# Application for Works Approval

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

| | |
|---|---|
| **Works Approval Number** | W6224/2019/1 |
| **Works Approval Holder** | Water Corporation |
| **File Number** | DER2019/000133 |
| **Premises** | Northam Wastewater Treatment Plant<br>Lot 29316 on Deposited Plan 221054<br>Lot 500, Lot 501 and Lot 502 on Deposited Plan 76392<br>Legal description -<br>Crown Reserve 25729<br>Crown Reserve 48146<br>NORTHAM WA 6401 |
| **Date of Report** | 23 December 2019 |
| **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 |
|---|---|
| AACR | Annual Audit Compliance Report |
| AER | Annual Environment Report |
| Category | Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations |
| CS Act | *Contaminated Sites Act 2003* (WA) |
| 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 | Department of Water and Environmental Regulation<br><br>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. |
| EP Act | *Environmental Protection Act 1986* (WA) |
| EP Regulations | *Environmental Protection Regulations 1987* (WA) |
| Minister | the Minister responsible for the EP Act and associated regulations |
| NEPM | National Environmental Protection Measure |
| Noise Regulations | *Environmental Protection (Noise) Regulations 1997* (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 *Guidance Statement: Risk Assessment* |
| UDR | *Environmental Protection (Unauthorised Discharges) Regulations 2004* (WA) |
| Works Approval Holder | Water Corporation |

# 2. Purpose and scope of assessment

## 2.1 Background

Northam is the regional service centre for farming communities in the Avon Valley and central wheat belt and is 96 km north-east of Perth. Northam is home to 6,550 residents (ABS, 2016), almost 60 per cent of the population of Northam Shire. The town is connected to a sewer network and wastewater services are provided by the existing Northam Wastewater Treatment Plant (WWTP), located about 1 km north-west of the town.

The Northam WWTP is a prescribed premises regulated under Licence L5989/1991/10. It consists of two sites to the south of the Avon River, separated by the Great Eastern Highway and the railway line. The primary treatment plant originally built in 1938 is located on Lot 500, Lot 501 (part of Crown Reserve 25729) and Lot 502 (Crown Reserve 48146) on Deposited Plan 76392 consists of an inlet screen, two sedimentation tanks, three sludge digesters and four sludge drying beds. The partially treated wastewater from the primary plant is transferred, by pipe, 800 m north-west to the secondary treatment plant on Lot 29316 on Deposited Plan 221054 (part of Crown Reserve 25729). Here, one primary and two secondary facultative ponds operate in parallel to treat the wastewater, alum dosing then occurs within the polishing pond, and treated water is temporarily stored in the Shire managed storage pond. Treated water is either chlorinated before being pumped away for irrigation of public open space by the Shire or disinfected by an ultraviolet disinfection (UV) unit prior to discharging to an infiltration channel on the banks of the Avon River.

## 2.2 Application details

The Water Corporation (Applicant) lodged an application for a Works Approval on 31 July 2018 to upgrade the treatment capacity of the Northam WWTP from 1,500 $m^3$/day to 2,000 $m^3$/day, lining the ponds, reconfiguring and upgrading the pond system to improve the quality of TWW discharged to the environment. The throughput of 2,000 $m^3$/day is not anticipated to be reached until 2048. There are no new ponds planned for installation. It is intended that once the upgrades are complete and operational, the primary treatment plant will be decommissioned. The proposed works aim to reduce the quantity of discharge to the Avon River and improve treated water quality. Information has also been provided to meet Conditions 1, 2 and 3 of the current Licence (Environmental Improvement Plan - EIP) and to inform the risk assessment for this works approval application.

For the upgrade of the Northam WWTP, the secondary pond system will be reconfigured and upgraded as follows:

- The three smaller ponds will no longer act as facultative ponds, but instead be converted into a series of three maturation ponds running from north-east to south-west.
- A new inlet works will be constructed south-west of the new maturation ponds 1 and 2. The new inlet works will be fully enclosed for odour containment, but an odour control facility will not be constructed as part of the works proposed in the application. The unit will be the typical Huber rotary screen which drops screenings via a continuous bagging system into a wheelie bin.
- A facility to receive waste from pump station maintenance will be installed immediately upstream of the new inlet works. This will be another Huber type unit and operated on an occasional basis (6 monthly) when maintenance works on the pump station (located in Northam town) is undertaken.
- The current storage pond (north-western pond), which currently doubles as a phosphorus removal facility via in-pond aluminium dosing, will be converted into a facultative “smart pond”. The pond will be extended 82 m to the north-east, and the level raised to allow gravity flow to and through the maturation ponds. At the north-eastern end of the smart

pond, a deep 22 m by 34 m anaerobic pot will be excavated in the base, with a facultative top layer over the pot to mitigate odours.

- Flow from the 2.5 ha smart pond will run through the series of three maturation ponds, each with 1.2 ha surface area, from north-east to south-west. Maturation Pond 3 will have a modulating weir penstock where freeboard can be reduced to 350 mm in order to increase holding capacity by an additional 1.5 ML to retain water during high-flow periods.
- Aluminium dosing will no longer be direct to the Storage Pond. Instead flow from the third maturation pond will feed through pipework installed with a flocculation unit for aluminium dosing to bring down phosphorus levels, followed by filtration to remove aluminium phosphate and algal solids via a fully enclosed disc cloth filter unit. Alum will be dosed at ~176 mg/L with a 49% Alum solution to achieve phosphorus removal to less than 1 mg/L. Backwash from the filters will be pumped to a geobag dewatering system located to the north east of the smart pond. The flocculation / filtration units will be located north of the Shire pond.
- After filtration, the treated effluent will flow to the Storage Pond (previously the Shire Pond).
- TWW to be delivered to the Northam Shire as part of a TWW Reuse scheme will be chlorinated within a new chlorine dosing facility to be constructed near the western access gate and will inject chlorine directly into the pumping main passing that point. A final decision on the design of the reuse system, specifically including selection of new pumps and the chlorination system, is pending further discussions with the Shire. Treated water will be delivered to a storage pond managed by the Shire, from where it is either directly irrigated or distributed to other storages for reuse in various facilities around the town.
- TWW that is in excess of the Shire's requirements will be disposed of via land to the Avon River. The TWW will flow from the Storage Pond through the existing UV system for disinfection. During rainfall events exceeding the 1 in 20 AEP and exceeding the additional holding capacity of the penstock in Maturation Pond 3, the TWW will bypass the UV treatment unit and be released via emergency discharge direct to land and the Avon River.
- The existing Geobag Laydown Area to the north of the Facultative Pond will be upgraded to include a compacted hardstand area, concrete drainage pad and pump station to return leachate to the Facultative Pond. HDPE liner will be installed on the hardstand area only when the Geobags are in use.

**Table 2: Prescribed Premises Categories in the Existing Licence**

| Classification of Premises | Description | Current Premises production or design capacity or throughput | Requested Premises production or design capacity or throughput |
|---|---|---|---|
| Category 54 | Sewage facility: premises –<br>(a) on which sewage is treated (excluding septic tanks); or<br>(b) from which treated sewage is discharged onto land or into waters. | 1,500 $m^3$ per day | 2,000 $m^3$ per day |

Table 3 lists the documents submitted during the assessment process.

**Table 3: Documents and information submitted during the assessment process**

| Document/information description | Date received |
|---|---|
| AECOM (2014) Northam Nutrient Irrigation Management Plan | 30 June 2014 |
| Cardno (2018) Detailed Site Investigation Northam Wastewater Treatment Plant (Ponds) | 24 December 2018 |
| Hydrobiology (2018) Northam WWTP: Environmental Impact Assessment | 24 December 2018 |
| Nilex Civil Environmental Group (undated) Coletanche bituminous geomembrane (BGM) liners | 9 May 2019 |
| Water Corporation (2010) Proposed trial ultraviolet disinfection unit at Northam WWTP, Reserve 25729, Northam. Application for Works Approval. | 22 October 2010 |
| Water Corporation (2018) Northam Wastewater Treatment Plant – 2.0MLD Upgrade Works Approval Application – Supporting Information. | 31 July 2018 |
| Water Corporation (undated) Northam WWTP (L5989) Proposed Monitoring Program | 22 December 2018 |
| Water Corporation (undated) Northam WWTP (L5989) Water balance for current and projected flows | 22 December 2018 |
| Water Corporation various incoming correspondence to clarify process and commitment decisions | 21 December 2018<br>04 February 2019<br>12 June 2019<br>26 July 2019<br>01 August 2019<br>03 September 2019 |

## 2.3 Infrastructure

The infrastructure to be modified or installed at the Northam Wastewater Treatment Plant is detailed in Table 4.

**Table 4: Northam Wastewater Treatment Plant infrastructure**

| Item | Infrastructure and proposed works description: Prescribed Activity Category 54 |
|---|---|
| 1 | Sewage treatment system designed and constructed to receive and treat a sewage inflow of up to 2,000 $m^3$ per day. |
| 2 | Pump station facility to be constructed south-west of the new inlet works to contain a Huber rotary screen. |
| 3 | Inlet works to be constructed south-west of the new maturation ponds 1 and 2:<br>• To be enclosed for odour containment; and<br>• To contain a Huber rotary screen. |
| 4 | Anaerobic pot to be constructed to hold a volume of 3,900 $m^3$ (located within the Facultative Pond);<br>• To be free of leaks and defects and lined with a concrete liner with a permeability of ≤$1x10^{-9}$ m/sec;<br>• Embankments adequately constructed to provide a freeboard of 500 mm; and<br>• Embankments constructed to a 2:1 embankment slope. |
| 5 | Modification of the current Polishing Pond into a Facultative Smart Pond: |

| Item | Infrastructure and proposed works description: Prescribed Activity Category 54 |
|---|---|
| | • To cover an area of 28,000 $m^2$;<br>• To be free of leaks and defects and lined with a Bituminous Geomembrane liner with a permeability of ≤ $1x10^{-9}$ m/sec;<br>• To contain a 22 m by 34 m anaerobic pot (refer to item 4);<br>• A facultative top layer over the anaerobic pot (refer to item 4);<br>• Embankments adequately constructed to provide a freeboard of 500 mm; and<br>• Embankments constructed to a 2.5:1 embankment slope |
| 6 | Modification of the current Primary Treatment Pond 1 and Secondary Treatment Ponds 2 and 3 into three Maturation Ponds M1 (north-east), M2 (middle) and M3 (south-west);<br>• Maturation Pond 1 to cover an area of 13,105 $m^2$;<br>• Maturation Pond 2 to cover an area of 12,665 $m^2$;<br>• Maturation Pond 3 to cover an area of 11,376 $m^2$;<br>• To be free of leaks and defects and lined with a geosynthetic or clay liner with a permeability of ≤$1x10^{-9}$ m/sec;<br>• Embankments adequately constructed to provide a minimum freeboard of 500 mm per pond; and<br>• Embankments constructed to a 3:1 embankment slope. |
| 7 | Storage Pond to be considered as Water Corporation operated infrastructure and upgraded to cover an area of 851 $m^2$:<br>• To be free of leaks and defects and lined with a clay liner with a permeability of ≤$1x10^{-9}$ m/sec;<br>• Embankments adequately constructed to provide a freeboard of 500 mm; and<br>• Embankments constructed to a 3:1 embankment slope. |
| 8 | Installation of an aluminium dosing system within pipework downstream of Maturation Pond 3. |
| 9 | Installation of a cloth media filter that includes an automatic backwash system to return the backwash water to the Geobag Laydown Area. |
| 10 | Installation of a chlorine dosing facility in pipework downstream of the Storage Pond, prior to discharge to the Northam reuse scheme. |
| 11 | Modification of the existing UV disinfection system to receive TWW from the Storage Pond, and treat via UV prior to discharge to the Avon River. |
| 12 | Installation of an overflow bypass system for transfer of overflows to bypass the UV system prior to discharge to the Avon River. |
| 13 | Modification of the existing Geobag laydown Area to include:<br>• Compacted hardstand area;<br>• Concrete drainage pad; and<br>• Pump station to return leachate to the Facultative Pond. |
| 14 | Site contouring to direct uncontaminated stormwater away from the pond embankments |

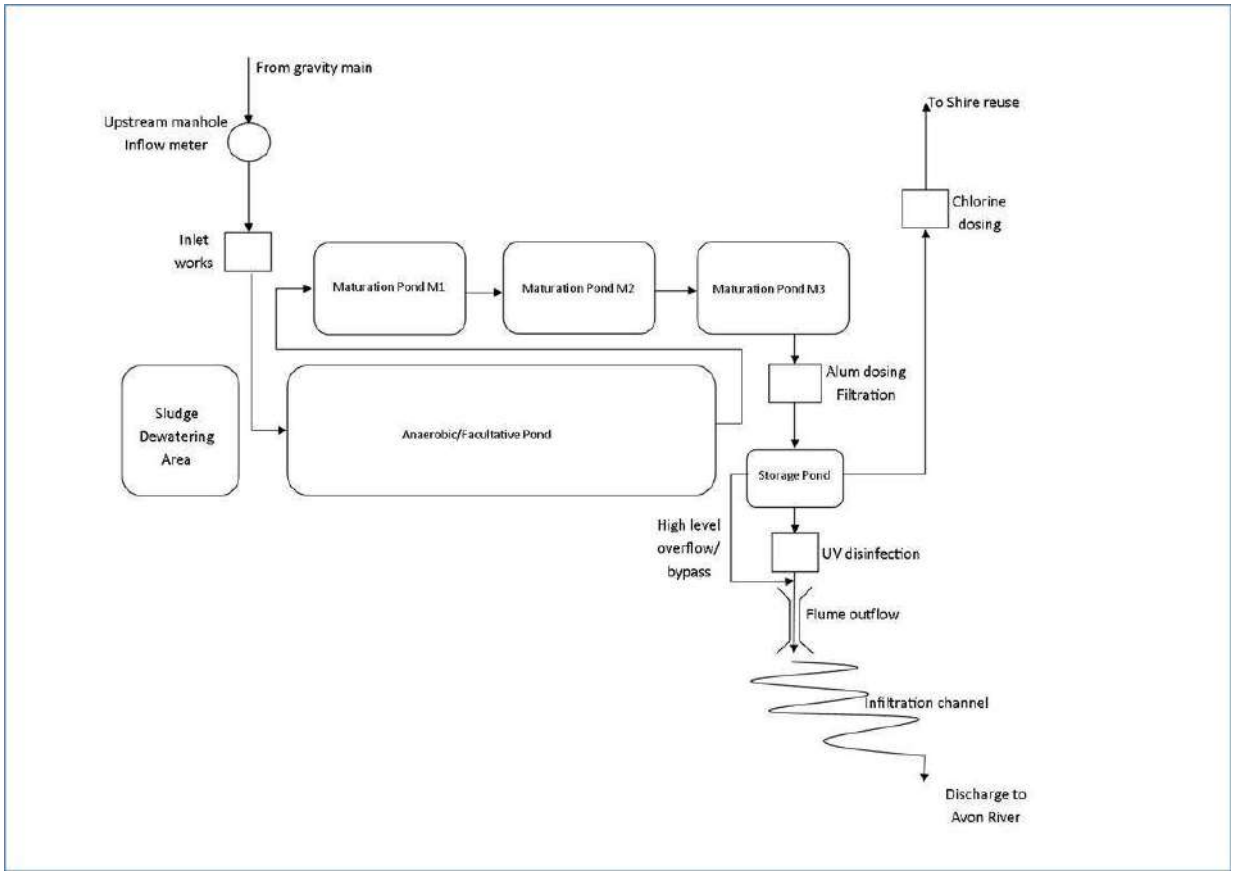



**Figure 1: Northam Wastewater Treatment Plant post-works process control schematic**

# 3. Legislative context

## 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: Publication of Annual Audit Compliance Reports (May 2016)*
- *Guidance Statement: Licence duration (August 2016)*
- *Guidance Statement: Environmental Standards (September 2016)*
- *Guidance Statement: Environmental Siting (November 2016)*
- *Guidance Statement: Land Use Planning (February 2017)*
- *Guidance Statement: Risk Assessments (February 2017)*
- *Guideline: Decision Making (June 2019)*
- *Guideline: Industry Regulation Guide to Licensing (June 2019)*

