Government of Western Australia
Department of Water and Environmental Regulation

Decision Report

Application for Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number	W6911/2024/1
Applicant	Water Corporation
ACN	28003434917
File Number	DER2024/000123~1
Premises	Alkimos Seawater Desalination Plant Lot 3000 Brindabella Parkway ALKIMOS WA 6038 Legal description - Part of Lot 3000 on Deposited Plan 415979 Brindabella Parkway ALKIMOS WA 6038 As defined by the coordinates in Schedule 1 of the Works Approval
Date of Report	19 September 2024
Status of Report	Final

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1. Definitions of terms and acronyms

In this Decision Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions.

Term	Definition
ACN	Australian Company Number
Alliance	means the Alkimos Seawater Alliance (formerly the Northern Water Partnership) - consortium of Acciona Agua Australia Pty Ltd and Jacobs Group Australia Pty Ltd as the preferred proponent to design, build and operate the future Alkimos Seawater Desalination Plant (ASDP). Subject to further negotiations, the companies will form an alliance to be known as the Northern Water Partnership (NWP) ahead of construction beginning in mid-2024.
applicant	means the Water Corporation, Australian Company Number 28003434917
ANZG	means the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand ARMCANZ (2000))
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
centrate	means a concentrated or dense solution or suspension that is obtained through the process of centrifugation.
CIP	means cleaning-in-place; an automated method of cleaning the interior surfaces of pipes, vessels, equipment, filters, and associated fittings, without major disassembly using chemical solutions.
commissioning	means the testing phase of the equipment and seawater desalination plant, prior to the operations phase.
construction activities	means activities that are associated with the substantial implementation of the proposal, including but not limited to, earthmoving, vegetation clearing, grading or construction of right of way. Construction activities do not include Geotechnical investigations (including potholing for services and the installation of piezometers) and other preconstruction activities where no clearing of vegetation is required.
CS Act	*Contaminated Sites Act 2003* (WA)

Term	Definition
decision report	refers to this document.
Delegated Officer	an officer under section 20 of the EP Act.
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Means the Department of Water and Environmental Regulation As of 1 July 2017, the Department of Environment Regulation (DER), the Office of the Environmental Protection Authority (OEPA) and the Department of Water (DoW) amalgamated to form the Department of Water and Environmental Regulation (DWER). DWER was established under section 35 of the *Public Sector Management Act 1994* and is responsible for the administration of the *Environmental Protection Act 1986* along with other legislation.
EDTA	means Ethylenediaminetetraacetic acid.
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
GL	means gigalitre, a metric unit of capacity equal to a billion litres.
HEPA	means the High Ecological Protection Areas, defined in MS 1207 as the area outside the Low Ecological Protection Area and as defined in the Technical Guidance Protecting the Quality of Western Australia's Marine Environment, as amended from time to time, and available at www.epa.wa.gov.au
LEPA	means the Low Environmental Protection Area, defined in MS 1207 as as the 100 m radius from the centre point of each outfall diffuser.
m^3	means cubic metres
Minister	the Minister responsible for the EP Act and associated regulations
ML	means megalitre, a metric unit of capacity equal to a million litres.
MS 1207	means Ministerial Statement number 1207
n/a	means not applicable
Noise Regulations	means the *Environmental Protection (Noise) Regulations 1997*

Term	Definition
	(WA)
occupier	has the same meaning given to that term under the EP Act.
prescribed premises	has the same meaning given to that term under the EP Act.
premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Risk Event	As described in *Guideline: Risk Assessments*
µg/m^3	micrograms per cubic metre
µg/L	micrograms per litre
westerly-facing berm	refers to the berm described by Water Corporations as "*The western boundary [of the] seawater desalination plant development envelope incorporates a sand berm with a finished top surface level of approximately 30 mAHD. This berm effectively connects the existing southern and northern sand dunes and forms a visual barrier to the plant from the future western residential development."*
WET	means whole of effluent (testing), elates to comingled brine/cleaning solution liquid waste stream.

2. Purpose and scope of assessment

2.1 Application details

Table 2 lists the documents submitted during the assessment process.

Table 2: Documents and information submitted during the assessment process.

Document/information description	Date received
Alkimos Seawater Desalination Plant Part V Works Approval Application Supporting Information, March 2024	16 March 2024

3. Background

The Water Corporation (the applicant) is proposing to undertake the construction of the first stage of a new 100 GL seawater desalination plant for the provision of drinking water for Perth's Integrated Water Supply Scheme. The Alkimos Seawater Desalination Plant (the premises, ASDP) is to be located within the footprint of the Alkimos Water Precinct (within Lot 3000 on Deposited Plan 415979 Brindabella Parkway, Alkimos). The application currently under assessment is for the first stage of the Alkimos Seawater Desalination Plant Proposal, with a total capacity of 50 gigalitres (GL).

Table 3 lists the prescribed premises categories that have been applied for.

Table 3: Prescribed premises categories applicable to this works approval application.

Classification of Premises	Description	Category Production or Design Capacity	Proposed production or design capacity
54A	Water desalination plant: premises on which salt is extracted from water if – (a) wastewater is discharged into marine waters; and (b) the discharged water has a density greater than the average ambient density of the marine water at the discharge site.	Over 10 gigalitres (GL) or more per year	50 GL per year (Stage 1)

4. Overview of premises

An overview of the Alkimos Seawater Desalination Plant is provided in Figure 4. The submitted application seeks a works approval to facilitate the construction, commissioning, and time-limited operations of the Alkimos Seawater Desalination Plant Stage 1, referred to herein as the premises.

The activities covered by the application include:

- Creation of hardstand areas, tracks, and vehicular access,
- Construction of the desalination plant and equipment, and
- Commissioning and operation of the desalination plant.

The construction of the premises requires the installation of a seawater intake pipeline (with two intake structures) and an outfall pipeline to return saline wastewater (through two outfall

structures) approximately 2.9 and 4.4 km offshore, respectively.

The Alkimos Water Precinct where the premises is to be located currently contains the Water Corporation's Alkimos Wastewater Treatment Plant (L8434/2010/2), approved for the treatment of 20,000 cubic metres of reticulated sewage per day, and 10,000 tonnes of tankered waste per year. The location of the Alkimos Water Precinct has been predominately reserved in the Metropolitan Regional Scheme as an area for 'Public Purpose' to support growth within the northwest urban corridor. The greater Alkimos Water Precinct will include the future construction of a co-located groundwater treatment facility to provide an additional 4.9 GL per annum. This groundwater treatment facility is not a prescribed activity and is not detailed in the submitted application.

The Alkimos Seawater Desalination Plant is proposed to be constructed in stages, with Stage 1 having a total capacity of 50 GL. The remaining 50 GL will be developed in either one (50 GL Stage) or two stages (two 25GL stages), projected for after 2030. The exact timing of future stages will be subject to future water demand; based on actual growth in population and demand, potential groundwater allocation reduction, actual streamflow conditions, and the timing of other source option development (e.g. construction of additional desalination activities in Kwinana).

The application relates to the construction, operation, and maintenance of the premises, equipped to produce up to 158 ML per day to a maximum of 50 GL per annum. For efficiency, some components of the project will be constructed to full (100 GL) capacity, such as the marine intake and outfall structures, though the throughput capacity remains at 50GL for the Stage 1 duration. An overview of site layout including the marine intake and outfall structures in provided in Figure 1.

The premises is located within the existing prescribed premises boundary for the Alkimos Wastewater Treatment Plant (L8434/2010/2). An overview of the premises location in relation to the premises boundary of the Alkimos Wastewater Treatment Plan is provided in Figure 3.

Drinking water produced from the premises will be pumped to the Wanneroo Reservoir and Carabooda Tank for onward distribution to the greater Perth region as part of the Perth Integrated Water Supply Scheme (IWSS).

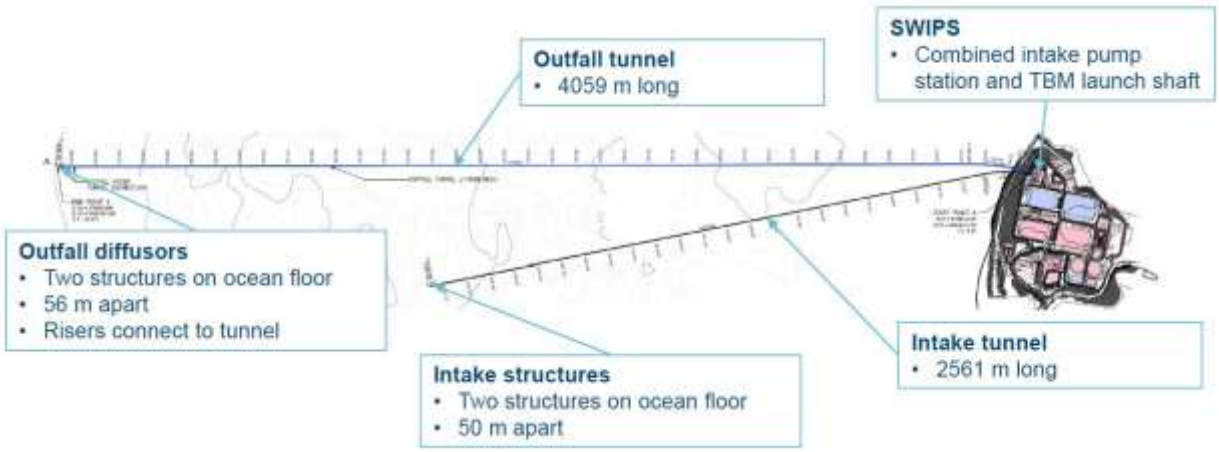

Figure 1: Alkimos Seawater Desalination Plant site layout including ocean Intake and Outfall structures.

Figure 2: Premises location.

Figure 3: Alkimos Seawater Desalination Plant premises boundaries in relation to the Alkimos Wastewater Treatment Plant.

For noting: The prescribe premise boundary for this works approval sits within the prescribed premises boundary of the Alkimos Wastewater Treatment Plant (WWTP) licence (L8434/2010/2) Under DWER's regulatory framework, a works approval and licence prescribed premises boundary can overlap so long as the instruments are held by the same operator. However, two licence prescribed premises boundaries are not permitted to overlap.

As such, the applicant is advised that to authorise ongoing operations of the premises under a licence:

The Alkimos WWTP licence will need to be amended to remove the works approval area for the premises from within the licence boundary; or

The Alkimos WWTP licence will need to be amended to incorporate the operations of the premises within the same licence.

4.1 Scope of proposed activities

Activities proposed under (and in conjunction with) the works approval application include:

- Temporary works for construction including site offices, crib rooms etc.
- Construction of the Alkimos Seawater Desalination Plant, including;
    - Tunnel boring machine launching structure,
    - Tunnel boring of seawater inlet and brine discharge pipes (outside of the prescribed premise boundary),
    - Intake and discharge riser installation (outside of prescribed premise boundary),
    - Intake and discharge structures installation (outside of prescribed premise boundary),
    - Seawater intake pumping station and brine discharge chamber,
    - ActiDAFF® pre-treatment,
    - Reverse osmosis feed pumping station,
    - Cartridge filtration,
    - Reverse osmosis,
    - Energy recovery systems, and
    - Chemical receival, storage & dosing systems.
- Eglinton multi-media gravity filtration (not part of the prescribed premise).
- Ultraviolet (UV) disinfection.
- Potabilization / stabilization including:
    - Lime water preparation & dosing,
    - Carbon dioxide storage & dosing,
    - Sodium hypochlorite disinfection, and
    - Fluoridation.
- Drinking water storage tanks.
- Drinking water pumping station.

- Administration building, workshops & stores.
- Commissioning and operation of the works.

4.2 Exclusions to the premises

The applicant has advised that in addition to the Alkimos Wastewater Treatment Plant and the Alkimos Seawater Desalination Plant Proposal, the Alkimos Water Precinct will also include a groundwater treatment plant for the treatment of extracted groundwater up to a capacity of 4.9 GL per annum. However, as groundwater treatment is not a prescribed activity, it will not be considered in the assessment of this application.

The following infrastructure are outside the prescribed premises boundary and/ or is independent from the prescribed premises category 54A, and do not form part of the works approval application, and are detailed for information purposes only:

- Offshore seawater intake structures.
- Intake tunnel.
- Brine discharge outfall tunnel.
- Brine diffuser structures.
- Eglinton groundwater bores and groundwater collector mains.
- Eglinton groundwater Treatment Plant.

5. Construction methodology

5.1 Temporary construction works

Temporary construction works are required to be undertaken within the premises boundary as part of the works approval prior to the construction of the permanent infrastructure of the Alkimos Seawater Desalination Plant. This includes:

- A temporary 132/11kV substation to power tunnel boring and construction site.
- A temporary 11kV electrical system for distribution of construction site power.
- Temporary site offices, crib rooms, stores, workshops, and ablutions to support construction.
- A temporary wastewater pumping station and pressure main to transfer domestic wastewater from the temporary facilities to the inlet of the Alkimos wastewater treatment plant.
- A slurry treatment plant to treat drilling mud, cuttings, and groundwater from the tunnel boring operations. Drilling mud (Bentonite) will be recycled back to the Tunnel Boring Machine (TBM).
- Cuttings will be stabilised, sorted by size, and used as structural fill where possible.
- A temporary access gate with security checkpoint.
- Temporary site construction roads and access ways.
- Temporary laydown areas for materials and plant required for construction of the works.

The following temporary works will be undertaken subject to additional approvals not included in the current application:

- A temporary helipad for helicopter crew transfers to/from the jack-up barge during the

marine construction works (subject to other external approvals).

- A temporary concrete batching plant if required.

5.2 Detailed design aspects

The detailed design of the overall Alkimos Seawater Desalination Plant is in its final stages. The applicant has provided details on the current design and construction methodology, which may be subject to change. The treatment specifications and final products, including the treatment quality and emissions are not subject to change and will meet the requirements set under the EP Act approval. An overview of the indicative site layout outline Stages 1 and 2 is included in Figure 4 and Figure 5.

- Stage 1 Alkimos Seawater Desalination Plant construction including:
  - Two offshore intake structures (not part of prescribed premises),
  - Intake tunnel (not part of prescribed premises),
  - Seawater intake pumping station (Stage 1 complete, Stage 2 structure only),
  - Reverse Osmosis (RO) pre-treatment facility,
  - Seawater RO,
  - Brine discharge chamber,
  - Brine outfall tunnel, and (not part of prescribed premises), and
  - Two brine diffuser structures (not part of prescribed premises).
- Equipping of three (3) Eglinton groundwater production bores (not part of prescribed premises).
- A network of DN300 and DN400 buried bore water collector mains (not part of prescribed premises).
- Eglinton groundwater multi-media filtration system (excluded from the proposed works approval as groundwater treatment is not a prescribed category under the *Environmental Protection Regulations 1987* and is independent from the desalination process).
- Potabilisation treatment comprising UV disinfection, lime dosing, carbon dioxide dosing, sodium hypochlorite disinfection and fluoridation.
- Pipelines to convey water around the plant.
- Drinking water tanks, pumping station and surge vessels.
- Sludge treatment.
- Power substation (not part of prescribed premises).
- Electrical equipment, cables, and controls systems.
- Administration buildings, workshops, and stores.
- Stage 2 ASDP plans include the following scope of works and separate works approval will be sought:
  - Seawater intake pumping station (Stage 2 mechanical and electrical work to be completed),
  - Duplication of the stage 1 Reverse Osmosis (RO) pre-treatment facility,
  - Duplication of the stage 1 Seawater RO,

- Expansion of the stage 1 potabilisation treatment comprising UV disinfection, lime dosing, carbon dioxide dosing, sodium hypochlorite disinfection and fluoridation,
- Duplication or expansion / upgrade of the drinking water pumping station,
- Expansion of the sludge treatment area,
- Pipelines to convey water around the plant, and
- Electrical equipment, cables, and controls systems.

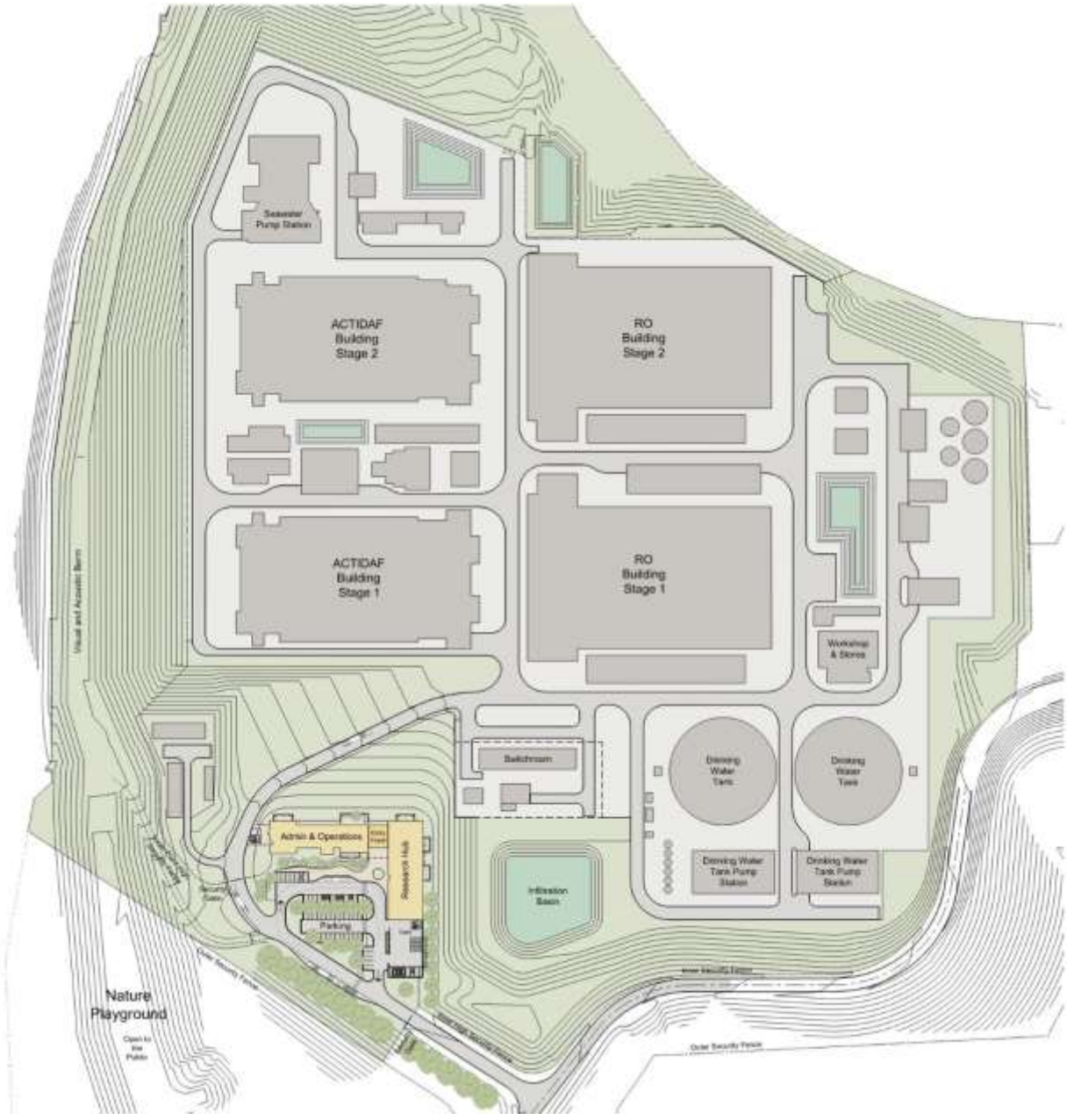

Figure 4: Indicative Alkimos Seawater Desalination Plant project site layout (Stages 1 and 2).

Figure 5: 3D model of Alkimos Seawater Desalination Plant project site layout (Stages 1 and 2).

5.3 Infrastructure

The premises infrastructure, as it relates to Category 54A activity, is detailed in Figure 7 and with reference to the site plan (attached in the issued works approval). Table 4 also lists infrastructure associated with each prescribed premises category.

Table 4: Alkimos Seawater Desalination Plant Category 54A infrastructure.

