



# Decision Report

## Application for Licence

### Division 3, Part V *Environmental Protection Act 1986*

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<b>Licence Number</b>	L9222/2019/1
<b>Applicant</b>	Water Corporation
<b>File Number</b>	DER2019/000566
<b>Premises</b>	Christmas Island Wastewater Treatment Plant Jalan Pantai Road Smith Point Crown Reserve 44529 Christmas Island  Legal description - Lot 333 on Plan 400613
<b>Date of Report</b>	24 January 2020
<b>Status of Report</b>	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
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
AS 4156.6 – 2000	Australian Standard AS 4156.6 – 2000: Determination of Dust/moisture Relationship for Coal.
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CS Act	<i>Contaminated Sites Act 2003 (WA)</i>
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 <i>Public Sector Management Act 1994</i> and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	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 <i>Public Sector Management Act 1994</i> and is responsible for the administration of the <i>Environmental Protection Act 1986</i> along with other legislation.
EPA	Environmental Protection Authority
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EP Regulations	<i>Environmental Protection Regulations 1987 (WA)</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of, and during this Review
Licence Holder	Water Corporation

m <sup>3</sup>	cubic metres
Minister	the Minister responsible for the EP Act and associated regulations
MS	Ministerial Statement
mtpa	million tonnes per annum
NEPM	National Environmental Protection Measure
Noise Regulations	<i>Environmental Protection (Noise) Regulations 1997 (WA)</i>
Occupier	has the same meaning given to that term under the EP Act.
PM	Particulate Matter
PM <sub>10</sub>	used to describe particulate matter that is smaller than 10 microns (µm) in diameter
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
Primary Activities	as defined in Schedule 2 of the Revised Licence
Review	this Licence review
Risk Event	As described in <i>Guidance Statement: Risk Assessment</i>
UDR	<i>Environmental Protection (Unauthorised Discharges) Regulations 2004 (WA)</i>

## 2. Purpose and scope of assessment

This assessment is for a new licence of a previously existing prescribed premises under L8655/2012/1. As a result of the previous licence ceasing to have effect due to non-payment of annual fees (as defined under r5DA of the *Environmental Protection Regulations 1987* (WA)(CI)), an application for a new Licence was received from Water Corporation by DWER, on 11 October 2019.

### 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
L8655 Christmas Island WWTP – Application for replacement licence.	11/10/2019

## 3. Background

The Christmas Island Wastewater Treatment Plant (WWTP) is operated by Water Corporation and is located on Lot 333 on Plan 400613, Jalan Pantai Road, Smith Point, Christmas Island. The WWTP has a design capacity of 1.75 ML/ day (Average Daily Wastewater Flow).

The premises has been in operation and under licence since 2006, and supports the communities of Christmas Island with the treatment and disposal of wastewater generated from residential and commercial properties, and the detention centres on island. Throughput volumes at the premises have fluctuated significantly over the course of the WWTP's operation due to the highly variable numbers of people being placed at the detention centres which has seen population numbers vary from 1500 to 2500 people at varying stages.

The facility has the ability to effectively operate at highly variable inflow volumes and has an excellent operational track record, with low emission parameters being recorded since 2010 when the plant was upgraded.

Previous licences, works approvals and amendments associated with this consolidated, new licence for the prescribed premises include:

Date	Reference number	Summary of changes
L8083/2006/1	09/02/2006	New application
L8083/2006/2	09/02/2007	Licence re-issue
IOT/CI/2010/1	14/05/2010	Works approval
L8655/2012/1	16/07/2012	Licence re-issue
L8655/2012/1	12/02/2015	Licence amendment to new format v 2.8
L8655/2012/1	03/03/2016	Licence amendment to update condition 1.3.5 to consider <i>Lemna spp.</i>

L8655/2012/1	29/06/2017	DWER initiated amendment to change the licence duration and Lot descriptor.
L9222/2019/1	24/01/2020	New Licence

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

**Table 3: Prescribed Premises Categories in the Licence**

Classification of Premises	Description	Approved Premises production or design capacity or throughput
Category 54	Premises – (a) on which sewage is treated (excluding septic tanks); or (b) from which treated sewage is discharged onto land or into waters	1,750 cubic metres per day

## 4. Overview of Premises

### 4.1 Operational aspects

Wastewater from the 'Siphon' gravity main and pumping station 'PS-1' enters the inlet chamber, which evenly distributes the wastewater inflow into the inlet screens. Rags, solids and grit are removed and washed by the screens and discarded to bins via a chute. Screened and de-gritted water from the Inlet works flows into the inlet balance tank by gravity. Wastewater is then pumped to the reactor tank into the bioselector zone. The incoming wastewater is mixed with a part of the return activated sludge (RAS) from the clarifiers to promote growth of good settling floc-forming microorganisms. Mixed liquor flows from the bioselector zone to the reactor, which is equipped with six submersible aerators. The aerators are operated via a continuous aeration process to alternate between aerobic and anoxic zones within the reactor tank.

