



Application for Licence Amendment

Division 3, Part V *Environmental Protection Act 1986*

Licence Number **L6316/1991/13**

Applicant **Water Corporation**

File Number **DER2016/000916**

Premises **Wagin Sewage Facility**
1801 Cowcher Road
WAGIN WA 6315
Lot 1801 on Plan 175363

Date of Report **14/09/2018**

Status of Report **Final**

Executive Summary

This Decision Report presents an assessment of the foreseeable Risk Events to public health, amenity, water resources and the environment from the Primary Activities currently being undertaken at the Water Corporation's Wagin sewage facility. A review of the Primary Activities and amendments proposed by Water Corporation to the Part V EP Act Licence L6316/1991/13 are considered within this Decision Report.

Sewage is pumped via pipeline into the Premises and treatment occurs through a three-stage pond system. Treated sewage is discharged, via a 200m PVC pipe, into an open drainage channel that slopes north to southeast from the Kersley Road reserve and through adjacent lands towards the Slippery Lake A-Class Nature Reserve. The Slippery Lake A-Class Nature Reserve is located approximately 600 m southeast of the PVC pipe discharge point.

The Delegated Officer has found that the discharge of treated sewage presents:

- a high risk to the environment due to the potential for nutrients within the discharge of treated sewage from the sewage facility to result in cyanobacterial blooms within Slippery Lake and cause short term impact to ecosystem services; and
- a high risk to public health due to the discharge periodically significantly exceeding 1000 cfu/ 100 mL *Escherichia coli* and potential for pathogens to impact human health.

The Delegated Officer considers that the high risk to the environment is not consistent with the the conservation of flora and fauna of the Slippery Lake A-Class Nature Reserve and based on the information currently available the risk from the on-going discharge of treated sewage at the current quality and quantity is unacceptable.

Based on this risk assessment the Delegated Officer has determined that the Revised Licence will be granted subject to Conditions commensurate with the determined controls and necessary for administration and reporting requirements.

The Water Corporation's amendment application dated 26 November 2014 and 25 November 2015 was withdrawn on 21 June 2018. Administrative matters raised in the amendment application have been addressed as part of the review.

In consideration of the risks from the discharge of treated sewage the Delegated Officer has resolved to limit the discharge of treated sewage from the sewage facility. The limit requires that treated sewage is not discharged to the environment after 30 June 2023 at the current quality and quantity due to the unacceptable risk to the environment. The timeframe takes into consideration:

- the obligations of Water Corporation under the *Contaminated Sites Act 2003*;
- the new information that will become available through processes under the *Contaminated Sites Act 2003* that may inform the uncertainty, assumptions and findings of the risk-based assessment process; and
- the approximately four year period is adequate for the obligations under the *Contaminated Sites Act 2003* to be completed and for the planning and implementation of appropriate actions, subject to the any changes to the Risk Rating and Conditions.

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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
AER	means Annual Environmental Report as submitted in accordance with Conditions
Application	means the submission made by the Licence Holder to amend the Existing Licence dated 26 November 2014 and supporting documentation detailed in Table 2 of this Decision Report
Category/ Categories	categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
Condition	means a condition to which a Licence (being the Existing Licence or Revised Licence) is subject under Section 62 of the EP Act
DEC	the then Department of Environment and Conservation
DER	the then Department of Environment Regulation
Decision Report	refers to this document
Delegated Officer	an officer under section 20 of the EP Act
Discharge Point L1	means the location granted approval under the Revised Licence for the Discharge of treated sewage
DWER	Department of Water and Environment Regulation
EIA	Environmental impact assessment
EIP	Environmental improvement plan
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EP Regulations	<i>Environmental Protection Regulations 1987 (WA)</i>
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of, and during this Review
Licence Holder	Water Corporation
NEPM	National Environmental Protection Measure
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

Term	Definition
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Primary Activities	activities which fall within the description of the category of Prescribed Premises in Schedule 1 of the EP Regulations and as defined in Schedule 2 of the Revised Licence
Review	the review of the Risk Events arising from the Primary Activities and the Existing Licence documented within this Decision Report
Revised Licence	the amended Licence issued under Part V, Division 3 of the EP Act following the finalisation of this Review
Risk Event	<p>being events that involve all of the following:</p> <ul style="list-style-type: none"> (a) an emission occurring; and (b) a receptor being exposed to the emission through an identified actual or likely pathway; and (c) potential adverse effects to the receptor from exposure to the emission
TWL	top water level.