## 3.1 Environment Protection Act 1986

With the aim of improving the TWW quality and to foster utilisation of TWW reuse off-site, in 2012 DER imposed conditions on the Licence (L5989/1991/10) which required Water Corporation to prepare, submit and implement an Environmental Improvement Plan (EIP). The EIP was required to incorporate actions and associated completion dates to achieve the ANZECC water quality guidelines for surface water in the Avon River by 31 December 2017. The timeframe was set to allow Water Corporation sufficient transitional time to either upgrade treatment infrastructure or determine alternative reuse or disposal options for TWW.

On 3 July 2013 Water Corporation submitted an EIP and committed to the cessation of TWW discharges to the Avon River by winter 2015; thus, the need to meet ANZECC water quality criteria was considered redundant. They would retain the discharge point to the Avon River for excess TWW during emergency overflow events.

On 30 March 2015 Water Corporation advised DER that based on the current inflow to the plant they would be unable to cease discharge to the Avon River by winter 2015.

Water Corporation then submitted a revised the EIP to DER on 16 June 2015 citing that the majority of TWW will either be used by the Shire to irrigate parks and gardens or pumped to the Northam Racecourse for irrigation; and Water Corporation would retain the discharge point to the Avon River for excess TWW that is surplus to reuse requirements.

DoW provided advice to DER on 27 June 2016 recommending that routine discharge of TWW to the Avon River be phased-out in favour of alternative disposal options such as reuse for irrigation and that further discussion should be held with all agencies involved in order to establish current environmental goals and objectives and to discuss further management options.

On 4 July 2016 DER wrote to Water Corporation advising them that DoW had recommended the ecosystem condition (disturbance status) of the Avon River was considered to be 'slightly to moderately disturbed', as defined in the ANZECC (2000) guidelines. DER communicated to Water Corporation that this criterion be considered as part of assessing surface water quality in the Avon River with regards to the related TWW discharges. DER also outlined concerns relating to the sole-use of dilution and mixing zones to mitigate potential impacts to the Avon River from TWW discharges. In light of this above advice DER requested Water Corporation to revise the Environmental Improvement Plan (EIP) for the site and submit this by 30 September 2016.

On 4 October 2016 Water Corporation submitted an amendment application to DER. The application relates to a proposal to undertake an Environmental Impact Assessment (Hydrobiology, 2018) to assess discharges of TWW to the Avon River against the ANZECC classification of the surface water system, to determine future upgrade options and potential amendment of the EIP. Water Corporation subsequently withdrew this application on 22 March 2017, however proceeded to conduct the EIA and a Detailed Site Investigation (Cardno, 2018).

## 3.2 Environmental Protection (Clearing of Native Vegetation) Regulations 2004

The works require the clearing of 0.3 ha of native vegetation. The Applicant has advised clearing is exempt under Regulation 5 Item 1 of the *Environmental Protection (Clearing of Native Vegetation) Regulations* 2004 for the purposes of clearing to construct a building.

## 3.3 Contaminated Sites Act 2003

Crown Reserve 25729, along with other land parcels comprising the WWTP operations, was reported as a known or suspected contaminated site under the *Contaminated Sites Act 2003* (CS Act) in 2007, due to suspected soil and groundwater contamination associated with sewerage sludge, septage waste, oil, asbestos and uncontrolled waste disposal.

The Applicant commenced contaminated site investigations during 2017, lodging the findings in the report 'Detailed Site Investigation - Northam Wastewater Treatment Plant (ponds) Northam WA' (Cardno 2018) (DSI). The report concluded additional investigations were required to inform the development of an appropriate remedial action plan and to inform the classification of the site under the CS Act. As of July 2019, the site remains 'awaiting classification'.

Key findings of the DSI that are relevant to this assessment are summarised below:

- The DSI identified a number of areas of potential contamination sources, including the current TWW storage ponds and the former septage disposal pits located south east of Maturation Pond 3.
- The contaminants of potential interest identified within soils at concentrations that exceeded ecological criteria included metals (copper, nickel and zinc), total recoverable hydrocarbons, and per- and poly-fluoroalkyl substances (PFAS).
- The contaminants of potential interest identified within groundwater at concentrations exceeding freshwater ecological criteria included metals (cadmium, copper, manganese and nickel), nutrients, faecal coliforms and PFAS.
- Elevated TDS, relative to other locations, was identified in groundwater in MW16 located down-hydraulic gradient of Pond 1, potentially suggesting that the Pond 1 liner integrity may be compromised.
- Surface water investigations at various locations within the Avon River indicated that the WWTP (current or historical practices) may be having an adverse impact on water quality (nutrients), but that the impact may be localised and 'relatively insignificant'
- Further investigations have been recommended to assess temporal effects and potential secondary exposure pathways (recreational contact and irrigation use) for contaminants contained in wastewater that is discharged to the Avon River, including PFAS.

Based on the concentrations of contaminants in soil and groundwater, activities at the premises have resulted in exceedances of relevant specific consequence criteria for soil (ecological) and water (freshwater ecosystems)

The Applicant has commenced preparation of a remedial action plan to guide the remediation of the former septage disposal pits. The plan has not been submitted to DWER for review and comment.

The Contaminated Sites Branch of DWER understands that the current polishing pond will be reconfigured and extended as part of the works proposed by this application. Given that this work will involve removal of the existing liner, consideration may be given to requirements for targeted soil investigation beneath the liner prior to the placement of the new liner.

These works may be beneficial in understanding historical discharges at the site and contributing to the overall assessment of site contamination. It would be recommended that soil investigation be targeted at areas where lack of containment is suspected based on observations during liner removal.

Further monitoring of soil and groundwater may be required as part of ongoing investigations required under the CS Act. As part of ongoing groundwater monitoring requirements under the CS Act, additional monitoring well locations may be considered to further delineate impacts to

groundwater quality due to discharges to land near the Avon River, historic seepage from ponds and groundwater migration from site operations.

### Key findings

1. The Delegated Officer notes a soil sampling program undertaken during the proposed works to meet CS Act requirements, is beyond the scope of this assessment under the EP Act. It is recommended the Applicant liaise with the Contaminated Sites Branch of DWER to determine a timely soil sampling program to suitably satisfy the provisions of the CS Act.
2. The Delegated Officer notes that contaminants of potential interest identified by the DSI include PFAS. The regulation of PFAS in wastewater is considered to be informed by the National Environmental Management Plan for PFAS (PFAS NEMP) which provides a risk-based framework for the environmental regulation of PFAS contaminated materials and sites, including TWW. As DWER are currently progressing implementation of the PFAS NEMP in a manner that is intended to apply regulation in a nationally consistent manner. While PFAS will be considered within he assessment of risk, the application of controls in relation to PFAS associated with current and proposed operations at the WWTP may be deferred until DWER's regulatory approach is finalised.

## 3.4 Rights in Water and Irrigation Act 1914

The proposal includes excavation works that have to potential to extend below the watertable (Facultative Pond excavation). As the groundwater below the Premises is potentially contaminated, the Applicant will need to obtain a Licence under Section 5C of the *Rights in Water and Irrigation Act 1914* should dewatering of the site be necessary.

# 4. Modelling and monitoring data

## 4.1 Water balance modelling – operational

The Applicant conducted an operational water balance model of the current WWTP process to identify suitable parameters for estimating projected wastewater flows after the upgrade works to the plant. The model assumed that there was no change in the pond storage volume (53,034 $m^2$ at highest water level). The results of this modelling are shown in Table 5 below.

**Table 5: Summary of inflows and outflows for period 1 July 2017 to 30 June 2018.**

| | Inflow | Rainfall | Evaporation | Reuse | Discharge | Deficit |
|---|---|---|---|---|---|---|
| | kL/day | mm/day | mm/day | kL/day | kL/day | kL/day |
| **Mean** | 1,595 | 33 | 172 | 629 | 369 | 420 |
| **Min: Max** | 1,325: 2,123 | 1: 78 | 59: 299 | 64: 1,104 | 60: 1,299 | 166: 837 |
| **Standard Deviation (SD)** | 250.1 | 29.4 | 86.9 | 327.4 | 433.2 | 204.4 |

Based upon the available flow and climatic data a mean water balance deficit of ~420 kL/day was calculated for the period 1 July 2017 to 30 June 2018. This deficit was attributed to various potential sources, including losses from either the conveyance and/or the treatment systems, seepage from ponds, or due to wastewater flow monitoring and instrument errors. The exact source of the losses was not determined. Given that seepage from a pond

treatment system should be a relatively constant rate, the reasonably large variability within the deficit loss rate value (mean: 420, SD: 204.4) is considered inconsistent with seepage being the sole source of losses.

## 4.2 Water balance modelling – projected

The Applicant conducted a projected water balance model to estimate discharges to the environment at the maximum inflow rate (i.e. "worst-case scenario") following the proposed upgrade works with inflows based upon 2.0 ML/day (Table 6).

**Table 6: Summary of projected inflows and outflows at 2.0 MLD.**

| | Inflow | Rainfall | Pan Evaporation | Reuse | Discharge Scenario 1 | Seepage | Discharge Scenario 2 |
|---|---|---|---|---|---|---|---|
| | kL/day | mm | mm | kL/day | kL/day | kL/day | kL/day |
| January | 2,000 | 23.2 | 299 | 542 | 1,012 | 420 | 592 |
| February | 2,000 | 16.5 | 249 | 569 | 1,013 | 420 | 593 |
| March | 2,000 | 18.2 | 214 | 428 | 1,257 | 420 | 837 |
| April | 2,000 | 21.7 | 131 | 567 | 1,256 | 420 | 836 |
| May | 2,000 | 48.4 | 83 | 445 | 1,521 | 420 | 1,101 |
| June | 2,000 | 58.2 | 61 | 805 | 1,219 | 420 | 799 |
| July | 2,000 | 74.1 | 60 | 1,104 | 954 | 420 | 534 |
| August | 2,000 | 55.7 | 75 | 304 | 1,690 | 420 | 1,270 |
| September | 2,000 | 41.8 | 105 | 64 | 1,848 | 420 | 1,428 |
| October | 2,000 | 24.6 | 167 | 164 | 1,611 | 420 | 1,191 |
| November | 2,000 | 14.9 | 223 | 438 | 1,212 | 420 | 792 |
| December | 2,000 | 10.6 | 281 | 723 | 834 | 420 | 414 |
| **Mean** | 2,000 | 34 | 162 | 513 | 1,285 | 420 | 865 |
| **Min: Max** | 2,000: 2,000 | 11: 74 | 60: 299 | 64: 1,104 | 834: 1,848 | 420: 420 | 414: 1,428 |
| **Standard Deviation** | 0 | 20.8 | 88.2 | 281.2 | 318.57 | 0 | 318.57 |

The model assumes the upgraded change in pond storage volumes of 65,997 $m^2$ (at top water level). Predicted reuse volumes are based upon 2017 reuse volumes and assumes no change in irrigation schedules at Northam ovals. Predicted discharge volumes assume that there is no onsite infiltration following discharge from the WWTP to the Avon River, with all TWW assumed to reach Avon River via overland flow.

Two discharge modelling scenarios were tested, with Scenario 1 assuming no losses of water from seepage or system losses, and Scenario 2, which assumed that losses from the treatment system (via seepage from ponds or other means) were equivalent to the current calculated loss of 420 kL/day (refer to Section 4.1)

Projected discharge volumes from the WWTP under Scenario 1 (e.g. no losses from seepage) range from 834 kL/day during the summer months to 1,848 kL/day during winter.

Inflows are not projected to reach 2.0 ML/day until past 2048 based upon Annual Average Daily Flows (AADF) and forecast population growth (Figure 2). It is also anticipated that re-use volumes will increase in accordance with State wastewater recycling targets. The modelled "worst-case" scenario represents an increase of ~496 kL/day on current discharge volumes.