Mixed liquor from the bioreactor is transferred via gravity to two clarifiers, where the biomass is separated from the treated wastewater. The settled biomass is returned to the bioreactor by the RAS pumping system. Clarified treated water is discharged to the clarifier launder boxes and gravity feed to the ultra violet disinfection system. Disinfected treated waste water is then discharged to the Indian Ocean, which is 50 m from the Premises.

Waste activated sludge is extracted from the bioreactor and transferred to the mechanical dewatering unit. Dewatered sludge is discharged from the volute dehydrator to a collection vehicle and taken to the Shire of Christmas Island Landfill for disposal. Weekly in-situ sampling is undertaken of the sludge with quarterly sampling sent through to 'SGS' for chemical analysis to ensure compliance with biosolids guidelines.

### 4.2 Infrastructure

The sewage facility infrastructure, as it relates to Category 54 activities, is detailed in Table 4 and with reference to the Site Plan (attached in the Licence).

Table 4 lists infrastructure associated with each prescribed premises category.

**Table 4: Christmas Island Wastewater Treatment Plant - Sewage facility Category 54 infrastructure**

<b>Site infrastructure and equipment</b>	<b>Operational requirement</b>	<b>Infrastructure location</b>
Inlet works (Screw Screen)	Grit and Screenings	<ul style="list-style-type: none"> <li>- Stored in a container on a drainage hardstand area which returns leachate to the start of the treatment process.</li> <li>- Screening removed to landfill weekly.</li> </ul>
Inlet balance tank	Wastewater	<ul style="list-style-type: none"> <li>- Tanks constructed of concrete.</li> </ul>
Bioselector	Wastewater	
Aeration tank	Wastewater	
Clarifiers	Treated wastewater	<ul style="list-style-type: none"> <li>- Clear water discharged to UV disinfection system and then to ocean outflow point.</li> <li>- Impermeable.</li> </ul>
Return Activated Sludge	Sewage sludge	<ul style="list-style-type: none"> <li>- Returned to bioselector via pipe network.</li> </ul>
Sewage sludge compound	Sewage sludge	<ul style="list-style-type: none"> <li>- Sent to volute dehydrator prior to disposal to landfill or to bunded hardstand or lined area (lined to achieve a permeability of less than <math>10^{-9}</math> m/s or equivalent), capable of preventing surface run-off of leachate and sludge and which includes a leachate collection system.</li> </ul>

## 5. Legislative context

### 5.1 Other relevant approvals

#### 5.1.1 Federal Legislation

The Indian Ocean Territories (IOT), includes Christmas Island and Cocos (Keeling) Islands and is managed by the Department of Water and Environmental Regulation (DWER) through a Service Delivery Arrangement with the Commonwealth of Australia, under the *Environmental Protection Act 1986* and related subsidiary legislation.

The federal Department of Infrastructure, Transport, Cities and Regional Development (DITCRD) is the primary contact for DWER in the management of all prescribed premises within IOT.

### 5.2 Part V of the EP Act

#### 5.2.1 Applicable regulations, standards and guidelines

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

The guidance statements which inform this assessment are:



- *Guidance Statement: Regulatory Principles (July 2015)*
- *Guidance Statement: Setting Conditions (October 2015)*
- *Guidance Statement: Licence Duration (August 2016)*
- *Guidance Statement: Publication of Annual Audit Compliance Reports (May 2016)*
- *Guidance Statement: Decision Making (February 2017)*
- *Guidance Statement: Risk Assessments (February 2017)*

### 5.2.2 Compliance inspections and compliance history

As part of the Service Delivery Arrangement with the Commonwealth of Australia, this site is inspected annually as part of the inspection programme for all Christmas Island prescribed premises.

The premises has no significant issues or risks identified with the operation of the premises, and no outstanding compliance issues.

## 6. Modelling and monitoring data

### 6.1 Monitoring of emissions to surface water

The primary discharge from the premises is the emission of treated wastewater via subterranean pipeline to surface water (Indian Ocean).

A study undertaken by Water Corporation regarding the influence/ impacts of discharge from the premises into the Indian Ocean was undertaken, in June 2010, by Oceanica Consulting Pty Ltd.