2. Purpose and scope of assessment

On 26 November 2014 Water Corporation (Licence Holder) applied for an amendment to the Existing Licence L6316/1991/13 that grants approval for the operation of the Wagin sewage facility at 1801 Cowcher Road, being Lot 1801 on Plan 175363, Wagin (Premises). The Licence Holder sought amendment of two elements of the Existing Licence through the following Application:

- (i) remove the reference to reuse of treated sewage by irrigation of public open space in the Licence preamble '*until the results of the Environmental Impact Assessment are received, and agreed actions documented in the Environmental Improvement Plan have been implemented*'; and
- (ii) amend the environmental improvement condition set (Conditions 14a and 14b) and align any conditions with the commitments made by the Licence Holder in a draft Environmental Improvement Plan (Draft EIP 2014).

As part of the assessment of the Application a full review of the Primary Activities carried out at the Premises and of the Existing Licence have been undertaken (Review). The Review considers previous decisions under Part V of the EP Act made in relation to the Primary Activities.

This Decision Report presents an assessment of the foreseeable Risk Events to public health, amenity, water resources and the environment as a result of the Primary Activities currently being undertaken at the Premises, arising from the amendments proposed in the Application where relevant and identified within the Review.

2.1 Application details

The risk-based assessment of the Application and the Review involved consideration of the available information including the Licence Holder's environmental improvement plan (EIP) and environmental impact assessment (EIA) processes, supporting technical information, annual environmental reports (AER) required by Conditions of the Existing Licence, relevant correspondence with stakeholders and previous approvals granted and decisions made under Part V of the EP Act. The final documents that form the Application are detailed in Table 2. A full list of documents considered within this Decision Report are detailed in Appendix 1.

Regarding the two elements of the Application the Delegated Officer notes that:

- (i) No reuse of treated sewage by irrigation of public open space is reported by the Licence Holder to have occurred since December 2011. The reuse of treated sewage by irrigation of public open space requires approval from the Department of Health (DoH). On 21 March 2014 Recycling Scheme Approval No. EHB-01957, for irrigation of treated sewage from the Premises within the Shire of Wagin, was rescinded (DoH 2014).
- (ii) The Existing Licence was granted on 7 June 2012 following an amendment, initiated by the then DEC, to include a Condition set (Conditions 14a, 14b) for the development, submission and implementation of an EIP. Condition 14(a) required the submission of an EIP by 31 December 2013. Condition 14(b) required the EIP to set actions that would achieve the objective of treated sewage discharges '*meeting the ANZECC water quality guidelines for surface water discharge*' and for the Licence Holder to implement the EIP actions by 31 December 2017. The Licence Holder's Draft EIP 2014, submitted 28 April 2014, and Final EIP 2015, submitted 25 November 2015, did not set out actions that would achieve the objective stated within Condition 14(b) and were not consistent with the Conditions of the Existing Licence, being 14(a) and 14(b).

Table 2: Final documents and information of the Application.