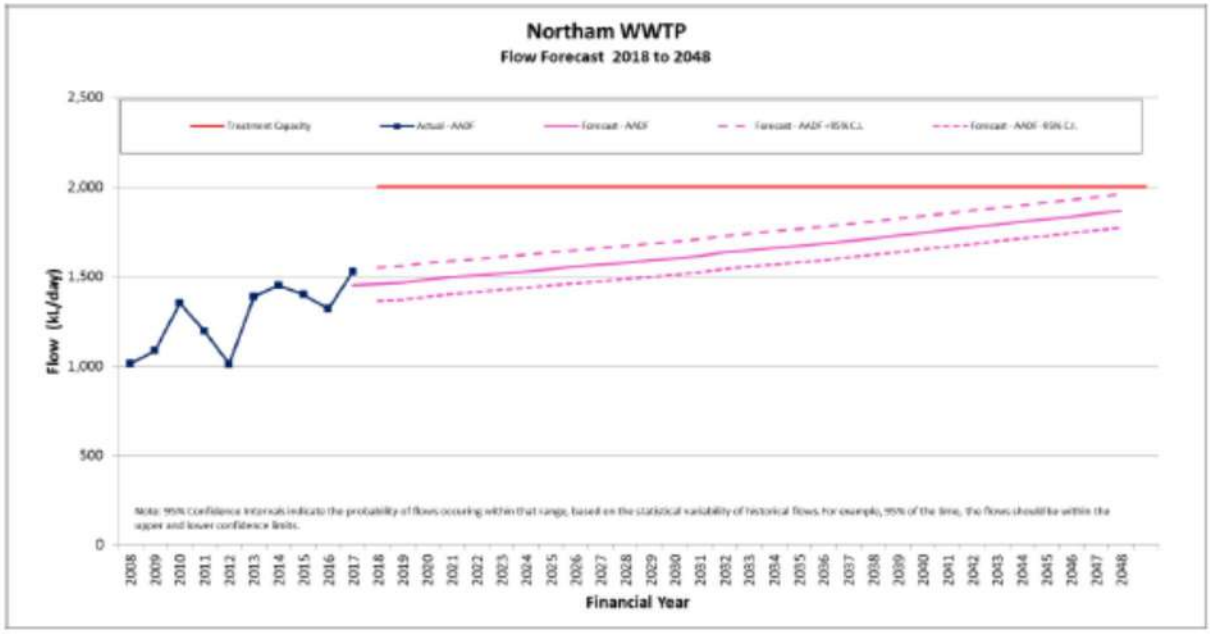



**Figure 2: Forecasted annual average daily flows at the Northam WWTP 2019 to 2048**

Recent monitoring of overland flow from the Infiltration Channel to the Avon River indicates that the majority of TWW discharged from the WWTP is currently infiltrating within the infiltration channel, with direct discharges to the river predominately during the wetter months when flows in the river are at their highest (Figure 3).

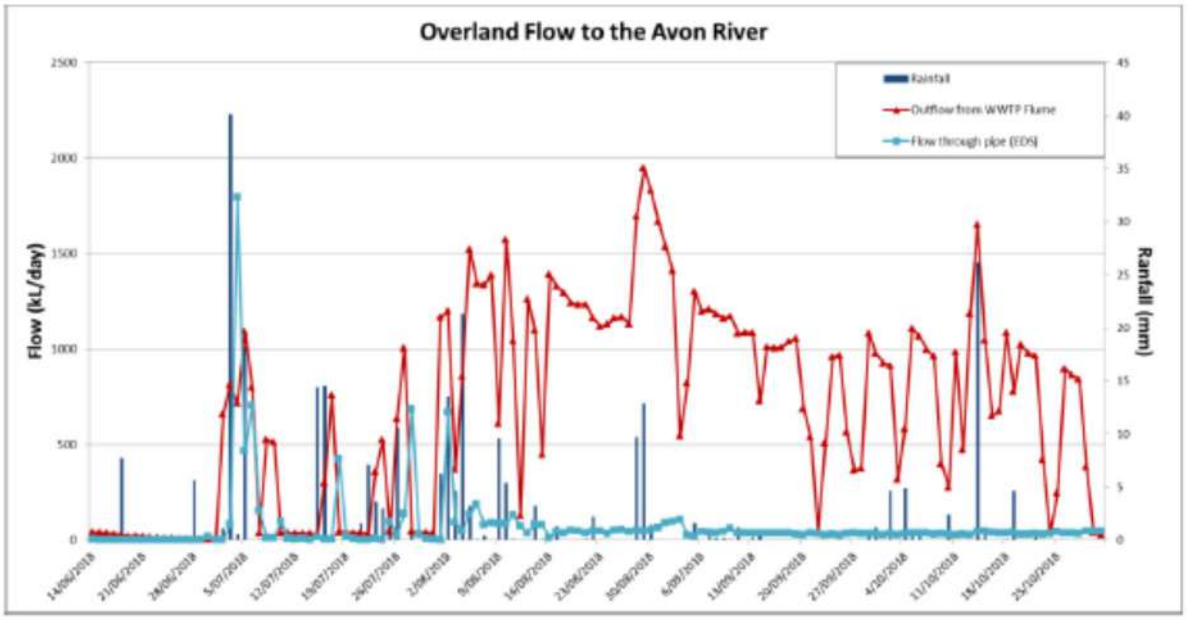



**Figure 3: Measurement of overland flows from infiltration area to the Avon River 2018**

Scenario 1 is likely to represent a realistic case given that the proposed upgrade works include replacement of the conveyance systems and relining of the Facultative Pond and Maturation Pond 1 with a low permeability liner, hence losses from the treatment system via seepage or other means are likely to be reduced or resolved.

It is intended that following completion of the works that a more detailed water balance will be completed for the pond system to locate and determine any remaining losses from the system.

### Key findings

3. The Delegated Officer notes the difficulties identifying the source of the water balance deficit at this time, and that the proposed works need to be completed and the plant operational prior to further water balance monitoring occurring. This will be considered in the assessment of risk in relation to potential seepage from the WWTP ponds.

## 4.3 Monitoring of local ecosystem

The Applicant conducted an Environmental Impact Assessment (EIA) (Hydrobiology 2018) to determine the impact of the discharge of TWW from the Northam WWTP to the Avon River. The aquatic communities present within the Avon River were indicative of a saline and eutrophic system, consistent with the grazing and cropping activities dominant within the catchment. The EIA identified that there was no indication that current discharges from the WWTP were impacting to aquatic fauna populations. The monitoring of discharges of TWW to the Avon River found that, while some increase in TN and total phosphorus (TP) was recorded 0.7 km downstream of the WWTP, by 1.5 km downstream concentrations had returned to similar ranges to upstream sites (Hydrobiology 2018).

The study considered the potential impacts from the proposed upgrade works and found that a reduction of 3% in TN concentrations to 22 mg/L could occur with the planned upgrade works. The study found the increase in TWW inflow and discharge rates, from the current capacity of 1,500 $m^3$/day to the proposed new capacity of 2,000 $m^3$/day, will not result in significant change to the TN loads reaching the Avon River. Specifically, the study noted that loading rates are likely to remain within the same order of magnitude as current discharges. The EIA formed the basis for the proposed upgrade works subject of this assessment. The loading rate of total phosphorus is expected to increase if the proposed increase in discharge volumes occurs, but the increase in loading is likely to result in a marginal increase of the existing TP base flow loading within the Avon River (Hydrobiology 2018).

DWER note that maximum inflow rates are not forecast until after 2048. The proposed upgrade works to the treatment system are likely to reduce the total nutrient concentrations in discharge water. DWER note that nutrient load impacts are of a concern to the Avon River and river catchment, and downstream estuary, particularly in summer when nutrient can trigger algal growth in the catchment. The proposed upgrade works are considered to result in an overall reduction in nutrient loading from the WWTP to the catchment on an annual basis.

## 4.4 Monitoring of discharges to land

Sampling of TWW is currently undertaken prior to discharge to the reuse scheme and prior to discharge to the infiltration channel that leads to the Avon River, in accordance with the requirements of Licence L5989/1991/11. As the proposed works will modify the location of the discharge infrastructure and physical sampling point, the location of the sampling point as depicted on the Licence will be amended to ensure it accurately depicts the physical location.

### Key findings

4. The Delegated Officer requires further information to determine the adequacy of the proposed monitoring of discharges to land. The current monitoring only requires monitoring of the discharge itself (quality and quantity) and does not take into consideration the accumulation of nutrients in soils as a result of infiltration of TWW prior to reaching the Avon River. The Delegated Officer notes this information is not necessary to assess the proposed works under this Decision Report; however, a proposed monitoring strategy to determine nutrient loading of soils as a result of infiltration within the infiltration channel shall be required in order to determine regulatory controls for monitoring discharges to land as part of the future Licence amendment application assessment.

## 4.5 Monitoring of discharges to surface water

Sampling of the Avon River is currently undertaken at two upstream and three downstream locations in accordance with the requirements of Licence L5989/1991/11 (Figure 4). The Applicant proposes sampling of these locations is continued to allow comparison of a long-term data set.

DWER note that the historical concern of the Northam WWTP, which has driven the previous application of Licence controls, has been overall nutrient loading to the Avon River and concentrations during summer months that have the potential to contribute to algal blooms. The proposed works will result in a reduction of the volume of discharge water during the summer months as the TWW is diverted to the reuse scheme in Northam, thereby reducing nutrient inputs from the WWTP to the River.

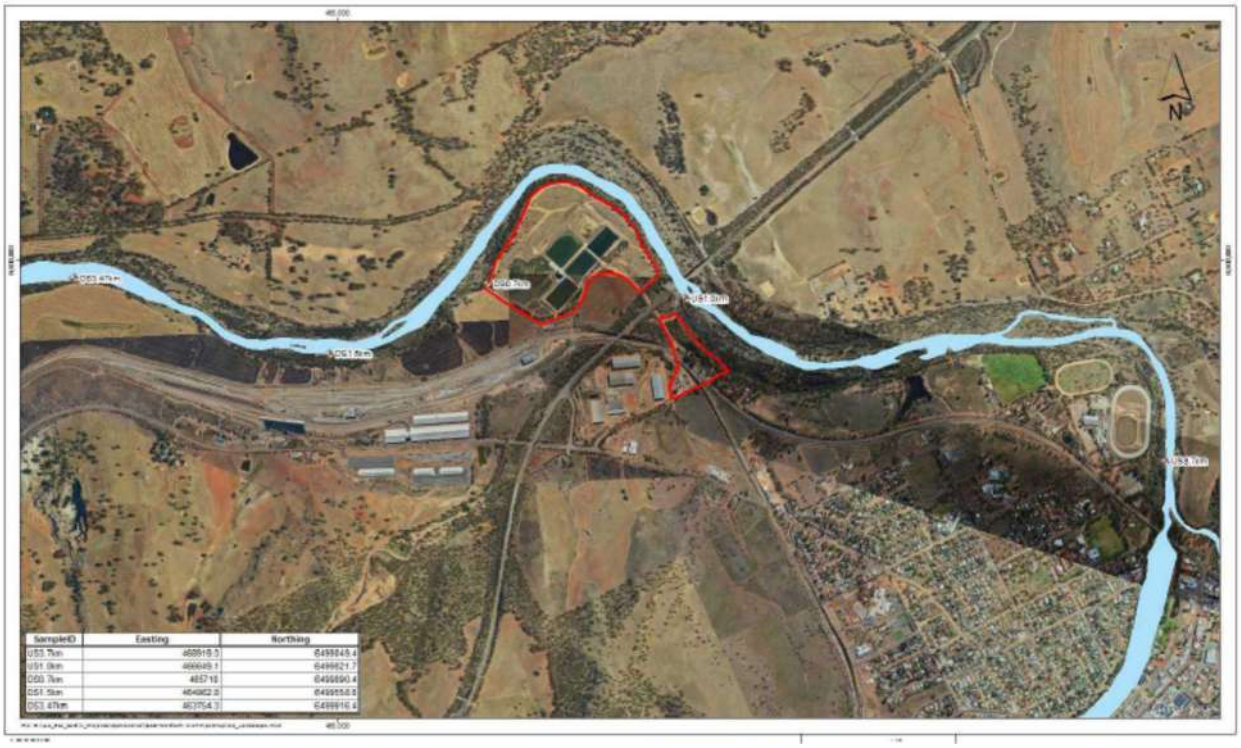



**Figure 4: Surface water monitoring locations within the Avon River**

## Key findings

5. The Delegated Officer requires further information to determine the adequacy of the proposed surface water monitoring program, in particular the number of sampling locations and the suite of parameters to be sampled. The Delegated Officer notes this information is not necessary to assess the proposed works under this Decision Report, however a proposed monitoring strategy to determine nutrient loading of surface waters shall be required in order to determine regulatory controls for monitoring discharges to surface waters as part of the future Licence amendment application assessment.

## 4.6 Monitoring of groundwater

There are currently no monitoring bores at the Premises nor groundwater monitoring conditions on the associated Licence L5989/1991/10. Seepage from the WWTP ponds and discharge of TWW to the infiltration channel, with nutrient loading of soils and groundwater, lateral transportation and discharge of impacted groundwater to the Avon River, were identified as potential risk events by the Applicant. Figure 5 shows the Applicant's proposed groundwater monitoring locations.

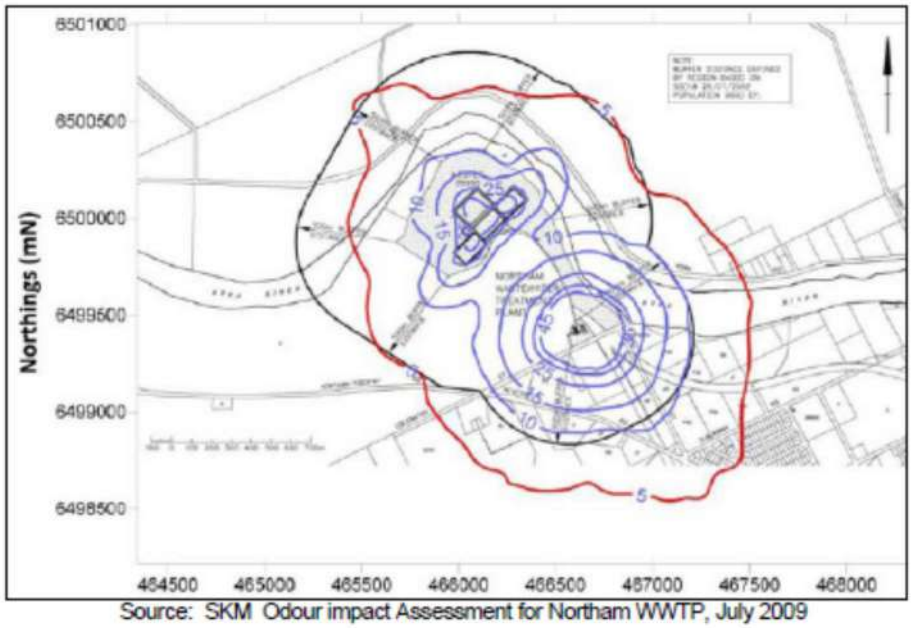

**Figure 5: Proposed groundwater monitoring bore locations**

DWER notes that the number and density of groundwater monitoring wells appears low given the size of the WWTP and the proximity of the Avon River. The analytical suite proposed is limited to nutrients, pH, TDS, TSS, BOD and faecal coliforms, although these parameters are appropriate for identifying limited changes in water quality associated with operational discharges.