The study determined that *“the bacterial counts in Flying Fish Cove on 25 May 2010 were all below the ANZECC/ARMCANZ (2000) guidelines for primary and secondary contact recreation for Enterococci, E. coli and thermotolerant coliforms.*

*Bacterial counts were highest directly in the plume, which was carried northward by the current. Bacterial counts directly in the path of the plume exceeded ANZECC/ARMCANZ guidelines for primary and secondary contact recreation for Enterococci, E. coli and thermotolerant coliforms on 25 May 2010.”*

Recommendations from the study identified that *“frequent sampling for bacteria in Flying Fish Cove, in combination with the release and tracking of surface drogues at the WWTP outfall will provide a better indication of the risk posed to human health in Flying Fish Cove. Water Corporation has already initiated weekly bacterial sampling of sites in Flying Fish Cove (FFC1-FFC11) (pers. comms. Megan Lally, 9 June 2010).*

*Water Corporation is also currently upgrading the Christmas Island WWTP, which is due to be completed late 2010 (pers. comms. Geoff Kendall, May 2010). This is expected to reduce the bacterial loads to the ocean. If the risk remains then Water Corporation may need to discharge via a subsea diffuser as a means to substantially improve mixing.”* This study was undertaken prior to the upgrade at the premises which was expected to improve operation and parameter output levels.

In 2015, the department requested a further assessment of the discharge channel suitability and ocean discharge impacts. Water Corporation undertook deployment of surface drogues to identify ocean discharge pathways. Sampling at four shore sites within Flying Fish Cove and Ethel Beach were also undertaken (as recommended by the 2010 study), between 2011 to 2014. Total Nitrogen and Total Phosphorus concentrations were noted within the marine ecosystem at elevated levels but with no discernable impacts identified. Discharge levels from the premises are well within departmental trigger levels. Ammonia levels exceed ANZECC/ARMCANZ (2000) guidelines, at a localised level.

The 2015 study determined that Total Nitrogen and Total Phosphorus concentrations in sediments measured directly below the WWTP outfall, and at other sites along the coast south of the WWTP *“were low and consistent with the reference site.”*

The premises has undertaken monthly monitoring of emissions for a range of parameters including heavy metals, pathogens and nutrient loads, with quarterly and annual reporting requirements in place. Assessment of the monitoring data quarterly and annually by DWER has shown that parameter emissions to surface water are well within licence recommended levels, and that the plant is operating at an optimal level, even with considerable variation in inflow volumes.

Current monitoring parameters for the premises (as per quarterly report July-September 2019) reflect the following emission levels:

pH insitu	8.02	8.00	8.07
Biochemical Oxygen Demand (mg/L)	<5	<5	<5
Total Dissolved Solids (by evap) mg/L	390	430	380
Total Nitrogen mg/L	4.5	1.8	2.3
Total Phosphorus mg/L	1.8	0.43	0.88
E.Coli /100 mL	160	<10	10
Ammonium-nitrogen mg/L	0.075	0.055	<0.05
Nitrate+Nitrate as Nitrogen mg/L	3.7	1	1.5
Oil and Grease mg/L	<5	<5	<5
Suspended Solids mg/L	<5	<5	<5
Copper mg/L	-	-	-
Lead mg/L	-	-	-
Zinc mg/L	-	-	-
Cadmium mg/L	-	-	-

**Key finding:**

*The upgrade of the premises in 2010 has resulted in improved operation of the WWTP and parameter level outputs have improved significantly. Discharge via the ocean outfall channel is not considered to have any significant impacts to the marine environment.*

*DWER will continue to ensure that there is ongoing review of the monitoring*

*parameters for the premises, on an annual basis. The prescribed premises licence will continue to condition requirements relating to monitoring of discharge parameters*

## 7. Location and siting

### 7.1 Siting context

The WWTP is located in the north eastern section of Christmas Island, at Smith Point and has a 500 m buffer around the premises from any other residential or commercial sensitive receptors. The premises is surrounded predominantly by tall, dense native vegetation (unallocated Crown land) which forms part of the Christmas Island National Park, and adjoins the Indian Ocean on the northern section of the premises.

Christmas Island is approximately 400 km south of Java and 2,650 km north-west of Perth and 1,550 km from Northwest Cape off the mainland of Australia, in the Indian Ocean. The Cocos (Keeling) Island are located 950 km south west of Christmas Island.

### 7.2 Residential and sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 5.

**Table 5: Receptors and distance from activity boundary**

Sensitive Land Uses	Distance from Prescribed Activity
<i>Residential Premises</i>	<i>Approximately 650m east of the premises</i>
<i>Indian Ocean</i>	<i>Approximately 50m west of the premises</i>

### 7.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are shown in Table 8. Table 8 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem.

The table below has also been modified to align with the *Guidance Statement: Environmental Siting*.

**Table 6: Environmental values**

Specified ecosystems	Distance from the Premises
Christmas Island National Park	<i>Adjacent to the eastern side of the premises</i>
Indian Ocean	<i>Approximately 50m to the west</i>
Threatened Ecological Communities and Priority Ecological Communities	<i>Terrestrial communities adjacent to/ directly east of the premises, which includes red crab migration.</i>
Christmas Island National Park - Marine Zone	<i>Approximately 42 km of the island shoreline that adjoins the land areas to 50 m seaward of the low water mark.</i>

## 7.4 Soil types

The geology of the island is considered to include highly porous, limestone deposits from coral sediments and volcanic remnants of impervious basalt rock, from two separate volcanic events in the development of the Island (Gray, 1995; Falkland, 1999a).