Document/ information description	Date received	In text reference
Water Corporation letter dated 26 November 2014 <i>Wagin Wastewater Treatment Plant L6316/1991/13: Licence amendment</i> ; includes attached <i>Form P4</i> and <i>Supporting documentation for licence amendment</i> .	26 November 2014	Application
Hydrobiology Pty Ltd 2015, <i>Wagin WWTP Environmental Investigations Technical Data Report</i> attachments: <i>Appendix 1 Water quality data summary</i> ; <i>Appendix 3 Benthic algae data</i> ; <i>Appendix 4 Zooplankton data</i> ; and <i>Appendix 5 Macroinvertebrate data</i> .	21 August 2015	TI Attachments 2015
Water Corporation 2015, <i>Wagin Wastewater Treatment Plant Environmental Improvement Plan</i> .	25 November 2015	Final EIP 2015
Hydrobiology Pty Ltd 2015, <i>Wagin WWTP Environmental Impact Assessment Report to the Department of Environmental Regulation Final – June 2015</i> .	10 December 2015	Final EIA 2015
Hydrobiology Pty Ltd 2015, <i>Wagin WWTP Environmental Investigations Technical Data Report Final – May 2015</i> .	4 August 2016	Final TI 2015
Water Corporation email dated 13 June 2017 <i>Wagin WWTP L6316 – response to queries re licence amendment application</i> .	13 June 2017	Water Corporation 2017
Water Corporation letter dated 21 June 2018, <i>Wagin Wastewater Treatment Plant L6316: Further commentary on Draft Licence and Decision Report</i> .	21 June 2018	Water Corporation 2018

(1) Key Finding: The Delegated Officer considers that removal of the preamble text stating that treated sewage is to be used for the irrigation of public open space from the Licence is appropriate and administrative. This decision takes into consideration:

- (a) the activity not having been undertaken since 2011; and**
- (b) the activity not having current approval by the Department of Health.**

Subsequently:

- (c) the reuse of treated sewage is excluded from the scope of the Review and risk assessment process; and**
- (d) no approval is granted for the reuse of treated sewage in the Revised Licence.**

(2) Key Finding: The Delegated Officer notes that the Application regarding the environmental improvement condition set was withdrawn on 21 June 2018. The Final EIP and Conditions 14a, 14b and 15 of the Existing Licence are relevant to the assessment of discharge to land (treated sewage) (see Section 9.5 of this Decision Report).

3. Background

The Licence Holder has been granted the Existing Licence, including previous versions, to operate the Wagin sewage facility since approximately 1991. 'As constructed' plans for the sewage facility are dated 1987 (see Appendixes 8 and 9 of this Decision Report). The Wagin sewage facility currently accepts and treats sewage at an average rate of 157 m³/ day

(monthly average), ranging from ~30 to >300 m³/ day, for subsequent discharge via a 200 m PVC pipe directly to a drainage channel that slopes into the A Class nature reserve Slippery Lake (see map in Attachment 1). The Premises location, infrastructure and surrounding features are depicted in Figure 1 and Table 3 describes the Prescribed Premises categories applicable to the Premises.

Table 3: Prescribed Premises Categories in the Existing Licence.

Classification of Premises	Description	Approved Premises design capacity
Category 54	Sewage facility: premises – (a) On which sewage is treated (excluding septic tanks); or (b) From which treated sewage is discharged onto land or into waters.	260 m ³ day/ per annual period