## 4.7 Modelling of odour emissions – operational

Odour modelling was carried out for the existing plant by SKM in July 2009 using the local wind file and the Ausplume dispersion model, with a resulting total odour emission of 43,500 OU/s. The Applicant has used statewide community complaints data to determine the 5 OU level of odour is the level at which odour can be perceived as annoying by the local community, when calculated using the Ausplume model at 99.9 percentile frequency over a 1-hour averaging period.

The predicted odour contours are mapped in Figure 6, including the 5 OU (99.9%) odour in red and the Special Control Area (SCA) as the black semielliptical line as depicted in the Northam Planning Scheme, and extends around the existing treatment facilities with a separation distance of 600 m from the nearest treatment unit. The 5 OU contour extends beyond the SCA. The concern is that odour emissions extend into the existing residential area on the north-west of the town.



Source: SKM Odour impact Assessment for Northam WWTP, July 2009

**Figure 6: Odour contour modelling for the existing Northam WWTP**

## 4.8 Modelling of odour emissions – projected

The 75 percentile odour emissions from the plant were calculated based on the proposed upgraded works to increase throughput up to 2,000 $m^3$ per day. The upgraded plant will have high odour emission sources being the anaerobic pot, and the facultative ponds. The predicted residual total odour emission rate for the upgraded plant is 24,600 OU/s. This represents a reduction from the emissions of the existing plant, despite the 25 % increase in TWW flow rate to 2,000 $m^3$ per day. This is primarily related to the proposal to close the primary treatment plant premises and therefore eliminate emission related to the anaerobic sludge digesters, that release hydrogen sulphide gases, and the sludge drying beds.

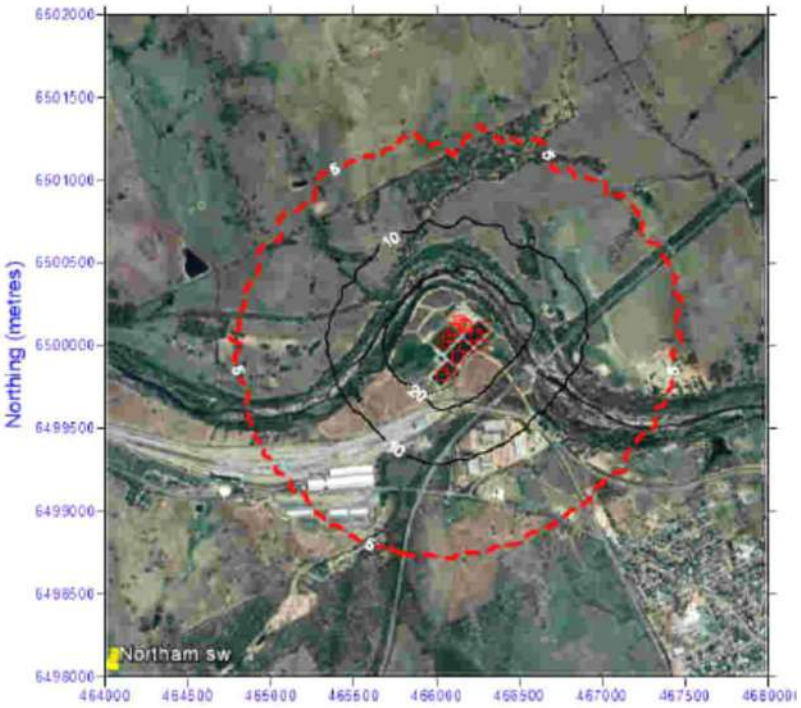



**Figure 7: Odour contour modelling for the upgraded Northam WWTP**

The predicted 5 OU contour for the proposed plant forms a circle that extends approximately 1,000 m from the perimeter of the proposed ponds and other treatment facilities (Figure 7). The 5 OU contour contracts away from the residential area located on the edge of Northam (Figure 8).

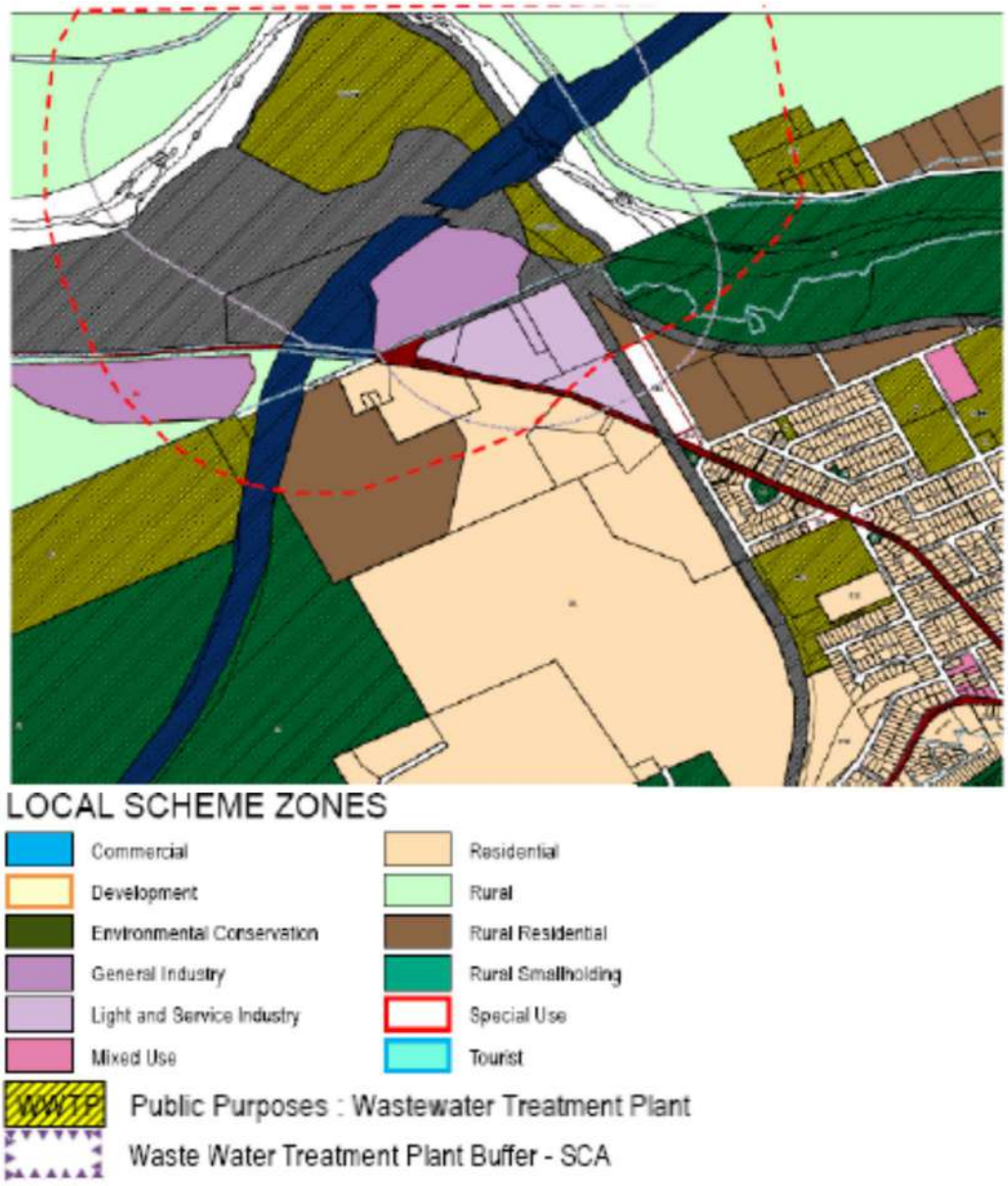



**Figure 8: 5 OU Odour contour modelling for the upgraded Northam WWTP in relation to surrounding land uses**

# 5. Consultation

The application was advertised in the West Australian on 18 March 2019 for public comment. No submissions were received.

A letter inviting comment was sent to the Shire of Northam on 11 March 2019. The Shire did not make comment on the proposal.

A letter inviting comment was sent to the Department of Health on 11 March 2019. DWER received notice the Department of Health has no objection to the proposed works on 1 April 2019.

# 6. Location and siting

## 6.1 Siting context

The primary treatment plant is located on Lot 500, Lot 501 and Lot 502 on Deposited Plan 76392. The secondary treatment plant is located on Lot 29316 on Deposited Plan 221054. The primary plant will be decommissioned after completion of the upgrade works.

The premises is located on the outskirts of the Northam town site on land zoned for Public Purposes, on the banks of the Avon River. The river surrounds the premises on the east, north and north western sides and supports remnant riparian vegetation. The land on the opposite banks of the river is zoned Rural and has been extensively cleared for broadacre farming of wheat and sheep, however no farmhouses are in close proximity. The Great Eastern Highway passes to the east of the ponds of the secondary plant and runs between the primary and secondary plants. Railway tracks and infrastructure and general industry are located on the southern side of the premises. Further to the south east are activities zoned Light and Service Industries and Parks and Recreation, with the closest residential premises located further south east.

## 6.2 Residential and sensitive Premises

Table 7 below provides a summary of human receptors, in proximity to the premises, which have a potential to be impacted from the site activities considered in this amendment. The risk assessment in Section 7 considers these human and environmental receptors in the context of emissions and potential pathways.

**Table 7: Receptors and distance from activity boundary**

| Sensitive Land Uses | Distance from Prescribed Activity |
|---|---|
| Residential Premises | 1,020 m south east of Premises boundary |

## 6.3 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. Table 8 below provides a summary of environmental receptors, in proximity to the premises, which have the potential to be impacted from the site activities considered in this report. The table has been modified to align with the *Guidance Statement: Environmental Siting.*

**Table 8: Environmental values**

| Specified ecosystems | Distance from the Premises |
|---|---|
| Threatened Fauna | Recorded 300 m east of the Premises boundary, located within remnant riparian vegetation along the Avon River and remnant roadside vegetation.<br>• Protected under an International Agreement - Calidris ruficollis (red-necked stint)<br>• Endangered - Calyptorhynchus latirostris (Carnaby's cockatoo)<br>• P4 Priority Fauna - Oxyura australis (blue-billed duck)<br>Recorded 730 m east and 570 m south of the Premises boundary, located within remnant roadside vegetation:<br>• Protected under an International Agreement - Tringa glareola (wood sandpiper) |
| Threatened Ecological Systems | • Wheatbelt Woodlands – Eucalypt woodlands of the wheatbelt, located adjacent to the Premises on the east, north and north western sides and extends along the Avon River riparian zone, plus various remnant roadside vegetation.<br>• York Gum Woodlands – York Gum woodlands of the wheatbelt, located 570 m south of the Premises, beyond the railway yards. |

## 6.4 Surface water and groundwater sources

Water sources have the potential to be impacted from the site activities considered in this report. The proximity of water sources to the prescribed activities are shown in Table 9.

**Table 9: Surface water and groundwater sources**

| Water sources | Description and distance from Premises |
|---|---|
| Avon River | Major, non-perennial water course located immediately adjacent to the Premises boundary, to the east, north and west. Flow is predominantly seasonal, following rainfall. The River supports saline and eutrophic aquatic communities (flora and fauna).<br>The river channel is located approx. 120 m from the proposed ponds at its closest point.<br><br>The Premises is located within the Avon River Waterways Management area, which is proclaimed under the *Waterways Conservation Act 1976*, therefore a disposal Licence will be required should dewatering effluent be disposed of to the Avon River. The Applicant has indicated that should dewatering be required, their intention is to dispose of the effluent to the ponds of the wastewater treatment plant. |
| Groundwater | Depth to groundwater is generally 3 to 6 metres below ground level.<br>Groundwater directional flow is from the north east, flowing radially to the north west and west and towards the Avon River.<br>Groundwater salinity is marginal to saline ranging from 657 mg/L to 7,700 mg/L. |

## 6.5 Meteorology

### Wind direction and strength

Prevailing wind patterns can provide a direct pathway for transmission of dust and odours by air, so the prevailing wind patterns that may carry these emissions to sensitive receptors have been considered in this assessment. The closest Bureau of Meteorology (BoM) weather station which records wind frequency data is Northam Airport (BoM site 010111). Prevailing winds during summer are on average from the east, south east and south in the mornings, and swing variably from the east, south and west in the afternoons (Figure 9). Prevailing winds during winter mornings are on average calm up to 56% of the time with wind speeds increasing up to 10 km/hr throughout the morning, and prevailing from the east, north east and north in the afternoons. (Figure 10). This pathway has been considered in the risk assessment table in Section 7.