## 7.5 Groundwater and water sources

The distances to groundwater and surface water sources are shown in Table 7.

**Table 7: Groundwater and surface water sources**

Groundwater and water sources	Distance from Premises	Environmental value <sup>1</sup>
Daniel Roux Cave	<i>Approximately 800m, Southwest of the premises.</i>	<i>Brackish outflow from basal aquifers along the edge of the Island. Karstic preferential pathways result in highly variable water directional flow, as a result of weathering processes. Groundwater has a high vulnerability rating (Falkland, October 2019)</i>
Groundwater	<i>Groundwater varies across the island from 87-165 mBGL due to the cone and three rift zones with valley's that are filled with coral limestone and underlying volcanic rock that occur across the island. Groundwater flows have been noted by Gray and Falkland as occurring 'where limestone and impervious basalt rock layers meet'.</i>	<i>Water is used for potable and/or industrial use.  Groundwater system linked to marine ecosystem with freshwater discharge points located across the Island.  Groundwater on Island is not well understood. Current studies through 'GeoScience Australia' are being undertaken to assess groundwater location and directional flow.</i>

*Note 1: Information as detailed within draft document, Water Resources Management Review Report for Indian Ocean Territories (Christmas and Cocos (Keeling) Islands), Tony Falkland, October 2019.*

### 7.5.1 Winds

The south-east trade winds affect the island between July to October which impact the islands ability to receive or send supplies by limiting the operation of the port.

### 7.5.2 Rainfall and temperature

Christmas Island has a tropical climate with defined dry (May to November) and wet, north-western monsoon (December to May) seasons. The average annual rainfall is approximately 2,150mm, with a maximum rainfall event reaching as high as 5,121mm. Due to the highly karstic nature of the highland, rainfall is quickly absorbed.

Temperatures are relatively stable, ranging from lows/highs of 26/ 27 degrees Celsius from June to November and approximately 28/ 29 degrees Celsius from December to May each year.

Christmas Island is on the edge of the area where tropical cyclones can form in the Southern Indian Ocean and is not often directly impacted by cyclonic activity, but can be influenced by tropical storms.

## 8. Risk assessment

### 8.1 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 9.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Table 8 below.

**Table 8: Identification of emissions, pathway and receptors during operation**

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
Waste Water Treatment Plant	Discharge of treated wastewater from discharge point via pipeline to Indian Ocean	Treated wastewater to surface water	Surface water (Indian Ocean)	Direct discharge	Disruption of normal ecosystem function	Yes	See Section 9.4 Managed under Part V of the Environmental Protection Act 1986.
				Infiltration	Groundwater contamination	No	Discharge from premises occurs via poly pipeline to ocean outfall. Groundwater is > 85 mBGL, brackish, highly variable and not associated with any drinking water lens utilised by the Island.
	Treatment of sewage	Odour	No residences or other sensitive receptors in close proximity	Air / wind dispersion	None	No	No receptor directly adjacent to/ present. Odour generation is minimal, very localised, with a perception threshold of <1 odour unit, directly at the premises boundary.

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
	<i>Sewage pipes and holding tanks</i>	<i>Rupture of pipes / overtopping of holding tanks resulting in sewage discharge to land</i>	<i>Vegetation adjacent to discharge area</i>	<i>Overland flow over concrete hardstand to land</i>	<i>Soil contamination inhibiting vegetation growth and survival</i>	<i>No</i>	<i>WWTP is located on a concrete hardstand with bunding around each tank facility to contain any potential discharges to land via overland flow off the concrete hardstand. All tanks and sludge beds are constructed of concrete. Sludge holding tanks are covered to ensure no rainfall can enter. The facility is manned daily and checked for critical risks/ issues with regular monitoring and maintenance.</i>
	<i>Sludge holding bay</i>	<i>Gaseous emissions (from decomposition of putrescible waste)</i>	<i>No residences or other sensitive receptors in proximity</i>	<i>Air / wind dispersion</i>	<i>None</i>	<i>No</i>	<i>No receptor present.  Sludge is dewatered and combined with polymer prior to being removed on the day of discharge for disposal to Shire landfill on Christmas Island. Covered concrete sludge holding bays are also present in the event of a system failure of the dewatering infrastructure or truck failure.</i>

## 8.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 9 below.

**Table 9: Risk rating matrix**

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 10 below.