Infrastructure		Design, construction, installation, and operational requirements	Site Plan Reference
Prescribed Activity Category 54A			
Pumping, filtration, and desalination of seawater using reverse osmosis, and discharge of hypersaline brine and contaminated washwaters via ocean outfall.			
1	Seawater intake pumping station and brine discharge chamber	• Seawater pumping station • Brine turbine facility • Seawater inlet chambers (Stage 1 and 2) • Brine discharge chamber(s) • Multimedia filters (Stage 1 screens) • Screening waste bins	Figure 7
2	ActiDAFF® Treatment	• 18 ActiDAFF® units • Filtered water tank	Figure 6 and Figure 7

Infrastructure		Design, construction, installation, and operational requirements	Site Plan Reference
3	Reverse Osmosis (RO) pretreatment facility	• Reverse Osmosis (RO) feed pumps • RO cartridge filters • First pass RO cartridge racks • Second pass RO cartridge racks • Antiscalant dosing system	Figure 7
4	Chemical receival, storage & dosing systems	• Fully bunded closed drain systems for storage and receival	Figure 7
5	Potabilization treatment	• UV disinfection unit • Lime water clarifiers	Figure 7
6	Sludge treatment	• Lamella settler • Decanter centrifuge • Sludge disposal bins	Figure 7
7	Clean-in-Place (CIP) Waste Handling Systems	• CIP waste tank	Figure 7
8	Drainage and Containment Systems	• Fully bunded power transformer compound drainage system • Fully bunded generator / diesel storage area • Fully contained brine outfall drainage system	Figure 7

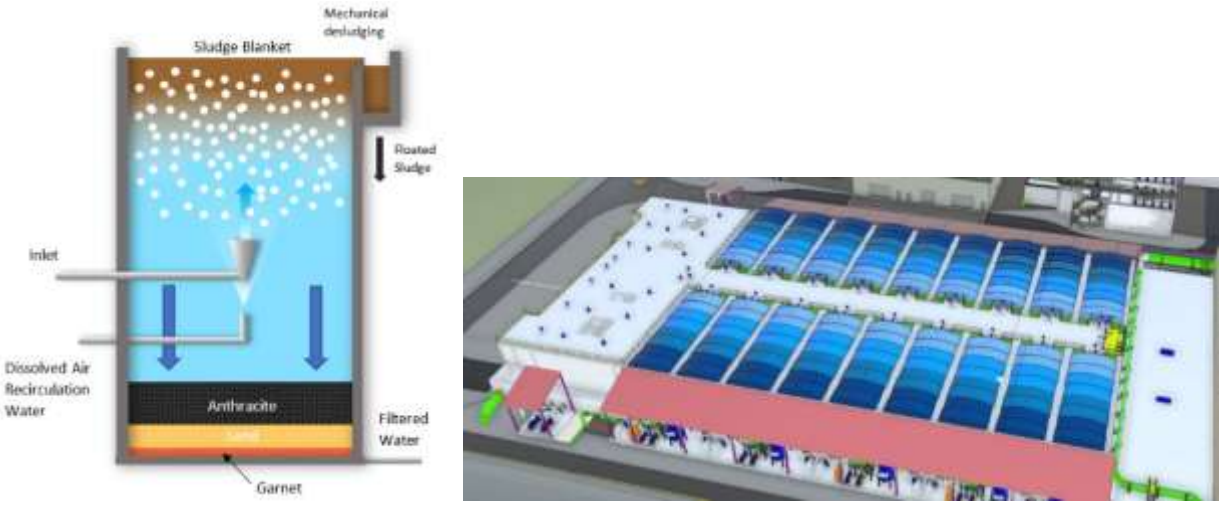

Figure 6: Diagram of ActiDAFF® filtration process (left) and overall structure (right).

Figure 7: Prescribed premises boundary and premises layout.

5.4 Construction Quality Assurance and Quality Control

Upon completion of the construction works, applicant will prepare and submit to DWER a Construction Quality Assurance (CQA) Report confirming that all the works have been completed in accordance with the specifications sent out in the works approval, and that all infrastructure and equipment is free of defects and has been installed as per the manufacturer's recommendations.

5.5 Factory acceptance testing / supply verifications

For significant packages of equipment, supply contracts will include the requirements for factory acceptance testing and other supply verifications. Factory acceptance tests will be carried out at locations around the globe. These tests will normally be witnessed by a commissioning team representative or an independent nominee who is approved by the commissioning manager. Supply verifications involve the completion of inspection and test plans (ITP's) by the supplier. These ITP have been developed or approved by the commissioning team.

6. Commissioning

6.1 Commissioning of infrastructure

The commissioning of the premises will commence following practical construction completion and is expected to take more than one year. A Construction Quality Assurance (CQA) Report will confirm the infrastructure has been installed as per the manufacturer's recommendations and is free of defects.

Planning of commissioning commences by breaking the works into discrete "commissioning areas". As construction of each commissioning area is completed, final inspection and testing is jointly carried out by the construction team and the area commissioning team. The inspection and testing aim to confirm that the construction works (for that commissioning area) have been correctly completed and the area is ready to be handed over to the commissioning team.

Commissioning will commence with the testing of each discrete piece of equipment or instrument. For example, an individual pump will be tested to confirm correct operation in terms of flow, pressure, suction head, power draw, vibration etc. A water quality analyser would be powered up, calibrated, and tested with flowing sample. This is all recorded on commissioning inspection and test plans and inspection and test records, all of which are kept as commissioning records. The applicants commissioning team will develop and provide the Inspection & Testing Plans (ITP's) and Inspection Test Records (ITR's) that will be used to verify the completion and quality of the construction works prior to area handover for commissioning. These will be completed by the construction team and compiled into the ITR for that area.

Integration commissioning focusses on commissioning of the control system. It aims to test and validate that:

- Instrumented safety systems function as per design and ensures safe operation of equipment and process.
- The process control system functions as per the design intent as documented in the functional control specification.

Occasionally, changes are necessary to ensure that the plant and process operates optimally and is unconditionally safe. Such changes to instrumented safety functions or process controls are managed according to an established management of change process.

Integration testing commences with any drinking water that is produced being directed (after neutralisation of any free chlorine with sodium bisulfite) to the brine outfall. At a later stage during integration testing, when all water quality safety systems have been proven and the plant

is producing drinking water that meets the specification, drinking water will be delivered to the Integrated Water Supply System (IWSS) for distribution to customers.

Once integration commissioning has been completed for all commissioning areas, a contractual process stabilisation period will be completed during which the premises will be required to operate “normally” and produce drinking water that meets the specifications for the plant. The aim of this contractual period is to allow processes to settle into their normal operating states before the contractual performance testing period is commenced. For example, it may take several days to weeks for a thickener to accumulate a normal operating inventory of sludge which is the feed that goes to the decanter centrifuges. Without this stabilisation period there would be no sludge to feed the centrifuge during the performance test.

A contractual performance test will be completed to “stress test” the plant over a period of several weeks. The performance test will last for a minimum of 6 weeks. Significant failures of the performance test can add to the test duration or require that the test is re-commenced after the cause of the failure is addressed. The performance test aims to confirm the reliable operation of the plant under the full range of design conditions and that the specified performance guarantee requirements have been achieved.

On successful completion of the performance test a further 6-week proving period will further demonstrate the new assets operate on a sustained basis in compliance with all project requirements.

Table 5 below details the various waste streams expected to be generated as part of the commissioning phases, including projected volumes and proposed monitoring regimes.

Seawater screenings (nominally 5mm and larger) are removed from the band screens automatically using high pressure water jets. The removed screenings and a portion of the spray water then flow down troughs to the online screenings bin. The bottom of the screenings bin consists of a heavy mesh to allow excess water to drain into the screenings bin sump which in turn drains back to the SWIPS. Seawater screenings will be monitored with daily visual inspection of the online screenings bin. Prior to collection by a licensed waste transport contractor, the screenings bin contents will have a final visual inspection before being transported to landfill where it is weighed (weighbridge) and inspected by the landfill operator before acceptance. Moving forward, beneficial reuse opportunities for putrescible organic waste will be explored.

ActiDAFF® and Eglinton sludge will be dewatered to approximately 25% dry solids by centrifuge. The dewatered sludge has a wet, cake-like consistency and is stored in conventional waste skip bins (nominally 10 m^3). Verification requirements will be as required by the relevant landfill operator for acceptance of the sludge-cake as a non-putrescible waste.

Lime sludge will be dewatered by centrifuge to approximately 40% dry solids. The dewatered lime sludge has a wet, cake-like consistency and is stored in conventional waste skip bins (nominally 10 m3). Verification requirements will be as required by the relevant landfill operator for acceptance of the sludge cake as a non-putrescible, inert waste. At the time of preparing this works approval the applicant has identified a potential reuse application and is working with the business owner to understand their quality and verification requirements for use of the lime sludge in their process.

Of these waste streams, Neutralised CIP waste component of combined marine discharge has the most potential for adverse impact on the receiving marine environment.

Table 5: Commissioning phase waste streams.

Waste stream	Parameter	Units	Frequency of measurement	Averaging period	Expected Average Daily Quantity During Commissioning (m^3/ tonnes)	Expected Average Daily Quantity During 1st Six Months of Operation (m^3/ tonnes)
Neutralised CIP waste component of combined marine discharge	Average Daily Flow	m^3/day	Continuous	Monthly	34.1	35.4
RO Brine component of Combined Marine Discharge	Average Daily Flow	m^3/day	Continuous	Monthly	82,324	220,169
Combined Marine Discharge	Average Daily Flow	m^3/day	Continuous	Monthly	141,635	240,364
Seawater Screenings	Tonnes removed from premises	Tonnes	Monthly	n/a	1.15	2.18
ActiDaff® & Eglinton Sludge	Tonnes removed from premises	Tonnes	Monthly	n/a	13.8	34.8
Lime Sludge	Tonnes removed from premises	Tonnes	Monthly	n/a	1.0	5.3

Water Corporation will provide DWER with a revised Commissioning and Operations Marine Management Plan 6-months before commencement of commissioning. Commissioning works shall not commence until the DWER CEO has confirmed in writing that these plans are acceptable.

For noting: The applicant is required to review and revise the Commissioning and Operations Marine Management (COMEMP) to demonstrate how achievement of marine environmental quality environmental outcomes will be achieved as a requirement of Ministerial Statement 1207 issued under Part IV of the EP Act. Therefore, the suitability of this plan will be assessed by the Environmental Protection Authority and signed off by the DWER CEO.

Responsibilities of the applicant under issued Ministerial Statements and Part IV of the EP Act are further outlined in Section 8.1.2 below.

6.2 Discharge of used biocide CIP solutions via ocean outfall during commissioning

The Environmental Protection Authority's (EPA) environmental review prepared for the Alkimos Seawater Desalination Plant Proposal addresses the potential impacts to marine biota due to toxicity and/or osmotic stress resulting from the discharge of mixed brine and clean-in-place wastewater. Ministerial Statement 1207 imposes a requirement for the applicant to prepare and submit a plan which includes measures to ensure that the 99% species protection guideline 'trigger' levels for toxicants, as defined in the ANZG, are achieved in the specified High Ecological Protection Areas. There is a level of uncertainty regarding the number of dilutions required to achieve a high level of ecological protection for brine containing 'clean-in-place' chemicals, with washwater varying in composition and concentration. The wastewater discharge and diffuser performance will need to be managed and adjusted during commissioning to ensure sufficient dilutions to achieve the 99% species protection levels determined through WET testing and under the full range of operating conditions.

The permeability of RO membranes will decline over time due to fouling and the accumulation of scale on the membrane surface. This process results in higher feed pressures being required to maintain a consistent flow of permeate. The performance of reverse osmosis membranes can be restored by using appropriate cleaning chemicals in a CIP process. Generally, high pH solutions (alkalis) are employed to remove biofilm and organics, with low pH solutions (acids) used for inorganic precipitates. Acids, such as citric acid, are added to lower the pH to approximately 2-3 in RO systems. However, in terms of toxicity it is generally the pH rather than the type of acid which has greater bearing on environmental impact. Acid and alkali cleaning solutions will be neutralised through the additional of appropriate reagents prior to discharge and provided it has been adequately neutralised or diluted these will not significantly contribute to toxicity discharge ecotoxicity. Sodium metabisulphite is dosed to the combined brine stream to neutralise any chlorine in the CIP waste to prevent the release of free chlorine to the marine environment.

Chemical biocides are also used to control biological accumulations (biofouling). The optimal frequency of use is site-specific and must be determined by operating experience at the future desalination plant. The frequency of use is typically adjusted seasonally with higher/more likely use during peak biological activity (summer) and lower use during low biological activity (winter). Chemical cleaning in place requires the shutdown and isolation of individual RO trains. Appropriate chemicals are then blended to the required concentration, pH, and temperature, prior to circulation through an RO train. The amount and type of chemicals required is dependent on the nature and severity of membrane fouling.

In terms of CIP chemicals with potential to significantly impact the ecotoxicity of discharged wastewater, 2,2-dibromo-3-nitrilopropionamide (DBNPA) which is used as a non-oxidising biocide is of primary concern, as it will exert toxic effects on aquatic organisms if not adequately managed. Spent DBNPA solutions will be drained from the RO rack to the CIP neutralisation tank. This tank can hold up to 2.5 batches of spent CIP solutions (Stage 1). There is significant natural degradation of DBNPA solution in the CIP neutralisation tank. Its half-life is ~24 hours at pH 7 and this is further accelerated by UV (sunlight) exposure in the open tank. Before the contents of the CIP neutralisation tank can be pumped to the brine discharge, the tank contents are recirculated by large pumps and the required neutralisation chemicals (sodium hydroxide and citric acid) are dosed. For spent CIP solutions containing DBNPA, the solution pH is raised to above 8.0 by addition of sodium hydroxide (caustic). At pH 8.0 the half-life of DBNPA is reduced to 2 hours. The spent DBNPA solution is then left in the CIP neutralisation tank for 12 hours at pH 8.0+ during which almost complete deactivation of the DBNPA occurs. An excess of sodium sulfite solution is then dosed into the CIP Neutralisation Tank to deactivate any remaining DBNPA. Confirmation that the solution ORP is <300 mV using a calibrated hand-held ORP analyser provides a final confirmation of the complete deactivation of DBNPA.

In the desalination process EDTA may be employed in acidic or alkaline chemical cleaning solutions to sequester metallic scale from the RO membranes and pipes. It is the expectation that the used antiscalant solutions discharged will be at concentrations low enough that they are contributing little or no toxicity in the discharge. The release of these waste streams should be managed such that the concentrations entering the discharge outfall are sufficiently low as to not increase the risk to the marine environment.

Several instrumented safeguards prevent the final discharge of neutralised CIP solutions to the Alkimos brine outfall. The control valves that divert the contents of the CIP Neutralisation Tank to the outfall will only open if all the following are true:

- The pH of the recirculating neutralised fluid must be within a target range of CIP neutralisation sump discharge pH target range of 4.5 to 10.0. To minimise use of neutralisation chemicals, this target range will consider the considerable further neutralisation that occurs when neutralised CIP solution is mixed with the minimum flow of RO brine.
- The minimum RO brine flow is established and maintained. The minimum RO brine flow rate for CIP neutralisation sump discharge is two (2) 1st pass RO racks in operation (2,700 m^3/hr of RO brine). This flowrate creates a 7:1 ratio between brine flow and CIP neutralisation sump discharge flow. This ratio is based on the neutralisation capability and buffering capacity of the brine and the pH process chemistry within the plant and corresponding flowrates. This ensures sufficient dilution of neutralised CIP solutions in brine from the RO process before discharge to the outfall.
- For spent DBNPA CIP solution, the operator must confirm that ORP < 300 mV has been achieved AND the absence of DBNPA confirmed by test kit. A record of this confirmation and the individual operator taking it will be maintained by the plant control system.
- An inline ORP analyser continuously monitors the ORP of the combined discharge stream. Detection of a high-high ORP will trip (stop) all discharge from the CIP Neutralisation Tank.

During the commissioning stage, the Commissioning and Operations Marine Environmental Management Plan (COMEMP) for the premises will undergo revision, and it will not be known what degree of dilution will be required to reduce potential impacts to the required protection levels.

Key findings: The Delegated Officer has reviewed the information regarding discharge of used chemical solutions via ocean outfall as part of premises commissioning, and has found:

1. Used DBNPA CIP waste has the potential to cause ecotoxicological impacts is not adequately managed prior to release into the marine environment.
2. DBNPA rapidly degrades in dilute aqueous solutions.
3. During commissioning, the Commissioning and Operations Marine Environmental Management Plan will not be sufficiently finalised to stipulate the levels of dilution necessary to ensure the discharged brine meets the requirements of the MS 1207.
4. Confirmation that the solution ORP is <300 mV using a calibrated hand-held ORP analyser provides a final confirmation of the complete deactivation of DBNPA.
5. Target pH of recirculating neutralised fluid to be determined through WET testing undertaken during commission.
6. Specific controls related to the management of CIP waste streams prior to discharge are required in the works approval.

As such, the Delegated Officer considers that the findings of the testing undertaken during commissioning will inform the ongoing management of the discharge of used chemical solutions via ocean outfall during operations of the premises.

7. Operational aspects

7.1 Overview of operations

The applicant has provided a summary of the process for producing potable water through the premises infrastructure and treatment procedures. This overview is outlined in Figure 8.

The applicant has also provided a key components summary as to where different treatment processes will occur at the premises during ongoing operations. This is outlined in Figure 8.

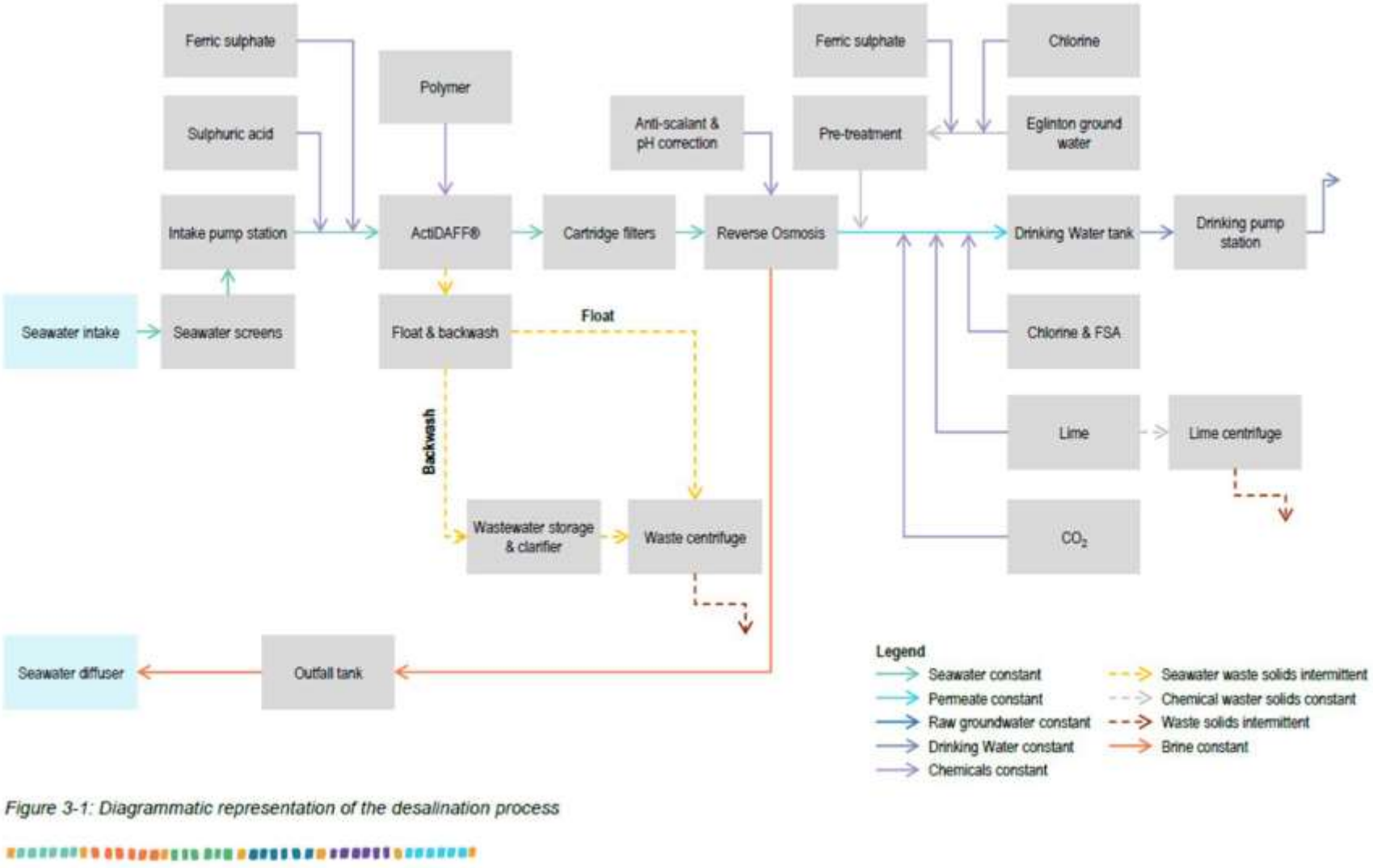

Figure 3-1: Diagrammatic representation of the desalination process

Figure 8: ASDP process schematic.

