s (estimated value based on the emission factors defined by the U.S. EPA for stationary sources and assuming EDG to generate an overall power of 8 MW). Maximum expected duration of EDG operation will be 3 months during first start-up.

Emissions are expected to decrease after this temporary phase, as soon as the first GTG is put into operation and the EDG diesel engines are switched off. However, it should be noted that GTGs may have a slightly higher NO_X emissions than what is potentially achievable during the normal operation during the initial commissioning phase, and until urea production nameplate capacity is approached. This is because achieving optimal operating conditions requires fine-tuning of the turbine and that it is not possible to rely on the reduction system (SCR) during this phase. The SCR will not be online until the stabilised operation of the Power block is achieved. Maximum expected duration of GTG operation without HRSG/SCR will be 6 months during first start-up.

It should also be noted that when temporary excess of liquid ammonia is sent to the ammonia storage tank (when the urea unit is not able to receive ammonia produced from the ammonia plant), before the urea plants line up, the emission level of NO_X in the ammonia process fired heater flue gas may reach about 7 g/s (against the normal expected value of 6.68 g/s). This slight increase in NOx emissions is due to the off gas generated from refrigeration loop (C-501 off gas scrubber outlet), which can contain traces of ammonia. This off gas is used as fuel into process fired heaters.

Finally, as anticipated, the use of plant flares during the start-up phase of the ammonia unit and urea production units, may include temporary emission of NOx, as result of combustion.

Sulphur Dioxide

SO_2 emissions are always expected to be very low in relation to the low sulphur content present in the fuels used.

During the initial commissioning phase, when electrical needs of the project will be covered by EDGs, sulphur emissions are expected to be insignificant as well as far lower than the emission expected during normal operation of the project (due to the maximum sulphur content in diesel fuel of 10 ppm, according to Australian fuel standard specification).

After this initial phase, SO_2 emissions will be related to natural gas combustion at ammonia process heaters and GTGs and will be directly related to the sulphur content in the fuel gas consumed. Since gas consumption in the commissioning phase is expected to be at similar levels to steady state operations, similar SO_2 emissions will be emitted during commissioning.

It should be noted that SO_2 emissions from the combustion of natural gas, as previously discussed for diesel, are controlled in Western Australia as natural gas is regulated to contain low levels of sulfur (Kwinana Industries Council, 2015).

The use of plant flares during the start-up phase of the ammonia/urea could temporarily emit SO_2 because of combustion and to the extent of the natural gas consumed.

Particulate Matter

Particulate emissions result from the carryover of non-combustible trace compounds in the fuel as well as from incomplete combustion.

During the commissioning phase, aqueous scrubbing at the urea granulation unit is expected to be in normal operation most of the time, therefore PM emissions from urea granulation (urea dust) are not expected to be higher than those considered during normal operation.

Carbon Monoxide

CO emissions generally result from incomplete combustion. Expected CO emissions during commissioning are extremely low (and generally not higher than those expected during normal plant operation). During the commissioning phase, excess oxygen will be much higher than normal and therefore CO emissions are not expected.

Ammonia

During commissioning and start-up activities, ammonia emissions are expected to be essentially related to the operation of the granulation units. During the commissioning and start-up phase of the granulation unit, ammonia emission at granulation stacks could reach levels of about 20 g/s until the acid scrubbing system will be online and normally operated (i.e., once granulation operation is stable). This transitory phase is expected to last a few days (approximately 1 week for each train).

7.2.3.5 Effluent Discharges

Wastewater will be discharged to King Bay via the MUBRL pipeline operated by Water Corporation under MS594. The following effluent streams will be discharged to the MUBRL pipeline tie-in:

- Cooling tower blowdown
- Treated wastewater from the final observation basin
- SWRO reject (brine)
- Collection pit effluents
- Brine from saline water pond
- Treated water from sewage treatment package

During commissioning and TLO (operations), Project Ceres shall only discharge effluent to the MUBRL in compliance with Water Corporation acceptance criteria. During commissioning, these volumes will not exceed the value foreseen during normal operation at nominal production capacity with the staged commissioning to start-up and operation resulting in a gradual increase in water use and wastewater generation (Table 7). Effluents to MUBRL will be discharged according to contractual quantities.

The discharge to the marine environment via the MUBRL is regulated through MS594. The MUBRL discharge criteria) are presented in Table 15. Effluents from the seawater treatment system, neutralised effluents from the condensate polishing system, and cooling tower blowdown are discharged to MUBRL via the final observation basin. The final observation basin will monitor the above-mentioned effluents to manage compliance of criteria. Interlock systems connected with online analysers will be installed to continuously monitor the stream sent to MUBRL for conductivity, pH, turbidity and ORP to avoid breach of limits.

The effluent streams from Project Ceres are summarised in Table 11 for normal operations. The volumes are expected to be at or below the range during commissioning while steady state optimisation is established.