**Table 10: Risk criteria table**

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	<ul style="list-style-type: none"> <li>onsite impacts: catastrophic</li> <li>offsite impacts local scale: high level or above</li> <li>offsite impacts wider scale: mid-level or above</li> <li>Mid to long-term or permanent impact to an area of high conservation value or special significance<sup>^</sup></li> <li>Specific Consequence Criteria (for environment) are significantly exceeded</li> </ul>	<ul style="list-style-type: none"> <li>Loss of life</li> <li>Adverse health effects: high level or ongoing medical treatment</li> <li>Specific Consequence Criteria (for public health) are significantly exceeded</li> <li>Local scale impacts: permanent loss of amenity</li> </ul>
Likely	The risk event will probably occur in most circumstances	Major	<ul style="list-style-type: none"> <li>onsite impacts: high level</li> <li>offsite impacts local scale: mid-level</li> <li>offsite impacts wider scale: low level</li> <li>Short-term impact to an area of high conservation value or special significance<sup>^</sup></li> <li>Specific Consequence Criteria (for environment) are exceeded</li> </ul>	<ul style="list-style-type: none"> <li>Adverse health effects: mid-level or frequent medical treatment</li> <li>Specific Consequence Criteria (for public health) are exceeded</li> <li>Local scale impacts: high level impact to amenity</li> </ul>
Possible	The risk event could occur at some time	Moderate	<ul style="list-style-type: none"> <li>onsite impacts: mid-level</li> <li>offsite impacts local scale: low level</li> <li>offsite impacts wider scale: minimal</li> <li>Specific Consequence Criteria (for environment) are at risk of not being met</li> </ul>	<ul style="list-style-type: none"> <li>Adverse health effects: low level or occasional medical treatment</li> <li>Specific Consequence Criteria (for public health) are at risk of not being met</li> <li>Local scale impacts: mid-level impact to amenity</li> </ul>
Unlikely	The risk event will probably not occur in most circumstances	Minor	<ul style="list-style-type: none"> <li>onsite impacts: low level</li> <li>offsite impacts local scale: minimal</li> <li>offsite impacts wider scale: not detectable</li> <li>Specific Consequence Criteria (for environment) likely to be met</li> </ul>	<ul style="list-style-type: none"> <li>Specific Consequence Criteria (for public health) are likely to be met</li> <li>Local scale impacts: low level impact to amenity</li> </ul>
Rare	The risk event may only occur in exceptional circumstances	Slight	<ul style="list-style-type: none"> <li>onsite impact: minimal</li> <li>Specific Consequence Criteria (for environment) met</li> </ul>	<ul style="list-style-type: none"> <li>Local scale: minimal to amenity</li> <li>Specific Consequence Criteria (for public health) met</li> </ul>

<sup>^</sup> Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting*.

\* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines*.

“onsite” means within the Prescribed Premises boundary.

### 8.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment table 11 below:

**Table 11: Risk treatment table**

Rating of Risk Event	Acceptability	Treatment
<b>Extreme</b>	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
<b>High</b>	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
<b>Medium</b>	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
<b>Low</b>	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

### 8.4 Risk Assessment – Discharge to surface water

#### 8.4.1 Description of surface water discharge

##### Operation

Water Corporation discharge treat wastewater from the premises via polypipe to the Indian Ocean (approximately 50m away) on a continuous decanting process, via aeration, balance and clarifier tanks. The wastewater is then treated through an ultra-violet (UV) disinfection system monitored through a continuous monitoring SCADA system, prior to discharge. The discharge water outfall pipeline discharges 20m above the seal level due to the volcanic nature of the majority of the coastline, into the Indian Ocean.

Wastewater is analysed for a wide variety of contaminants (heavy metals, nutrient loads and pathogens) which have been historically reported to DWER annually through previous licence L8655/2012/1.

#### 8.4.2 Identification and general characterisation of emission

The wastewater is received from the community of Christmas Island (commercial and residential) and the detention centres on the Island. The maximum discharge volumes are considered equal to or greater than the inflow/ receival volumes due to the high rainfall and humidity levels received at the premises.

The parameter concentrations at the discharge point are mostly well below or equal to ANZECC/ ARMCANZ guideline (2000) levels, with the premises facility operating to a highly optimal level.

Discharge from the premises is on a continuous decanting cycle from the clarifier tanks.



### 8.4.3 Description of potential adverse impact from the emission

Treated wastewater can impact the environment through physical and chemical stressors such as dissolved oxygen, pH, suspended particulates, salinity and temperature which are toxic to marine ecosystem biota. Wastewater also has the potential to result in algal growth which can impact marine biota.

It was identified in the 2010 modelled ocean outfall study that potential does exist, under specific ocean current conditions, for treated wastewater discharged from the premises to enter Flying Fish Cove (closest recreational beach area), at the western most edge of the Cove.