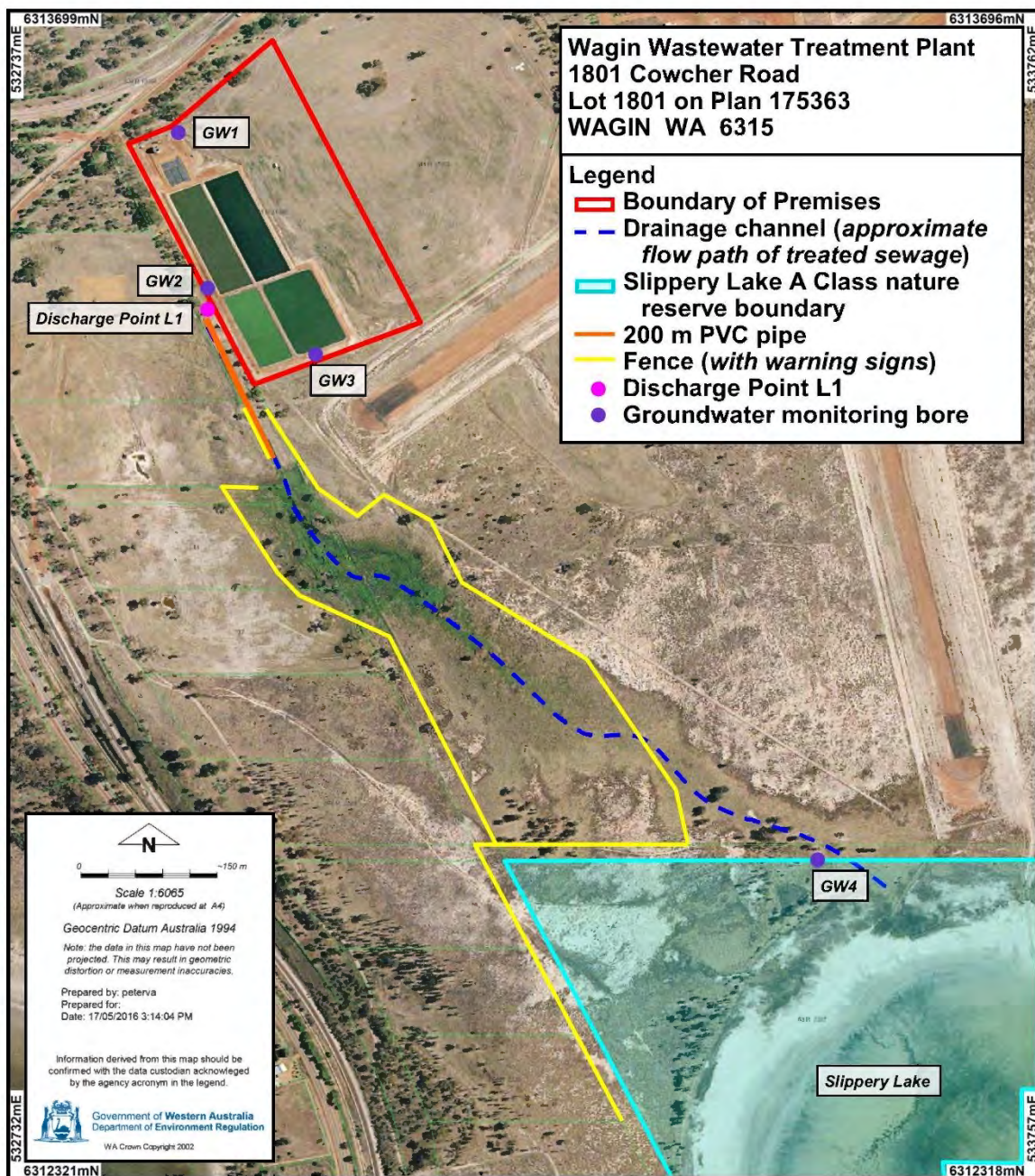


Figure 1: Premises location, infrastructure and surrounding features.

4. Overview of Premises

4.1 Construction aspects

The Licence Holder proposed no changes or construction activities within the boundary of the Premises within the Application. The Licence Holder had proposed alterations to the receiving environment, being the proposed infiltration channel, that were withdrawn except for the installation of a 200 m PVC pipe along the initial part of the drainage channel.

(3) Key Finding: the Delegated Officer considers that no construction is proposed by the Licence Holder that is relevant to the assessment of the Application or the Review within the boundary of the Premises. The Licence Holder has not demonstrated occupancy of any additional lands at this time that could be included as an expanded boundary of the Premises in the Revised Licence (see Section 4.4 in this Decision Report for further consideration of the commitments made by the Licence Holder in the Final EIP).

4.2 Operational aspects

Sewage is pumped via pipeline into the Premises in the north-western corner and directed into one of two primary facultative ponds. Volumes of sewage inflows to the Premises are calculated from the upstream pump station at an average of 157 kL/ day. A highly variable volume of sewage inflow is inferred from the level of variability observed in the discharged volume of treated sewage (see Table 4 and Figure 2). Higher sewage inflows are generally associated with the winter period (May to August) and indicate that stormwater ingress into the sewage collection network is occurring.