Table 11: Effluent sources and disposal

Effluent Steam	Stream description	Frequency	Estimated flowrate / volume
Cooling water blowdown	It represents the greatest contribution to the overall stream. Conditioning of recirculated water will include intermittent dosing of anti-scalants, and biocide to condition water. It is essentially seawater with increased TDS (with 1.4 times higher salinity than the original inlet seawater salinity). Approximately 3.5 % of the circulating volume (as part of cooling water tower duty) will be continuously discharged to MUBRL as blowdown.	Continuous, directly to MUBRL	2218 m^3/hr
Desalination water treatment (reject stream)	The desalination plant concentrate (brine) is typically 80-87,000 mg/l TDS, when the RO system operates effectively.	Continuous, directly to MUBRL	75 m^3/hr
Polishing neutralised effluent and ultrafiltration concentrates	Polishing neutralised effluent and ultrafiltration concentrates are collected in the final observation Basin and then disposed to MUBRL. Polishing neutralized effluent is essentially water with less than 13,000 mg/l TDS (mostly sodium sulphate). Ultrafiltration concentrates is essentially sea water with TSS removed from feed sea water and small amounts of cleaning chemicals salts (sodium sulphate).	Intermittent (directly to MUBRL)	35 m^3/hr
Filter backwashing	Directed to MUBRL	Intermittent	300 m^3/hr (average)
Black and grey water after STP	Black and grey water will be pre-treated in a dedicated treatment package to meet the bacterial	Continuous, directly to	24 m^3/day (40 m^3/day at peak

Effluent Steam	Stream description	Frequency	Estimated flowrate / volume
treatment	count target (E. coli and Thermotolerant coliforms).	MUBRL	
Contaminated stormwater	First-flush stormwater from hardstand process areas that could be contaminated will be captured and directed to the saline water pond.	Intermittent (via saline pond to MUBRL)	110 m^3/hr (2,750 m^3 total first-flush event)
	Potentially contaminated hydrocarbon water will be treated through an oily water interceptor package to ensure the hydrocarbon content is < 5 ppm (2m g/l) prior to discharge to saline water pond. Recovered oils will be collected and disposed of through an authorised controlled waste carrier.	Intermittent (via saline pond to MUBRL)	55 m^3/hr (110 m^3 is the working capacity of the treatment water pit)
	Incidental runoff from chemical sumps / pits within urea Units. These will be directed to saline water pond.	Intermittent to saline pond when pits and sumps are full (level indicator alarm)	16.5 m^3/hr
Wastewater outside MUBRL discharge criteria	Wastewater in the saline water pond not suitable for discharge to MUBRL will be evaporated in the 5,000 m^3 capacity saline evaporation pond.	Intermittent, as a contingency	-

The effluent streams, as identified in Table 11, will be stored in the lined 9,000 m^3 capacity saline water pond prior to disposal to the MUBRL with a combination of online (in-stream) instrumentation and composite sample testing to verify compliance. An interlock system will prevent nonconforming effluent (detected through instream monitoring) being discharged to MUBRL and will divert the effluent to the saline pond.

Wastewater from the saline water pond not meeting the discharge criteria, will be directed to the lined 5,000 m^3 saline evaporation pond, which is located next to the saline water pond. The saline water pond freeboard will be managed by high-level alarms to prevent overtopping. The saline water pond and saline evaporation pond will be operated with a 500 mm freeboard during normal operating conditions.

It is expected that under operating conditions, approximately 58.9 ML wastewater will be discharged to MUBRL daily (excluding intermittent releases from filter backwashing).

Uncontaminated stormwater collected in stormwater ponds will be reused on site or will be discharged to the King Bay supratidal flats via dedicated spillways during overtopping events (which will be subject to discharge monitoring in accordance with MS1180 requirements).

MS594 has discharge criteria that will be applied to the MUBRL discharges to ensure compliance of the Water Corporation approval.

Wastewaters collected from potentially hydrocarbon contaminated sources will be directed to a hydrocarbon separator unit prior to discharge into the saline water pond and ultimately discharged to MUBRL.

7.2.3.5.1 **Sewage Treatment Package**

Domestic wastewater and sewage generated on the premises will be treated by a discrete sewage treatment package (STP) located at Site F, collected (piped/pumped) from both Site C and Site F. The average feed to the plant is expected to be 24 m^3/day (40 m^3/day peak) based on an average of 120 people onsite per day (with a peak of 200 people). Treated wastewater is discharged via the MUBRL while sludge will be disposed of off-site via truck (controlled waste operator). The STP will operate fully automated with minimal manual intervention required (PLC controlled).

A disinfection agent dosing skid will be provided to avoid biological growth in the treated water tank. The treated water will be sampled and analysed, prior discharge at MUBRL, to ensure compliance with discharge limits (especially coliforms/bacteria count). Treated water out of spec will be pumped back to sewage balance tank. Treated effluent will be sent to MUBRL by means of transfer pumps. Sewage treatment package design shall avoid the spread of unpleasant odours.