The 2010 study identified the following against the WWTP operation, for ANZECC/ ARMCANZ (2000) guidelines for recreational marine environment:

Parameter	Compliance to ANZECC/ ARMCANZ guideline (2000)
Thermotolerant coliforms and <i>E. coli</i>	Below recommended guidelines for primary and secondary contact.
<i>Enterococci</i>	highly variable from no detection to 990 organisms/ 100 mL which may indicate a natural occurrence, as results closest to the discharge point were 18 organisms / 100 mL, with a median of < detection limit of the laboratory method
pH	At lower limit (within range)
Dissolved oxygen	At lower limit of 90%. No evidence of low DO originating from WWTP.
Total Nitrogen (TN)	At or above guideline with highest concentration 200 m north of WWTP. Below DWER limit of 10 mg/L at premises.
Total Phosphorus (TP)	Ortho-phosphate concentrations at or below guideline. Highest concentration directly beneath outfall point. TP is currently relatively low (average of 1.04 mg/L) at the WWTP and within DWER limits.
Ammonia	Above guideline values directly at outfall discharge point (Current average concentration of 0.06 mg/L at WWTP).
Nitrate and Nitrite	Above guideline values directly at outfall discharge point. Majority of sample sites had elevated concentrations above guidelines

A further study undertaken by Water Corporation, from 2011-2014, to verify the potential risk associated with discharge from the outfall pipeline into the Indian Ocean, subsequent to the WWTP upgrade confirmed that:

Parameter	Compliance to ANZECC/ ARMCANZ guideline (2000)
Thermotolerant coliforms and <i>E. coli</i>	Below recommended guidelines for primary and secondary contact.

<i>Enterococci</i>	Highly variable from no detection to 990 organisms/ 100 mL which may indicate a natural occurrence, as results closest to the discharge point were 18 organisms / 100 mL, with a median of < detection limit of the laboratory method
pH	Within guideline value, at lower limit (within range)
Dissolved oxygen (DO)	At lower limit of 90%. No evidence of low DO originating from WWTP.
Total Nitrogen (TN)	There has been a 74% parameter concentration reduction from the WWTP, as a result of the upgrade. Below DWER limit of 10 mg/L at premises.
Total Phosphorus (TP)	There has been a 50% parameter concentration reduction from the WWTP, as a result of the upgrade. TP is currently relatively low (average of 1.04 mg/L) at the WWTP and within DWER limits.
Ammonia	Above guideline values directly at outfall discharge point. Current average concentration of 0.06 mg/L at WWTP.
Nitrate and Nitrite	There has been a 55% parameter concentration reduction from the WWTP, as a result of the upgrade.

The receiving environment is highly susceptible to impact from human activity however, the operation of the WWTP is considered to be at optimal level, and the risk of impact to the marine environment is also considered low.

The Indian Ocean currents along the coastline of Christmas Island are very active/ volatile and dispersion occurs readily. There is very low to no recreational activity occurrence directly to or adjoining the discharge point, posing a low risk to public health and the marine environment.

#### 8.4.4 Criteria for assessment

Assessment of the premises operation is undertaken against the ANZECC/ ARMCANZ (2000) guideline trigger values for recreational marine waters. This guideline identifies that the premises is operating at or below proposed levels for the majority of parameters.

#### 8.4.5 Applicant/Licence Holder controls

The following mitigation measures have been identified:

- The WWTP was upgrade subsequent to the 2010 study, with the plant now operating at a much higher standard since 2012 with parameter emission levels reducing as much as 75%. The plant is now stable and producing excellent quality treated wastewater;
- The discharge point site falls outside of the Christmas Island National Park and Marine Zone boundaries;
- Premises is located away from any environmentally sensitive RAMSAR wetlands;
- Located away from the Islands groundwater resource and drinking water supply points;

- Located outside of the main populations areas with a minimum of a 500 m buffer from sensitive premises;
- The discharge point has been assessed for suitability by Water Corporation via a visual tracer inspection and video camera investigations which revealed that the fissure used has hydraulic conductivity to the ocean, has little likelihood of connectivity to nearby fissures, is narrow and straight and does not contain bifurcations, dolines and blowholes;
- Ultra-violet disinfection system is monitored continuously through a SCADA system. This allows the operator to be alerted to any issues before the effluent quality is impacts which reduces the risk of effluent quality being above DWER limits;
- An operator is onsite every day to manage the plant operation, ensuring prompt action to any abnormal activity at the premises;
- Influence to the closest recreational area to the WWTP (Flying Fish Cove, is also impacted by activities from the port through loading operations and vessels that are moored within the Cove;
- Water Corporation have committed to “*continue to undertake risk based assessments of individual events during abnormal operation from equipment malfunction or overflow. If there is potential for impact to primary or secondary contact from an abnormal event, the Department of Water and Environmental Regulation, Shire and Christmas Island Administration will be notified, and appropriate action decided to protect [human health and the marine environment]*”.

This assessment has reviewed the controls set out in Table 12 below.

**Table 12: Applicant’s/Licence Holder’s proposed controls for discharge to surface water**

Site infrastructure	Description	Operation details
Christmas Island Wastewater Treatment Plant – Discharge of treated wastewater	Tank structures on hardstand	Concrete, impermeable. Designed to contain 1.75 GL
	UV disinfection system	Continuous operation. Routinely maintained.
	SCADA monitoring system	Continuous operation Routinely maintained. Daily monitoring by onsite staff.