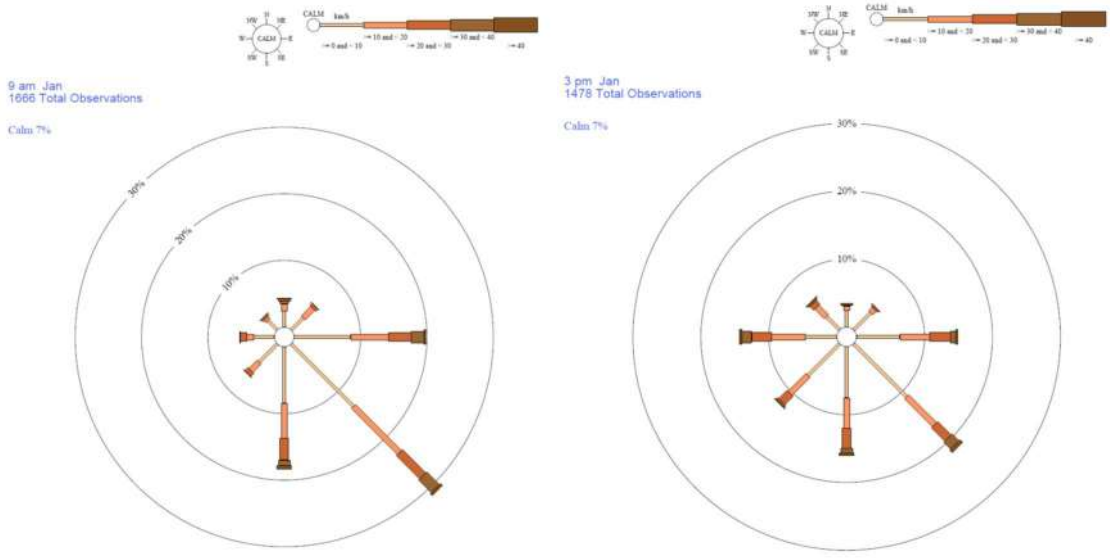



**Figure 9: January wind roses for 9am and 3pm at Northam Airport (BoM site 010111).**
Source: Bureau of Meteorology website www.bom.wa.gov.au

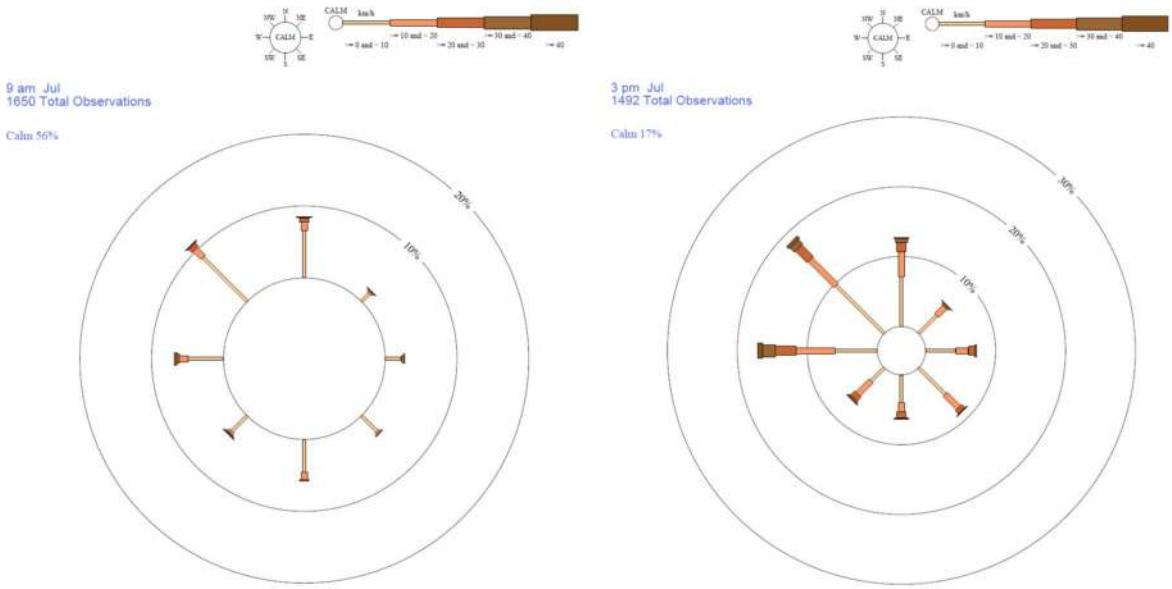



**Figure 10: July wind roses for 9am and 3pm at Northam Airport (BoM site 010111).**

Source: Bureau of Meteorology website www.bom.wa.gov.au

## Rainfall

The closest Bureau of Meteorology (BoM) weather station which records rainfall data is Northam Airport (BoM site 010111). Maximum average rainfall is received in June and July annually. Minimum average rainfall is received November to March annually. (Figure 11). Rainfall as stormwater can contribute to emissions where it becomes contaminated after coming into contact with untreated wastewater and then exits the Premises, potentially contaminating receptors in close proximity to the WWTP. This risk event has been considered in the risk assessment table in Section 7.

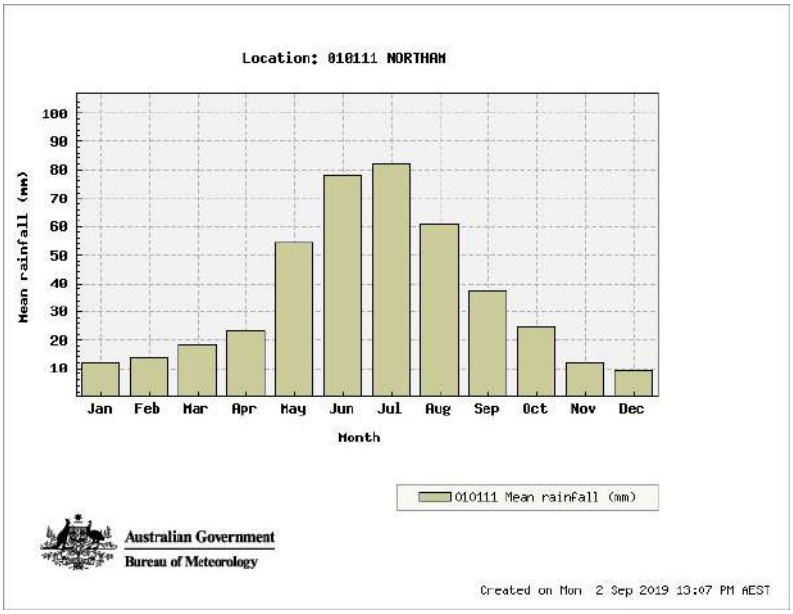



**Figure 11: Average annual rainfall (mm) at Northam site 010111.**

Source: Bureau of Meteorology website www.bom.wa.gov.au

# 7. Risk assessment

## 7.1 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 Tables 10 and 11.

The identification of the emissions, pathways and receptors to determine Risk Events are set out in Tables 10 and 11 below.

**Table 10. Identification of emissions, pathway and receptors during construction**

| Risk Events | | | | | | Reasoning | Continue to detailed risk assessment |
|---|---|---|---|---|---|---|---|
| **Sources/Activities** | | **Potential emissions** | **Potential pathway** | **Potential receptors** | **Potential adverse impacts** | | |
| **Construction, mobilisation and positioning of infrastructure** | Vehicle movements on unsealed access roads<br>Modification of existing ponds and construction of new ponds and infrastructure | Dust | Air / wind dispersion | Residential premises located 1 km south east of the Premises | Amenity impacts | The Delegated Officer considers the prevailing wind conditions for July 3 pm may provide a pathway for minor dust emissions to impact the nearest sensitive receptor.<br>Due to the short term nature of construction activities, any emissions of dust may be subject to the provisions of section 49 of the EP Act.<br>No further risk assessment is required. | No |
| | | Noise | | | | The Delegated Officer considers a separation distance of 1.1 km sufficient to ensure noise emissions will not significantly impact upon amenity during construction.<br>Due to the short term nature of construction activities, any emissions of noise may be subject to the provisions of the *Environmental Protection (Noise) Regulations 1997*.<br>No further risk assessment is required. | No |

| Risk Events | | | | | | Reasoning | Continue to detailed risk assessment |
|---|---|---|---|---|---|---|---|
| Sources/Activities | | Potential emissions | Potential pathway | Potential receptors | Potential adverse impacts | | |
| | Modification of existing ponds and construction of new ponds and infrastructure | Discharges and spills of untreated and treated wastewater | Overland flow<br>Subsurface leaching | Surface water and riparian habitat - Avon River<br>Beneficial uses of groundwater | Potential impact to aquatic ecosystems<br>Soil contamination inhibiting native vegetation survival and growth and impacting fauna habitat<br>Degradation of surface water and groundwater quality | Decommissioning and construction works are planned in a manner that will allow ponds to be taken offline and modified in a sequential basis.<br>The Delegated Officer considers that the staged approach for construction is only likely to result in minor spills which may be managed through construction environmental management procedures. Construction timing commitments will be reflected in the regulatory controls.<br>Regulatory controls on the current Licence require management of the ponds so that overtopping of the ponds into the environment does not occur.<br>Discharges to land (Avon River) that may occur during commissioning of the system will be regulated consistently with the current licence and no additional risk assessment is required.<br>In addition, any discharges may be subject to the provisions of the *Environmental Protection (Unauthorised Discharges) Regulations 2004.* | No |
| | | Spills of hydrocarbons and other chemicals from vehicles and equipment | Direct discharge to land and surface waters | Surface water and riparian habitat - Avon River<br>Beneficial uses of groundwater | Soil contamination inhibiting vegetation survival and growth and impacting fauna habitat<br>Surface water and groundwater contamination | There will be no onsite fuel storage.<br>Fuelling activities are planned to occur via mobile refuelling trucks on a lined hardstand pad designed to contain any potential spills, with spill response kits available.<br>Discharges of hydrocarbons and other chemicals may also be subject to the provisions of the *Environmental Protection (Unauthorised Discharges) Regulations 2004* | No |

**Table 11: Identification of emissions, pathway and receptors during operation**

| Risk Events | | | | | | Reasoning | Continue to detailed risk assessment |
|---|---|---|---|---|---|---|---|
| **Sources/Activities** | | **Potential emissions** | **Potential pathway** | **Potential receptors** | **Potential adverse impacts** | | |
| **Waste Water Treatment Plant** | Treatment of sewage | Odour | Air / wind dispersion | Residential premises located 1km south east of the Premises | Amenity impacts | Proposed works will increase the currently Licensed throughput by one third up to 2,000 $m^3$/day. Whilst the potential for increased odour emissions is likely, this throughput is not estimated to be reached until 2048.<br>Projected odour modelling shows the 5 OU odour plume for the current WWTP will constrict away from the residential area after modification of the WWTP, due to closure of the primary plant and improved treatment functionality of the secondary plant.<br>The Delegated Officer considers a separation distance of 1.1km sufficient to ensure increased odour emissions will not result in a significant impact upon amenity.<br>Existing Licence conditions are considered to be adequate to manage this risk during operation of the infrastructure. | No |
| | | Noise | | | | The Delegated Officer considers a separation distance of 1 km sufficient to ensure noise emissions will not significantly impact upon amenity.<br>Noise emissions may be subject to the provisions of the *Environmental Protection (Noise) Regulations 1997* | No |
| | | Seepage of untreated sewage and treated wastewater from ponds | Overland flow<br>Subsurface seepage and subsequent discharge to Avon River | Surface water and riparian habitat - Avon River<br>Beneficial uses of groundwater | Potential impact to aquatic ecosystems<br>Soil contamination inhibiting native vegetation | See section 7.4 | Yes |

| Risk Events | | | | | | Reasoning | Continue to detailed risk assessment |
|---|---|---|---|---|---|---|---|
| Sources/Activities | | Potential emissions | Potential pathway | Potential receptors | Potential adverse impacts | | |
| | | Overtopping of containment ponds with treated and untreated wastewater | Overland flow<br>Subsurface seepage and subsequent discharge to Avon River | Surface water and riparian habitat - Avon River<br>Beneficial uses of groundwater | survival and growth and impacting fauna habitat<br>Degradation of surface water and groundwater quality<br>Public health impacts for recreational users of the Avon River including gastroenteritis and other diseases | See section 7.5 | Yes |
| | | Contamination of stormwater | Overland flow<br>Subsurface seepage and subsequent discharge to Avon River | Surface water and riparian habitat - Avon River<br>Beneficial uses of groundwater | Soil contamination inhibiting vegetation survival and growth and impacting fauna habitat<br>Degradation of surface water and groundwater quality<br>Public health impacts for recreational users of the Avon River including gastroenteritis and other diseases | The upgraded WWTP is designed to accommodate flood events up to the 1 in 20 (20%) Annual Exceedance Probability (AEP) and all treatment ponds and the storage pond will have raised embankments to maintain 500 mm freeboard level, which will ensure stormwater entering the ponds and becoming contaminated is retained in the system. Contouring of the site will ensure overland flow of stormwater is directed away from the ponds, thereby preventing contamination.<br>The Delegated Officer considers that the controls proposed by the Applicant are sufficient to prevent an emission occurring under most circumstance.<br>Any discharges may be subject to the provisions of the *Environmental Protection (Unauthorised Discharges) Regulations 2004.*<br>Construction commitments and operational outcomes (freeboard requirements, reportable events and monitoring conditions) will be reflected in the regulatory controls determined at Licence Amendment stage. | No |



/ 2017)

| Risk Events | | | | | | Reasoning | Continue to detailed risk assessment |
|---|---|---|---|---|---|---|---|
| Sources/Activities | | Potential emissions | Potential pathway | Potential receptors | Potential adverse impacts | | |
| | Onsite operational equipment | Spills of hydrocarbons and chemicals such as alum and chlorine | Direct discharge to land and surface waters | Surface water and riparian habitat - Avon River<br>Beneficial uses of groundwater | Soil contamination inhibiting vegetation survival and growth and impacting fauna habitat<br>Degradation of surface water and groundwater quality | There will be no onsite fuel storage as vehicle refuelling will not be required during operation of the WWTP. All facilities will be connected to mains power. Where there is a need for temporary generators during power outages the Applicant has committed to containing the fuel in self-bunded fuel tanks which meets Australian Standard AS1692.<br>The Delegated Officer considers there is no foreseeable risk from spills of hydrocarbons given the Applicant's proposal. No further risk assessment is required.<br>The Applicant has not confirmed the quantities of alum and chlorine required to be stored at the Premises, nor operational controls and spill prevention. Regulatory controls will be determined at Licence Amendment stage. | No |
| **Discharge to reuse scheme (Public open space)** | Irrigation of treated wastewater | Treated wastewater containing contaminants at concentrations not fit for purpose (e.g. nutrients, pathogens) | Direct contact and ingestion of irrigation mist<br>Overland flow and runoff<br>Subsurface seepage | Users of Public open space<br>Beneficial uses of groundwater | Public health impacts for recreational users of Public open spaces including gastroenteritis and other diseases | See section 7.6 | Yes |
| | | | | | Contamination of soil<br>Impact to vegetation health<br>Degradation of groundwater quality | See section 7.7 | Yes |
| **Discharge to banks and surface waters of Avon River** | Discharge of treated wastewater | Treated wastewater containing contaminants at concentrations not fit for purpose (e.g. nutrients, | Direct contact and ingestion of contaminated surface water | Recreational users of Avon River<br>Surface water and riparian | Public health impacts for recreational users of the Avon River including gastroenteritis and other diseases | See section 7.6 | Yes |

| Risk Events | | | | | | Reasoning | Continue to detailed risk assessment |
|---|---|---|---|---|---|---|---|
| Sources/Activities | | Potential emissions | Potential pathway | Potential receptors | Potential adverse impacts | | |
| | | pathogens) | Overland flow and runoff<br>Subsurface seepage | habitat - Avon River<br>Beneficial uses of groundwater | Contamination of soil<br>Impact to vegetation health<br>Degradation of groundwater quality | See section 7.7 | Yes |