Table 12: The STP is designed to achieve the following standards prior to discharge to MUBRL:

Parameter	Treatment value
pH	5.5 – 8.5
5-day Biochemical Oxygen Demand (BOD)	< 20 mg/L
Chemical Oxygen Demand (COD)	< 125 mg/L
Total Suspended Solids (TSS)	< 30 mg/L
Total Nitrogen (TN)	< 40 mg/L
Residual free chlorine	< 0.1 mg/L
E. coli	< 13,000 MPN/100 mL
Thermotolerant coliforms	< 910 CFU/100 mL

7.2.3.5.2 Contaminated Oily Water Package

The contaminated oily water treatment package will treat effluents from potential oil spills from main compressors and pumps, to remove or reduce the concentration of hydrocarbons. The package will receive effluents from different oily water sumps located in the ammonia production block, urea and granulation block, utility block (ASU, power block and EDG) and ammonia storage by means of dedicated pumps. The treated water is routed to the treated water pit prior to being pumped to the saline pond. Any possible accidental oil spills will be within contained areas, removed by portable vacuum pump and directly disposed offsite by a controlled waste carrier. The oily water separator will be a corrugated plates separator type with a floating oil skimmer to maximise total recoverable hydrocarbons (TRH) reduction. The oil recovered is stored in a dedicated skimmed oil drum and disposed offsite by a controlled waste carrier.

The package shall operate fully automatically with minimal manual intervention. All sequences shall be controlled by a process control system (PCS) from a centralised control room (CCR). Operators shall be able to control all the functionalities from the CCR. High-level alarms will be installed in the skimmed oil/sludge drum and installed for any sequence malfunctions.

The system is configured for a design inlet flowrate of 25 m^3/hr and reduce the TRH to < 5 ppm weight (wt).

7.2.3.5.3 Desalination and Demineralised Wastes

The desalination and demineralisation (DM) systems will be automated to manage permeate quality, controlled with diversion valves and in-line analysers. Rejects are normally discharged to the existing MUBRL tie-in point at south-eastern corner of Site C) along with the cooling seawater blowdown or to the on-site saline / brine evaporation pond for salts offsite disposal, depending on the salt contents in the brine stream. DM reject is recycled in the DM plant.

The anticipated characteristics of the RO reject stream (brine) from the Desalinisation (desal) Plant presented in Table 13 will be mixed with other wastes streams (e.g. cooling tower blowdown) to achieve the MUBRL limits as per Table 15. During the initial startup phase when the water treatment precedes commissioning of the cooling tower, the saline pond will be used for storing the desal plant reject and subsequently be discharged to MUBRL in a controlled manner.

Table 13: Indicative brine characteristics

Parameters	Units	Desalination rejects
Sodium	mg/l	27,137
Potassium	mg/l	835
Magnesium	mg/l	2,928
Calcium	mg/l	795
Strontium	mg/l	19.7
Barium	mg/l	0.02
Chloride	mg/l	47,354
Sulfate	mg/l	6,778
Carbonate	mg/l	18.8
Bicarbonate	mg/l	317
Silica	mg/l	4.34
CO_2	mg/l	0.65
Total Dissolved Solids	mg/l	84,162
pH	-	8.7

7.2.3.5.4 Cooling Tower Blowdown

The cooling tower will cycle seawater for cooling. Evaporative losses will result in increased concentration of salts and metals, which will periodically require blowdown and topping up with new water. The basis of design assumes approximately 1.4 times increase in concentration of salts in the cooling water released to MUBRL as part of the cooling tower blowdown. Indicatively, the blowdown water quality is present in Table 14. Online analysers are provided to continuously monitor the stream sent to MUBRL for conductivity, pH, ammonia, turbidity & ORP. Based on high conductivity, auto diversion to Saline Pond is provided.

Acceptable discharge temperature will be calculated through measuring the temperature difference between reject stream and seawater makeup stream with an alarm on high differential temperature.

Table 14: Indicative blowdown effluent quality

Parameter	Unit	Value
Temperature	°C	37
pH	-	6.9-8.3
Conductivity	µS/cm	~74,800
TDS	mg/l	~54,000
Copper	mg/l	< 0.007
Barium	mg/l	<0.01
Strontium	mg/l	<13

The seawater cooling blowdown is combined with the desalination plant concentrated saline stream (the second largest contributor to MUBRL after the cooling tower blowdown which makes up ~95% contribution) to produce an overall saline water that is compliant with MUBRL discharge criteria.

The desalination plant concentrate is typically 80-87,000 mg/l TDS for the RO system to operate effectively. Compliance with MUBRL criteria will be achieved by the mixing with blowdown water, the seawater cooling tower circulation blowdown. During initial start-up, the saline pond will be used for storing the desalination plant reject and subsequent controlled discharge.

7.2.3.5.5 MUBRL discharge

The seawater blowdown from cooling towers and concentrated brine (Demineralised Water Plant) provides a continuous discharge stream to the MUBRL (subject to meeting MUBRL discharge criteria, otherwise directed to the saline water pond). Other effluents (including treated hydrocarbon-contaminated waters from the dedicated hydrocarbon separation system) are first received by the

Saline Water Pond prior to intermittent discharge to the MUBRL. A summary of the proposed waste streams discharged from the premises to the MUBRL is presented in Table 11.

The wastewater quality criteria for discharge to MUBRL is presented in Table 15. Interlocks with inline monitoring of critical parameters will be installed to ensure compliance with diversions to the saline water pond when outside the discharge criteria requirements. Discharges to MUBRL are regulated under MS594.

As some of the parameters identified in the discharge criteria require laboratory analysis in lieu of instantaneous measurements, compliance will be demonstrated against rolling monthly averages as presented below to allow for the laboratory analysis and result interpretation.