#### 8.4.6 Key findings

The Delegated Officer has reviewed the information regarding discharge of treated wastewater to surface water and has found:

1. *Routine monitoring by Water Corporation and daily management of the premises, as well as the plant upgrade in 2012, has resulted in the premises operating to an optimal level with parameter emission levels routinely recorded at low levels.*
2. *DWER assessment of compliance issues, including complaints and incidents, has not identified any significant issues or risks as a result of the operation of the premises.*
3. *The assessment undertaken by Water Corporation in 2010 and 2015 regarding the discharge point and impacts to the marine environment has not identified any significant issues or risks to the marine environment or to public health.*
4. *Ongoing annual reviews of report submissions and inspections by DWER have not identified any significant issues or risks as a result of the operation of the plant, and subsequent discharge of treated wastewater to the marine environment.*
5. *The current operation of the WWTP has confirmed that it has the ability to operate optimally at both very low and high inflow volumes. This flexibility ensures that the current operation is able to effectively address the needs of the community without negatively impacting on the receiving environment. It also identifies that the plant design is sufficient for the purposes intended.*

#### 8.4.7 Consequence

If discharge of treated wastewater to surface water occurs, then the Delegated Officer has determined that the impact of such activity will result in minimal off-site impacts at a local scale to the environment with specific consequence criteria likely to be met in most circumstances (for environment and public health). Therefore, the Delegated Officer considers the consequence of *treated wastewater being discharged* to be **minor**.

#### 8.4.8 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of impacts from the discharge of *treated wastewater to surface water* occurring will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of Risk Event 1 to be **unlikely**.

#### 8.4.9 Overall rating of discharge of treated wastewater to surface water

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 10) and determined that the overall rating for the risk of *discharge of treated wastewater to surface water* is **medium**.

### 8.5 Summary of acceptability and treatment of Risk Events

A summary of the risk assessment and the acceptability or unacceptability of the risk events set out above, with the appropriate treatment and control, are set out in Table 13 below. Controls are described further in section 11.

**Table 13: Risk assessment summary**

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	Source	Pathway/ Receptor (Impact)			
1.	<i>Discharge of treated wastewater to surface water via ocean outfall pipeline</i>	<i>Christmas Island Wastewater Treatment Plant discharge pipeline to Indian Ocean</i>	<i>Surface water (Indian Ocean) to impact marine ecosystem</i>	<i>See section 8.4.5</i>	Minor consequence Unlikely likelihood <b>Medium Risk</b>	Acceptable subject to regulatory controls

## 9. Regulatory controls

### 9.1 Licence controls

The operation and monitoring of the WWTP has been routinely assessed against the ANZECC/ ARMCANZ (2000) trigger value guidelines for recreational marine water. This will continue to be the guiding document for the foreseeable future, along with DWER standard policies and guidelines for wastewater treatment plants.

#### 9.1.1 Wastewater Treatment Plant infrastructure and equipment

The following environmental controls, infrastructure and equipment should be maintained and operated onsite for management of potential impacts to surface water:

- Monitoring of emission parameter levels and throughput volumes;
- Maintenance requirements of all equipment and infrastructure for the receipt, processing of wastewater and discharge of treated wastewater;
- Management of infrastructure and equipment of the processing and disposal of sludge;
- Reporting of any elevated levels, malfunction or system failures.

#### 9.1.2 Discharge pipeline

The Licence Holder will be required to undertake regular inspections on the channel and pipeline that discharges to the Indian Ocean to ensure no discharge occurs prior to the discharge point.

#### 9.1.3 Monitoring requirements

The Licence Holder will be required to monitor parameters and report quarterly and annually to DWER for review of any potential discharges and impacts.

Any discharges that may cause impacts to the environment will be required to be reported to DWER under section 72 of the *Environmental Protection Act 1986*.

#### 9.1.4 Monitoring reports

The Licence Holder must ensure that all monitoring reports submitted to DWER are readable, applicable and include clear data trends.

## 10. Determination of Licence conditions

The conditions in the issued Licence in Attachment 1 have been determined in accordance with the *Guidance Statement: Setting Conditions*.

The *Guidance Statement: Licence Duration* has been applied and the issued licence expires in 20 years from date of issue.

Table 14 provides a summary of the conditions to be applied to this licence.

**Table 14: Summary of conditions to be applied**

Condition Ref	Grounds
Infrastructure and Equipment Conditions 1 to 5	These conditions are valid, risk-based and contain appropriate controls.

Condition Ref	Grounds
Emissions and discharges Conditions 6 to 8	This condition is valid, risk-based and consistent with the EP Act.
Monitoring and Reporting Conditions 9 to 15	These conditions are valid, risk-based and consistent with the EP Act.
Records and Reporting Conditions 16 to 24	These conditions are valid and ensure appropriate maintenance of records and linkage between the licence and the EP Act.