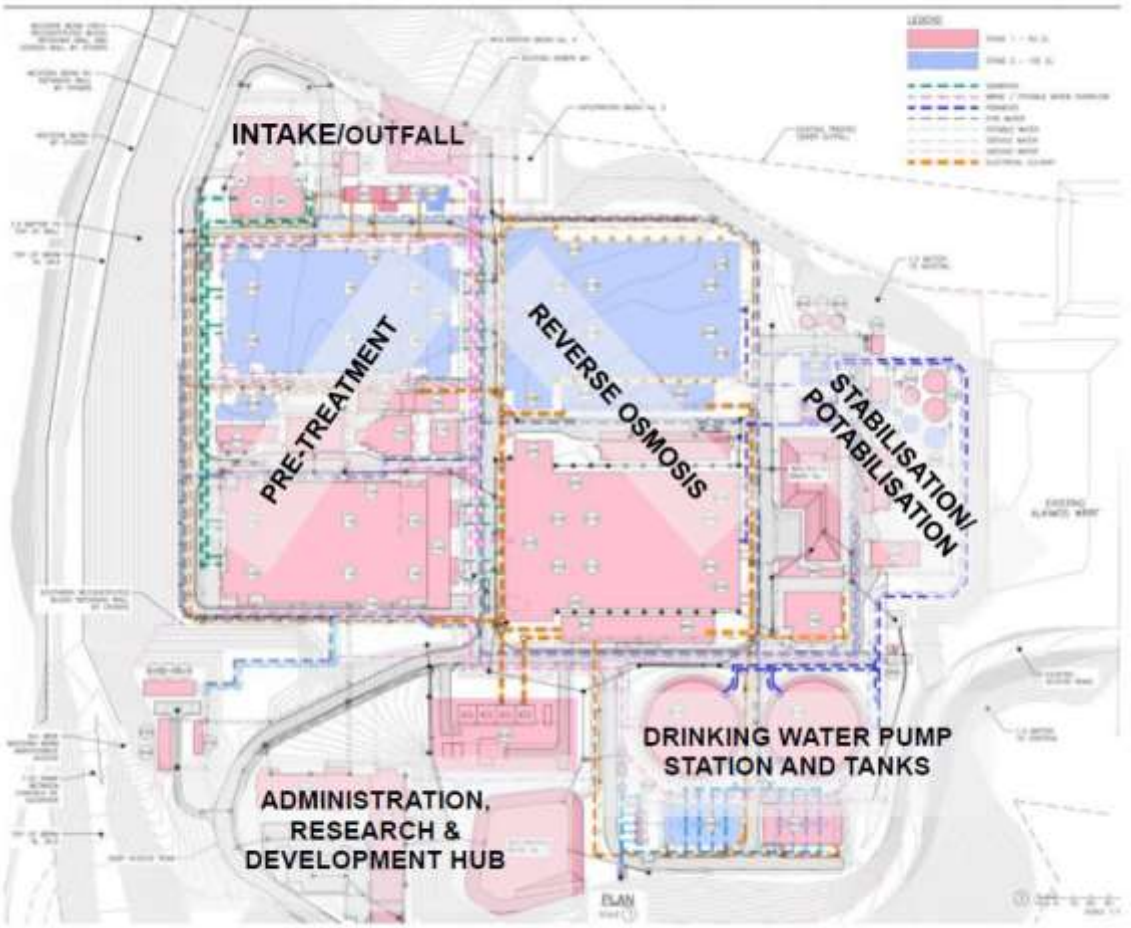

Figure 9: ASDP simplified key components diagram.

7.2 Potable water production

The plant will produce potable water from purified seawater through the process of reverse osmosis (RO). RO permeate, the water produced through the RO process, is too “pure” for drinking water use and is corrosive to most pipe and plumbing materials. It is proposed that permeate from the RO process and filtered water from the Eglinton Groundwater Treatment area will be blended and directed to the potabilization area (note this is independent of desalination and not part of the prescribed premises). Blending of these two streams is highly beneficial as it significantly reduces the treatment requirements for Eglinton groundwater and reduces the chemical requirements for potabilization of the RO permeate.

Potabilisation consists of the following treatment steps:

- UV disinfection (as necessary e.g. during storm events where turbidity is increased)
- Carbon dioxide and lime water dosing to increase the pH and alkalinity of the drinking water,
- Optional caustic soda dosing to further adjust pH for corrosion minimisation,
- Fluorosilicic acid dosing to provide a fluoride concentration for public health benefit, and
- Sodium hypochlorite dosing to provide a free chlorine residual to manage the risk of pathogen contamination.

Following potabilization the drinking water is sampled and monitored by a group of online water quality analysers that continuously monitor pH, temperature, turbidity, conductivity, free

chlorine, and fluoride ion concentration. Any deviation from allowable limits for these parameters will initiate an alarm on the control system. Unsafe deviations will automatically stop the transfer of drinking water from the site into the distribution system.

After the water quality sample offtake, the drinking water is directed to two concrete drinking water tanks each of 25 million litres volume. The drinking water will be transferred from the drinking water tanks to Carabooda Tank and Wanneroo Reservoir by the large drinking water pumps located with the Drinking Water Pump Station (Stage 1). Several large surge vessels reduce pressure surges that can damage piping and cause excessive noise when a drinking water pump starts or stops. Both drinking water tanks will be constructed with the stage 1 works but only one pumping station will initially be constructed; the second pumping station will be constructed with the future Stage 2 upgrade.

An overview of the RO permeate potable water process is outlined in Figure 10.

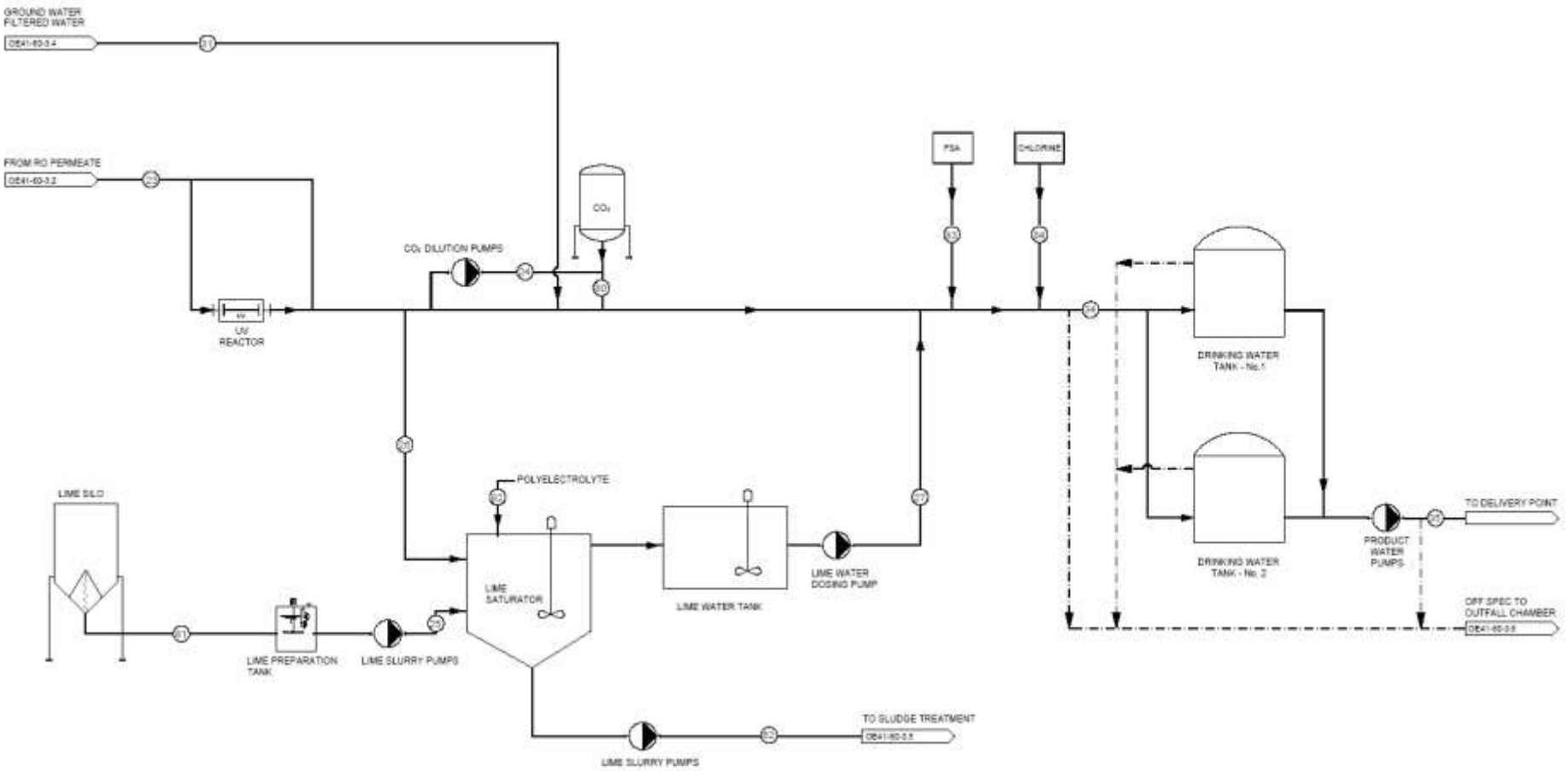

Figure 10: RO permeate potabilisation process.

7.3 Process chemicals and waste streams

A suite of chemical additives will be employed at the premises for the treatment of seawater inflows, wastewater and permeate streams, and the maintenance and cleaning of plant infrastructure.

During the RO process, inorganic scale deposits comprising iron and manganese solids and colloids from seawater will accumulate on the RO membrane surface. Additionally, organic material or biofilms also accumulate on the membranes, hindering permeate production. To maintain the efficacy of the membranes, these accumulations must be removed through a "clean-in-place" process.

Inorganic scale is removed using a solution of citric, sulfuric, or hydrochloric acid, and accumulated organic foulants are treated using a caustic solution, such as sodium hydroxide. Biofouling is cleaned using disinfectants such as sodium hypochlorite or peracetic acid, and surfactants. A list of required chemicals, as well as their purpose and disposal options are set out in Table 6 below.

For noting: Discharges to ocean outfall of chemicals used within the ASDP treatment process will be regulated under Part V of the EP Act through conditions on the works approval, as this emission pathway falls outside of the scope of Part IV of the EP Act and regulation under Ministerial Statements.

Responsibilities of the applicant under issued Ministerial Statements and Part IV of the EP Act are further outlined in Section 8.1.2 below.

Table 6: ASDP process chemicals.

Chemical	Application and waste management
Clean-in-place process (CIP) solution [Caustic soda, Sodium Lauryl Sulphate & Ethylenediamine tetraacetic acid (EDTA)]	A CIP solution comprising caustic soda, sodium lauryl sulphate & ethylenediaminetetraacetic acid (EDTA) is typically applied to RO membranes to remove metal contaminants from the membrane, particularly iron sulphate. It is uncertain at this time whether there will be sufficient dilution in the brine stream to reduce the ecotoxicity to acceptably low levels, of certain CIP wastes that contain EDTA as a component (including a normal safety factor of 10 to EC10). Before the contents of the CIP neutralisation tank can be pumped to the ASDP brine discharge, the tank contents are recirculated by large pumps and the required neutralisation chemicals (sodium hydroxide and citric acid) are dosed. If doubts remain at completion of engineering design, then this neutralised CIP waste will not be directed to the brine outfall without further treatment to address ecotoxicity. Alternatively, another disposal method will be identified, or an alternative membrane cleaning chemical solution will be investigated during operation. All methods will be undertaken in accordance with the whole-of-effluent toxicity (WET) testing requirements as per MS1207 and the revised Construction and Operation Environmental Management Plan (COMEMP).
Citric acid	CIP solution of up to 3% citric acid is commonly used to address RO membrane fouling with metal hydroxides. The CIP solution is acidic with pH in the range 2.0 – 4.0. After cleaning the membranes, the spent citric acid solution will be neutralised with caustic soda. This converts the residual acid to sodium and citrate salts. Dilution of this neutralised solution into the RO brine stream will reduce concentration to levels that ensure compliance with the

Chemical	Application and waste management
	MS 1207 and the COMEMP that have been set for the project i.e. 99% marine species protection at the boundary of the low environmental protection area (LEPA).
Sodium bisulphite	A solution of up to 3% sodium bisulfite (SBS) is commonly used to preserve RO membranes in racks that are to be shut down for longer than 24-hours. When the RO rack is to be re-started this preservation solution is neutralised within the CIP waste tank before discharge with RO brine. Sodium bisulfite solution breaks down to sodium and sulphate salts when exposed to air or mixed with oxidising chemicals. The waste SBS will partially decompose in the CIP waste tank and dilution with RO brine will further reduce its concentration to levels that ensure compliance with MS 1207 and the COMEMP requirements that have been set for the project i.e. 99% marine species protection at the boundary of the LEPA.
Sodium hypochlorite	Sodium hypochlorite will be intermittently dosed into the seawater intake to control marine fouling in the intake structure and intake tunnel. Chemical solution lines installed inside the intake tunnel will convey the chemical solution to the dosing locations within each of the two intake structures. 12.5% sodium hypochlorite will be delivered to site and stored in 1000 L isotainers in a bunded area within the seawater intake pumping station (SWIPS) chemical building in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007*. All sodium hypochlorite dosed into the seawater intake will be fully neutralised with sodium bisulphite upstream of the reverse osmosis membranes. No free chlorine will be discharged to the outfall. The neutralisation reaction, once pH adjusted, produces only sodium ions, chloride ions and sulphate ions in solution.
Sulphuric acid	Sulphuric acid is used at multiple locations throughout the treatment process for pH reduction of seawater and to neutralise high pH waste streams prior to discharge. The 98% sulphuric acid will be delivered to site in bulk and stored in a single bunded chemical storage tank within the pretreatment chemical building in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007.* All sulphuric acid used will be pH neutralised prior to discharge to the outfall. Once neutralised sulphuric acid produces sulphate ions in solution. This neutralisation and dilution ensure that the waste complies with MS 1207 and the COMEMP requirements that have been set for the project i.e. 99% marine species protection at the boundary of the LEPA.
Sodium meta-bisulfite / sodium bisulfite	Sodium meta-bisulphite solution is used in multiple locations throughout the seawater desalination plant for the following purposes: • For neutralisation of chlorine dosed to the seawater intake so that free chlorine is not present at the RO membranes (free chlorine rapidly damages RO membranes). • For intermittent dosing upstream of the RO membranes and energy recovery devices to control aerobic bacteria growth within. • For preservation of RO membranes in RO racks not in use for >24-hours. Sodium meta-bisulphate solution (40%) will be delivered to site in IBC's and stored accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007* for use as required. When diluted with water, sodium meta-bisulphite forms sodium bisulfite. When sodium bisulphite is used to neutralise chlorine, it is normal to apply excess bisulphite as a safety measure. Therefore, some un-reacted sodium bisulphite can be present in the outfall discharge occasionally. Due to dilution with the large volume of brine however, the discharge concentration becomes negligible at the diffuser. The oxidation potential of the combined discharge to the diffuser is continuously monitored to ensure this. This waste is managed to comply with MS 1207 and the COMEMP requirements that have been set for the project i.e. 99% marine species protection at the boundary of the LEPA.

Chemical	Application and waste management
Ferric Sulphate	Ferric sulphate is used as a general-purpose coagulant that is dosed at the following plant/process locations: • Upstream of the ActiDAFF® units to coagulate fine colloidal material and dissolved organics so they can be effectively removed in the ActiDAFF®'s • Upstream of the Eglinton groundwater filters to coagulate fine colloidal material and dissolved organics so they can be effectively removed in the multi-media filters. • In the sludge treatment area to improve the performance of sludge thickening. Ferric sulphate solution (42%) will be delivered to the ASDP site in bulk and stored in two bunded tanks located at the pre-treatment chemical storage building in accordance with *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007*. Chemical dosing pumps will deliver the required dose of ferric sulphate to the above dosing locations. The iron content of the dosed ferric sulphate all turns to solids and ends up in the sludge. Negligible iron remains present in the brine discharge where the very low iron concentrations are comparable to background seawater managed by MS 1207 and the COMEMP requirements that have been set for the project i.e. 99% marine species protection at the boundary of the LEPA. Whenever a ferric coagulant is applied, solids in the backwash wastewater shall be separated and directed to land-based reuse or disposal (not discharged to the marine environment). Following solids removal, clean backwash wastewater that is in compliance with Whole Effluent Toxicity Testing and the confirmed Commissioning and Operational Marine Environmental Management Plan (COMEMP), shall be discharged to the brine outfall.
Polymer / Flocculant for ActiDAFF® feed	A polyelectrolyte (flocculant) will be dosed at the inlet of the ActiDAFF®s to aid filter performance. Typically, a cationic polyelectrolyte is used. The polyelectrolyte will be delivered to site either in powder form (25 kg bags) and batched into solution prior to dosing, or alternatively delivered to site as concentrated solution or emulsion for dilution on-site. The polyelectrolyte storage, batching and dosing equipment will be in a dedicated room within the pre-treatment chemical building. The polyelectrolyte (flocculant) receival, storage and dosing systems will be managed in accordance with *Dangerous Goods Safety Act* 2004 and *Dangerous Goods Safety (General) Regulations 2007*.
Polymer / Flocculant for ActiDAFF® sludge thickening	The solids containing backwash water from the ActiDAFF®s is processed through a sludge thickener to concentrate the solids and recover the backwash water. To assist settlement, a polyelectrolyte will be dosed into the thickener feed. The polyelectrolyte will be delivered to site either in powder form (25 kg bags) and batched into solution prior to dosing, or alternatively delivered to site as concentrated solution or emulsion for dilution on-site and will be managed in accordance with *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007*. The polyelectrolyte storage, batching and dosing equipment will be in a dedicated room within the pretreatment chemical building.
Polymer / Flocculant for lime sludge	Sludge from the lime water clarifiers will be dewatered prior to removal from site for either reuse or landfill. A polymer / flocculant is dosed into the sludge to assist dewatering in a centrifuge. The polyelectrolyte will be delivered to site either in powder form (25 kg bags) and batched into solution prior to dosing, or alternatively delivered to site as concentrated solution or emulsion for dilution on-site and will be managed in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007*. The polyelectrolyte storage, batching and dosing equipment will be in the lime sludge dewatering building.

Chemical	Application and waste management
Reverse Osmosis Antiscalant	An antiscalant is required to be dosed into the RO feed stream to prevent precipitation of low-solubility salts in the RO membranes. The antiscalant used will be of low ecotoxicity as it is discharged with the brine sent to the diffuser managed under MS 1207 and the COMEMP requirements that have been set for the project i.e. 99% marine species protection at the boundary of the LEPA. RO antiscalant will be delivered to site by either bulk tanker truck or IBC's and transferred into a bunded bulk storage tank located in the RO Chemical Building and will be managed in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007*. A bank of chemical dosing pumps will deliver the required antiscalant dose to each dose point within the RO process.
Citric acid	Citric acid is used for periodic Cleaning-in-Place of the RO membranes in each RO rack. This is done to remove any accumulated acid soluble contaminants that foul the RO membrane surface. Citric acid CIP is also partially effective for reducing biofilm from the membrane surface. The spent CIP solution will be pH neutralised prior to discharge with the brine. managed under MS 1207 and the COMEMP requirements that have been set for the project i.e. 99% marine species protection at the boundary of the LEPA. Neutralisation of citric acid with caustic results in sodium ions and citrate ions in solution. Citrate has moderate biological oxygen demand but the significant dilution with brine prior to discharge reduces this to negligible levels at the diffusers. The 50% citric acid solution will be delivered to site by bulk tanker truck and transferred into a bunded storage tank and will be managed in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007*. Chemical dosing pumps will transfer the required volume of citric acid solution into a CIP batch as necessary
Sodium bisulphite	A solution of up to 3% sodium bisulfite (SBS) is commonly used to preserve RO membranes in racks that are to be shut down for longer than 24-hours. When the RO rack is to be restarted this preservation solution is neutralised within the CIP waste tank before discharge with RO brine. Sodium bisulfite solution breaks down to sodium and sulphate salts when exposed to air or mixed with oxidising chemicals. The waste SBS will partially decompose in the CIP waste tank and dilution with RO brine will further reduce its concentration to levels that ensure compliance with MS1207 and the COMEMP conditions that have been set for the project i.e. 99% marine species protection at the boundary of the LEPA. The 3% sodium bisulfite (SBS) will be received and stored in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007.*
2,2-dibromo-3-nitrilopropionamide (DBNPA)	DBNPA is a biocide that will be intermittently used to address any biological fouling of the RO membranes. DBNPA can be either shock dosed into the feed of an RO rack or applied as a CIP where it is recirculated through an offline RO rack and then left to soak. A dilute solution of DBNPA is prepared in the RO CIP tank by mixing concentrated DBNPA with RO permeate. A typical batch strength is 30-50 mg/L DBNPA. The dilute solution of DBNPA is recirculated through an RO rack for a pre-determined duration (typically a few hours). DBNPA will be delivered to site in 25 kg drums and stored in a bunded area within the RO CIP Building and will be managed in accordance with Dangerous Goods Safety Act 2004 and Dangerous Goods Safety (General) Regulations 2007. When applied as a shock dose into the feed of an RO rack, DBNPA associates with the brine leaving the RO rack being

Chemical	Application and waste management
	treated. Dilution with RO brine from all other RO racks and sodium bisulphite dosing into the brine effectively reduces the ecotoxicity of DBNPA before reaching the outfall diffusers. When used as a CIP solution for an RO rack, the spent DBNPA CIP solution is neutralised with SBS prior to discharge with the brine. The risk associated with the DBNPA has been modelled in the ERD and is subject to the management requirements stipulated in MS 1207 and the COMEMP. The spent DBNPA solution is then drained from the RO rack to the CIP neutralisation tank. This tank can hold up to 2.5 batches of spent CIP solutions (ASDP stage 1). There is significant natural degradation of DBNPA solution in the CIP neutralisation tank. Its half-life is ~24 hours at pH 7 and this is further accelerated by UV (sunlight) exposure in the open tank. Before the contents of the CIP neutralisation tank can be pumped to the ASDP brine discharge, the tank contents are recirculated by large pumps and the required neutralisation chemicals (sodium hydroxide and citric acid) are dosed. For spent CIP solutions containing DBNPA, the solution pH is raised to above 8.0 by addition of sodium hydroxide (caustic). At pH 8.0 the half-life of DBNPA is reduced to 2 hours. The spent DBNPA solution is then left in the CIP neutralisation tank for 12 hours at pH 8.0+ during which almost complete deactivation of the DBNPA occurs. An excess of sodium sulfite solution is then dosed into the CIP Neutralisation Tank to deactivate any remaining DBNPA. Confirmation that the solution ORP is <300 mV using a calibrated hand-held ORP analyser provides a final confirmation of the complete deactivation of DBNPA.
Caustic Soda	Caustic soda (sodium hydroxide) is used to: • Increase the pH of filtered water entering the RO unit to optimise performance of the RO membranes. • Increase the pH of the drinking water to reduce corrosion in the water distribution network. • raise the pH of some of the CIP solutions during their preparation. • neutralise acidic spent CIP solutions (e.g. spent citric acid CIP solution) prior to their discharge. Such neutralisation is done in the CIP neutralisation tank. At the pH neutral conditions of the brine discharge, the caustic soda breaks down to only sodium ions in solution managed by MS1207 and the COMEMP requirements that have been set for the project i.e. 99% marine species protection at the boundary of the LEPA. Caustic soda will be delivered to site in bulk and stored in two (2) tanks within a dedicated bund inside the RO Chemical Building and will be managed in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007.*
Ethylenediamine tetraacetic acid (EDTA)	EDTA is used in the preparation of clean-in-place solutions for removal of metal scaling on RO membranes, particularly sulphate-based scaling. The solutions are expected to be used infrequently (if at all). EDTA has high ecotoxicity. An investigation is currently being completed to determine whether spent CIP solutions that contain EDTA can be directed to the brine discharge with an acceptable dilution safety factor that will ensure compliance with the EPA conditions (MS 1207). The disposal route for spent CIP solutions that contain EDTA will depend on the outcome of this work. It is likely that this waste will not be directed to the brine discharge or will require additional treatment to destroy the EDTA before discharge with the brine. Alternative this waste may be managed as a trade waste for discharge to sewer or third-party operator. The risk associated with the discharge to brine has been modelled in the ERD and is subject to the management requirements stipulated in MS1207 and the COMEMP.