Table 15: Wastewater discharge to MUBRL criteria

Parameters	Units	Water Corporation Discharge Criteria (emission limits)	Averaging period
Ammonia	µg/l	<1,700	Propose monthly rolling average (aggregated weekly sampling) to verify compliance
Arsenic III	µg/l	<140	
Arsenic V	µg/l	<275	
Cadmium	µg/l	<36	
Chromium III	µg/l	<459	
Chromium IV	µg/l	<8.5	
Cobalt (filtered)	µg/l	<61	
Copper (filtered)	µg/l	<11	
E. coli	MPN/100 ml	<13,000	
Lead (filtered)	µg/l	<134	
Mercury (filtered)	µg/l	<1.4	
Nickel (filtered)	µg/l	<427	
Oxidation-reduction potential (ORP)	mV	<228	
Selenium(filtered)	µg/l	<183	
Silver	µg/l	<49	
Vanadium	µg/l	<3,050	
Zinc	µg/l	<419	
Turbidity	NTU	<63	
pH	pH units	>6.9 and <8.3	Continuous
Conductivity	µS/cm	<75,000 (TDS - 55,000mg/L)	Continuous
Temperature	°C	Not exceeding a maximum of 5 °C above inlet sea temperature	Continuous
		Less than 2 °C above inlet seawater temperature 80 % of the time	Continuous - Averaged for 80 percent of the time
Thermotolerant coliforms	CFU/100mL	<910	Monthly
Free Chlorine	mg/L	<0.1	Monthly

7.2.3.5.6 **Stormwater**

Stormwater collected is reused on site to offset cooling water requirements and dilution of waste streams to comply with discharges to MUBRL as regulated under MS1180.

7.2.3.6 Noise

The design has maximised opportunities to implement noise-reduced equipment. An updated noise study report by Herring Storer Acoustics 2025 (Document reference: 33999-4-23270-02), was developed since W6875 was granted. It considered updated engineering and some updated vendor data. Its development aligns with the W6875 conditions 12 to 14, which required the report to be submitted to the CEO by November 2025. The report was submitted to the CEO on 7 May 2025.

In summary, the modelled noise levels at sensitive receivers show full compliance with regulatory limits during normal operation of the project and in the worst-case night-time conditions. Noise in residential premises in Dampier (the nearest highly noise sensitive premises) is rated at less than 20 dB(A), significantly below the assigned criteria.

With reference to the nearest industrial receptor, the Yara Pilbara Fertilisers industrial plant operational boundary has been considered, and the calculated noise level is assessed to be approximately 63.1dB(A), which is below the Noise Regulations 65 dBA assigned level.

7.2.4 Phase 4 - Performance Testing

After the completion of plant start-up activities and once the steady operating conditions have been reached, "performance test" will be carried out in accordance with the applicable contractual terms and conditions, to verify that:

- the throughput and quality of the facilities, and related systems, corresponds to the design requirements; and
- the facilities can be safely and satisfactorily operated in all design conditions.

The objective of the performance guarantee test run (PGTR) is to demonstrate the plant performance guarantees and minimum performance levels (including emission levels) are achieved for 72 consecutive hours at the plant nominal capacity.

The results will be submitted as part of the Environmental Commissioning Report.

7.2.5 Phase 5 – Time limited operations

Perdaman requests a period of up to 240 days of time-limited operations after the completion of commissioning validation, whereby all the functional units associated with the works approval will commence operations while the ECR is being prepared and submitted to support a Licence Application which requires assessment by DWER (which could plausibly take up to 6 months to be determined).

A TLO Report will be submitted to the CEO within 60 days of the being licence granted. The report will include a summary of throughput and operations, a review of performance against established criteria / TLO condition, and where these have not been met, what mitigation measures (including timeframes) are being implemented to rectify the situation.

7.3 Commissioning Emissions Testing / Monitoring

The objective of the testing and monitoring is to verify emission profiles, avoiding and limiting impact to the environment by keeping emissions below the limits and targets specified in Table 10 and Table 15, and implement corrective measures if any deviation is detected.

The sampling locations during the emission verification testing are presented in Figure 3.

7.3.1 Air Monitoring

During commissioning (start-up and subsequent performance testing), air emission testing will be carried out at the plant stacks to verify compliance with Project emission limits for the principal pollutants.

Testing will be carried out by means of Continuous Emission Monitoring System (CEMS) provided at the Ammonia Heater, HRSGs and Granulation Stacks suitable to continuously check emissions from that equipment, or as specified (Table 16).