DWER notes that it may review the appropriateness and adequacy of controls at any time and that, following a review, DWER may initiate amendments to the Licence L9222/2019/1 under the EP Act.

## 11. Applicant's comments

The *Licence Holder* was provided with the draft Decision Report and draft issued Licence on 27 November 2019. The Licence Holder provided comments which are summarised, along with DWER's response, in Appendix 2.

## 12. Conclusion

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

This assessment was also informed by a site inspection by DWER officers on 24 August 2019.

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

**Stephen Checker**  
**MANAGER WASTE INDUSTRIES**  
 Delegated Officer  
 under section 20 of the *Environmental Protection Act 1986*

## Appendix 1: Key documents

	Document title	In text ref	Availability
1.	Christmas Island Wastewater Treatment Plant – Application for replacement licence	L8655/2012/1	DWER records (DWERDT219471)
2.	L8655 – Christmas Island Wastewater Treatment Plant – Water Corporation – Licence Improvements – 25 June 2019	L8655/2012/1	DWER records (A927579)
3.	Christmas Island Wastewater Treatment Plant – Quarterly Report – July-September 2019	L8655/2012/1	DWER records (DWERDT217194)
4.	Christmas Island Wastewater Treatment Plant – Oceanica – Outfall Investigation – June 2010	L8655/2012/1	DWER records (A927583)
5.	Christmas Island Wastewater Treatment Plant – Polymer details and monitoring results – 25 August 2016	L8655/2012/1	DWER records (A1158926)
6.	DER, July 2015. <i>Guidance Statement: Regulatory principles.</i> Department of Environment Regulation, Perth.	DER 2015a	accessed at <a href="http://www.dwer.wa.gov.au">www.dwer.wa.gov.au</a>
7.	DER, October 2015. <i>Guidance Statement: Setting conditions.</i> Department of Environment Regulation, Perth.	DER 2015b	
8.	DER, August 2016. <i>Guidance Statement: Licence duration.</i> Department of Environment Regulation, Perth.	DER 2016a	
9.	DWER, February 2017. <i>Guidance Statement: Risk Assessments.</i> Department of Environment Regulation, Perth.	DER 2016b	
10.	DWER, February 2017. <i>Guidance Statement: Decision Making.</i>	DER 2016c	



	Document title	In text ref	Availability
	Department of Environment Regulation, Perth.		

## Appendix 2: Summary of applicant’s comments on risk assessment and draft conditions

Condition	Summary of Licence Holder comment	DWER response
Condition 1, Table 1	The site infrastructure “Reactivated Sludge” is incorrect. The correct term is ‘Return Activated Sludge’.	Terminology changed to reflect Licence Holder’s comment.
Condition 15, Table 6 - Units	Requesting to record Escherichia coli units in MPN	<i>E. Coli</i> units have not been changed, they will remain on the licence as cfu/100ml
Condition 22, Table 8	When referring to Table 7, evaporation basins are mentioned which do not exist. There is no pumped discharge of treated wastewater.  Licence Holder suggested wording.	Reference to ‘evaporation basin’ and ‘pumped’ have been removed from the row and replaced with the following wording: Methodology and calculations used to estimate the daily volumetric flow rate of treated wastewater discharged to the ocean discharge point and results of those calculations.
Condition 24, Table 9	Clarify Table 9 (non-annual reporting requirements), as Table 9 refers to Table 7 as “Monitoring of point source emissions to surface water”. This is incorrect as Table 7 is for “Monitoring of inputs and outputs”. Table 6 is “Monitoring of point source emissions to surface water”.	Reference to Table 7 removed and replaced with Table 6.
Multiple	The Licence Holder made a number of other requests that are unable to be addressed during this licence reinstatement process. Should the Licence Holder like to make the requested changes they may submit an amendment application to the Department. The applicant then revised their original comments via an email received on 19/12/19, as shown below:	
Condition 5, Table 3	“Addition of (EM640) polymer or other approved emulsion polymer for flocculation in the dehydrator (mechanical dewatering system).”	Change in wording included in Licence

Condition	Summary of Licence Holder comment	DWER response
Condition 5, Table 3	"After dewatering by the Volute Dehydrator or drying in the Sludge Drying Beds, no more than 150 m3 of dewatered sludge cake to be stored at any one time, for no longer than 72 hours."	Change in wording included in Licence
Condition 5, Table 3	"Removed to licenced landfill or other approved beneficial reuse."	No change. Considered new process to be submitted under amendment.
Condition 24, Table 9	"6 monthly"	No change.
Condition 10	Revert wording to "targets"	Condition 10 removed. Targets were proposed in error as they were not on former licence.

## Attachment 1: Issued Licence L9222/2019/1

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