Chemical	Application and waste management
	EDTA receival, storage and dosing systems will be managed in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007*.
Sodium lauryl sulphate	Sodium lauryl sulphate is used in clean-in-place (CIP) solutions for the intermittent cleaning of RO membranes. The CIP solution is often alternated between high pH through the addition of caustic soda, followed by low pH by the addition of acid. The resulting detergent solution is effective in removing organic fouling from the surface of the membranes. Spent CIP solutions containing SLS are adjusted to neutral pH in the CIP neutralisation tank prior to discharge with the RO brine to the outfall diffusers. The discharge is managed by MS1207 and the COMEMP requirements that have been set for the project i.e. 99% marine species protection at the boundary of the LEPA. The resulting neutralised solution has negligible ecotoxicity. Sodium lauryl sulphate is used in clean-in-place (CIP) solutions will be managed in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007.*
Carbon dioxide	To manage corrosion in the distribution system and in customer plumbing, the pH of RO permeate needs to be adjusted to a target range (7.5pH – 8.5pH) and the hardness and bicarbonate alkalinity need to be increased (target alkalinity >50mg/L). This is achieved by dosing carbon dioxide and calcium hydroxide (hydrated lime). These two chemicals react with each other to form calcium ions (calcium hardness in solution), bicarbonate ions (alkalinity) and increase the pH. Liquid carbon dioxide is delivered to site in bulk tanker trucks and stored in several cryogenic liquid carbon dioxide vessels and will be managed in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007*. Liquid CO2 is drawn from the vessels and passed through an atmospheric vaporizer where heat from the atmosphere boils the liquid CO2. The gas pressure is regulated by a pressure regulator valve at the outlet of the vaporizer. A control valve then adjusts the flow of CO2 gas to inline carbonators that dissolve the required flow of CO2 gas into the flowing permeate. The cryogenic liquid carbon dioxide storage vessels are heavily insulated to minimise heat entering the tanks from the surrounding atmosphere. This heat causes some minimal boil-off of CO2 from the vessels. This bio-off gas is vented to atmosphere. The boiloff rate is dependent on ambient temperature and solar radiation. For the large vessels that will be required for ASDP, the boiloff rate is expected to be less than 0.5% of the vessel volume per day.
Hydrated lime	Hydrated lime is used to produce a clear lime water solution that is then used to increase the pH and alkalinity of the drinking water. Hydrated lime will be delivered to site in bulk powder form and pneumatically transferred into two (2) lime silos located in the potabilization area. A high-quality hydrated lime product will be used that has low insoluble components. Most insoluble components are calcite and silica (sand), which end up in the lime clarifier sludge. All chemical receival, storage and dosing systems will be managed in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007*.
Fluosilicic acid	Fluosilicic acid (FSA) is dosed into drinking water in the potabilization area to provide a fluoride ion concentration in drinking water as per WA Health Department directive. A nominal fluoride ion concentration of 0.85 mg/L is required. A 22% FSA solution is delivered to site in bulk tanker trucks and stored in two (2) bunded tanks in the potabilization area chemical building. Chemical metering pumps dose the required flow of FSA into the drinking water before it enters the drinking water tanks. The dosing lines between the chemical bund and the dosing location are double contained. This arrangement of bunded storage and double contained dose pipes is industry best practice and

Chemical	Application and waste management
	minimises the risk of leaks and spills causing environmental harm in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007.*
Chlorine gas	Chlorine gas is used for final disinfection of the drinking water by providing a free chlorine residual that provides lasting (several days) protection against pathogens as the water traverses through the distribution system to customers. Liquified chlorine gas will be delivered to site in 920 kg (or possibly 1000 kg) containers and stored in a dedicated chlorine building in accordance with the *Dangerous Goods Safety Act 2004* and *Dangerous Goods Safety (General) Regulations 2007.* Chlorine gas is drawn from the online containers and reduced to vacuum conditions by vacuum regulators that are mounted directly on the chlorine container outlet valves. A vacuum ejector generates the vacuum that opens the vacuum regulator allowing chlorine gas to flow out of the container. This arrangement minimises the risk of chlorine leaks because any small leak tends to draw air in rather than allow chlorine gas to leak out. Larger piping or equipment leaks result in a loss of vacuum and automatic closure of the spring-loaded vacuum regulators. The rate of chlorine gas flow that is drawn from the containers is controlled by a specialised chlorinator and dissolved into water at the vacuum ejector. This solution is then piped to the chlorine dose points in the potabilization area. The management of chlorine release risk mandates the designation of a 100 m diameter chlorine risk buffer with restricted land use within this buffer.

7.4 Chemical storage area drainage infrastructure

All chemical storage areas within the premises will be designed and constructed in accordance with the Water Corporation's DESIGN STANDARD DS 79, Design of Chemical Systems - Legislative Requirements and General Principles.

Chemical storage area drainage includes normally closed drains from chemical bunds and chemical drains. These drains are segregated where necessary to prevent risk of mixing of incompatible chemicals. For bunded chemicals, any inventory found within the bund is initially considered to be a potential chemical spill. The spill is investigated to determine whether it is chemical or water. Such testing depends on the chemical stored in the bund. Acids and bases would typically be tested using a pH meter for example. The chemical delivery truck aprons, which are outdoors and will therefore also collect stormwater, are directed to a contained drainage sump. All liquid entering the sump is also initially considered to be a potential chemical spill until proven otherwise.

Where liquid in the chemical bunds and chemical delivery apron drainage sumps is proven to be water, the contents will be drained to the stormwater drainage network. Where found to contain chemical, then an operational decision will be made regarding how to manage the spill and whether any further investigation is required. Testing to differentiate chemicals from water will generally consist of:

- In-situ pH testing for acid and base storage and transfer areas (e.g. citric acid, FSA, caustic).
- In-situ conductivity testing for areas where ionic chemicals that are neither strong acids or bases are stored (e.g. sodium meta-bisulfite).
- Conductivity combined with either ORP or free chlorine testing for sodium hypochlorite storage areas.
- Sampling and laboratory analysis for chemicals where simple in-situ testing cannot reliably differentiate between a dilute chemical spill and water (e.g. DBNPA).

Chemical spills may be:

- Neutralised in-situ (e.g., simple inorganic acids and bases) before release to the stormwater drainage system.
- Neutralised in-situ (e.g., small quantities of CIP chemicals) and then transferred to the brine outfall drainage system.
- Transferred directly to the CIP neutralisation tank(s) where the chemical may either contribute to neutralisation of spent CIP solutions or can be effectively neutralised in that tank prior to discharge to the brine outfall drainage system.
- Transferred off-site to a licensed chemical waste treatment and disposal facility.

7.5 Reverse osmosis clean-in-place drainage

CIP wastewater streams may comprise either a single chemical solution or a mix of several chemicals that aim to remove different contaminants from the membrane surface. One CIP is carried out on one RO rack at a time, with more frequent cleans required on first pass RO racks compared to second pass racks. On completion of a CIP, the spent CIP solution is drained through a dedicated drainage network to the CIP neutralisation tank(s). After the CIP, the RO rack also needs to be thoroughly flushed with permeate before being put back into normal operation, and this flushing water is also directed to the CIP neutralisation tank.

Following neutralisation, confirmed by online pH measurement, the contents of the CIP neutralisation tank are pumped to the brine outfall drainage system for discharge into the brine

outfall. Only spent CIP solutions that can be neutralised to very low levels of ecotoxicity are managed in this manner. Before the contents of the CIP neutralisation tank can be pumped to the ASDP brine discharge, the tank contents are recirculated by large pumps and the required neutralisation chemicals (sodium hydroxide and citric acid) are dosed. For spent CIP solutions containing DBNPA, the solution pH is raised to above 8.0 by addition of sodium hydroxide (caustic). At pH 8.0 the half-life of DBNPA is reduced to 2 hours. The spent DBNPA solution is then left in the CIP neutralisation tank for 12 hours at pH 8.0+ during which almost complete deactivation of the DBNPA occurs. An excess of sodium sulfite solution is then dosed into the CIP Neutralisation Tank to deactivate any remaining DBNPA. This is to ensure the necessary levels of protection of marine species within the Low Ecological Protection Area and the High Ecological Protection Area around the brine diffusers are achieved in accordance with MS 1207 and the COMEMP. Spent DBNPA solution from RO plants that has been deactivated by the above process demonstrate low toxicity. WET test results at reference sites (Southern Seawater desalination Plant and Adelaide Desalination Plant) demonstrate that 99% species protection is achieved after approximately 20 dilutions.

7.6 Discharge via ocean outfall

Where commissioning has determined acceptability, and in accordance with the revised COMEMP, neutralised spent chemical waste will be discharged with RO brine via the ocean outfall. Ecotoxicological assessment of discharges simulating operational desalination plant brine undertaken for other seawater desalination plants have shown that salinity was the chief cause of the observed toxicity, with a smaller effect being observed in some assessments from the addition of process chemicals such as antiscalant. The dilution required to protect the receiving environment from the effects of salinity has generally been shown to be more than adequate to nullify this additional toxicity. However, chemicals such as biocides are inherently ecotoxic and require a higher degree of dilution to mitigate adverse effects.

Process streams discharged to the brine outfall during normal plant operation and maintenance activities will comprise:

- RO brine – filtered seawater at ~150% salts concentration, discharged continuously, and
- Recirculated screened seawater – when the plant is operated at less than full flow, some screened seawater is recirculated from the intake directly back to the outfall to maintain near optimum velocity at the brine diffusers to achieve maximum mixing / dilution with background seawater in the LEPA.

Continuous monitoring systems will be employed by the applicant to monitor inflow and effluent quality at the premises. Continuous online monitoring of the brine discharge shall be downstream of the point of addition of all neutralised spent chemical waste. Table 7 below provides the location and water quality parameters that will be monitored during commissioning and operation of Alkimos Seawater Desalination Plant. Parameter thresholds are exceeded, then an appropriate management response may be undertaken to correct the issue. These may include, but should not necessarily be limited to:

- Investigate the potential sources of higher than predicted toxicity,
- If possible, review and adjust ASDP processes to reduce the waste stream toxicity,
- Increase the dilution ratio of the waste stream prior to discharge, to reduce toxicity,
- Adjust discharge regime (e.g. timing, flow rate, volume) where possible, or
- Revision of CIP chemical usage.

Table 7: Continuous monitoring.

Monitoring Location	Parameter	Units	Frequency	Method
Seawater Pump Discharge	Instantaneous Flow	m^3/second	Continuous	Magnetic flow meter
	Totalised Flow	m^3	Continuous	Magnetic flow meter / digital totaliser
Seawater Intake Sample Point	Temperature	°C	Continuous	APHA 2550 using online PT100 sensor
	pH	pH units	Continuous	APHA 4500-H Electrometric or ASTM D1293-18 Method B
	Oxidation-Reduction potential	mV	Continuous	APHA section 2580
	Conductivity/salinity	mS/ppt	Continuous	APHA section 2520
	Turbidity	NTU	Continuous	APHA section 2130 B
Combined Marine Discharge Sample Point	Temperature	°C	Continuous	APHA 2550 using online PT100 sensor
	pH	pH units	Continuous	APHA 4500-H Electrometric or ASTM D1293-18 Method B
	Oxidation-Reduction potential	mV	Continuous	APHA section 2580
	Conductivity/salinity	mS/ppt	Continuous	APHA section 2520
	Turbidity	NTU	Continuous	APHA section 2130 B
	Dissolved oxygen	mg/L	Continuous	APHA section 4500-O

If the threshold is exceeded, then the management response may include, but should not necessarily be limited to:

- Investigate the potential sources of higher than predicted toxicity,
- If possible, review and adjust ASDP processes to reduce the waste stream toxicity,
- Increase the dilution ratio of the waste stream prior to discharge, to reduce toxicity,
- Adjust discharge regime (e.g. timing, flow rate, volume) where possible, or
- Revision of CIP chemical usage.

Figure 11: Intake and outflow sampling point locations.

7.7 Brine outfall drainage system

The brine outfall drainage system comprises a network of pipes that collect the following process streams, and route them to the brine outfall chamber:

- 1st pass RO reject (brine)
- Any recirculated seawater from the seawater intake pumps (used to improve offshore diffuser mixing during periods of low plant throughput).
- Raw seawater drainage from the SWIPS and seawater pipelines up to the ActiDAFF®s.
- Filtered seawater drainage.
- Filtered ActiDAFF® maturation / rinse water (the initial flow of filtrate following backwash of an ActiDAFF® filter).
- Clear supernatant from the ActiDAFF® backwash thickener.
- Centrate (separated process water) from the sludge centrifuges in the thickening area.
- Centrate (separated process water) from the lime dewatering centrifuge area.
- Any filtered seawater or RO permeate that is not within specification but otherwise presents ALARP environmental risk if discharged to the brine outfall.
- Overflows from the filtered water tank, permeate tank and drinking water tanks (any drinking water tank overflow will have free chlorine neutralised with sodium bisulfite).
- Neutralised spent RO CIP solutions from the CIP Neutralisation Tank.
- Other plant drains where specifically risk assessed as safe to be directed to the brine outfall.

All of the above streams have been determined as suitable to be directed to the brine outfall in compliance with MS 1207 and the COMEMP requirements that have been set for the project i.e. 99% marine species protection at the boundary of the LEPA.

Whole of Effluent Toxicity (WET) Testing will be carried out during commissioning to confirm that the combined effluent stream meets the required marine species protection guideline “trigger” levels for toxicants before entering the designated Low Ecological Protection Area

around each outfall diffuser and the High Ecological Protection Area beyond. WET testing will include test carried out on effluent samples that contain neutralised CIP solutions since brine discharge that contains this intermittent stream represent the highest concentration and broadest range of contaminants. All testing will comply with the EPA-WA Technical Guidance on Protecting the Quality of Western Australia's Marine Environment.

The contents of the outfall chamber are continuously monitored by online water quality analysers, and regularly sampled for other contaminants of potential concern. Continuous online monitoring measures and alarms the following parameters:

- Dissolved oxygen
- Oxidation reduction potential (ORP)
- pH
- Conductivity / salinity
- Turbidity
- Chlorine (confirmation that none is present)
- Temperature

7.8 Discharge of used biocide CIP solutions via ocean outfall as part of ongoing operations

The applicant proposes to begin the time limited operation (plant proving and system integration) of the premises in April 2028, through to October 2028. During this period, samples of two wastewater streams, being brine discharge containing used CIP solutions and standard brine discharge, will be used for WET testing to determine the appropriate dilutions required to achieve the levels of protection required under Ministerial Statement 1207. Following the completion of WET testing and plant proving, the COMEMP for the Alkimos Seawater Desalination Plant will be amended to reflect the requirement for the ongoing management and discharge of chemical waste streams at the premises.

Online water quality analysers will be employed at the premises to continuously monitor the water quality parameters of the contents of the ocean outfall chamber. The parameters which will be continuously monitored are:

- Dissolved oxygen;
- Oxidation reduction potential (ORP);
- pH;
- Conductivity / salinity;
- Turbidity;
- Chlorine (confirmation that none is present); and
- Temperature.

Should the water quality analysers detect parameters outside of the acceptable range (as dictated by the revised COMEMP), alarms will alert the relevant operational staff.

As detailed in section 6.2, several instrumented safeguards prevent the final discharge of non-conforming neutralised CIP solutions to the brine outfall. Operators must confirm that an ORP < 300 mV has been achieved and the absence of DBNPA confirmed by test kit for spent DBNPA CIP solution prior to release. Furthermore, an inline ORP analyser continuously monitors the ORP of the combined discharge stream. Detection of a high-high ORP will trip (stop) all discharge from the CIP Neutralisation Tank. While DBNPA is a non-oxidising biocide, it will give

an ORP reading of approximately 400 mV at a concentration of 0.5 – 3 ppm. This is much less than chlorine where 1 ppm will typically give an ORP reading of approximately 700 mV. Whenever DBNPA CIP activities are being performed, the operator will perform DBNPA deactivation by dosing caustic and sodium bisulfite solution to the CIP Neutralisation Tank until a consistent ORP < 300 mV is measured by calibrated portable ORP instrument. An inline ORP analyser continuously monitors the ORP of the combined discharge stream. Detection of a high-high ORP will trip (stop) all discharge from the CIP Neutralisation Tank. The combined outflow sample is drawn from the outfall chamber by a sample pump (Figure 11). The outfall chamber is the northernmost chamber of the SWIPS structure.

Key findings: The Delegated Officer has reviewed the information regarding discharge of used chemical solutions via ocean outfall as part of ongoing premises operations, and has found:

1. DBNPA will be the only biocide used for CIP at the premises.
2. Ecotoxicological assessment of discharges simulating operational desalination plant brine undertaken for other seawater desalination plants have shown that salinity was the chief cause of the observed toxicity.
3. Ecotoxicological assessment (WET) testing undertaken during the commissioning of the plant will inform a revised COMEMP, including required management actions for dilution and discharge of CIP waste.
4. The dilution required to protect the receiving environment from the effects of salinity has generally been shown to be more than adequate to nullify this additional toxicity.
5. Continuous monitoring systems will be employed by the applicant to monitor inflow and effluent quality at the premises.
6. An inline ORP analyser continuously monitors the ORP of the combined discharge stream. Detection of a high-high ORP will trip (stop) all discharge from the CIP Neutralisation Tank.

7.9 Stormwater management

All stormwater drainage shall be designed in accordance with Australian Rainfall and Runoff (AR&R). The drainage systems shall be designed to cater for a 1 in 10-year ARI storm event and to comply with Local Authority requirements. Events exceeding this criterion shall overflow to the brine discharge chamber such as by means of a weir which only overtops in extreme events. This provision is also intended to provide resilience for the drainage system if extreme events occur within the life of the asset because of climate change.

During extreme, 1 in 100-year ARI storm events, Plant equipment and buildings shall not become inundated, and the facility shall be able to maintain its design drinking water production rate. All works shall be in accordance with the latest publication of the relevant Local Authority (City of Wanneroo) Standards.

All plant stormwater shall be collected in suitable stormwater collection structures and directed to an appropriate on-site storm water disposal facility.

Any process wastewater or other contaminated water shall be collected separate from the stormwater and directed to an on-site process wastewater treatment facility. Potentially contaminated areas shall be roofed to prevent the collection and need for treatment of contaminated stormwater.

Grates, pipes, access chambers and other drainage structures shall be suitable for heavy-duty traffic loading and accessible for cleaning purposes. All pipes shall be laid in accordance with

the manufacturer's recommendations.

Premises stormwater drainage system comprises four drainage infiltration basins, with a pit and pipe network for rooftop runoff, roads, open drains on the southwest and southeast of the site and drainage swales (rain gardens) throughout the site. The site is divided into catchment areas. The largest catchment area is designed to go to infiltration basin no. 1 and sized to accommodate the entire site's runoff. Infiltration basin no. 4 is located in the north of the site and will accommodate runoff from the seawater intake chamber area, as well as Stage 2 Pre-treatment and RO buildings. Infiltration basin no. 5, located in the eastern part of the site will accommodate runoff for a portion of Stage 1 and 2 RO buildings, as well as the ancillary buildings located on the eastern part of the site. Premises stormwater catchments are depicted in Figure 12 below.

The City of Wanneroo Stormwater Design Standard (WDS5, 2015) specifies design criteria for the minor and major storm events. For the minor storms (10% Annual Exceedance Probability - AEP), the drainage infrastructure will safely convey all flows in open swales, side entry pits (SEPs) and pipes, as well as partly on road corridors, while allowing at least one lane on all roads to remain serviceable. For major storm events (1% AEP), the drainage infrastructure will safely convey all flows in the open swales, SEPs and pipes, and on road corridors up to the top of kerb level, by maintaining a freeboard of at least 300 mm between the 1% AEP flood level and the building floor levels to prevent building floor flooding, as per WDS5.13

Storm events greater than 1% AEP will result in the collected stormwater overflowing weirs (located in selected infiltration basins) and flowing to the brine discharge drainage system in accordance with MS 1207 and the COMEMP.