Table 16: Proposed continuous air quality testing during commissioning and operations

Emission reference locations	Parameters	Units	Averaging period	Measuring principle
Fired Process Heater & Fired Steam Superheater Common Stack (See Figure 3)	Volumetric flow rate	m/s	Hourly	Ultrasonic flowmeter – ultrasonic transit time difference technique
	NOx measured as NO_2	g/s	Hourly	Nondispersive infrared (NDIR)
	Suspended particulate matter (SPM)	g/s		SPM analyser – light scattering
	O_2			O_2 analyser – zirconia (in situ) type
	CO	g/s		NDIR
Urea Train 1 Granulator stack and Urea Train 2 Granulator Stack (See Figure 3)	Volumetric flow rate	m/s	Hourly	Ultrasonic light meter
	Dust (PM_{10})	g/s		Light scattering measuring technique
	NH_3	g/s		Tuneable diode laser
HRSG stack of GTG 1 and HRSG stack of GTG 2 (See Figure 3)	Flow measurement	m/s	Hourly	Ultrasonic flowmeter
	NO_X	g/s	Hourly	NDIR two-beam alternating light principle. Extractive type of CEMS with one (1) set of analysers per line; two sets in total with one CEMS computer station
	SO_2	g/s mg/Nm^3		
	NH_3	g/s		
	CO	g/s		

Stack emission monitoring will be supported by an ambient air analyser system consisting of four fixed stations for worker health and safety. The ambient air quality monitoring will be completed in accordance with the MS1180-required Air Quality Management Plan.

7.3.2 Effluent Discharge Monitoring

Project effluents to MUBRL will be measured to verify compliance with Project emission limits through a Continuous monitoring system and through scheduled laboratory testing. The proposed parameter testing during commissioning for internal controls as presented in Table 17 are to manage compliance with regulatory controls after blending.

The effluent continuous monitoring will be carried out through online (in-stream) monitoring devices. Field instrumentation will be calibrated in accordance with manufacturer specifications.

Table 17: Proposed effluent monitoring during operational commissioning.

Monitoring location	Parameters	Units	Monitoring frequency	method
Tie-in to MUBRL (Figure 2)	pH, Conductivity, Oxidation-Reduction Potential (ORP), ammonia-N Turbidity Free chlorine	n/a µS/cm mV µg/L NTU µg/l	Continuous	Online (in-stream) probes / sensors instrumentation
	Temperature	^{o}C		Temperature sensor
	Flowrate	m^3/hr		Probe / flow sensor

Monitoring location	Parameters	Units	Monitoring frequency	method
	Accumulated flow	m^3/hr		Probe / flow sensor
	Temperature pH Conductivity ORP Ammonia Arsenic III Arsenic V Cadmium Chromium III Chromium VI Cobalt Copper Lead Mercury Nickel Selenium Silver Vanadium Zinc E. coli Thermotolerant coliforms Free chlorine [1]	°C n/a µS/cm mV µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l MPN/100mL CFU/100mL µg/L	Weekly at in-house laboratory, with 6 monthly external NATA accredited laboratory analysis.	AS5667.1-1998 and AS5667.10-1998
Saline water pond outlet (Figure 2)	Temperature, pH, conductivity, ORP, Ammonia	°C n/a µS/cm mV µg/L	Prior to scheduled discharge to MUBRL (using in-house laboratory)	Spot / Composite sample from recirculation pump
	pH Conductivity ORP Ammonia Arsenic III Arsenic V Cadmium Chromium III Chromium VI Cobalt Copper Lead Mercury Nickel Selenium Silver Vanadium Zinc E. coli Thermotolerant coliforms Free chlorine [1]	n/a µS/cm mV µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l µg/l MPN/100mL CFU/100mL µg/l		Spot sample at outlet sample point AS5667.1-1998 and AS5667.10-1998
STP (treated effluent tank outlet)	Free chlorine [1] and pH	µg/l n/a	Continuous	In-stream instrumentation
	Biochemical oxygen demand (BOD), chemical oxygen demand (COD),	mg/l mg/l mg/l	Weekly (using in-house laboratory)	Spot sample at outlet sample point AS5667.1-1998 and AS5667.10-1998

Monitoring location	Parameters	Units	Monitoring frequency	method
	Total suspended solids (TSS), Thermotolerant coliforms	CFU/100ml		
Oily water treatment system outlet	Total recoverable hydrocarbons (TRH)	mg/l	Prior to scheduled discharge from oily water treatment unit (using in-house laboratory)	Spot sample from holding tank

Note 1: Free Chlorine is not among parameters included in MUBRL discharge criteria, but it is monitored since existing Ministerial Statement 594 specifies the limit of 0.1 mg/L for oxidising biocide in the effluent discharge.

Collected stormwater on site will be used to supplement seawater in providing cooling, and discharges from site will be rare. Any stormwater pond overflows discharges to the supratidal flats will be managed in accordance with the surface water management plan (MS1180 requirement). This includes sampling of discharging water for specified parameters against Surface Water Management Plan (SWMP) criteria when safe to do so, to verify the discharge is not having an environmental impact.

Ambient groundwater monitoring will be completed in accordance with the MS1180-confirmed SWMP.

The project will notify DWER within seven (7) days after completing verification testing and prepare an Environmental Commissioning Report (ECR).

8 Environmental Control Measures

The commissioning phases are described in Section 7.2.

During the start-up and operational phases, identified emissions and discharges will be released to the environment. Table 18 illustrates the expected environmental aspects and the control measures proposed to manage the environmental risks associated with emissions from the start-up and commissioning process.