## 7.2 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 12 below.

**Table 12: 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 13 below.

**Table 13: 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 | • **onsite impacts**: catastrophic<br>• **offsite impacts local scale**: high level or above<br>• **offsite impacts wider scale:** mid-level or above<br>• Mid to long-term or permanent impact to an area of high conservation value or special significance^<br>• Specific Consequence Criteria (for environment) are significantly exceeded | • Loss of life<br>• **Adverse health effects:** high level or ongoing medical treatment<br>• Specific Consequence Criteria (for public health) are significantly exceeded<br>• **Local scale impacts:** permanent loss of amenity |
| Likely | The risk event will probably occur in most circumstances | Major | • **onsite impacts**: high level<br>• **offsite impacts local scale**: mid-level<br>• **offsite impacts wider scale**: low level<br>• Short-term impact to an area of high conservation value or special significance^<br>• Specific Consequence Criteria (for environment) are exceeded | • **Adverse health effects:** mid-level or frequent medical treatment<br>• Specific Consequence Criteria (for public health) are exceeded<br>• **Local scale impacts**: high level impact to amenity |
| Possible | The risk event could occur at some time | Moderate | • **onsite impacts**: mid-level<br>• **offsite impacts local scale**: low level<br>• **offsite impacts wider scale**: minimal<br>• Specific Consequence Criteria (for environment) are at risk of not being met | • **Adverse health effects:** low level or occasional medical treatment<br>• Specific Consequence Criteria (for public health) are at risk of not being met<br>• **Local scale impacts:** mid-level impact to amenity |
| Unlikely | The risk event will probably not occur in most circumstances | Minor | • **onsite impacts**: low level<br>• **offsite impacts local scale**: minimal<br>• **offsite impacts wider scale**: not detectable<br>• Specific Consequence Criteria (for environment) likely to be met | • Specific Consequence Criteria (for public health) are likely to be met<br>• **Local scale impacts:** low level impact to amenity |
| Rare | The risk event may only occur in exceptional circumstances | Slight | • **onsite impact**: minimal<br>• Specific Consequence Criteria (for environment) met | • **Local scale**: minimal to amenity<br>• Specific Consequence Criteria (for public health) met |

^ 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.

## 7.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment in Table 14 below:

**Table 14: Risk treatment table**

| Rating of Risk Event | Acceptability | Treatment |
|---|---|---|
| **Extreme** | Unacceptable. | Risk Event will not be tolerated. DWER may refuse application. |
| **High** | May be acceptable.<br>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. |
| **Medium** | 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. |
| **Low** | Acceptable, generally not controlled. | Risk Event is acceptable and will generally not be subject to regulatory controls. |

## 7.4 Risk Assessment – Seepage

### Description of the risk event for seepage from ponds during operations

The untreated sewage from the town of Northam is received at the WWTP for treatment. During treatment (source) seepage of untreated sewage and TWW from ponds (emission) has the potential to be discharged via overland flow and subsurface seepage (pathway) into the surface waters and riparian habitat of the Avon River and local groundwater sources (receptors). Untreated wastewater typically contains nutrients (nitrogen and phosphorus); solids (including organic matter); persistent organic pollutants; pathogens (including bacteria, viruses and protozoa); helminthes (intestinal worms and worm-like parasites).

Seepage of untreated wastewater may potentially lead to impacts to aquatic ecosystems, soil quality and vegetation health and fauna habitat, surface water and groundwater degradation, and public health impacts for recreational users of the Avon River such as gastroenteritis and other diseases (adverse impact).

Wastewater, if treated sufficiently, should contain lower quantities of nutrients, no solids and very low levels of pathogens and helminthes to minimise or prevent adverse impacts to humans and the environment.

### Criteria for assessment

Relevant land and surface water quality criteria include:

- National Environment Protection (Assessment of Site Contamination) Measure 1999;
- ANZECC & ARMCANZ (2000) – freshwater criteria;
- Department of Health (2011) – Guidelines for the non-potable use of recycled water in Western Australia; and
- National Health and Medical Research Council (2019) – Guidelines for managing risks in recreational water.

## Applicant controls

Water balance modelling has considered maximum inflows of wastewater and rainfall data compared to evaporation data, reuse scheme irrigation data, infiltration rates for the liner and discharges to land prior to the Avon River and found a deficit of ~420 kL/day. The source of the deficit is currently unknown, however seepage from the treatment ponds and losses from the conveyance system are potential pathways.

Proposed works include relining the Facultative Pond with a Bituminous Geomembrane liner, lining the Anaerobic Pond with a concrete liner and confirming the liner of Maturation Pond 1 has a permeability of ≤1x10$^{-9}$ m/sec to mitigate pond seepage. Following testing of the Maturation pond liners, the liners may be replaced (with clay or geomembrane liner) or repaired. A revised water balance monitoring will be conducted when the plant is operational to determine if the liner mitigated seepage or if further investigations are required.

## Key findings

**The Delegated Officer has reviewed the information regarding seepage from ponds and has found:**

6. Lining the ponds with a Bituminous Geomembrane liner, concrete liner and clay or geomembrane liner that have a permeability of ≤1x10$^{-9}$ m/sec is sufficient to minimise seepage of untreated sewage and TWW within the ponds.
7. The current water balance for the premises identified a 420 kL/day deficit of water, indicating potential losses from the system. It is recognised that the construction works are required to be completed before re-estimating the water balance for the premises.
8. The existing Licence requires maintenance of the ponds to prevent discernible seepage losses, which adequately manages operations. This regulatory control will be updated on the completion of works to require specific controls for prevention of seepage from the ponds (e.g. liner inspections, sludge removal etc.).
9. The Applicant should consider the installation of additional monitoring wells to provide greater confidence in identifying changes in groundwater quality due to discharges from site operations.

## Consequence

If seepage of untreated sewage and TWW from ponds occurs, the Delegated Officer has determined that the impact of contamination of soil, surface water and groundwater has the potential to have mid level on-site impacts, low level off-site impacts at a local scale and minimal off-site impacts at a wider scale. Therefore, the Delegated Officer considers the consequence of the impact of seepage of untreated sewage and TWW from ponds to be **Moderate.**

## Likelihood

The Delegated Officer has determined that, with the use of a Bituminous Geomembrane liner, concrete liner and clay (or geomembrane) liner that have a permeability of ≤1x10$^{-9}$ m/sec, the likelihood of seepage of untreated sewage and TWW from ponds will probably not occur from the ponds in most circumstances. Therefore, the Delegated Officer considers the likelihood of seepage of untreated sewage and TWW from ponds to be **Unlikely**.

## Overall risk rating of seepage from ponds

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12) and determined that the overall rating for the risk

seepage of untreated sewage and TWW from ponds is **Medium**.

## 7.5 Risk Assessment – Overtopping of containment

### Description of the risk event for overtopping ponds

The untreated sewage from the town of Northam is received at the WWTP for treatment. During treatment of sewage (source) overtopping of ponds of untreated and TWW (emission) has the potential to be discharged via overland flow and subsurface seepage (pathway) into the surface waters and riparian habitat of the Avon River and local groundwater sources (receptors). Untreated wastewater typically contains nutrients (nitrogen and phosphorus); solids (including organic matter); persistent organic pollutants; pathogens (including bacteria, viruses and protozoa); helminthes (intestinal worms and worm-like parasites).

This may potentially lead to impacts to aquatic ecosystems, soil quality and vegetation health and fauna habitat, surface water and groundwater degradation, and public health impacts for recreational users of the Avon River such as gastroenteritis and other diseases (adverse impact).

Wastewater, if treated sufficiently, should contain lower quantities of nutrients, no solids and very low levels of pathogens and helminthes to minimise or prevent adverse impacts to humans and the environment

### Criteria for assessment

Relevant land and surface water quality criteria include:

- National Environment Protection (Assessment of Site Contamination) Measure 1999;
- ANZECC & ARMCANZ (2000) – freshwater criteria; and
- National Health and Medical Research Council (2019) – Guidelines for managing risks in recreational water.

### Applicant controls

Water balance modelling has considered averaged inflow of wastewater and rainfall data compared to evaporation data, reuse scheme irrigation data, infiltration rates for the liner and discharges to land prior to the Avon River, to determine proposed reconstruction works for the WWTP as follows:

- Designed to accommodate flood events up to the 1 in 20 (20%) Annual Exceedance Probability (AEP);
- Will include an aerobic pond, a smart facultative pond, three maturation ponds and a storage pond which will increase hydraulic retention of the system to 37.6 days;
- All treatment and storage ponds will have raised embankments to maintain 500 mm freeboard level between the top of water level and the top of embankment;
- The holding capacity of the smart facultative pond will be increased by extending the pond northwards to increase the volume up to 56,700 $m^3$.
- Maturation Pond 3 will have a modulating weir penstock where freeboard can be reduced to 350 mm in order to increase holding capacity by an additional 1.5 ML to retain high water levels during high inflow events.
- During flood events exceeding the 1 in 20 AEP and exceeding the additional holding capacity of the penstock in Maturation Pond 3, the WWTP is designed for emergency discharges to bypass the UV treatment plant and discharge directly to land and the Avon River.

## Key findings

**The Delegated Officer has reviewed the information regarding overtopping of ponds and has found:**

10. Design parameters and proposed construction works will ensure a reduced likelihood of overtopping of ponds.
11. The current water balance for the premises identified a 420 kL/day deficit of water, indicating potential losses from the system. It is recognised that the construction works are required to be completed before re-estimating the water balance for the premises.
12. The existing Licence includes conditions related to the management of the Premises to prevent overtopping of the ponds but does not describe specific operational controls (e.g. freeboard and reportable events, discharge to maintain pond capacity and other pond maintenance controls).

## Consequence

If overtopping of ponds with untreated and TWW occurs, the Delegated Officer has determined that the impact of soil and surface water contamination has the potential to have mid level on-site impacts, low level off-site impacts at a local scale and minimal off-site impacts at a wider scale. Therefore, the Delegated Officer considers the consequence of overtopping of ponds with untreated and TWW to be **Moderate**.

## Likelihood

The Delegated Officer has determined that, with the design parameters and hydraulic retention period, the likelihood of overtopping of ponds with untreated and TWW will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of overtopping of ponds with untreated and TWW to be **Unlikely**.

The Delegated Officer notes that the likelihood has been determined on the information provided including a water balance that identifies a net loss of water from the treatment system, and discharge of water to the Avon River. It is noted that an updated water balance is intended to be provided following construction works. Review of likelihood on the basis of further information provided on discharge scenarios will be considered as part of the Licence amendment assessment.

## Overall risk rating of overtopping ponds

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12) and determined that the overall rating for the risk of overtopping of ponds with untreated and TWW is **Medium**.

It is noted that the control of risk relies on the ability to discharge TWW via the infiltration channel directly to land and the Avon River during operations. The application has not provided sufficient information to determine controls that would be applied in operations to regulate these emissions (description of by-pass scenarios including volumes and quality, and additional monitoring that would be undertaken during by-pass discharge). Additional regulatory controls will be considered as part of Licence amendment assessment.

## 7.6 Risk Assessment – Discharge of TWW containing pathogens

### Description of the risk event for discharges of TWW containing pathogens

The untreated sewage from the town of Northam is received at the WWTP for treatment, following which TWW may be piped to the Shire's reuse pond in Clarke Street for subsequent irrigation via the registered reuse scheme to Northam town ovals and public open space areas. TWW volumes in excess of the Shire's reuse needs are disposed of to land on the banks of the Avon River and in high flows, usually during winter months, this discharge reaches the Avon River.

Untreated or incorrectly treated wastewater may contain pathogens (including bacteria, viruses and protozoa) and helminthes (intestinal worms and worm-like parasites). During discharge of TWW (source) the release of pathogens (emission) by direct discharge to land and surface waters (pathway) may lead to humans (receptors) suffering public health concerns including gastroenteritis and other diseases (adverse impact).

Wastewater, if treated sufficiently, should contain very low levels of pathogens and helminthes to prevent or minimise adverse impacts to humans.

### Criteria for assessment

Relevant land and surface water quality criteria include:

- Department of Health (2011) – Guidelines for the non-potable use of recycled water in Western Australia;
- ANZECC & ARMCANZ (2000) – heavy metals criteria for irrigation use;
- National Health and Medical Research Council (2019) – Guidelines for managing risks in recreational water;
- Department of Environment Regulation (2014) Assessment and management of contaminated sites: Contaminated sites guidelines; and
- Department of Water (2008) Water Quality Protection Note 22 Irrigation with nutrient-rich wastewater.

### Applicant controls

- The WWTP will be designed to include an aerobic pond, a smart facultative pond, three maturation ponds and a storage pond which will increase hydraulic retention of the system to 37.6 days.
- Maturation Pond 3 will have a modulating weir penstock where freeboard can be reduced to 350 mm in order to increase holding capacity by an additional 1.5 ML to retain high water levels during high inflow events.
- TWW sent through the reuse scheme to Northam ovals for irrigation will be chlorinated prior to release from the WWTP to manage concentrations of biological contaminants to levels acceptable for the reuse scheme (as determined by DoH).
- TWW sent as discharges to land and the Avon River will be UV treated prior to release from the WWTP to manage pathogen levels. The UV disinfection unit treats to 150 faecal coliform organisms per 100 mL (cfu/100ml). The UV system will be designed to fully disinfect up to a peak day flow rate of 48.6 L/s and an average day flow rate of 24.3 L/s.
- The Department of Health regulates public health impacts from the wastewater reuse scheme. The Applicant has obtained Department of Health approval for the reuse scheme.