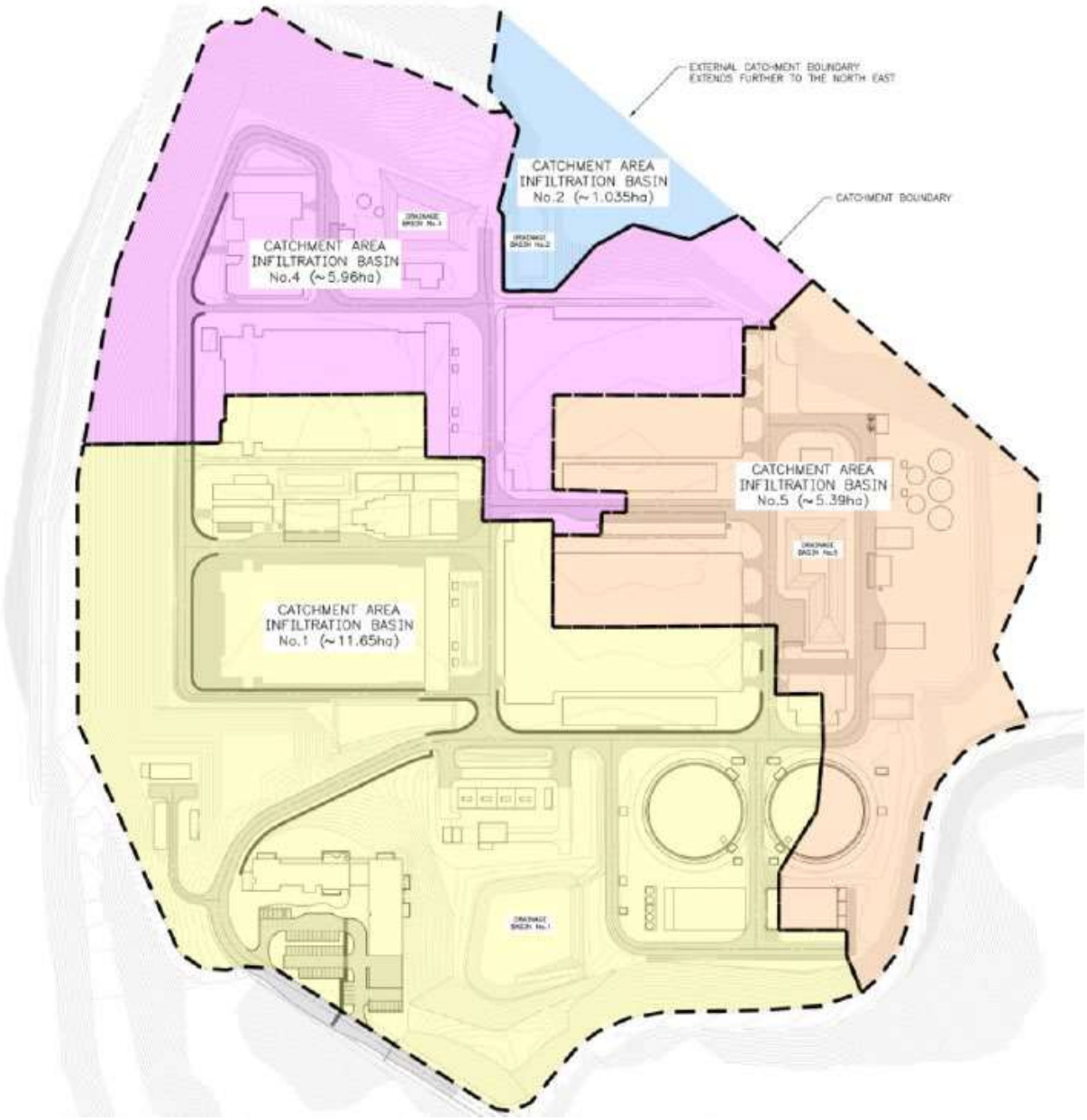

Figure 12: Premises stormwater drainage catchment areas.

7.10 Power Transformer Compound Drainage

All high voltage and medium voltage transformers within the Alkimos Seawater Desalination Plant site will utilise natural ester oil for cooling. This oil is biodegradable in soil, and all transformers will be located within dedicated bunds. Stormwater that accumulates within the transformer bunds will initially be held in the bund until confirmed to be oil free. Oil free stormwater will be discharged to the stormwater drainage system via an oily water separator. Any leaked transformer oil or oil contaminated stormwater that is found in a transformer bund will be removed offsite to a licensed waste disposal facility.

7.11 Generator Set/Diesel Storage Bund Area Drainage

Generator sets and their associate diesel storage(s) will be located within dedicated bunds.

Stormwater that accumulates within the bund will initially be held in the bund until confirmed to

be hydrocarbon free. Oil free stormwater will be discharged to the stormwater drainage system via an oily water separator. Any leaked hydrocarbons or contaminated stormwater that is found in a bund will be removed offsite to a licensed waste disposal facility.

7.12 Domestic Wastewater Drainage System

Domestic wastewater from construction temporary facilities (offices, kitchens, crib rooms, bathrooms, showers and similar will be collected in a temporary gravity sewage collection system that drains to a temporary package sewage pumping station. The temporary sewage pumping station will transfer the domestic wastewater to the inlet of the adjacent Alkimos Wastewater Treatment Plant by a buried sewer pressure main.

Domestic wastewater from the permanent facilities (Administration Building, R&D Complex, Workshop) will be collected in a permanent gravity sewage collection network that drains to the permanent sewage pumping station. Sewage will then be pumped to the inlet of the adjacent Alkimos Wastewater Treatment Plan by a buried sewer pressure main.

7.13 Power generation

Alkimos Seawater Desalination Plant will include rooftop solar panels to several of the major structures including stage 1 RO building, drinking water tanks and chemical building. The combined stage 1 solar PV systems are estimated to reduce the Alkimos Seawater Desalination Plant site grid demand by 3,300 MWh per annum. In addition to rooftop solar, all site streetlighting is proposed to utilise integrated stand-alone solar battery systems.

8. Legislative context

Table 8 summarises approvals relevant to the assessment.

Table 8: Relevant approvals and tenure.

Legislation	Number	Subsidiary	Approval
Environment Protection and Biodiversity Conservation Act 1999 (Cth)	Decision Notice 2019/8453	Water Corporation	Alkimos Desalinisation Plant, Alkimos WA. To construct, operate and decommission: - a seawater desalination plant of about 100 gigalitre (GL) per annum capacity, and - a groundwater treatment plant of about 6 GL per annum capacity within the Alkimos Water Precinct, approximately 40 km northwest of Perth, - tunnels beneath the seabed containing a seawater intake pipeline about 2.46 km long and a separate brine outfall pipeline about 3.99 km long, both with vertical risers, and - a pipeline about 33 km long from the seawater desalination plant to the Wanneroo Reservoir and other distribution points along the pipe route. See EPBC Act referral 2019/8453 subject to the variation of the proposed Action accepted by the Minister under section 156B on 17 August 2023.

Legislation	Number	Subsidiary	Approval
Dangerous Goods Safety Act 2004	n/a	Water Corporation	A Dangerous Goods Site License shall be obtained from DMIRS prior to any licensable quantities of dangerous good being delivered to the site. A Poisons Permit shall be obtained from the Dept. of Health prior to any schedule 7 chemicals being stored on site.
Part IV of the EP Act (WA)	Ministerial Statement 1207	Water Corporation	The construction and operation of a 100 GL per annum seawater desalination plant and a 6 GL per annum groundwater treatment plant at the Alkimos water precinct. The source water for the desalination process will be delivered through the construction of a pipeline directly west of the proposed seawater desalination plant. By-products of the desalination process will be returned further offshore to the marine environment through a separate pipeline. In order to distribute the drinking water into Perth's Integrated Water Supply Scheme, the project includes a 32.93-kilometre pipeline from the Alkimos site to the Wanneroo Reservoir, and other significant distribution points along the pipe route.
	Ministerial Statement 722	Western Australian Planning Commission	To amend reservations and zonings in the Metropolitan Region Scheme consistent with the Alkimos-Eglinton Structure Plan. The main elements of the amendment with the potential to impact on the environment are: • the relocation inland of the wastewater treatment plant (WWTP) (from current Site A to proposed Site B); • relocation inland of the groundwater treatment plants that will service the Northwest Corridor, to improve access to the prime regional beach at Alkimos; and • modifications to land reserved for Parks and Recreation, to improve coastal access and create a town park at Alkimos.
Part V of the EP Act (WA)	W6523/2021/1	Water Corporation	Alkimos Wastewater Treatment Plant
	L8434/2010/2		Alkimos Wastewater Treatment Plant

8.1 Part IV of the EP Act

8.1.1 Background

The Alkimos Seawater Desalination Plant Proposal has been assessed under Part IV of the *Environmental Protection Act 1986* by the WA Environmental Protection Authority (EPA). This assessment process concluded in August 2023, when Ministerial Statement 1207 (MS 1207) was issued. The Alkimos Seawater Desalination Plant Proposal approved in MS 1207 was for a capacity of 100 GL. This applicant is currently seeking Part V approval to construct Stage 1 of the greater proposal, with a total capacity of 50 GL. The remaining 50 GL will be developed in either one (50 GL Stage) or two stages (two 25 GL stages), estimated to be after 2030 and subject to future requirements. The timing of each stage is based on actual growth in water demand, potential groundwater allocation reduction, actual streamflow conditions and timing of other source option development (e.g. construction of additional desalination activities in Kwinana).

8.1.2 Ministerial Statement 1207 - Alkimos Seawater Desalination Plant

Ministerial Statement MS 1207 was made in relation to a proposal by the Water Corporation for the construction and operation of a 100 GL per annum seawater desalination plant and a 6 GL per annum groundwater treatment plant at the Alkimos water precinct. The source water for the desalination process will be delivered through the construction of a pipeline directly west of the proposed seawater desalination plant. By-products of the desalination process will be returned further offshore to the marine environment through a separate pipeline. To distribute the drinking water into Perth's Integrated Water Supply Scheme, the project includes a 32.93-kilometer pipeline from the Alkimos site to the Wanneroo Reservoir, and other significant distribution points along the pipe route.

Much of the statement relates to activities beyond the scope of the application, including for provisions for the clearing of pipeline corridor vegetation and the offshore pipeline, inlet, and outfall construction and installation.

MS 1207 stipulates the limitations and extent of the overall proposal. The operational elements of the seawater desalination plant are set out in condition A1-1, namely:

- Marine brine discharge maximum salinity of 75,200 mg/L; and
- Intake velocity Maximum velocity of 0.15 metres/second.

The project life is also limited to 100-years from commissioning of the desalination plant.

MS 1207 sets a number of outcomes-based conditions relating to monitoring and adaptive management of toxicants discharged from the premises. Among these is the requirement for the applicant to review and revise the Commissioning and Operations Marine Environmental Management Plan (COMEMP) prepared for the premises. The COMEMP includes monitoring, management and reporting protocols, remodeling of density stratification and dissolved oxygen concentrations in bottom waters to inform adaptive/pre-emptive management actions, and provision for further whole of effluent toxicity testing of brine containing clean-in-place chemicals. This requirement is outlined in condition B4-2 and related condition C4-2 of MS 1207; provided below.

> *B4-2 The proponent must review and revise the Commissioning and Operations Marine Environmental Management Plan (Rev 3, February 2023), that satisfies the requirements of condition C4 and demonstrates how the achievement of the marine environmental quality environmental outcomes in condition B4-1 will be monitored and substantiated, and submit to the CEO.*
>
> *…*

C4-2 The environmental management plan required under condition B4-2 are also required to include, but not be limited to:

(1) the spatial data and coordinates for the Low Ecological Protection Area referred to in condition B4-1;

(2) at least two years of baseline data for salinity in the local receiving environment;

(3) measures to ensure that the 99% species protection guideline 'trigger' levels for toxicants, as defined in the ANZG, are achieved in the High Ecological Protection Areas;

(4) the monitoring and evaluation, including remodelling, of the environmental effects of discharging wastewater into the marine environment off Alkimos, during commissioning phase including on density stratification and dissolved oxygen concentrations in bottom waters, to assess performance against the environmental outcome;

(5) a program to undertake whole-of-effluent toxicity testing during the commissioning phase, of two wastewater types, including one sample that contains clean-in-place chemicals, and one sample that does not contain clean-in-place chemicals, with sufficient rigor to determine the dilutions required to achieve the 99% species protection level of each.

Key Findings

1) In relation to the regulation of the marine discharge component of the premises, MS1207 regulates the discharge volume and salinity concentrations within the discharge. Regulation of discharges to ocean outfall of used chemical solutions used in the treatment process are not within the scope of MS 1207 and as such, will be regulated under Part V of the EP Act through conditions in the works approval.
2) The Delegated Officer has determined that the impacts of osmotic stress resulting from the discharge of brine shall be managed through MS 1207, under Part IV of the EP Act and are therefore not assessed in this Decision Report:
3) Impacts and emissions associated with the construction of pipelines and diffusers outside of the nominated prescribed premises boundary will not be included in this assessment.
4) The Water Corporation is required to review and revise the Commissioning and Operations Marine Environmental Management Plan (COMEMP)prepared for the for the Alkimos Seawater Desalinating Plant project.
5) The COMEMP states that diffuser performance will be validated during commissioning to confirm the number of dilutions achieved at the individual LEPA sites is sufficient to meet the 99% species protection guideline.
6) A high level of ecological protection will be maintained 100 m from the point of discharge.
7) There is a level of uncertainty regarding the number of dilutions required to achieve a high level of ecological protection for brine containing clean-in-place chemicals.
8) The management of clean-in-place waste streams, particularly the chemical biocide 2,2-dibromo-3-nitrilopropionamide (DBNPA), prior to discharge as part of the commissioning and time-limited operation of the Alkimos Seawater Desalinating Plant will be assessed in this Decision Report.

8.2 Contaminated sites

The premises is not a known or suspected contaminated site under the *Contaminates Sites Act 2003*. There are no mapped, registered contaminated sites within 1 km of the premises boundary. The nearest registered contaminated site is located approximately 7.2 km east of the premises.

8.3 Other relevant approvals

8.3.1 Planning and Development Act 2005

Water Corporation applied for a Development Approval for the Alkimos Seawater Desalination Plant in April 2023 (DAP/23/02473) under the *Planning and Development Act 2005.* The Metropolitan Outer Joint Development Assessment Panel (JDAP) approved the development application on 20 September 2023 subject to conditions (LGA Ref: DA2023/401; WAPC 30-50279-8).

8.3.2 Rights in Water and Irrigation Act 1914

A licence to take groundwater under 5C of the *Rights in Water and Irrigation Act 1914* (RIWI Act) will be sought and obtained prior to any dewatering works being undertaken.

8.3.3 Federal Legislation

Environment Protection and Biodiversity Conservation Act 1999 (Cth)

Water Corporation referred the proposed action (Alkimos Seawater Desalination Plant Proposal) to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 23 July 2019.

The Alkimos Seawater Desalination Plant Proposal was determined to be a 'Controlled Action' on 29 October 2019. On 4 March 2020, the Alkimos Seawater Desalination Plant Proposal was determined as an 'accredited assessment' in accordance with the Bilateral Agreement between the State and Commonwealth Governments.

The Alkimos Seawater Desalination Plant Proposal was approved subject to conditions under Section 133(1) of the EPBC Act on 8 November 2023 (EPBC Ref: 2019/8453).

8.4 Part V of the EP Act

8.4.1 Applicable regulations, standards, and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations.

The guidance documents which inform this assessment are:

- *Guidance Statement: Setting conditions (October 2015)*
- *Guideline: Decision making (December 2020)*
- *Guideline: Environmental siting (December 2020)*
- *Guideline: Regulatory principles (December 2020)*
- *Guideline: Risk assessments (December 2020)*

8.4.2 Works approval and licence history

Table 9 summarises the works approval and licence history for the premises.

Table 9: Works approval and licence history.

Instrument	Issued	Nature and extent of works approval, licence, or amendment
W4423/2008/1	28/08/2008	Approval to construct Stage 1 of the Alkimos WWTP
L8434/2010/1	26/05/2011	Licence granted.
L8434/2010/1	15/04/2016	Amendment Notice 1: Removal of conditions relating to waste discharge to air, water, and land. Addition of conditions regarding waste acceptance, processing, containment infrastructure and monitoring.
W6523/2021/1	04/01/2022	Works Approval for the construction and time limited operations associated with the equipping of oxidation ditch 3 and commissioning works.
W6523/2021/1	13/12/2022	Works Approval amendment for the construction and operation of a larger volume bioselector.
L8434/2010/2	25/05/2023	Licence renewal, including reinstatement of treated wastewater sampling conditions previously erroneously removed under Amendment Notice 1.

8.4.3 Clearing

The proposed prescribed Alkimos Seawater Desalination Plant works approval premises boundary is cleared and does not contain any native vegetation. The prescribed premises clearing was authorised under MS1207 and EPBC 2019/8453.

9. Location and siting

9.1 Siting context

The proposed Alkimos Seawater Desalination Plant is located within the Alkimos Water Precinct, across Lot 3000 on Plan 415979 on Brindabella Pathway, Alkimos, within the City of Wanneroo local government area. This Lot was set aside as an area for Public Purposes, with a small portion of Urban Deferred, in an amendment of the Metropolitan Region Scheme (MRS) (MRS Amendment 1029/33). The MRS specifically provided for a 600 m odour buffer surrounding the Alkimos WWTP, hence the circular nature of the lot. EP Act Ministerial Statement 0722 (2006) approving the Alkimos-Eglinton Metropolitan Region Scheme Amendment, sets portions of the wastewater treatment plant Public Purposes reservation aside to be managed for conservation purposes. Ministerial Statement 0722 conditions Areas 9a, 10a, and 10b to be managed for conservation purpose; to protect the integrity, function, and environmental value of bushland. Ministerial Statement 1207 and EPBC Approval 2019/8453 condition the management requirements of Areas 9a, 10a and 10b.

9.2 Residential and sensitive receptors

Sensitive human receptors surrounding the Alkimos Water Precinct include current and proposed future primarily residential dwellings. Separation distances to current and future receptors was assessed and managed under MS 1207. The distances to residential and

sensitive receptors are detailed in Table 10 below.

Table 10: Receptors and distance from activity boundary.

Sensitive Land Uses	Distance from Prescribed Activity
Future urban development (currently undeveloped area of degraded remnant vegetation)	Approximately 10 m from western premises boundary.
Residential premises, Commander Drive, Alkimos	Approximately 1 km northwest of northern premises boundary.
Residential premises, Painted Parkway, Alkimos	Approximately 330 m south of southern premises boundary.
Future Highschool site, Marmion Avenue, Alkimos	Approximately 1 km northeast of northern premises boundary.
St. James Anglican School, 2 Graceful Boulevard, Alkimos	Approximately 880 m southeast of eastern premises boundary.
Residential premises, Fresco Way, Alkimos	Approximately 1.25 km northeast of eastern premises boundary.
Alkimos Beach, Coolangatta Rise, Alkimos	Approximately 580 m west of western premises boundary.
Alkimos Surf Lifesaving Club, 100 Coolangatta Rise, Alkimos	Approximately 860 m southwest of premise boundary.
Alkimos Beach Primary School, 200 Leatherback Boulevard, Alkimos	Approximately 700 m southeast of southern premises boundary.
Haven Baptist Church and Shorehaven Primary School, 91 Shorehaven Boulevard, Alkimos	Approximately 1.3 km north of northern premises boundary
Shorehaven Beach foreshore park and Oceans 27 restaurant, 27 Portside Promenade, Alkimos	Approximately 1.3 km northwest of northern premises boundary.

9.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted by activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are presented in Table 11 below. Table 11 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem. The table has also been modified to align with the *Guideline: Environmental Siting.*

Portions of the Public Purposes reservation within which the Alkimos Water Precinct is located have been set aside to be managed for conservation purposes; to protect the integrity, function, and environmental value of the bushland. These areas were identified in Ministerial Statement 722 (Areas 9a, 10a, and 10b), and are assessed and managed under Ministerial Statement 1207.

The premises is located within an Environmentally Sensitive Area (ESA).

Table 11: Environmental values.

Specified ecosystems	**Distance from the Premises**
Bush Forever Site 397/ System 6 Conservation reserve – M2	Bordering northwest of Licence L8434/2010/2 prescribed premises boundary, within which the premises is located.
Acacia Shrublands on Taller Dunes of Swan Coastal Plain priority 3 ecological community (Acacia Shrublands PEC)	Surrounding and within northern portion of the Licence L8434/2010/2 prescribed premises boundary, within which the premises is located.
Banksia Woodlands of the Swan Coastal Plain threatened ecological community (Banksia Woodlands TEC).	
Tuart Woodlands and Forests of Swan Coastal Plain threatened ecological community (Tuart Woodlands TEC) (Water Corporation, 2022a)	
Biological component	**Distance from the Premises**
Threatened/Priority Flora: • *Hibbertia leptotheca* (Priority 3)	Recorded from limestone ridges within Bush Forever Site 397
Threatened/Priority Fauna including: • Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), • Carnaby's Black Cockatoo (*Zanda latirostris),* • Quenda (*Isoodon fusciventer)* (P4), • Western Brush Wallaby (*Notamacropus Irma)* (P4), • Black-striped Burrowing Snake (*Neelaps calonotos (*P3), and • SCP Shield-Backed Trapdoor Spider (*Idiosoma sigillatum*) (P3)	Recorded habitat surrounding and within northern portion of the Licence L8434/2010/2 prescribed premises boundary, within which the premises is located. The works approval proposed prescribed premises boundary does not contain any native vegetation/fauna habitat.