Table 18: Proposed Environmental Control Measures

Environmental aspect	Environmental control measures
Air emissions (NO_x, SO_x, NH_3, PM10 and urea dust) from stack and other polluting activities	Air emissions will be managed under the Air Quality Management Plan (AQMP) (PCF-PD-EN-AQMP) as approved by MS 1180. The plan requires monitoring of plant emissions and pollutant deposition rates to protect sensitive receptors. Controls applicable to commissioning and operation include: Selected design technology to minimise emissions (best available technology used). Waste gases from urea production will be treated prior to release to the environment (scrubbing). The ammonia plant is designed so there is no venting during normal operations. Any vented ammonia is directed to the flare for thermal oxidation (combustion). The Urea trains have scrubbing systems to manage potential ammonia and urea emissions. The expended scrubbing solution is a fertiliser by-product that is sold. Flue gases from the GTG are treated via selective catalytic reduction technology and low NO_x burners Elevated stack release points to maximise dispersion (minimise impact) in the airshed

	Implementing emission monitoring systems to ensure emissions remain below approved levels and manage the potential risk to sensitive receptors. The plant operations will be managed through automated plant control systems with alarms, trips and interlocks when processes trigger unsafe / criteria thresholds. Through a human interface device, systems can be optimised with operator oversight to maintain manufacturing within the design range. The system will be automated to trip (cease operation) should any parameter be outside the established criteria.
Noise emissions	Noise emissions produced during the commissioning of the Project will be caused by activities including hydrostatic testing, chemical cleaning flushing etc. High noise levels may occasionally occur during commissioning; however, all efforts will be made to limit where practical all possible emissions to below 85 dB at a 1 m distance from the source. Noise is predicted to comply with the noise regulations at sensitive receptors, including the Yara Pilbara Fertilisers operational industrial boundary to the east of the facility.
Light Emissions	Light emissions will be managed under the Confirmed Light Management Plan (LMP) (PCF-PD-EN-LMP) as approved by MS1180. In order to minimise the light emissions, Contractor will conduct light monitoring at Hearson Cove and Deep Gorge and other sites identified by MAC" during plant commissioning and compare against benchmark.
Solid & Liquid Wastes	Solid and liquid wastes will be managed under the Solid and Liquid Waste Management Plan (SLWMP) (PCF-PD-EN-SLWMP). Cleaning of some of the equipment with water or other liquids will be required, during commissioning. Cleaning water will be routed to the PCWS. No wastewater will be discharged on to, or off site, without written approval of the Environment and Heritage Manager (or their delegate). In-line effluent monitoring with diversion valves to reroute flows to the saline pond, to prevent unacceptable discharges of specified parameters, supplemented by weekly-tested sample at a proposed onsite laboratory. Intermittent releases from the saline water pond will be tested prior to release. Where analysis shows a high level of pollutant concentration exceeding MUBRL discharge limits, brine from the saline water pond will be sent to the saline evaporation pond for evaporation. The sludges / precipitate will be collected from the evaporation pond and disposed of to an authorised waste facility. Black/grey water from permanent staff amenities including toilets, showers, washing and kitchen facilities will be treated via a sewage treatment plant prior to being discharged to the Water Corporation's MUBRL. Sludges will be removed by an authorised controlled waste contractor. Solid wastes from the commissioning activities will be disposed offsite by an appropriately licensed waste contractor, with waste tracking records maintained.
Spills	All hazardous product areas will be bunded and contained in case

	of spillages. Spills will be managed in accordance with spill management procedures (control, containment and cleanup) Bunded areas and containment facilities will be constructed such that no contamination of the soil and natural ground water is possible. Drainage systems for hazardous product will be able to resist the effects of corrosion and other harmful effects it may be exposed to. All drainage systems containing contaminated / hazardous effluent will be leak-proof. All the contaminated oil will be collected in drums and will be disposed of to an acceptable waste processing facility offsite.
Fugitive urea dust	The manufacture and handling of urea presents potential for dust emissions. Controls to manage the risk include: Selection of solid urea in granular form using technology to improve granule strength (hard and durable and therefore generate less dust). Minimisation of the number of transfer operations (conveyor to conveyor) and drop heights. Conveyor chutes are full covered and sealed with entry and exit curtains. Conveyor chutes are designed to capture solids, from the primary and secondary belt scrapers, back into the convey stream. Easy access to conveyor enclosures for inspection and cleaning to remove dust accumulation. Outdoor conveyors are fully enclosed. Dedusting systems will be installed at various transfer towers to collect micro dust. Stockpile is located inside a purpose built shed to provide dust containment during stacking and reclaiming operations. Cone shell stockpiling methods to be used to stack urea to the stockpile resulting in less material degradation and dust generation. Implement housekeeping practices to minimise dust accumulation on mechanical components and parts of equipment on long-term avoiding dust segregation in the operating areas. Housekeeping means also conducting regular inspections and daily cleaning of any spillage around conveyors after completion of handling operations.
Effluent discharge to MUBRL	Probes and instrumentation are in place to monitor water quality of discharge to MUBRL. Where water quality does not meet the specification criteria, the water will be diverted to the lined Saline water pond for further dilution. Effluent proposed to be discharged to MUBRL from this pond that does not meet the discharge criteria will be diverted to the lined saline evaporation basin. The ponds will have high-level flow switches installed with alarms.