## Key findings

**The Delegated Officer has reviewed the information regarding discharges of TWW containing pathogens during irrigation of ovals and discharges to land and has found:**

13. The ability to chlorinate reuse scheme irrigation water and UV treat discharges to land and the Avon River will ensure sufficient management of pathogenic contaminants.
14. When discharges to land and the Avon River are required in order to prevent overtopping of ponds and damage to pond infrastructure, the system is designed to bypass the UV treatment process which can lead to pathogens being present in discharges. The modulating weir penstock will ensure an additional 1.5 ML of TWW retained within the system, thereby slowing the discharge rate and will ensure a greater volume of TWW is UV treated or chlorinated prior to discharge.
15. The Department of Health approval is appropriate for the regulation of public health impacts associated with the reuse schemes to Northam ovals and public open space.

## Consequence

If TWW containing pathogens is released during irrigation of Northam ovals and discharges to land, the Delegated Officer has determined that impacts from pathogens could result in specific consequence criteria for public health not being met and health effects requiring low-level or occasional medical treatment. Therefore, the Delegated Officer considers the consequence of the release of pathogens during irrigation to be **Moderate.**

## Likelihood

The Delegated Officer has determined that with the proposed chlorination and UV treatment methods the likelihood of pathogens being discharged in TWW will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of pathogens being released during irrigation to be **Unlikely**.

It is noted that the application has not provided sufficient information to determine controls that would be applied in operations to regulate these emissions (description of by-pass scenarios including volumes and quality, and additional monitoring that would be undertaken during by-pass discharge). Additional regulatory controls will be considered as part of Licence amendment assessment.

## Overall risk rating for discharges of TWW containing pathogens

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12) and determined that the overall rating for the risk of TWW containing pathogens is released during irrigation of Northam ovals and discharges to land is **Medium**.

## 7.7 Risk Assessment –Discharge of TWW containing nitrogen and phosphorus

### Description of the risk event for discharges of TWW containing nitrogen and phosphorus

The untreated sewage from the town of Northam is received at the WWTP for treatment, following which TWW may be piped to the Shire's reuse pond in Clarke Street for irrigation via the reuse scheme to Northam town ovals. TWW volumes in excess of the Shire's reuse needs are disposed of to land on the banks of the Avon River and in high flows, usually during winter months, this discharge reaches the Avon River.

Untreated or incorrectly treated wastewater may contain elevated concentrations of nitrogen and phosphorus as well as metals, metalloids and persistent organic pollutants. During irrigation and discharges of TWW to land (source) the release of contaminants in elevated concentrations (emission) by overland flow and runoff and subsurface seepage (pathway) may cause adverse impact to aquatic and riparian ecosystem health, surface water of the Avon River, contamination of soil, impacts to riparian vegetation health and degradation of groundwater quality (adverse impact).

Wastewater, if treated sufficiently, should contain contaminants at levels adequate for the receiving environment to appropriately buffer, thereby preventing or minimising adverse impacts to the environment.

### Criteria for assessment

Relevant land quality criteria include:

- ANZECC & ARMCANZ (2000) – freshwater criteria;
- Department of Water and Environmental Regulation (2008) Water Quality Protection Note 22 Irrigation with nutrient-rich wastewater;
- Department of Water (2010) Water Quality Protection Note 33 Nutrient and irrigation management plans; and
- National Health and Medical Research Council (2019) – Guidelines for managing risks in recreational water.

### Applicant controls

- The WWTP will be designed to include an aerobic pond, a smart facultative pond, three maturation ponds and a storage pond which will increase hydraulic retention of the system to 37.6 days.
- The holding capacity of the smart facultative pond will be increased by extending the pond northwards to increase the volume up to 56,700 $m^3$.
- Maturation Pond 3 will have a modulating weir penstock where freeboard can be reduced to 350 mm in order to increase holding capacity by an additional 1.5 ML to retain high water levels during high inflow events.
- The existing aluminium dosing facility will be retained onsite for the removal of phosphorus from TWW prior to TWW moving to the Storage Pond and the reuse scheme or discharges to land and the Avon River.
- The Applicant has an existing Nutrient Irrigation Management Plan for irrigation of Northam town ovals, as required by the existing Licence L5989/1991/10, to ensure application rates of nitrogen and phosphorus are suitable to the receiving soils of the ovals.

## Key findings

**The Delegated Officer has reviewed the information regarding discharges of TWW containing nitrogen and phosphorus in elevated concentrations during irrigation of ovals and discharges to land and has found:**

16. Ensuring the hydraulic retention of the system is 37.6 days will provide further treatment time to reduce N and P concentrations in TWW.
17. The increased size of the WWTP and the modulating weir penstock will ensure TWW is retained within the premises and can be adequately treated with aluminium to reduce phosphorus to acceptable levels prior to discharges to land and Northam town ovals.
18. The Applicant has an existing Nutrient Irrigation Management Plan for irrigation of Northam town ovals previously approved by the Department, which will remain unchanged by the proposed upgrade works.
19. The total nutrient uptake capacity of the infiltration trench at the discharge to land location is unknown. The Delegated Officer requires further information to determine the ability of the soils to remove nitrogen and phosphorus from the discharged TWW, to further assess the risk. As this information is not necessary to assess the proposed works under this Decision Report, the Delegated Officer shall defer a decision on this matter until the Licence Amendment application.
20. The Delegated Officer requires further information to determine the adequacy of the proposed groundwater monitoring program, in particular the number of bores, the location of bores and the suite of parameters to be sampled. As this information is not necessary to assess the proposed works under this Decision Report, the Delegated Officer shall defer a decision on this matter until the Licence Amendment application.
21. The Delegated Officer requires further information to determine the adequacy of the proposed surface water monitoring program, in particular the number of sampling locations and the suite of parameters to be sampled. As this information is not necessary to assess the proposed works under this Decision Report, the Delegated Officer shall defer a decision on this matter until the Licence Amendment application.

## Consequence

If TWW is released containing elevated concentrations of contaminants, the Delegated Officer has determined that the impact of a change in soil chemistry, inundation of the root zone and mounding of groundwater in the local area will cause low level on-site impacts and minimal off-site impacts. Therefore, the Delegated Officer considers the consequence of TWW containing elevated concentrations of nitrogen and phosphorus release to be **Minor**.

## Likelihood

The Delegated Officer has determined that the likelihood of impacts from contaminants in TWW discharge could occur at some time. Therefore, the Delegated Officer considers the likelihood of TWW containing elevated concentrations of contaminants to be **Possible**.

## Overall risk rating for discharges of TWW containing nitrogen and phosphorus

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 12) and determined that the overall rating for the risk of TWW containing elevated concentrations of contaminants; including nitrogen and phosphorus is **Medium**.

## 7.8 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 15 below. Controls are described further in section 8

**Table 15: Risk assessment summary**

| Description of Risk Event | | | Applicant controls | Risk rating | Acceptability with controls (conditions on instrument) |
|---|---|---|---|---|---|
| **Emission** | **Receptor & Pathway** | **Potential adverse impacts** | | | |
| Seepage of untreated sewage and treated wastewater from ponds | Surface water and riparian habitat - Avon River, beneficial uses of groundwater.<br>Via overland flow, subsurface seepage and subsequent discharge to Avon River. | • Potential impact to aquatic ecosystems.<br>• Soil contamination inhibiting native vegetation survival and growth and impacting fauna habitat.<br>• Degradation of surface water and groundwater quality.<br>• Public health impacts for recreational users of the Avon River including gastroenteritis and other diseases. | • Relining the Facultative Pond with a Bituminous Geomembrane liner with a permeability of ≤1x10$^{-9}$ m/sec.<br>• Lining the Anaerobic Pond with a concrete liner with a permeability of ≤1x10$^{-9}$ m/sec.<br>• Lining Maturation Pond 1 with a liner with a permeability of ≤1x10$^{-9}$ m/sec. | Moderate consequence<br>Unlikely likelihood<br>**Medium Risk** | Acceptable subject to proponent controls, conditioned / outcomes based regulatory controls |
| Overtopping of containment ponds with treated and untreated wastewater | | | • Designed for a 1 in 20 AEP;<br>• Hydraulic retention of the system is 37.6 days;<br>• Embankments to maintain 500 mm freeboard;<br>• The holding capacity of the smart facultative pond is 56,700 m$^3$.<br>• Modulating weir penstock in Maturation Pond 3 to reduce freeboard to 350 mm to increase holding capacity by an additional 1.5 ML.<br>• Emergency discharges to bypass the UV treatment plant and discharge direct to land and the Avon River. | Moderate consequence<br>Possible likelihood<br>**Medium Risk** | Acceptable subject to proponent controls, conditioned / outcomes based regulatory controls |
| Release of pathogens at concentrations not fit for purpose, during irrigation and discharge of treated wastewater | Users of Public open space, beneficial uses of groundwater.<br>Via direct contact and ingestion of irrigation mist, | • Public health impacts for recreational users of Public open spaces including gastroenteritis and other diseases.<br>• Contamination of soil.<br>• Impact to vegetation health.<br>• Degradation of groundwater | • Hydraulic retention of the system is 37.6 days;<br>• Modulating weir penstock in Maturation Pond 3 to reduce freeboard to 350 mm to increase holding capacity by an additional 1.5 ML.<br>• Reuse scheme TWW chlorinated prior to release.<br>• Discharges to land and the Avon River TWW UV treated prior to release. | Moderate consequence<br>Unlikely likelihood<br>**Medium Risk** | Acceptable subject to regulatory controls |

| | | | | | |
|---|---|---|---|---|---|
| | overland flow and runoff, subsurface seepage. | quality. | • Department of Health approval for the reuse scheme received. | | |
| Release of contaminants, including nitrogen and phosphorus, at concentrations that may cause impact, during irrigation and discharge of treated wastewater | Recreational users of Avon River, surface water and riparian habitat - Avon River, beneficial uses of groundwater.<br>Via direct contact and ingestion of contaminated surface water, overland flow and runoff, subsurface seepage. | • Public health impacts for recreational users of the Avon River including gastroenteritis and other diseases.<br>• Contamination of soil.<br>• Impact to vegetation health.<br>• Degradation of groundwater quality. | • Hydraulic retention of the system is 37.6 days;<br>• The holding capacity of the smart facultative pond is 56,700 $m^3$.<br>• Modulating weir penstock in Maturation Pond 3 to reduce freeboard to 350 mm to increase holding capacity by an additional 1.5 ML.<br>• Retain existing aluminium treatment of TWW prior storage, reuse or discharges to land and the Avon River.<br>• Existing Nutrient Irrigation Management Plan for irrigation to manage nitrogen and phosphorus application to ovals. | Minor consequence<br>Possible likelihood<br>**Medium Risk** | Acceptable subject to regulatory controls |

# 8. Regulatory controls

## 8.1 Works Approval controls

- Condition 1 and Schedule 2 allows construction of the infrastructure as per Table 2 and Table 7 in the Works Approval. It is noted that the lining material of the Maturation ponds is proposed to be tested prior to reconfiguration. Regulatory controls are considered to be the minimum specifications that are expected to be attained in construction to address seepage risks from the ponds.
- Condition 2 allows for minor deviations from the proposed construction.
- Condition 3 requires a construction compliance document to be submitted to the CEO, to confirm all infrastructure has been constructed as required by each stage of construction.
- Condition 4 relates to authorised emissions from the proposed works.
- Conditions 5 to 9 relate to staged commissioning of the WWTP and includes notification of the commencement of commissioning, commissioning periods per stage, commissioning monitoring and submission of commissioning reports.
- Conditions 10 and 11 require accurate record keeping and outlines that a Works Approval Holder must comply with a Departmental Request within 14 days.

## 8.2 Aspects to be determined as part of Licence assessment

The assessment has noted that in some cases the assessment of risk was based on limited information, or that further information would be required to assess operational risks in order to determine regulatory controls for assessment of the future Licence amendment application. While noted throughout the document a summary of additional information required to be provided with the Licence application is listed below:

- Monitoring strategy to determine nutrient and other contaminant loading of soils as a result of infiltration within the infiltration channel for monitoring of discharges to land and subsequently the Avon River;
- Monitoring strategy to determine potential impacts associated with discharges to the river during conditions that may present a higher risk (by-pass of UV treatment, or discharge during low base-flow) to surface waters of the Avon River;
- Revised water balance monitoring to determine if the liner mitigated seepage or if further investigations are required; and
- Proposed groundwater monitoring strategy including consideration of installation of additional monitoring wells to provide greater confidence in identifying changes in groundwater quality due to discharges from site operations.

The risk assessment has determined that additional controls will be applied to the Licence following construction of the proposed works in order to manage identified operational risks. These include but are not limited to:

- Conditions detailing reportable events (e.g. pond overtopping, seepage occurrence, by-pass discharge or discharge during low river base-flow), reporting requirements and contingency procedure to be followed on the occasion of a reportable event;
- Operational conditions for pond capacity maintenance;
- Infrastructure maintenance conditions; and
- Conditions detailing monitoring requirements (locations and parameters) for:

- Ambient environmental monitoring (surface water and groundwater)
- By-pass discharge monitoring; and
- Infiltration channel monitoring.

# 9. Determination of Works Approval conditions

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

Table 16 provides a summary of the conditions to be applied to this works approval.

**Table 16: Summary of conditions to be applied**

| Condition Ref | Grounds |
|---|---|
| Infrastructure and Equipment<br>1 – 3 | These conditions are valid, risk-based and contain appropriate controls. |
| Authorised Emissions<br>4 | This condition is valid, risk-based and consistent with the EP Act. |
| Commissioning<br>5 – 9 | These conditions are valid, risk-based and consistent with the EP Act. |
| Record keeping<br>10 – 11 | These conditions are valid and are necessary administration and reporting requirements to ensure compliance. |

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 under the EP Act.