Sewage treatment continues into the single secondary pond and then through the single tertiary pond before being discharged to land at the western boundary of the Premises. A sludge drying hardstand is located adjacent to and north of the treatment ponds. The location of infrastructure and flow path of sewage through the sewage facility is depicted in the Revised Licence (Schedule 1: Premises Maps) and Decision Report (Appendix 5 and 6). Copper dosing in the form of 'Cupricide' (copper ethanalamine and triethanolamine, at a copper concentration of 105 g/L and dosing rate of approximately 0.5 L/day occurs within the secondary and tertiary ponds. At the average daily sewage inflow volume copper concentrations are approximately 0.3 mg/L. The concentrations of copper within the treated sewage discharge are detailed in Figure 3. Cupricide acts to inhibit photosynthesis in algae. No data is available on the species or concentration levels of the algae.

The discharge of treated sewage occurs into a drainage channel located within Lot 350 on Plan 77669, being the Kersley Road reserve, that grades north to south along the west side of the boundary of the Premises and is defined as Discharge Point L1, located approximately 800 m north of the Slippery Lake A Class Nature Reserve boundary.

The variation in volumes of treated sewage discharge is detailed in Figure 2, indicating peak daily discharge volumes consistently in the order of >300 m³/ day. The variation is considered to be influenced by the higher evaporation rate/ lower inflow summer periods and lower evaporation rate/ higher inflow winter periods. The quantity and quality of treated sewage discharges is summarised Table 4. Based on the data presented in Table 4, the average annual load from the discharge of treated sewage to the environment of total nitrogen is 1265.1 kg and of total phosphorus is 635.3 kg.

(4) **Key Finding:** The Delegated Office considers that the quality of treated sewage discharged from the Wagin sewage facility exhibits a high degree of variability for some parameters. The variability indicates that the infrastructure and operational controls at the sewage facility may not be adequate to treat sewage inflows to consistent concentration levels for some parameters when considering the context of the receiving environment. This variability and elevated results for some parameters may result in an increased consequence for some Risk Events due to higher concentrations of contaminants. Storm water ingress into the sewage collection network and the high degree of inflow variability are considered to contribute to the variability observed in the quality of treated sewage discharged from the facility.