For management of all relevant environmental aspects, Perdaman has in place the following environmental management plans.

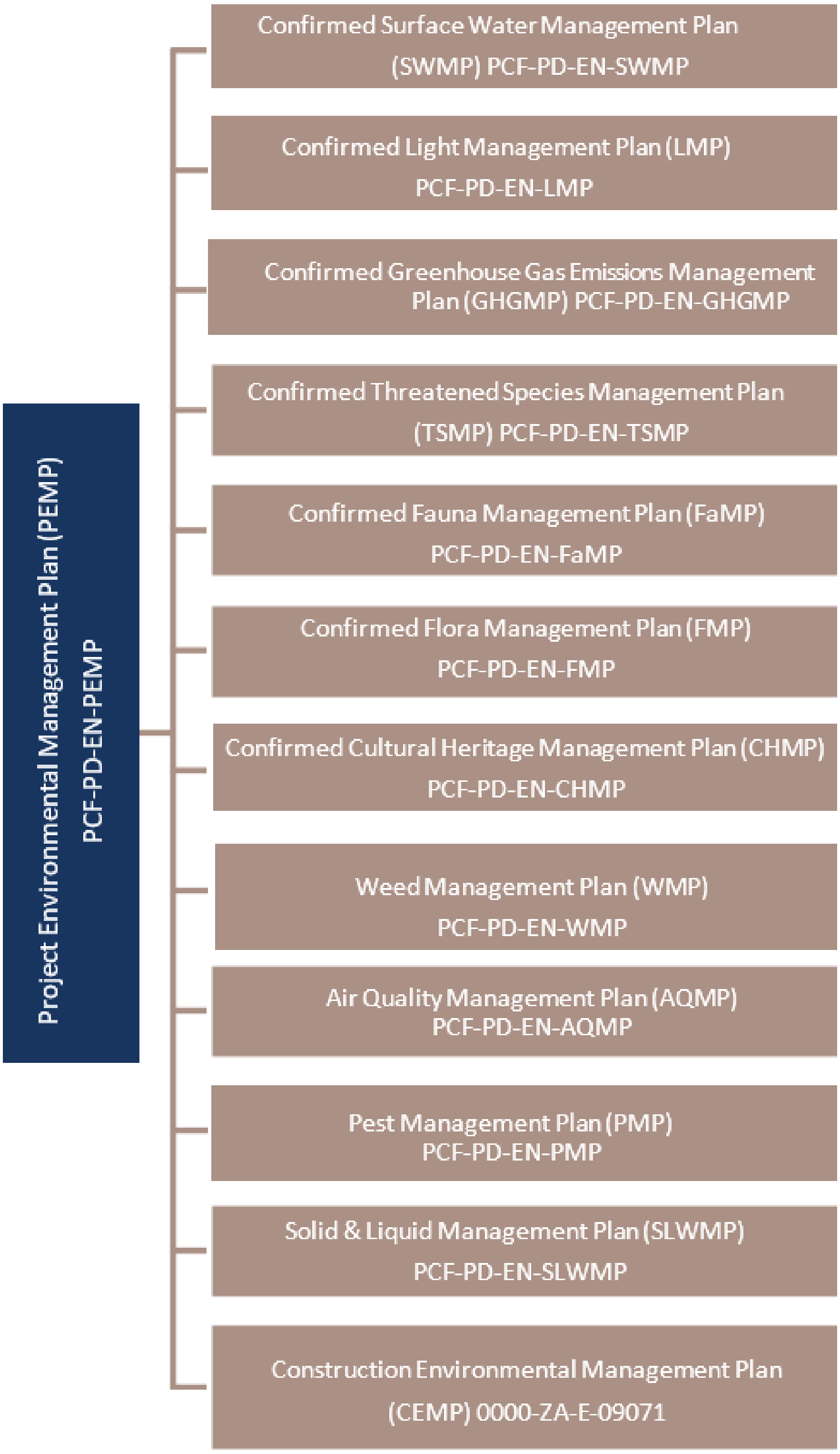

Figure 9: Structure of the Project Environmental Management Plan and supporting management plans

9 Risk Management and Contingency Planning

The controls (including management actions) that will be put into place to address the expected emissions and/or discharges and contingency plans for emissions exceedances or unplanned emissions and/or discharges are provided in this section.

As a DEMIRS-identified major hazard facility, a safety report and associated stringent process controls will be implemented to mitigate community risk associated with the operations. The facility operation will be automated and controlled to maintain optimised manufacturing and emission control. The Plants will be set-up to trip when parameters exceed established limits and thresholds, supported by warning systems.

The facility will include fire-fighting infrastructure that includes dedicated fire water (2 x 1,800 m^3 water tanks), a ring main supply and strategically located hydrants.

9.1 Incident Management and Compliance

Internal procedures identify, assess and assure major accident events are managed across the EPC activities, which includes commissioning, through a Major Accident Prevention Program. Using internal systems, all incidents on site are reported, investigated, reviewed and recorded.

Any environmental incident causing an emission or discharge must be reported to the CEO in accordance with s72 EP Act requirements; this includes initial notification, investigation and reporting.

Conditions of the Works Approval and subsequent licences will be managed under the Project's Environmental Compliance and Obligations Register.