9.4 Hydrogeology and Hydrology

9.4.1 Surface water

The premises is located within the coastal surface water catchment area. The premises does not contain nor is it located within proximity to any surface water features including watercourses, geomorphic wetlands, Ramsar wetlands, South Coast Significant Wetlands or Wetlands of International Importance. The nearest wetland is Carabooda Lake, classified as a Resource Enhancement Wetland (REW) located approximately 3.5 km to the east of the premises boundary.

9.4.2 Marine environment

The Alkimos Seawater Desalination Project involves the drilling and construction of dedicated pipelines for the intake of seawater and discharge of saline wastewater from the premises. The

potential impacts to the marine environment were assessed under the under Part IV of the EP Act and are managed under the conditions of MS 1207 and EPBC Act approval 2019/8453.

9.4.3 Groundwater

The premises is situated in the Perth Basin, which comprises a regional sedimentary basin up to 12 km thick with several significant groundwater aquifers. The Swan Coastal Plain drainage basin covers an area of 2,126 km^2 and forms part of the larger geological formation of the Perth Basin.

The key aquifer is the superficial aquifer, a shallow unconfined regional aquifer. The superficial aquifer is made up of multiple geological formations and comprises Quaternary– Tertiary sediments of the coastal plain. The premises footprint encompasses portions of the Safety Bay Sand and Tamala Limestone Formations.

Groundwater flow in the Alkimos region is westward from the Gnangara Mound towards the coast, where groundwater discharges over a saline wedge. Recharge is primarily from surface infiltration of rainfall and some runoff from the Gingin Scarp. During geotechnical site investigations, groundwater was encountered at depths ranging from approximately 5.8 to 17.5 metres below ground level (mbgl) or between 0.2 and 3.2 mAHD.

The premises is located within a groundwater area proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act). The premises is not located within a proclaimed surface water area.

The distances to groundwater and water resources are shown in Table 12 below.

Table 12: Groundwater and water resources.

Groundwater and water sources	Distance from Premises	Environmental value
Perth Coastal and Gwelup Underground Water Pollution Control Area	Northeastern/Eastern portion of the Licence L8434/2010/2 prescribed premises.	Protection of groundwater resource for extraction and inclusion in Perth's Integrated Water Supply Scheme.
Perth Coastal and Gwelup Underground Water Pollution Control Area - Wellhead Protection Zones	Perth Coastal and Gwelup Underground Water Pollution Control Area approximately 100 m east of proposed works approval prescribed premises boundary.	
Indian ocean	Approximately 760 m to the west of the Licence L8434/2010/2 prescribed premises boundary, within which the premises is located.	Marine environment with associated recreational, environmental, and commercial values.
Groundwater	Groundwater beneath the premises is between 5.8 and 18.5 m (below ground level). Groundwater in the superficial aquifer is recharged by rainfall infiltration and flows westwards to discharge to the ocean.	Pathway for dissolved pollutants to nearshore environment.

9.5 Soil type

The premises is situated across sand dunes, coastal dunes, and calcareous and siliceous locally shelly and/or cemented beach rock, which is generally referred to as Tamala Limestone. This comprises unconsolidated to strongly lithified calcarenite with calcrete/kankar soils. The premises is largely located on the topographically irregular ridges and undulating landscape underlain by aeolianite which is frequently exposed with varied elevations of up to approximately 100 m above sea-level.

The premises is bound by steep-sided high-relief sand dunes to both the north and south of the site. The eastern boundary of the site is characterised by moderate relief sand dunes with steep to undulating topography; whilst the western boundary is characterised by a low-relief and gently undulating ridge of shallow limestone rock. The central part of the site has gently undulating to flat topography and comprises an area of low elevation, defining a 'central depression' bound on all sides by relatively higher ground. The 'central depression' is characterised by sands, variably weakly cemented in places, underlain by a layer of peat and clay in the middle and eastern parts of the depression.

The premises is not mapped as having any risk of Acid Sulfate Soils (ASS) occurring within 5 m of natural ground level. No actual ASS or potential ASS (PASS) has been identified from geotechnical investigations within the premises.

9.6 Meteorology

9.6.1 Wind direction and strength

Wind strength and direction in the Alkimos locality varies significantly between summer and winter seasons. In summer, winds are predominately south-westerly, and consistently moderate to fresh (67%).

Wind direction in the winter months is variable. Average wind strengths are lower (calm to moderate [72%]) but characterised by short periods (4%) of strong winds of greater than 40 km/hr coinciding with winter storm events.

9.6.2 Regional climate

The northern suburbs of Perth area experience a Mediterranean type climate characterised by mild, wet winters and hot, dry summers. The nearest weather station to the premises is the Gingin Aero (Station 009178), located approximately 17 km east of the premises. Atmospheric temperatures are highest in January/February and lowest in July/August. The annual mean maximum temperature is 25.7 °C and the annual mean minimum temperature is 11.1 °C. The Gingin Aero station reports an annual mean rainfall of 632.0 mm, with the majority falling in winter in association with cold fronts from the southwest. However, remnants of ex-tropical cyclones from the northwest can bring heavy rain falls from late summer to early autumn.

10. Risk assessment

10.1 Determination of emission, pathway, and receptor

In undertaking its risk assessment, DWER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event which requires detailed risk assessment.

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Table 14.

The key emissions and associated actual or likely pathway during premises construction, commissioning, and operation which have been considered in this decision report are detailed in Table 13 below. Table 13 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 13: Proposed applicant controls.

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Vehicle movements on unsealed access roads Excavations Construction of new buildings, plant, and infrastructure	Air/windborne pathway	• Water carts, • Sprinklers, • Soil-binding agents, • Avoiding dust-raising activity during periods of high winds, • Construction planned to minimise potential for airborne dust, • Vehicle movement to be minimised and to remain on designated tracks and maintain appropriate speed to minimise dust generation, • Stabilisation of soil stockpiles to prevent erosion and dust emissions, • Dust producing activities to be suspended immediately if dust suppression

Emission	Sources	Potential pathways	Proposed controls
			measures prove ineffective.
Sediment contaminated groundwater	Dewatering activities	Overland flow and infiltration through soil profile	• A licence to take groundwater under 5C of the Rights in Water and Irrigation Act 1914 (RIWI Act) will be sought and obtained prior to any dewatering works being undertaken. • Development of a site-specific Acid Sulfate Soils and Dewatering management Plan(s) in accordance with 'Identification and investigation of acid sulfate soils and acidic landscapes' (DER, 2014) and 'Treatment and management of soil and water in acid sulfate soil landscapes' (DER, 2015) guidelines prior to any works that may cause disturbance to ASS, including but not limited to, groundwater abstraction, dewatering, tunnelling, excavations in risk areas. • A slurry treatment plant to treat drilling mud, cuttings, and groundwater from the tunnel boring operations. Drilling mud (Bentonite) will be recycled back to the Tunnel Boring Machine (TBM). • Cuttings will be stabilised, sorted by size, and used as structural fill where possible.
Noise and vibration	Heavy equipment usage Vehicle movements Excavation activity Construction of new buildings, plant, and infrastructure	Air/windborne pathway	• Nominate the equipment types and expected noise emissions for construction activities and how works will be conducted in accordance with Section 4 of AS 2436-2010. • Works are to be limited to between 0700 and 1900h Monday to Saturday. • All mechanical plant is to be silenced by the best practical means using current technology. Mechanical plant, including noise-suppression devices, shall be maintained.
Uncontrolled Spills / Discharges of Chemicals, Hydrocarbons or Contaminants	Transportation and storage of fuels and chemical products Refuelling of vehicles, plant, and equipment	Infiltration through soil profile and contamination of unconfined groundwater aquifer	• All chemicals are to be stored in accordance with relevant Australian standards including AS1940: The Storage and Handling of Flammable and Combustible Liquids and AS3780: The Storage and Handling of Corrosive Substances. • Any refuelling and servicing of plant, vehicles and equipment is to occur on a bunded area at least 100 m away from any TEC, PEC, Bush Forever Sites, or water bodies.

Emission	Sources	Potential pathways	Proposed controls
	Civil and construction work		• Spill kits are to be readily available at chemical storage locations and during maintenance, refuelling, or transfer of chemicals.
Light emissions	Construction and safety lighting	Air and space dispersal	• Where possible, lighting required for the construction activities will be designed to be directionally positioned into the premises to minimise light spill outside of the prescribed premises boundary.
Construction waste	Waste bins and stockpiles	Air/windborne pathway Overland flow and infiltration to soil and groundwater	• All waste bins on site will have securely fitted lids to prevent the attraction of fauna or movement of waste in wind/weather. • Remove all general waste from site and dispose of to a suitable landfill facility, as often as required to prevent overflow of waste receptables. • Safely contain hazardous/controlled waste and prevent exposure of harmful substances to personnel or the public through correct handling and disposal. • Hydrocarbon waste to be disposed of to an appropriate Controlled Waste Contractor licenced under the Environmental Protection (Controlled Waste) Regulations 2004. • Wastes, other than excess overburden (excluding spoil) will not be buried on any construction site. • Excess overburden produced from trenching/tunnelling excavations will be disposed of to: ○ The excavated trench; or ○ Suitable location agreed with the Landowner (the Landowner has first preference to retain excess overburden from their own property); or ○ A suitable location agreed with adjacent landowners; or ○ A local landfill as inert waste. • Other suitable sites for disposal of excess overburden may be identified by the Contractor but shall be approved by Water Corporation.

Emission	Sources	Potential pathways	Proposed controls
Commissioning			
Liquid waste containing free chlorine and process chemicals	Commissioning of drinking water infrastructure and discharge via ocean outfall	Overland flow and infiltration to soil and groundwater	• Appropriate treatment of hyper-chlorinated water prior to disposal. • Ensure discharge of chlorine-treated water is directed to an identified and approved discharge location/system.
Operation			
Noise and vibration	Operations of desalination plant (pump noise) Heavy vehicle movements	Air/windborne pathway	• Plant layout has been designed to reduce noise levels with lower-emitting activities/processes situated closer to the edges of the prescribed premises and higher noise emitting activities/processes screened by other buildings. • The design and construction of the westerly-facing berm to reduce noise emissions from the desalination plant. • Detailed design of the Alkimos Seawater Desalination Plant to ensure operational noise meets the *Environmental Protection (Noise) Regulations 1997.* • Noise attenuation measures will be required for all noise generating infrastructure. All noise generating equipment will typically be housed within buildings fitted with noise attenuation features, which will substantially dampen noise, in particular for the future residential area to the west.
Odour	Storage of seawater intake screenings Production and storage of liquid/solid organic waste	Air/windborne pathway	• Alkimos Seawater Desalination Plant process and containment infrastructure will be designed and constructed to limit the potential for odour emissions by using covers or other odour reduction measures on infrastructure and/or locating containment/process infrastructure within buildings, where possible.

Emission	Sources	Potential pathways	Proposed controls
Light emissions	Operations of desalination plant	Air/windborne pathway	• Where possible, lighting required for the construction activities will be designed to be directionally positioned into the premises to minimise light spill outside of the prescribed premises boundary. • The westerly-facing berm will be designed and constructed to provide a barrier to the adjacent future residential land development area from light emissions from the desalination plant.
Brine waste from desalination process, blended with the following streams: • Seawater intake screen washings. • Membrane backwash effluent from membrane filter. • RO plant chemical clean wastewater. • Neutralised membrane filter plant chemical clean wastewater. • RO plant flushing wastewater. • Stormwater in the event of stormwater	Operation and maintenance of desalination plant	Direct discharge to via ocean outfall	• Alkimos Seawater Desalination Plant has been designed to reduce the potential environmental impacts associated with the discharge of brine effluent to the marine environment. • Toxicity testing of a similar desalination plant discharge revealed that a sample of brine containing 'clean-in-place' chemicals (CIP) required 29.4 dilutions and brine without CIP required 21.7 dilutions to meet the required 99% species protection level. The outfall diffusers of the proposal are designed to achieve 30 dilutions at a distance of 70 m from the point of discharge. • The COMEMP will incorporate a program to undertake comparative whole-of-effluent toxicity testing of wastewater from the ASDP that contains CIP chemicals, and that does not contain CIP chemicals during the commissioning phase. The results will be used to determine the dilutions required to achieve the 99% species protection level and to determine which sample type has the greatest toxicity. The number of dilutions required for the most toxic sample type will provide the minimum dilutions to be achieved 100 m from the discharge point and will guide toxicity testing during operations. • WET testing completed on a sample of SSDP waste stream containing CIP chemicals suggested the dilutions required to maintain a high level of ecological protection (~1:21) for brine are similar to those after the addition of CIP chemicals (+CIP) (1:29). The sample toxicity is predominantly due to the osmotic imbalance caused by salinity, rather than the addition of the CIP chemicals (Intertek 2018). The risk of toxicity due to the addition of CIP chemicals is therefore considered low. CIP chemicals will be used intermittently (<10% of the time) and present at low concentrations once diluted in the waste stream.

Emission	Sources	Potential pathways	Proposed controls
containment.			• The risk posed by the discharge of CIP chemicals is considered negligible relative to the effects of brine, and not expected to compromise the EPA's environmental objectives for the EPAs identified factors: ○ Marine Environmental Quality ○ Benthic Communities and Habitats ○ Marina fauna, and ○ Social surroundings.
Uncontrolled spills / discharges of chemicals or hydrocarbons	Operations and maintenance activities Refuelling of vehicles, plant, and equipment Storage/containment of process effluent Storage/containment of process solids Overflows of containment infrastructure Overflows of stormwater containment infrastructure	Overland flow and infiltration to soil and groundwater	• All chemicals are to be stored in accordance with relevant Australian standards including: ○ AS1940: The Storage and Handling of Flammable and Combustible Liquids ○ AS3780: The Storage and Handling of Corrosive Substances. • Spill kits are to be readily available at chemical storage locations and during maintenance, refuelling or transfer of chemicals. • Any refuelling and servicing of plant, vehicles and equipment is to occur on a bunded area at least 100 m away from any TEC, PEC, Bush Forever Sites, or water bodies. • All solid and liquid waste produced from the desalination process will be stored within vessels or compounds that are impervious containers (except for seawater intake screening collection baskets which have a meshed bottom for drainage of liquid back to the brine outfall). • All processing and liquid/solid waste storage infrastructure will be situated on impervious hardstand areas that have been designed to capture and contain any spilled or overflowed process or waste liquids/solids. • The design and construction of the Alkimos Seawater Desalination Plant will ensure stormwater is managed separately from process operations and activities of the Alkimos Seawater Desalination Plant. The stormwater systems are to be able to contain up to a 1 in 100-year ARI weather event.

Emission	Sources	Potential pathways	Proposed controls
Liquid waste streams, including: • CIP effluents • Sludge • Intake screen debris •Seawater intake screen washings	Operation and maintenance of the desalination plant	Overland flow and infiltration to soil and groundwater	• Safely contain hazardous/controlled waste and prevent exposure of harmful substances to personnel or the public through correct handling and disposal. • Hydrocarbon waste to be disposed of to an appropriate Controlled Waste Contractor licenced under the *Environmental Protection (Controlled Waste) Regulations 2004*. • Solid waste (sludge) produced by the desalination process will be stored on site in impervious containers prior to being transported to an appropriately licenced waste facility offsite for disposal. • Liquid waste including CIP chemicals and other wastes will be transported and disposed of to a licensed facility.

10.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and considers potential source-pathway and receptor linkages as identified in Section 10.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Table 13), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 14.

Works approval W6911/2024/1 that accompanies this decision report authorises construction and time-limited operations. The conditions in the issued works approval, as outlined in Table 14, have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the premises i.e. seawater desalination and wastewater discharge via ocean outfall. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence application.

Table 14. Identification of emissions, pathway, and receptors during construction, commissioning, and operations.

Risk events						Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient ?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities		**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Construction									
Construction, mobilisation, and positioning of infrastructure	Vehicle movements on unsealed access roads	Dust	Air / windborne pathway causing impacts to health and amenity	Residential properties, schools, and beachgoers	Refer to Table 13	C = Slight L = Possible **Low Risk**	Y	Condition 2 and 3	N/A
		Noise							
	Construction of new buildings, plant, and infrastructure	Noise and vibration	Air / windborne pathway causing impacts to health and amenity	Residential properties, schools, and beachgoers	Refer to Table 13	C = Slight L = Unlikely **Low Risk**	Y	N/A	N/A
		Dust				C = Minor L = Possible **Medium Risk**	Y	Condition 2 and 3	N/A
		Groundwater from dewatering activities	Overland flow and infiltration through soil profile resulting in soil contamination and impacts on remnant native vegetation communities	Remnant native vegetation	Refer to Table 12	C = Slight L = Possible **Low Risk**	Y	N/A	N/A
	Construction and safety lighting.	Nighttime light pollution	Space and air, resulting in night-time disturbance of residents	Residential properties	Refer to Table 13	C = Slight L = Possible **Low Risk**	Y	N/A	N/A

Risk events						Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient ?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities		Potential emission	Potential pathways and impact	Receptors	Applicant controls				
	Waste bins and stockpiles	Wind-blown construction waste	Air / wind dispersion with impacts to visual amenity, and potential entrapment of native fauna	Residential properties, schools, public spaces, and natural areas (beaches and reserves)	Refer to Table 13	C = Minor L = Possible **Medium Risk**	Y	Condition 4	N/A
		Waste leachate	Overland flow and infiltration to soil and groundwater with impacts on remnant native vegetation or Indian Ocean nearshore environment	Indian Ocean nearshore environment. Remnant native vegetation	Refer to Table 13	C = Slight L = Rare **Low Risk**	Y	N/A	N/A
Civil and construction works (including transportation and storage of fuels and chemical products and refuelling of vehicles, plant, and equipment)	Uncontrolled spills / discharges of chemicals or hydrocarbons	Soil or groundwater contaminants	Overland flow and infiltration through soil profile with impacts on Remnant native vegetation or Indian Ocean nearshore environment	Remnant native vegetation Indian Ocean nearshore environment	Refer to Table 13	C = Slight L = Possible **Low Risk**	Y	Condition 10 and 11	N/A

Risk events						Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient ?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities		**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Commissioning and operation during time-limited operations									
Commissioning of drinking water infrastructure (discharge via ocean outfall)	Chlorine flushing / disposal of disinfection water	Liquid waste containing free chlorine and process chemicals	Failure of waste containment infrastructure resulting in overland flow and infiltration to soil and groundwater	Remnant native vegetation	Refer to Table 13	C = Slight L = Unlikely **Low Risk**	Y	Condition 12	N/A
			Direct discharge via ocean outfall, with impacts on marine biota	Indian ocean (marine environment)	Refer to Table 13	C = Moderate L = Possible **Medium Risk**	N	Condition 13 and 15	N/A
Desalination plant operation	Access and security lighting	Light emissions	Space and air, resulting in night-time disturbance of residents	Residential properties	Refer to Table 13	C = Slight L = Unlikely **Low Risk**	Y	N/A	N/A
	Treatment of ocean intake	Odour	Air / wind dispersion with adverse amenity impacts	Residential properties, schools, and beachgoers	Refer to Table 13	C = Slight L = Possible **Low Risk**	Y	Condition 1	N/A
		(accidental spillage of) collected organic sludge	Overland flow and infiltration through soil profile causing soil contamination impacting remnant vegetation, and discharge to marine environs via infiltration and unconfined groundwater flows	Indian ocean (marine environment) Remnant native vegetation	Refer to Table 12	C = Slight L = Unlikely **Low Risk**	Y	Condition 1	N/A

Risk events						Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient ?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities		Potential emission	Potential pathways and impact	Receptors	Applicant controls				
	Chemical storage	Chemical discharge as a result of spillage or containment failure	Loss of containment causing chemical runoff and infiltration to soil	Indian ocean (marine environment), remnant native vegetation	Refer to Table 13	C = Slight L = Possible **Low Risk**	Y	Conditions 1, 10, 12, and 13	N/A
	Brine waste from desalination process, blended with the following streams: • Seawater intake screen washings. • Membrane backwash effluent from membrane filter. • RO plant chemical clean wastewater. • Neutralised membrane filter plant chemical clean wastewater. • RO plant flushing wastewater. • Stormwater in the event of stormwater containment.	Wastewaters containing caustic soda, Sodium Lauryl Sulphate & Ethylenediaminetetraacetic acid (EDTA), citric acid, sodium bisulphate, 2,2-dibromo-3-nitrilopropionamide (DBNPA), sodium hypochlorite etc.	Direct discharge via ocean outfall with potentially toxic effects on marine biota	Indian ocean (marine environment)	Refer to Table 13	C = Moderate L = Possible **Medium Risk**	Y	Condition 15	N/A

Risk events						Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient ?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities		Potential emission	Potential pathways and impact	Receptors	Applicant controls				
Maintenance of the desalination plant	Cleaning and maintenance activities involving production of liquid waste streams	Liquid waste streams, including: • CIP effluents unsuitable for discharge • organic and inorganic sludges • Intake screen debris •Seawater intake screen washings containing marine debris	Overland flow and infiltration through soil profile resulting in soil contamination impacting remnant vegetation, and discharge to marine environs via infiltration and unconfined groundwater flows	Indian ocean (marine environment, remnant native vegetation	Refer to Table 13	C = Slight L = Possible **Low Risk**	Y	Condition 1, 12,13, 15 and 27	N/A
Premises operations and maintenance activities	Refuelling of vehicles, plant, and equipment Storage/containment of fuel Overflows of containment infrastructure Overflows of stormwater containment infrastructure	Uncontrolled spills / discharges of hydrocarbons	Overland flow and infiltration through soil profile resulting in soil contamination impacting remnant vegetation, and discharge to marine environs via infiltration and unconfined groundwater flows	Indian ocean (marine environment, remnant native vegetation	Refer to Table 13	C = Slight L = Possible **Low Risk**	Y	Condition 1, 12,13, 15, and 27	N/A

11. Consultation

Extensive consultation on the project was undertaken as part of the Part V approvals process for Ministerial Statement 1207. The details of stakeholder engagement are set out in the referral documentation available at Alkimos Seawater Desalination Plant | EPA Western Australia.