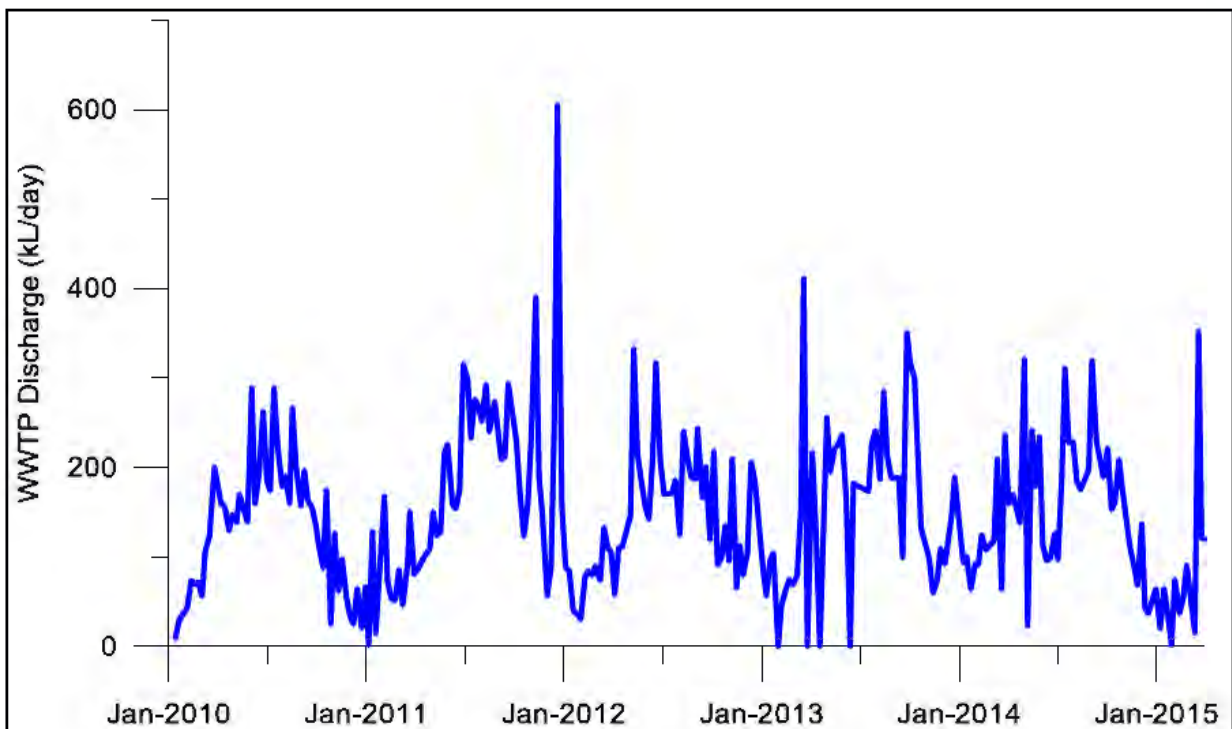


Figure 2: Daily treated sewage discharge volume (source Final TI 2015, page 8)¹.

Note 1: The Wagin town site received a rainfall event of approximately 92 mm in mid December 2011, correlating with the approximately 600 m³/ day discharge event (source: Bureau of Meteorology, Wagin Station 10647).

Table 4: Summary of treated wastewater quality and quantity discharged from the Wagin sewage facility mid 2013 – mid 2017.

		Biochemical oxygen demand (mg/L)	<i>Escherichia coli</i> (cfu/ 100 ml)	pH	Ammonium (mg/L)	Total nitrogen (mg/L)	Total phosphorus (mg/L)	Total dissolved solids (mg/L)	Total suspended solids (mg/L)	Volume/ day (kL)
2013/14	Average	23.75	2572.1	8.16	0.26	23.25	10.19	616.42	147.08	154.39
	Min: Max	15: 40	10: 24000 ¹	6.97: 10.4	0.05: 0.74	13: 55	7: 15	506: 774	65: 380	84.2: 227.6
	Standard deviation	6.44	6797.8	1.08	0.20	11.22	2.42	101.12	94.33	50.17
2014/15	Average	31.25	1023.33	7.98	0.94	22.33	11.19	638.92	145.83	146.77
	Min: Max	10: 140	20: 5800	7.09: 9.5	0.05: 8.8	13: 41	7.9: 14	450: 851	60: 325	34.4: 224.6
	Standard deviation	34.98	1644.75	0.72	2.49	7.05	2.08	147.22	93.17	68.08
2015/16	Average	25.42	1416.33	8.19	1.29	21.33	11.65	602.67	109.17	159.17
	Min: Max	10: 40	20: 6500	6.8: 9.8	0.05: 10	12: 35	8.8: 14	499: 780.8	60: 180	88.9: 228.3
	Standard deviation	9.88	2019.41	1.02	2.83	6.88	1.47	91.16	35.47	56.88
2016/17	Average	5	1451.55	7.85	0.94	21.42	11.33	679.47	121.25	167.50
	Min: Max	5	10:13000	7.15: 8.6	0.05: 2.6	12: 29	8.8: 15	512: 947	65: 170	50: 350 ²
	Standard deviation	0	3843.14	0.36	0.87	5.25	2.26	137.5	40.6	82.7

Note 1: 24,000 cfu/ 100 mL is the upper reporting limit used by the Licence Holder for analysing the data, actual concentrations almost certainly exceed this value.

Note 2: The Wagin town site received a rainfall event of approximately 185.6 mm in mid-February 2017 coinciding with the 350 kL/ day average discharge for that month (source: Bureau of Meteorology, Wagin Station 10647).