# 10. Applicant's comments

The Applicant was provided with the draft Decision Report and draft Works Approval on 8 November 2019. The Applicant provided comments on 29 November 2019 and 10 December 2019 which are summarised, along with DWER's response, in Appendix 2.

# 11. 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).

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

**Tracey Hassell**
**A/MANAGER WASTE INDUSTRIES**
**REGULATORY SERVICES**
Delegated Officer under section 20 of the *Environmental Protection Act 1986*

# Appendix 1: Key documents

| | Document title | In text ref | Availability |
|---|---|---|---|
| 1. | Licence L5989/1991/11 – Northam Wastewater Treatment Plant | L5989/1991/11 | accessed at www.der.wa.gov.au |
| 2. | Works Approval W4791/2010/1 – Northam Wastewater Treatment Plant | W4791/2010/1 | |
| 3. | DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth. | DER 2015a | accessed at www.dwer.wa.gov.au |
| 4. | DER, October 2015. *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth. | DER 2015b | |
| 5. | DER, May 2016. *Guidance Statement: Publication of Annual Audit Compliance Reports.* Department of Environment Regulation, Perth. | DER 2016a | |
| 6. | DER, August 2016. *Guidance Statement: Licence duration.* Department of Environment Regulation, Perth. | DER 2016b | |
| 7. | DER, September 2016. *Guidance Statement: Environmental Standards.* Department of Environment Regulation, Perth. | DER 2016c | |
| 8. | DER, November 2016. *Guidance Statement: Environmental Siting.* Department of Environment Regulation, Perth. | DER 2016d | |
| 9. | DER, February 2017. *Guidance Statement: Land Use Planning.* Department of Environment Regulation, Perth. | DER 2017a | |
| 10. | DER, February 2017. *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth. | DER 2017b | |
| 11. | DWER, June 2019. *Guideline: Decision Making.* Department of Water and Environmental Regulation, Perth. | DWER 2019a | |
| 12. | DWER, June 2019. *Guideline: Industry Regulation Guide to Licensing.* Department of Water and Environmental Regulation, Perth. | DWER 2019b | |

# Appendix 2: Summary of Applicant's comments on risk assessment and draft conditions

| Condition | Summary of Applicant's comment | DWER response |
|---|---|---|
| Condition 1<br>Table 2<br>Item 1: Sewage treatment system | Amend to add wording<br>• Designed and constructed to receive and treat a sewage inflow of up to 2,000 $m^3$/day Annual Average Daily Flow (AADF). To clarify the treatment capacity definition.<br>• Design to accommodate flood events up to the 10% Annual Exceedance Probability (AEP) for a 72 hour rainfall event. Design standards and licences are to contain a 1 in 10 year, 72 hour rainfall event. The by-product of the treatment process will achieve a plant design that can handle a 1 in 20 year 72 hour rainfall event (5% AEP). | The annualised daily flow is a calculation used on a Licence to enable the fluctuations of incoming daily wastewater flow to be averaged out over a monthly period during operation. It is not applicable for the construction of the WWTP. DWER needs assurance that the WWTP is designed and constructed to adequately manage an incoming flow of up to 2,000 $m^3$/day, as that volume of wastewater is the maximum intended to be sent to the WWTP. Request to modify declined.<br>The requirement to design the WWTP to accommodate flood events up to the 10% Annual Exceedance Probability (AEP) for a 72 hour rainfall event meets best practice standards generally accepted by DWER. This modification does not increase the risk of overtopping of the WWTP, therefore the change is accepted. |
| Condition 1<br>Table 2<br>Item 2: Pump station facility | Remove as the pump station will not be constructed as part of the inlet works. It will be a gravity flow system through the treatment process. | Removed as requested. |
| Condition 1<br>Table 2<br>Item 4: Anaerobic Pond | Confirmation the anaerobic pond will be concrete lined.<br>Remove 'Embankments adequately constructed to provide a freeboard of 500mm'. The anaerobic pond is contained within the facultative pond for 'Smart Pond' operation. Freeboard requirement will be met by the entire Smart Pond as a single entity. | Confirmation accepted.<br>Removal of embankment freeboard accepted, as the requirement for freeboard maintenance of the Facultative Pond will ensure the risk of overtopping is adequately managed. |

| Condition | Summary of Applicant's comment | DWER response |
|---|---|---|
| Condition 1<br>Table 2<br>Item 5: Facultative Pond | Confirmation the embankments will be constructed to a 2:5:1 embankment slope. | Confirmation and minor change accepted. |
| Condition 1<br>Table 2<br>Item 6: Maturation Ponds 1, 2, 3 | Remove 'and lined with a clay or geosynthetic liner'.<br>It is the intention of the Applicant that all three ponds will be inspected and relined if they do not meet the permeability of ≤1x10$^{-9}$ m/sec. The Applicant confirms the liner will have a permeability of ≤1x10$^{-9}$ m/sec, however liner material and applicable construction methodology to be confirmed during design.<br>Confirmation the embankments will be constructed to a 3:1 embankment slope. | The specification of liner requirements is considered to be the minimum standard for prevention of seepage from the maturation ponds. DWER has assessed risk on the basis of the application and determined that a functional clay liner (or equivalent) to meet a permeability of ≤1x10$^{-9}$ m/sec will ensure the risk of seepage is adequately managed.<br>Table 2 only requires that the Applicant demonstrate that the current liner is free of leaks and defects and is lined to achieve a permeability of ≤1x10$^{-9}$ m/sec. It does not require the Applicant to re-line the ponds specifically. No change has been made to this condition or to Schedule 2.<br>Section 7.4 and 8.1 of the Decision report have been updated to clarify that the Applicant intends to test the current clay liner to confirm permeability first. It is noted that the Applicant will be required to confirm the liner test results, and should the permeability not meet the specification, DWER require that the ponds be lined in either clay or geomembrane to achieve the specification described in Table 2 of the works approval.<br>Condition 3, Table 3 has been amended to include an additional Construction stage to allow for phases assessment of liner integrity in the Maturation ponds.<br>Should the detail design identify differing outcomes or construction methodology a works approval amendment may be sought to vary the condition to achieve seepage risk mitigation.<br>Minor change to embankment slope accepted. |

| Condition | Summary of Applicant's comment | DWER response |
|---|---|---|
| Condition 1<br>Table 2<br>Item 7: Storage Pond | Remove 'and lined with a clay or geosynthetic liner'.<br>It is the intention of the Applicant that the Storage Pond will be inspected and relined if it does not meet the permeability of ≤1x10$^{-9}$ m/sec. The Applicant confirms the liner will have a permeability of ≤1x10$^{-9}$ m/sec, however liner material and applicable construction methodology to be confirmed during design.<br>Confirmation the embankments will be constructed to a 3:1 embankment slope. | Change to liner requirements accepted, as the requirement to meet a permeability of ≤1x10$^{-9}$ m/sec will ensure the risk of seepage is adequately managed.<br>Minor change to embankment slope accepted. |
| Condition 2 | Noted that the applicant may vary design as in accordance to a) and b), prior, during and post commissioning. Delivery will be via design and construct contract and infrastructure details may alter without detrimental impact on risks or performance. | DWER confirms this is the correct interpretation of the intention of Condition 2. |

<table>
<tr><th>Condition</th><th>Summary of Applicant's comment</th><th>DWER response</th></tr>
<tr><td>Condition 3<br>Table 3</td><td>None provided</td><td>Telephone conversation held with Applicant on 03/12/2019 regarding this condition. Applicant advised the gas chlorination system will be the subject of a tender process and therefore the timeframe for construction could be delayed in relation to the proposed Stage 5.<br><br>DWER proposed rewording of Table 3 to provide the Applicant with flexibility for the construction of the chlorination system as follows, where additions are shown in yellow and deletions shown in strikethrough:<br><br>Table 3: Stages of construction
<table>
<tr><th>Stage of Construction</th><th>Infrastructure</th></tr>
<tr><td>Construction Stage 1</td><td>Anaerobic Pond<br>Geobag laydown area;<br>Filter Unit<br>Aluminium dosing system</td></tr>
<tr><td>Construction Stage 2</td><td>Facultative Pond</td></tr>
<tr><td>Construction Stage 3</td><td>Maturation Ponds 1, 2, 3</td></tr>
<tr><td>Construction Stage 4</td><td>Gas chlorination system</td></tr>
<tr><td>Construction Stage ~~4~~ 5</td><td>Storage Pond<br>~~Gas chlorination system~~<br>UV disinfection system<br>Stormwater drainage infrastructure</td></tr>
</table>
The Applicant confirmed via email on 10/12/2019 they agree with the proposed rewording of Table 3. It is noted that the Construction stages are not required to be completed in numerical order.</td></tr>
</table>

| | | |
|---|---|---|
| Condition 6<br><br>Table 5 | Amend commissioning aspects for Stage 2 for the chlorination disinfection process. The Applicant will not be commissioning the existing reuse scheme, only the new chlorine disinfection facility.<br><br>Accept not exceeding period for Commissioning Stage 1 of the treatment proving process.<br><br>Amend 'The Works Approval Holder must ensure that each stage of commissioning does not exceed the commissioning period specified in Table 5' as follows:<br><br>• Amend commissioning period – Stage 2 - Remove '(maximum duration of discharge to Northam town ovals)'<br><br>• Amend commissioning period – Stage 3 - Remove '(maximum duration of discharge to the Avon River via land)'<br><br>Commissioning validation monitoring of disinfection will occur over a **minimum** 6 week period as required by DoH. Subject to DoH requirements.<br><br>Discharge to Avon River is seasonal (Winter) when the Shire can no longer take TWW for reuse and storage. Discharge will continue until the Shire starts their irrigation scheme again. | Telephone conversation held with Applicant on 03/12/2019 regarding comments on this condition. Clarified DWER requires commissioning of all infrastructure located inside the Premises boundary. This will include the chlorine disinfection facility.<br><br>Commissioning is a required step to ensure construction has occurred correctly, in order to confirm processing of treated wastewater is adequate. Clarified that DWER considers the 6 week period for Stage 2 and Stage 3 is considered adequate to determine this. Clarified that DWER considers any discharges in excess of 6 weeks will increase the potential risk posed by emissions. Clarified that this applies specifically to discharges to Northam town ovals and to the land adjacent to the Avon River, however would not apply should the discharges be contained within the Premises boundary, such as being diverted back to treatment or storage ponds.<br><br>Confirm the comment regarding discharge to the Avon River is seasonal, however DWER notes commissioning does not have a commencement timeframe thereby commissioning of Stage 3 may be delayed until winter river flows are sufficient to mitigate any risk of discharges. Actual discharges in an operational capacity will be regulated under the subsequent Licence Amendment.<br><br>DWER proposed rewording of Table 5 to clarify the intention of commissioning requirements as follows, where additions are shown in yellow and deletions shown in strikethrough:<br><br>**Table 5: Stages of commissioning** |

<table>
<tr><th>Condition</th><th>Summary of Applicant's comment</th><th>DWER response</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Stage of Commissioning</th><th>Process</th><th>Commissioning Period</th></tr>
<tr><td>Commissioning Stage 1</td><td>Wastewater Treatment Plant Process Proving Period</td><td>3 months</td></tr>
<tr><td>Commissioning Stage 2</td><td>Discharges from the Premises, for the purpose of Reuse Scheme irrigation of ~~to~~ Northam town ovals</td><td>6 weeks (maximum duration of discharge to be received at Northam town ovals).</td></tr>
<tr><td>Commissioning Stage 3</td><td>Discharges from the Premises, to the Avon River via land</td><td>6 weeks (maximum duration of discharge to be received via land at the Avon River ~~via land~~).</td></tr>
</table>
The Applicant confirmed via email on 10/12/2019 they agree with the proposed rewording of Table 5.
</td></tr>
<tr><td>Condition 7<br>Table 6</td><td>Amend "Post UV Wet Well sampling point" to be "Sampling Point S2"<br>Amend "XX to Reuse Scheme" to be "Sampling Point S4"<br>Amend "Final Flume Discharge to Avon River" to be "Sampling Point S3"</td><td>Change to reference points accepted.</td></tr>
</table>

| Condition | Summary of Applicant's comment | DWER response |
|---|---|---|
| Condition 7<br>Table 6 | Delete the requirement to sample for Helminths and Nematodes as sampling is only required above 26 degree parallel. | The requirement to sample for Helminths and Nematodes is only for the purposes of Commissioning sampling as per Condition 7. DWER considers these parameters relevant to determine commissioning compliance. Request to delete declined.<br>Parameters required for ongoing sampling under the Licence amendment will be considered with regard to relevant advice from the Department of Health specific for this Premises. |
| Condition 9 | Applicant notes Condition 2 applies; monitoring results as per condition 9a) will be the summary of monitoring results recorded under condition 7. | The DO advises Condition 2 does not apply to Condition 9. Condition 2 only applies to departures from the requirements of Condition 1 Table 2.<br>The DO confirms the monitoring results required under Condition 9(a) for the Commissioning Report are those results recorded under Condition 7. |
| Schedule 1: Maps<br>Premises Map | Please see Appendix A attached, a replacement aerial image of the Premises. | Substituted aerial image accepted. |
| Schedule 1: Maps<br>Flow Diagram | Please see Appendix B attached, a replacement flow diagram with monitoring points indicated. | Substituted flow diagram accepted.<br>DO notes Schedule 1: Maps Monitoring locations for commissioning is a blank page and therefore will be deleted. |
| Schedule 2: Minimum specification for geomembrane installation | Delete this schedule as information will be provided in commissioning reports. Liner material and applicable construction methodology to be determined but will meet permeability ≤$1x10^{-9}$ m/sec. | As noted above, the Applicant must ensure the Maturation pond liners meet the specifications described in Table 2 of the works approval.<br>DWER has described the minimum specifications for use of a geomembrane liner as an alternative to clay as the Applicant advised during the assessment process that geomembrane may be considered.<br>During the construction process, should it be determined that lining for Maturation Ponds 2 and 3 and the Storage Pond will be with a geomembrane liner, Schedule 2 will apply to ensure the liner meets a minimum specification. |

# Attachment 1: Works Approval W6224/2019/1