The above notwithstanding, additional advertising and stakeholder consultation as undertaken as part of the Part IV decision making process. The details of this consultation are set out in Table 15 below.

Table 15: Advertising and stakeholder consultation.

Consultation method	Comments received	Department response
Application advertised on the department's website on 20 August 2021	None received	N/A
Local Government Authority advised of proposal on 18 April 2024	On 18 April 2023, the City received an application from Element on behalf of the Water Corporation seeking approval to commence development of a Sea Water Desalination Plant at the subject land. The subject land is zoned Public Purposes (water supply sewerage and drainage) and Urban Deferred under the Metropolitan Region Scheme. Under the provisions of the City of Wanneroo District Planning Scheme No. 2 (DPS 2), the land is designated Public Purposes and Urban Development. The use of the property is consistent with the purpose of the reserve and is considered to be Public Works under the Public Works Act 1902. The Desalination Plant was considered and approved by the Metro Outer Joint Development Assessment Panel (JDAP) subject to conditions on 12 September 2023 (Ref: DAP/23/02473). Based on the City's review of the proposal, the anticipated capacity of water treated is consistent with the approval granted by the JDAP and given the development is operated in accordance with the conditions of approval, the City has no objection to the granting of a works approval by the Department of Water and Environmental Regulation.	Noted.
Applicant was provided with draft documents on 28 July 2024	Refer to Appendix 2	Refer to Appendix 2

Applicant was provided with revised draft documents on 14 August 2024	Refer to Appendix 5	Refer to Appendix 5
Applicant was provided with revised draft documents on 4 September 2024	Refer to Appendix 6	Refer to Appendix 6

12. Applicant's comments

The Applicant was provided with the draft decision report and draft issued works approval on 28 July 2024. The applicant provided comments which are summarised, along with DWER's response, in Appendix 2.

13. Conclusion

This assessment of the risks of activities on the premises has been undertaken with due consideration of numerous factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1).

Based on this assessment, it has been determined that the issued works approval will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Grace Heydon

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Grace Heydon

A/Manager Waste Industries

Officer delegated under section 20 of the Environmental Protection Act 1986

Appendix 1: Key documents.

	Document title	In text ref	Availability
1.	EPBC referral 2019/8453	EPBC ref 2019/8453	accessed at Project Decision · EPBC Act Public Portal (awe.gov.au)
2.	Ministerial Statement 1207	MS 1207	accessed at www.epa.wa.gov.au/
3.	Ministerial Statement 722	MS 722	
4.	DER, October 2015. *Guidance Statement: Setting conditions*, Perth.	DER 2015b	accessed via https://www.dwer.wa.gov.au/regulatory-documents
5.	DER, August 2016. *Guidance Statement: Licence duration*, Perth.	DER 2016a	
6.	DWER, October 2019, *Procedure: Prescribed premises works approval and licence*, Perth, Western Australia	DWER 2019	
7.	DWER, December 2020, *Guideline: Decision Making*, Perth, Western Australia.	DWER 2020a	
8.	DWER, December 2020, *Guideline: Environmental siting*, Perth, Western Australia.	DWER 2020b	
9.	DWER, December 2020. *Guideline: Regulatory principles*, Perth, Western Australia.	DWER 2020c	
10.	DWER, December 2020, *Guideline: Risk Assessments*, Perth, Western Australia.	DWER 2020d	
11.	Water Corporation, 2023d. *Alkimos Seawater Desalination Plant Commissioning and Operational Marine Environmental Management Plant (COMEMP).* Leederville, Western Australia.	Water Corporation 2023	Available at: Commissioning-and-operations-marine-environmental-management-plan.pdf (watercorporation.com.au)

Appendix 2: Summary of applicant's comments on risk assessment and draft (Draft 1) works approval conditions.

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
Table 1 – 1(a)	Amend	Stage 1 to accommodate a seawater intake flow of up to 438 ~~360~~ ML/d ~~from the two (2) offshore subsea intake structures via a single intake tunnel~~	Intake structures, intake pipeline and intake screens are not within the prescribed premises. The stage 1 seawater desalination plant design has been optimised for lower recovery which allows lower power consumption, and a lower brine discharge TDS however increases the volume of seawater intake.	Noted. Intake flow to be accommodated has been increased to 438 ML/d. Removal of reference to subsea intake structures of no consequence.
Table 1 – 1(b) & Table 2 1(a)	Delete	-	As per DWER Guidance statement: Setting conditions (October 2025), guidance statement 5 "Conditions will not unnecessarily duplicate requirements imposed on licensees directly by the EP Act or another written law." The requirement of this condition is already a requirement under Ministerial Statement 1207 condition A1-1.	Condition A1-1 of MS1207 sets out the limitations and extent of the proposal and requires that the proponent must ensure the proposal is *implemented* so as not to exceed a maximum intake velocity of 0.15 metres/second. This is an *operational* element of the activity. Condition 1(1)(b) of the works approval states that the seawater intake pumping station must be *constructed* to accommodate a maximum face velocity of 0.15 meters per second at subsea intake screens. This is therefore not regulatory duplication and this condition will remain in the works approval. Condition 9(1)(a) for the works approval states that the Face velocity at subsea intake screens for the seawater intake pumping station must be a maximum of 0.15 m/s during *commissioning*.

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
				This is therefore not regulatory duplication and this condition will remain in the works approval.
Table 1 - 1 (e) & (f)	Combine (e) & (f) and amend as per alternate wording.	Seawater booster pumps to deliver flow to the RO pre-treatment area or outfall chamber. Five (5) seawater intake pumps (4 duty & 1 standby) that are submerged within the final chambers of the SWIPS and deliver seawater to the RO pre-treatment area. Each pump has a duty flow rate of 4,560 m^3/hr providing a total maximum seawater flow for the SWIPS of 18,233 m^3/hr.	This corrects the name of the pumps and combines the two sub-conditions (e) and (f) that relate to the same pumps. Addition of 'outfall chamber' as at times a portion of the flow from the seawater booster pumps will be directed to the outfall chamber to assist with achieving diffuser dilution by maintaining the nozzle velocity.	Noted and incorporated.
Table 1 - 1(g)	Amend	One (1) online and several spare 2 to 10 m^3 self-draining screening waste bins	Detailed design for self-draining screening waste bins not complete. Range provided to allow flexibility; final size installed will be provided in Environmental Compliance Report as required by condition 5.	Noted and amended.
Table 1 - 1(h)	Amend	Outfall ~~Brine~~ discharge chamber	Technically the chamber contains brine plus other waste e.g. supernatant from the sludge thickener.	Noted and amended.
Table 1 - 2(b)	Delete	~~(b) Two (2) filtered water tanks~~	Remove here as the filtered water tanks are already in table 1 item 3 'Filtered Water Tank & Reverse Osmosis Feed Pumping Station'.	Noted and deleted.
Table 1 - 3	Add	Three rectangular, adjoining filtered water tanks: (a) Tank A – 1500 m^3 nominal volume (b) Tank B – 1500 m^3 nominal volume	The tanks are sized to provide 8 minutes of retention time for process control (level control) as per generally accepted good engineering practice and pump supplier recommendations	Noted and inserted.

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
		(c) Tank A/B - 750m^3 nominal volume Intermediate pumps building contains: (a) Five (5) Intermediate ERD pumps. Four duty and one standby. Nominal duty flow of 2,437 m^3/hr each. (b) Five (5) Intermediate HP pumps. Four duty and one standby. Nominal duty flow of 1,818 m^3/hr each. (c) Three ActiDAFF backwash pumps. Two duty and one standby. Nominal duty flow of 922 m^3/hr each.		
Table 1 - 3 and Table 2 – 3	Amend	Filtered Water Tank, Intermediate & Reverse Osmosis Feed Pumping Station	Insertion of word.	Noted and amended.
Table 1 – 4 (a)	Amend	Twelve (12) RO cartridge filters (nominally ~~8~~10 online and 2 standby).	Correction to reflect the latest design which has changed slightly since the initial submission.	Noted and amended.
Table 1 - 6 (a)	Change to	~~Eight (8)~~ Multiple UV disinfection units to disinfect for intermittent or continuous use.	While the current engineering design is based on 8 UV units, manufacturers of UV disinfection units all have different sizes in their range. The	Noted and amended.

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
			final number of units required will be determined based on the outcome of competitive tendering for the total flow capacity requirement of 158 ML/d and may differ from 8. The final number will be provided in Environmental Compliance Report as required by condition 5.	Specification added to ensure that the final number of units can accommodate for the specified flow capacity requirement.
Table 1 - 6 (e)	Amend	~~Chlorine~~ Sodium hypochlorite disinfection system	A recent change has been made to the design to substitute sodium hypochlorite for chlorine gas. This change eliminates the need for a risk buffer around the chlorine gas storage building and provides cost benefits for the Corporation and its customers.	Noted and amended.
Table 1 – 6 (f)	Amend	With warning alarm and interlock settings (where appropriate) for each parameter.	Whilst all the parameters listed will have warning alarms, not all will have interlocks. Only chlorine will have an interlock as it is a critical control point (CCP), this is consistent with Southern Seawater Desalination Plant and Perth Seawater Desalination Plant	Condition amended to reflect that interlock settings are only for chlorine.
Table 1 - 8(a)	Amend	~~Maximum~~ ~~1000~~ 1500 to 3000 m^3 CIP waste tank to facilitate up to 6 RO CIPs.	CIP waste tank size has been optimised to facilitate completion of a greater number of CIPs prior to discharge. This does not change the required frequency or total number of CIP's performed. Enlarging the CIP neutralisation tank has the benefit of simplifying operation and potentially reducing the amount of neutralisation chemicals required to be added since caustic and acid CIP wastes can be combined within the waste tank to substantially neutralise each other. Final tank size installed will be provided in Environmental Compliance Report as required by condition 5.	Noted and amended.
Table 1 - 8(b)	Amend	(b) Sodium hydroxide ~~or~~ and sulphuric acid dosing units.	Both hydroxide and sulphuric acid dosing is required to neutralise the waste depending if it is a caustic CIP (dose acid to neutralise) or an acid CIP (dose caustic to neutralise).	Noted and amended.

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
Table 1 – 8(e)	Delete		Request to delete here as it does not refer to a component of the Clean-in-Place waste handling system and is also covered at Table 1 item 10.	Noted and deleted.
Table 1 - 10	Amend	Flowrate (summation of all flowmeters on individual contributing streams)	Each stream that is directed to the outfall chamber is individually flow measured. The total discharge flow is calculated by summation of multiple flow meters on the various process streams that are directed to the brine outfall chamber. This is consistent with Perth and Southern Seawater Desalination plant.	Noted and amended.
Table 1 – 10(b)	Amend	~~free chlorine~~.	Delete free chlorine analyser. Experience from Southern Seawater Desalination Plant (SSDP) was that the chlorine analysers were problematic in this application – confirming the absence of chlorine residual. As a result, they were removed from their sample panels. An ORP (oxidation reduction potential) analyser provides reliable indication of the absence of chlorine when measured ORP is less than 400mV.	Noted and deleted.
Table 1 - 10	Amend	~~Brine Discharge System~~ Effluent discharge system	Should be changed to effluent discharge system. There are different uses of terminology throughout WA, these should be standardised. Brine should only be used when specifically talking about waste off the RO. In the text of this part of the Table, it refers to 'combined marine discharge'. Consistency required.	Noted and amended.
Table 2	Add	Outfall Discharge Chamber Test, commission and calibrate all instruments prior to commencing any discharge to the outfall (recirculation of uncontaminated seawater directly from the seawater intake is exempt from this requirement).	Outfall Discharge Chamber and Surge Vessels are not included in table 2 (both items are in table 1 items 10 & 12).	Noted and inserted.

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
		Surge Vessels Confirm noise from the surge vessels and their associated air compressors is consistent the manufacturers specification and design requirements.		
Table 2	Comment	commissioning must cease by 31 ~~March~~ December 2028	Extended commissioning period requested due to commissioning of the plant site subject to other packages (e.g. integration pipeline) that could be delayed	Noted and amended.
Table 2 - 2(b)	Amend	Following solids removal, ~~clean~~ backwash wastewater ~~that is in compliance with WET Testing~~ shall be discharged to the brine outfall.	Clean backwash wastewater is not defined. Further reference to compliance with WET testing is incorrect. WET is by definition whole-effluent, it is not broken up and toxicity tested as a 'portion' of effluent. Also, WET testing only tells the toxicity level of what is being tested so the required number of dilutions to protect 99% of species can be achieved, WET testing is not appropriate to be used in any micro-level like this condition suggests.	Noted and amended. Neutralised added to ensure that wastewater may be safely disposed of to outfall.
Table 2, item 5(a)	Delete		As per table 2 item 2(b), WET testing will be conducted on a whole-effluent basis and it will demonstrate whether representative (and worst-case tested) effluent samples will fall within the dilution range being achieved by the diffusers. This condition also reads like it implies neutralised chemical waste has to be tested every time before it can be discharged.	Noted. Wording amended to refer to continuous online monitoring rather than WET testing.
Table 2, item 9(d)	Amend	~~Small quantities of~~ Neutralised CIP chemicals are to be transferred to the brine outfall drainage system.	'Small quantities' are ambiguous, request removal as volumes will be variable	Noted and amended.
Table 2, item 9(f)	Delete	~~Sampling and laboratory analysis must be undertaken where simple in-situ~~	If in-situ sample testing on site can't distinguish between a dilute chemical spill and water, it	Noted and deleted.

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
		~~testing cannot reliably differentiate between a dilute chemical spill and water.~~	would indicate it is so similar to water that it would be of low risk to the environment for discharge, therefore making sampling and laboratory testing unnecessary.	
Table 2, item 9(g)	Amend	Chemical leaks or spills ~~to a potentially contaminated drain~~ that cannot be neutralised and managed onsite shall be taken offsite to a licensed facility.	Not clear what is meant by 'potentially contaminated drain' or how it is being defined.	Noted and amended To "*recovered spilt chemicals that cannot be neutralised and managed onsite shall be taken offsite to a suitably licensed waste facility"* - now Table 2, Item 9(f).
Table 3	Amend	~~Uncontaminated~~ stormwater	Remove uncontaminated as some stormwater that cannot be neutralised and managed on site will be taken offsite to a licensed facility. Note stormwater discharge to the outfall chamber is only for storm events >1% AEP, all other stormwater goes to infiltration basins.	Noted and amended.
Table 4	Amend	~~Free chlorine~~	Delete free chlorine analyser from the Outfall Discharge Chamber monitoring. The process requirement is to reliably determine the absence of chlorine and experience at other Water Corporation desalination plants is that chlorine analysers are not reliable for this application. At SSDP the chlorine analysers were problematic and consequently removed. An ORP (oxidation reduction potential) analyser provides a reliable means to confirm the absence of chlorine (free or combined) based on ORP < 400mV.	Noted and deleted.
Table 4	Amend	Combined desalination effluent volume up to 450 ML/d ~~50 XX GL per year~~	*"Combined desalination effluent volume 50 GL per year*" which is listed under outfall chamber is incorrect, this is the volume of drinking water to be produced under stage 1.	Noted and amended.

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
			A daily volume limit is more appropriate for commissioning given that the duration is expected to be much less than one year. The discharge flow to the outfall chamber is much higher during commissioning because drinking water quality is not being achieved so all treated water streams are diverted to the outfall.	
Table 9	Amend	Maximum values Temperature: < +/- 3°C of the seawater inlet. pH: 6.0 - 9.0 ORP: < 400mV TDS: < 75,200 mg/L Turbidity: < 1.75x seawater intake turbidity DO: > 50%	Many of the parameters listed have the statement '*Limit to align with the value determined through WET Testing undertaken during commissioning as determined by condition 20(h) and as approved by the CEO.*' The limits for the parameters: temperature, pH, ORP, turbidity and DO are not obtained by the WET testing and are provided based on marine modelling. WET testing cannot be started until part way into commissioning when the process is commissioned and operating as per design. Only then can representative samples be collected for WET tests. The proposed limits are to serve until WET test results are available to inform further commissioning and time limited operation.	Noted and amended.
Condition 3b	Amend	limiting all vehicle traffic on unsealed roads within the premises to speeds of less than ~~20~~ 40 km/hr	Standard practice for managing dust on unsealed roads is limiting speed to 40 km/hr (in addition to water carts etc)	Noted and amended. Onsite speed limits within the premises best determined by premises occupier.
Condition 5	Amend	The works approval holder must within ~~30~~ 90 calendar days of all items of infrastructure or equipment required by condition 1 being constructed and/or installed:	The current wording will generate significant administrative burden having to complete reports 30 days after each item of infrastructure or equipment is constructed and/or installed.	Noted and amended.

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
Condition 6c	Amend	Factory acceptance test results and/or supply verifications for each item of infrastructure installed (where applicable), and	FAT results and supply verifications are only applicable for specific items of infrastructure (e.g. pumps etc) other items are systems and would not have FAT results or supply verifications.	Noted and amended.
Condition 19	Amend	The works approval holder must submit to the CEO an Environmental Commissioning Report within ~~30~~ 90 calendar days	The current wording will generate significant administrative burden having to complete reports 30 days after each item of infrastructure or equipment is commissioned.	Noted and amended.
Condition 20g(ii)	Delete	Delete	As per DWER Guidance statement: Setting conditions (October 2025), guidance statement 5 "Conditions will not unnecessarily duplicate requirements imposed on licensees directly by the EP Act or another written law." The requirements of these conditions are already a requirement under Ministerial Statement 1207 condition B4-2, C4-2(4) and C4-2(5)	MS1207 does not include the requirement for a commissioning report, only a commissioning and operations marine environmental management plan. The outcomes of WET testing also do not need to be reported under MS1207. This condition is therefore not regulatory duplication and will remain in the works approval.
Condition 20h				MS1207 does not include the requirement for a commissioning report. The COMEMP must include the program to determine the number of dilutions required, but does not need to contain the determined dilution factor, or a justification for how the dilution factor was determined, but would need to justify the specified program and why it would provide sufficient rigour to determine the dilutions required.
Condition 20i				
Condition 20j				

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
				This condition is therefore not regulatory duplication and will remain in the works approval.
Condition 22	Delete		Water Corporation request deletion of this condition. This condition would require all discharges to cease for the period between completion of environmental commissioning and submission of the Environmental Commissioning Report to the CEO. This period is likely to be several weeks to several months in duration due to the time taken to obtain laboratory results, prepare the report and review the report. Ceasing all discharges during this period would require the Corporation to place the RO membranes into preservation solution which comes with considerable risk to the life and performance of the membranes. It is not uncommon for preserved membranes to experience failures and/or shortened lifespan after being placed in preservation. The cost of such damage can be considerable. It is highly preferrable once RO membranes are commissioned to maintain them in service for at least a few hours every day. This would require discharges to continue. Discharge parameters and monitoring will adhere to the conditions specified in the works approval (Time Limited Operation period) and the Commissioning and Operations Marine Environmental Management Plan as required by Ministerial Statement 1207, condition B4-2.	Noted. Condition wording amended to allow works approval holder to commence discharging from authorised discharge points in accordance with condition 29 once the Environmental Commissioning Report required by condition19 has been submitted to the CEO in writing.
Conditions 25, 26, 27, 28	Delete		Conditions are duplicates of conditions 10, 11, 12 & 13.	Conditions are not a duplication.

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
				Condition set 10-13 relate to operations during construction, conditions set 25-28 relate to subsequent time limited operations stage.
Condition 34	Amend	The works approval holder must submit to the CEO a report of time limited operations within ~~30~~ 90 calendar days of the completion date of time limited operations or within ~~30~~ 90 calendar days before the expiration date of the works approval, whichever is sooner.	Significant time required to prepare and collate all documentation	Noted and amended.
Condition 35f(iii)	Delete		As per DWER Guidance statement: Setting conditions (October 2025), guidance statement 5 "Conditions will not unnecessarily duplicate requirements imposed on licensees directly by the EP Act or another written law." The requirements of these conditions are already a requirement under Ministerial Statement 1207 condition B4-2, C4-2(4) and C4-2(5)	MS1207 does not include the requirement for a report on time limited operations. The COMEMP must include the program to determine the number of dilutions required, but does not need to contain the determined dilution factor, or a justification for how the dilution factor was determined, but would need to justify the specified program and why it would provide sufficient rigour to determine the dilutions required. This condition is therefore not regulatory duplication and will remain in the works approval.

Appendix 3: Additional Information Requested for Alkimos Desalination Plant Draft Works Approval.