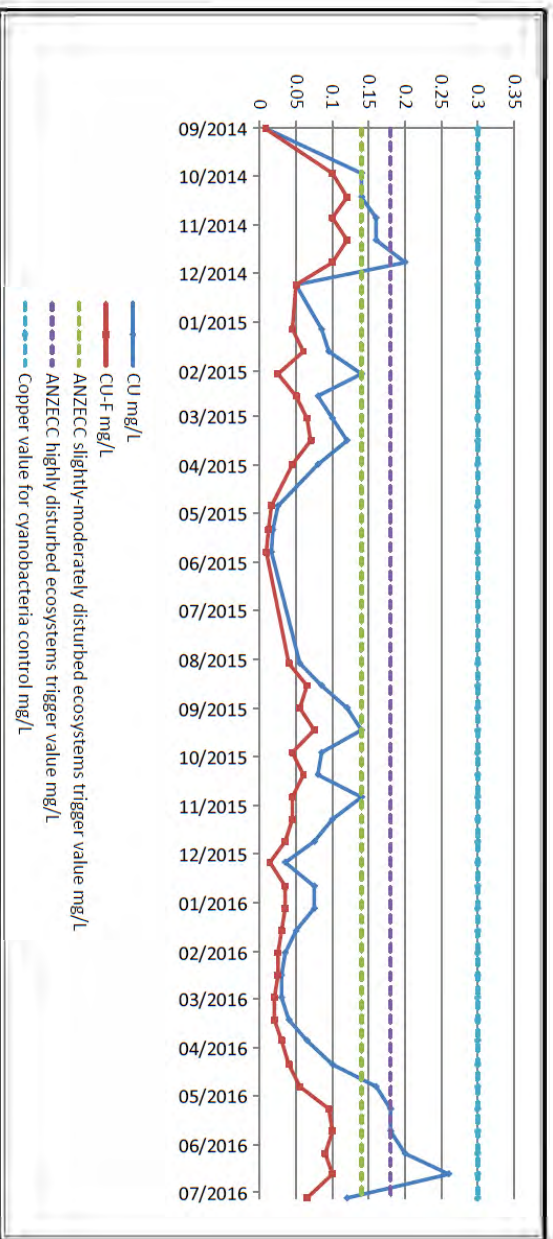


Figure 3: Copper concentrations in treated sewage discharge (AER 2016, page 8)¹.

Note 1: the ANZECC and ARMCANZ 2000 Table 3.4.1: *Trigger values for toxicants at alternate levels of protection* reported within Figure 2 were incorrectly applied as values of 1.4 mg/L (95 % species level of protection) and 1.8 mg/L (80 % species level of protection) and are actually 1.4 µg/L (0.0014 mg/L) and 1.8 µg/L (0.0018 mg/L) respectively.

4.3 Infrastructure

The Wagin sewage facility infrastructure, as it relates to the Primary Activities listed in Table 5 and depicted in the Revised Licence (Schedule 1: Premises Maps) and Decision Report (Appendix 5 and 6). Details of the infrastructure are considered further in Section 9.3.2 of this Decision Report.

Table 5: Wagin Sewage Facility Primary Activity infrastructure.

Infrastructure and equipment		Plan reference
1	Sewage inflow, outflow and conveyance pipes	Decision Report: Appendix 5 and 6.
2	Two separate parallel primary ponds	
3	One secondary pond	Revised Licence: Schedule 1 Premises Plan
4	Copper dosing unit	
5	One tertiary pond	
6	Treated sewage discharge flume and monitoring station	
7	Sewage sludge drying hardstand	

4.4 Environmental Improvement Plan

The Licence Holder's Draft EIP 2014 that was submitted as part of the Application was superseded by the submission of the Final EIP 2015. The Final EIP 2015 proposed an 'Environmental Improvement Action Plan' (EIAP) to manage the discharge of treated sewage, that involved:

- construct a one kilometre treated sewage infiltration channel, in place of the current drainage channel;
- sign and fence the infiltration channel;
- acquire occupation and amalgamate the road reserve, where the drainage channel is located, as the boundary of the infiltration channel;
- install one groundwater monitoring bore upstream of the treated sewage discharge point; and
- monitor groundwater quality and level at the infiltration channel.