Emergency preparedness and response requirements will be implemented as part of the project, including the establishment of an emergency response team, as specified in DMIRS approvals.

9.2 Hydrocarbon & Hazardous Substances Management

Hydrocarbon and hazardous substances utilised, and spills, will be managed in accordance with the Hydrocarbon and Hazardous Substances Management Protocol, Appendix F of the Landside Construction Environmental Management Plan (CEMP) (0000-ZA-E-09071) that accompanied the initial works approval application. A separate complementary CEMP was developed for the Portside works (0000-ZA-E-09073) to meet PPA requirements. Hazardous wastes will be managed in accordance with the Solid & Liquid Waste Management Plan (PCF-PD-EN-SLWMP). Ongoing storage of hydrocarbons and hazardous substances, including wastes, will be managed by conducting periodic inspections of storage areas to confirm compliance with applicable licence conditions and Australian Standards as outlined in the *Chemical and Hazardous Substance Work Instruction* (CORP-HSE-WI-G-0022).

If diesel storage areas are required to be licensed under the *Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007*, facilities will be designed and constructed in accordance with the *AS 1940:2017 Storage and Handling of Flammable and Combustible Liquids*.

9.3 Surface Water and Drainage

Risks to surface water are managed under MS1180 regulatory controls and under the requirements of the SWMP.

9.4 Deviation from Normal Operations

It is recognised that in optimising operations, emissions higher than normal operation may occur in the short term until the plant is stabilised.

During the commissioning and start-up phases, possible unplanned emissions or emission exceedances (if applicable) will be managed by adjusting the load of production where necessary.

9.5 Public Complaints Management

Complaints management is detailed in the works approval amendment application.

All complaints received from the public are to be recorded in a complaint register which records the following:

- Contact details of the party raising the concern
- Details of the complaint / incident (date, time, location etc)
- Action taken or required
- Response to the party raising the concern of the action taken
- Actions taken to prevent re-occurrence

10 Notification and Reporting

10.1 Environmental Compliance Reporting

Perdaman will submit a Critical Containment Infrastructure Report (CCIR) and the final component of the ECR (and) within 30 days of completed construction of the Project. Compliance reporting may be staged to aligned completion systems of the facility (i.e. submitting partial compliance documents) to stream assessment of the compliance information in the lead up to completed construction. The ECR will be submitted at least seven days prior to commissioning.

10.2 Commencement and conclusion of commissioning

Perdaman will notify DWER seven (7) days prior to commencement of wet commissioning and seven days after completion.

10.3 Complaints reporting

The Project will maintain a complaint register and investigate all complaints. A summary will be submitted with the environmental compliance reporting.

10.4 Environmental incidents

In the event of an environmental incident, the following steps will be implemented:

- Prevent further pollution / environmental harm
- Clean-up and / or control polluting substances
- Implement measures to prevent recurrence of a similar event
- Document the incident and instigate an incident investigation as appropriate

Any waste discharge to the environment will be notified to DWER CEO in accordance with the *Duty to notify of waste discharge* requirements identified under Section 72 of the EP Act.

All environmental incidents are recorded and tracked through InX (application).

10.5 Environmental Commissioning Report

Perdaman will provide an Environmental Commissioning Report within 45 days of completed commissioning of works.

The Environmental Commissioning Report will include:

- Summary of the commissioning works undertaken.
- Summary of the results from monitoring undertaken, with graphical representation of results.
- Summary of the environmental performance of the equipment as installed against the design

specification set out in the works approval application, and any limits or targets set out in the ECP.

- A review against the performance against the works approval conditions.
- Where the performance has not met the expectation, measures proposed to meet the design specification and / or works approval conditions with timescales for implementing the proposed measures; and
- Incidents and complaints information

The project proposes to continue operating the prescribed premises while an application for a licence is being prepared, submitted and assessed by DWER.

11 References

Department of Environment Regulation, 2016. WA Continuous Emission Monitoring System (CEMS) Code for Stationary Source Air Emissions.

Kwinana Industries Council, 2015. Air Quality Management in Kwinana: Factsheet on Sulphur Dioxide.

United States Environmental Protection Agency, 2000. Compilation of Air Pollutant Emissions Factors (AP-42). https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-fifth-edition-volume-i-chapter-13-miscellaneous-0

Emergency Response Planning Guidelines. National Oceanic and Atmospheric Administration (US) https://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/resources/emergency-response-planning-guidelines-erpgs.html

Internal documents:

Commissioning Execution Plan (0000-ZA-E-09050). Internal document dated 22/1/2025 (rev 2).

Environmental Design Criteria (0000-ZA-E-85980). Internal document dated 15/2/2024

Project Ceres Final Air Quality Study Report. Ramboll, December 2024.

Flaring Air Quality Study (0000-ZA-E-85966). Internal document dated 9/1/2025.

HSE Plan for Commissioning and Start-up (0000-ZA-E-09702). Internal document dated 12/1/2024.

Process description for water treatment and cooling water system (3700-ZA-E-86230). Internal document dated 05/04/2023.

Start up and Shutdown Philosophy (0000-ZA-E-05006). Internal document dated 13/2/2025