Condition No.	DWER Requested Information	WC Response (include nexus links for attachments)	DWER response
Table 1 Seawater Intake pumping Station (SWIPS)	Seawater Intake pumping Station (SWIPS) Infrastructure Location: **Please provide publishable figures and diagrams for inclusion in Schedule 1**	3D model and engineering drawings of SWIPs arrangement shown at end of this document	Noted. 3D model included in works approval as Figure 4
Table 1 Item 1c	Seawater Intake pumping Station (SWIPS) (c) Duty and standby continuous screens (2 total) to remove coarse suspended matter from seawater inflows **[Please provide screen grade and sizing].**	The screens shall be of the aperture type and able to be equipped at an aperture size ranging from 2mm to 10mm. *The initial aperture size at plant commissioning is expected to be 5mm but this may be modified at a later date as part of plant optimisation. The final screen grade and sizing will be provided in the Compliance Report.*	Noted and incorporated.
Table 1 Item 1f	Seawater Intake pumping Station (SWIPS) (f) Seawater booster pumps to deliver flow to the RO pre- treatment area **[Please provide pump capacity and flow rates].**	Four duty and one standby pump each with a duty flow rate of 4560 m^3/hr providing a total maximum seawater flow for the SWIPS of 18,233 m^3/hr (17,201 m^3/hr nominal flow).	Noted and incorporated.
Table 1 Item 2b	ActiDAFF® Treatment filtration system Two (2) filtered water tanks **[Please provide tank capacity and why capacity has been determined as appropriate].**	Item 2 (b) in table 1, the two (2) filtered water tanks should be in item 3 of table 1 (see next row).	Noted and amended.

Condition No.	DWER Requested Information	WC Response (include nexus links for attachments)	DWER response
Table 1 Item 3a	Filtered Water Tank & Reverse Osmosis Feed Pumping Station **Please provide detailed construction specifications. Figures to be provided if relevant**	Three rectangular, adjoining filtered water tanks: (d) Tank A – 1500m^3 nominal volume (e) Tank B – 1500m^3 nominal volume (f) Tank A/B - 750m^3 nominal volume Intermediate pumps building contains: (d) Five (5) Intermediate ERD pumps. Four duty and one standby. Nominal duty flow of 2,437m^3/hr each. (e) Five (5) Intermediate HP pumps. Four duty and one standby. Nominal duty flow of 1,818m^3/hr each. (f) Three ActiDAFF backwash pumps. Two duty and one standby. Nominal duty flow of 922m^3/hr each. *The two larger tanks are nominally 1500 m^3 each and the smaller central tank is 750 m^3 for a total nominal volume of 3750m^3.* *Normal operation will be with intermediate valves between the tanks all open so the tanks will normally operate as one tank. If an RO bank is offline for maintenance then one of the three tanks may be taken offline and the remaining two tanks will continue to operate as a single tank (with intermediate valves open).* *The capacity of the three tanks is determined to provide an adequate storage of filtered water for backwashing of the ActiDAFF filters, and to also provide an adequate volume of water for balancing the outflow from the ActiDAFF's to the inflow to the reverse osmosis units.*	Noted and amended.
Table 1 Item 10a	Brine discharge system Must be designed and constructed to accommodate a combined marine discharge volume of **?** ML/day **(Please provide the maximum possible discharge rate for the final (stage 1 and 2) plant)**	The maximum daily discharge rate for the brine discharge system is 307 ML/day for stage 1 and 611.6 ML/day for stage 2.	Noted and inserted.

Condition No.	DWER Requested Information	WC Response (include nexus links for attachments)	DWER response
Table 1 Item 11	Drinking water storage tanks **Please provide detailed construction specifications. Figures to be provided if relevant.**	Two (2) drinking water storage tanks with a capacity of 25ML total volume each. *Both Stage 1 and 2 drinking water storage tanks (2 in total) will be built in Stage 1.*	Noted and inserted.
Table 1 Item 12a	Surge vessels **Please provide detailed construction specifications. Figures to be provided if relevant.**	Up to 4 vessels of up to 120m3 each *The size and number of surge vessels is still preliminary and pending confirmation of the Alkimos to Wanneroo Reservoir transfer main detailed design. The preliminary design is based on 4 off 120m^3 surge vessels for stage 1 with an additional 2 off 120m^3 vessels added in stage 2. The vessels will be rated to 25 bar and supplied with oil free air from duty and standby air compressors to be located within the drinking water pump station.* *The vertical vessels would be approximately 4.5m diameter and stand approximately 12.3m tall (relative to local ground level of 10.0m AHD).*	Noted and inserted.
Table 1 Item 13a	Drinking water pump station **Please provide detailed construction specifications. Figures to be provided if relevant.**	Stage 1 will include three variable speed pumps configured as two duty and one standby.	Noted and inserted.

Condition No.	DWER Requested Information	WC Response (include nexus links for attachments)	DWER response
Table 2 Item 3	Filtered Water Tank, Intermediate & Reverse Osmosis Feed Pumping Station **Please provide details of proposed commissioning.**	(a) Verify that all works have been constructed as per the design (construction verification). (b) The water tightness of all tanks shall be tested and confirmed (equipment commissioning). (c) All tanks and pumps shall be confirmed as free of contaminants including those that may be released from the cured concrete or internal pump coating and contaminate filtered water (equipment commissioning). (d) Filtered seawater will initially be directed to the outfall chamber until the downstream RO is ready to receive flow. (e) Verify that all equipment controls and safeguards function as per the design (equipment commissioning). (f) Test and optimise the integration of the commissioning area with upstream and downstream areas / systems, including inter-system safeguards (system commissioning). All pumps shall be tested to confirm performance is as per design (performance testing).	Noted and inserted.
Table 2 Item 4	Reverse Osmosis (RO) facility **Please provide details of proposed commissioning.**	(a) Verify that all works have been constructed as per the design (construction verification). (b) The internals of all piping, pumps and RO vessels shall be thoroughly flushed with filtered seawater and confirmed as free of contaminants. (c) New RO membranes shall be loaded into the RO racks. (d) Each RO rack, both first pass and second pass, shall be commissioned and tested to confirm performance is as per the design. RO permeate will initially be directed to the outfall chamber (with the RO brine) until downstream plant is ready to receive feed flow.	Noted and inserted.

Condition No.	DWER Requested Information	WC Response (include nexus links for attachments)	DWER response
Table 2 Item 7c	Sludge treatment system Separated water is to be directed to the outfall chamber **[please confirm that this is the correct location for the separated water]**	This is correct. There are several internal streams within the desalination plant that contain high concentrations of solids and that are directed to the sludge treatment system: 1) ActiDAFF backwash wastewater 2) ActiDAFF floated sludge 3) Lime clarifier sludge 4) Eglinton backwash wastewater The sludge treatment area comprises clarifier-thickeners and centrifuges that separate the solids from the water. The clarified water from the clarifier-thickeners and centrifuges is combined with RO brine and discharged through the ocean outfall. The turbidity analyser that monitors the combined brine discharge quality will stop all flows from the sludge treatment area that are directed to the ocean outfall if a high-high turbidity if detected.	Noted and modified. Item 7 (d) inserted in reference to turbidity analysis.
Table 2 Item 8c	Clean-in-Place (CIP) Waste Handling Systems pH of neutralisation tank contents must be within **[Please provide appropriate range and reasoning why this range has been selected]** prior to being discharged to the brine stream	Clean-in-Place (CIP) Waste Handling Systems pH of neutralisation tank contents must be within 4.5 - 10.0 prior to being discharged to the brine stream. Discharge to the brine stream shall only occur when at least two (2) first pass RO racks are in operation to ensure that there is sufficient dilution present such that the combined discharge to outfall is within pH 6.0 - 9.0.	Noted and inserted.

Condition No.	DWER Requested Information	WC Response (include nexus links for attachments)	DWER response
Table 2 Item 10	Drinking water storage tanks **Please provide details of proposed commissioning.**	(a) Verify that all works have been constructed as per the design (construction verification). (b) The two (2) drinking water tanks will be leak tested with potable water. The large volume of potable water used for this leak test will likely be reused for other leak testing activities across the site. Any chlorinated leak test water that is discharged to the outfall chamber will first be dechlorinated with sodium bisulphite solution. (c) During process commissioning, the drinking water tanks will be allowed to overflow to the outfall chamber until the safety of the drinking water has been validated and the drinking water pumping station is commissioned, after which drinking water will be transferred to the integrated water supply system. Any / all chlorinated drinking water that is directed to the outfall shall be dechlorinated by dosing an excess of sodium bisulphite such that the ORP as measured at the outfall chamber is less than 400mV.s	Noted and inserted.
Table 2 Item 11	Drinking water pump station **Please provide details of proposed commissioning.**	(a) Verify that all works have been constructed as per the design (construction verification). (b) Disinfect the internals of all piping and equipment that conveys drinking water. (c) All pumps shall be tested to confirm performance is as per design (performance testing). Any / all drinking water transferred into IWSS (Integrated Water Supply System) to comply with Drinking Water Quality Management Plan.	Noted and inserted.

Condition No.	DWER Requested Information	WC Response (include nexus links for attachments)	DWER response
Table 4	Emission and discharge limits during commissioning **[Please provide interim maximum permissible values based on surrogate premises which will be verified through WET Testing and adopted in eventual licence.]** Temperature, pH, ORP, turbidity, DO, free chlorine,	Maximum values Temperature: +/- 3°C relative to the seawater intake pH: 6.0 - 9.0 ORP: < 400 mV Turbidity: 1.75x seawater intake turbidity DO: > 50% Total chlorine: absent as determined by ORP < 400mV The proposed values here are somewhat less stringent than the values proposed for *Table 9 – Emissions and discharge limits during time limited operation*. This is a reflection of the fact that the complex treatment process is being commissioned and brought under control during this period. A commissioning priority will be to minimise the discharge of any effluent that is "worse" than table 9 and to bring the commissioned plant areas to a state of reliable control, as soon as is practicable, such that the more stringent limits that are proposed in table 9 can be consistently achieved.	Noted and amended.
Table 7 Items 1c, 1f, 2b, 3a, 10a, 11, 12a, 13a		Additional information requested is the same as provided for same items in table 1.	Noted and inserted.
Table 11	Clean-in-place solutions and rinsing component of effluent **Applicant to advise of monitoring point**	Recirculation line of the CIP Neutralisation Sump.	Noted and inserted.

Appendix 4: Additional Information Requested for Alkimos Desalination Plant Draft Works Approval – Decision Report

Condition/ Section	DWER Requested Information	WC Response	DWER Response
Section 5.1 Temporary construction works	Cuttings will be stabilised, sorted by size, and used as structural fill where possible (note the slurry treatment plant will be subject to a separate works approval submitted by the Alliance). [Please confirm the timeframes for the submission of this additional works approval].	A works approval is deemed not required for the slurry treatment plant. The slurry treatment plants purpose is to separate water from the tunnel spoil to enable water to be recirculated back to the tunnel boring machine, with solids disposed of or reused on site without further treatment. Further it does not fit any of the categories in schedule 1 of the *Environmental Protection Regulations 1987* and other recent projects that utilised a slurry treatment plant to manage tunnel boring spoil (e.g. southern desal project and the Forrestfield Airport Link project) did not require a works approval.	Noted. Reference to slurry plant works approval deleted.
Section 5.1 Temporary construction works	A temporary concrete batching plant if required (works approval to be obtained by the Alliance). **[Please confirm the timeframes for the submission of this additional works approval].**	Concrete batching will be undertaken on the premises for use at that premises only, therefore a works approval is not required. Works will be undertaken in accordance with the *Environmental Protection (Concrete Batching & Cement Product Manufacturing) Regulations 1998* (Concrete Batching Regulations). Dust will be managed through these regulations.	Noted. Reference to concrete batching plant works approval deleted.
Section 6.1 Commissioning of Infrastructure	Table 5 below details the various waste streams expected to be generated as part of the commissioning phases, including projected volumes and proposed monitoring regimes **[Please advise how wastes will be verified, stored, collected, and disposed of if not proposed for discharge via the ocean outfall].**	Seawater screenings (nominally 5mm and larger) are removed from the band screens automatically using high pressure water jets. The removed screenings and a portion of the spray water then flow down troughs to the online screenings bin. The bottom of the screenings bin consist of a heavy mesh to allow excess water to drain into the screenings bin sump which in turn drains back to the SWIPS. Seawater screenings will be monitored with daily visual inspection of the online screenings bin. Prior to collection by a licensed waste transport contractor the screenings bin contents will have a final visual inspection before being transported to landfill where it is weighed (weighbridge) and inspected by the landfill operator before	Noted and inserted.

		acceptance. The Corporation continues to search for a reuse / recycling opportunity for this (mostly) putrescible organic waste but is yet to identify one. ActiDAFF and Eglinton sludge is dewatered to approximately 25% dry solids by centrifuge. The dewatered sludge has a wet cake like consistency and is stored in conventional waste skip bins (nominally 10m^3). Verification requirements will be as required by the local landfill operator for acceptance of the sludge cake as a non-putrescible waste (to be confirmed). Lime sludge is dewatered to approximately 40% dry solids by centrifuge. The dewatered lime sludge has a wet cake like consistency and is stored in conventional waste skip bins (nominally 10m^3). Verification requirements will be as required by the local landfill operator for acceptance of the sludge cake as a non-putrescible, inert waste (to be confirmed). At the time of preparing this works approval the Corporation and its contractor have identified a potential reuse application and are working with the business owner to understand their quality and verification requirements for use of the lime sludge in their process.	
Section 6.2 Discharge of used biocide CIP solutions via ocean outfall During commissioning	The pH of the recirculating neutralised fluid must be within a target range **[Please provide range and justification as to why this range has been selected].**	CIP neutralisation sump discharge pH target range is 4.5 to 10.0. The pH target range incorporates the neutralisation that occurs when the CIP neutralisation sump discharge is combined with the brine prior to the outfall. The pH target range is based on the neutralisation capability and buffering capacity of the brine and the pH process chemistry within the plant.	Noted and inserted.
Section 6.2 Discharge of used biocide CIP solutions via ocean outfall During commissioning	The minimum RO brine flow is established and maintained **[Please advise minimum RO brine flow rate and justification why this has been selected].**	The minimum RO brine flow rate for CIP neutralisation sump discharge is two (2) 1st pass RO racks in operation (2,700 m^3/hr of RO brine). This flowrate creates a 7:1 ratio between brine flow and CIP neutralisation sump discharge flow. This ratio is based on the neutralisation capability and buffering capacity of the brine and the pH process chemistry within the plant and corresponding flowrates.	Noted and inserted.

Section 7.4 Chemical storage area drainage infrastructure	[Please provide design specifications for the chemical storage area drainage infrastructure. Drawings to be provided if relevant].	The project specification for bulk chemical storage area drainage is within Water Corporation design standard DS79. The directly relevant sections of this standard are: • 5.1 • 5.7 • 5.12.1.5 • 5.12.1.6 • 5.12.2.4	Noted. Reference and hyperlink to Water Corporation design standard DS79 inserted.
Section 7.9 Stormwater management	[Please provide design specifications for stormwater management infrastructure across the premises, including the infiltration basins. Drawings to be provided if relevant].	All stormwater drainage shall be designed in accordance with Australian Rainfall and Runoff (AR&R). The drainage systems shall be designed to cater for a 1 in 10-year ARI storm event and to comply with Local Authority requirements. Events exceeding this criterion shall overflow to the brine discharge chamber such as by means of a weir which only overtops in extreme events. This provision is also intended to provide resilience for the drainage system if extreme events occur within the life of the asset because of climate change. During extreme, 1 in 100-year ARI storm events, Plant equipment and buildings shall not become inundated and the facility shall be able to maintain its design drinking water production rate. All works shall be in accordance with the latest publication of the relevant Local Authority (City of Wanneroo) Standards. All plant stormwater shall be collected in suitable stormwater collection structures and directed to an appropriate on-site storm water disposal facility. Any process wastewater or other contaminated water shall be collected separate from the stormwater and directed to an on-site process wastewater treatment facility. Potentially contaminated areas shall be roofed to prevent the collection and need for treatment of contaminated stormwater. Grates, pipes, access chambers and other drainage structures shall be suitable for heavy-duty traffic loading and accessible for cleaning purposes.	Noted and inserted.

		All pipes shall be laid in accordance with the manufacturer's recommendations.	
Table 8: Relevant approvals and tenure	Dangerous Goods Licences **Please provide detail on any required approvals for the premises.**	A Dangerous Goods Site License shall be obtained from DMIRS prior to any licensable quantities of dangerous good being delivered to the site. A Poisons Permit shall be obtained from the Dept. of Health prior to any schedule 7 chemicals being stored on site.	Noted and inserted.
Table 13: Proposed applicant controls.	Cuttings will be stabilised, sorted by size, and used as structural fill where possible (note the slurry treatment plant will be subject to a separate works approval submitted by the Alliance). **[Please advise on timeframes for the submission of this works approval].**	A works approval is deemed not required for the slurry treatment plant. The slurry treatment plants purpose is to separate water from the tunnel spoil to enable water to be recirculated back to the tunnel boring machine, with solids disposed of or reused on site without further treatment. Further it does not fit any of the categories in schedule 1 of the *Environmental Protection Regulations 1987* and other recent projects that utilised a slurry treatment plant to manage tunnel boring spoil (e.g. southern desal project and the Forrestfield Airport Link project) did not require a works approval.	Noted and amended.

Appendix 5: Summary of applicant's comments on revised draft (Draft 2) works approval.

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
Table 1, Item 2 (b) AND Table 7 Item 2 (b)	Delete item 2 (b)	n/a	The (10) filtered seawater forwarding pumps that are referred to at item 2(b) are the same 10 pumps that are described in table 1, item 3 – Five (5) Intermediate ERD pumps and Five (5) Intermediate HP pumps.	Noted. References deleted.
Table 1, Item 4 (a) AND Table 7 Item 4 (a)	Amend	Twelve (12) RO cartridge filters (normally 10 online and 2 standby)	Typo – There are two standby RO cartridge filters, not four	Noted. Details amended.
Table 1, item 6 (f) AND Table 7 item 6 (f)	Delete the last paragraph of Item 6 (f)	~~with warning alarm and interlock settings for each parameter.~~	The last dot point duplicates the first paragraph with respect to the requirement for warning alarms for all parameters. Regarding interlocks, the first paragraph is correct as only chlorine alarms will initiate an interlock.	Noted. Points deleted.
Table 2, Item 1 (b)	Amend	Screen washings must be well drained within self-draining ~~appropriately impervious~~ bins to prevent seepage during transport to landfill.	As per Table 1, Item 1 (g) the screenings bins are self-draining via a coarse mesh bottom, to drain prior to transport to landfill to prevent seepage of free seawater during transport. Collected seepage is returned to the outfall chamber.	Noted. Requirement amended.
Table 2, Item 2 (b)	Delete the word "neutralised".	~~neutralised~~	ActiDAFF backwash wastewater is not neutralised. The stream is already sufficiently neutral. Further neutralisation is not necessary for compliance with the discharge limits of the combined marine discharge.	Noted. Wording amended.
Table 2, item 4 (b)	Amend	The internals of all piping, pumps and RO vessels shall be thoroughly flushed	Addition allows other water to be used for flushing, if required.	Noted. Wording amended.

Condition No.	Requested Action (amend/delete)	Proposed alternate wording (when amending a condition)	Justification and/or comment	DWER response
		with filtered seawater, drinking water or other clean water and confirmed as free of contaminants.		
Table 5 Heading text AND Table 10 Heading text	Amend	Monitoring of ~~discharge~~ water quality during commissioning	This table includes both intake and discharge monitoring requirements.	Noted. Table heading amended.
Table 5, Outfall Sample Point AND Table 10, Outfall Sample Point	Delete the row for "Free Chlorine" under Outfall Sample Point	n/a	As per earlier correspondence the design will use ORP to detect oxidants (which includes chlorine) in the outfall chamber and not a "Free Chlorine" analyser. A free chlorine analyser is not a reliable instrument for proving the absence of free chlorine in this saline stream. ORP provides a significantly more reliable means to prove the absence of free chlorine with the benefit of also being sensitive to other oxidants and DBNPA. The ORP measurement is already included in table 5 under the "Both intake and outfall sample points" list of parameters.	Noted. Deleted.
Table 11, row 3, column 2	Amend	Discharge flow to the outfall chamber ~~Recirculation line of the CIP Neutralisation Sump~~	The discharge flow from the CIP neutralisation tank to the outfall chamber is the important parameter to be monitored for environmental reporting. The recirculation flow is not relevant	Noted. Amended.

Appendix 6: Summary of applicant's comments on revised draft (Draft 3) works approval.

<table>
<tr><th>Condition No.</th><th>Requested Action (amend/delete)</th><th>Proposed alternate wording (when amending a condition)</th><th>Justification and/or comment</th><th>DWER response</th></tr>
<tr><td>14, Table 3
And
29, Table 8</td><td>Amend</td><td>Please see below additions in italics to be added to table 3 and table 8.<table><tr><th>Emission</th></tr><tr><td>Neutralised CIP waste</td></tr><tr><td>RO brine</td></tr><tr><td>Stormwater</td></tr><tr><td>Neutralised waste chemicals and clean-up residues</td></tr><tr><td>Screened Seawater / Filtered Seawater</td></tr><tr><td>RO permeate / filtered groundwater / chlorine free drinking water</td></tr><tr><td>Lamella sludge clarifier supernatant</td></tr><tr><td>Lime sludge centrifuge centrate</td></tr><tr><td>ActiDAFF rinse water</td></tr><tr><td>Clean plant drainage and water overflows</td></tr></table></td><td>Tables within previous draft do not accurately capture all waste streams intended for discharge via the outfall chamber.</td><td>Noted.
Amended - Additional streams discussed in section 7.7</td></tr>
</table>