The Final EIP 2015 does not define the construction and design specifications of the 'infiltration channel'. Actions proposed in the Final EIP 2015 were estimated to be completed by June 2018. In the correspondence Water Corporation 2017 the Licence Holder confirmed:

- the EIAP is being implemented as per Final EIP 2015;
- the timeframes associated with the EIAP remain accurate estimates;
- the adjacent lands proposed for the infiltration channel are currently being surveyed by the Department of Land and that the Licence Holder is not the Occupier of the lands at this time;
- the infiltration channel will be comprised of a 260 m gravity pipe discharging to a '*... chamber/ wet-well and then via an open channel at approximately 260 mm deep x 3000 mm wide at the top level with a 1:3 embankment*';
- '*... the proposed minor changes to the discharge from the [sewage facility] are for the purpose of general maintenance to improve the existing discharge channel primarily to mitigate public health risks; and ... the works will not alter the nature or volume of the waste*';
- copper dosing occurs prior to discharge into the secondary and tertiary ponds and that copper is dosed at a rate to ensure concentrations in treated sewage are ≤ 0.12 mg/L.
- the Wagin sewage facility has no specific grit/ solids removal or screening infrastructure;
- the Wagin sewage facility ponds are likely to have been constructed with '*300 mm thick compacted clay lining*'; and
- the Wagin sewage facility ponds are of the following dimensions and capacities:

Pond	TWL length (m)	TWL width (m)	Profile depth (m)	Slope	Volume (m ³)
Primary Pond 1	128	35	0.96	1:3	3922
Primary Pond 2	130	37	1.12	1:3	4842
Secondary Pond	92	52	1.66	1:3	6847
Tertiary Pond	93	34	1.79	1:3	4541

- (5) **Key Finding: The Delegated Officer notes that the Application proposing the infiltration channel was withdrawn on 21 June 2018.**
- (6) **Key Finding: The Delegated Officer notes that the Licence Holder considers that the PVC pipe installation is provided a defence under Section 53(1)(g) or 53(2)(d) of the EP Act, being ‘for the purpose of general maintenance’. No approval is being sought under Section 59(2) of the EP Act (Water Corporation 2017; Water Corporation 2018).**
- (7) **The Delegated Officer considers that the proposals made by the Licence Holder within the Final EIP 2015 were on land not demonstrated to be occupied by the Licence Holder and not part of the Premises. Subsequently the Delegated Officer has determined that the scope of the assessment for Risk Events arising from the discharge to land (treated sewage) will be from the point of discharge at the boundary of the Premises, being Discharge Point L1 within the Kersley Road Reserve.**

5. Legislative context

5.1 Conservation and Land Management Act 1984

The land and water body referred to as Slippery Lake, being Lot 63 on Plan 233158, is defined as a nature reserve under Section 6(5) of the *Conservation and Land Management Act 1984* (CALM Act) and subsequently vested with the Conservation and Parks Commission (CPC) under Section 19 of the CALM Act. Section 5 of the CALM Act defines nature reserves as being reserved for ‘... *the conservation of flora or fauna or both flora and fauna* ...’.

The Department of Biodiversity Conservation and Attractions (DBCA) is responsible for day to day management of the Slippery Lake Nature Reserve for the purpose of conservation of flora and fauna on behalf of the CPC. The CPC document *Position Statement No. 5 June 2011 Drainage* states that the CPC:

‘... will evaluate proposals for drainage effecting vested land and where deemed to be beneficial or neutral to the values of the reserve, the proposals may be supported’.

In correspondence dated 8 August 2017 DBCA advised that the discharge of treated sewage is not within the context of *Position Statement No. 5 June 2011 Drainage*. In addition, DBCA advised, in regard to the discharge of treated sewage, that ‘... *impacts on lands ... should be either positive or neutral* ...’. Correspondence received from the then DEC and DBCA is summarised in Appendix 2. This advice has been considered within Section 9.5 of this Decision Report.

- (8) **Key Finding: The Delegated Officer considers that any approval of the Application and Primary Activities under Part V of the EP Act must be consistent with the environmental values of the Slippery Lake A Class Nature Reserve, being the conservation of flora and fauna.**

5.2 Contaminated sites

The Premises has not been classified under the *Contaminated Sites Act 2003*. On 19 June 2018 the lands adjacent the Premises, as depicted in Figure 4, were classified as *Possibly contaminated – investigation required* based on information submitted by the Applicant. Soil and groundwater investigations will be required to adequately delineate and characterise the nature and extent of contamination at the adjacent lands.

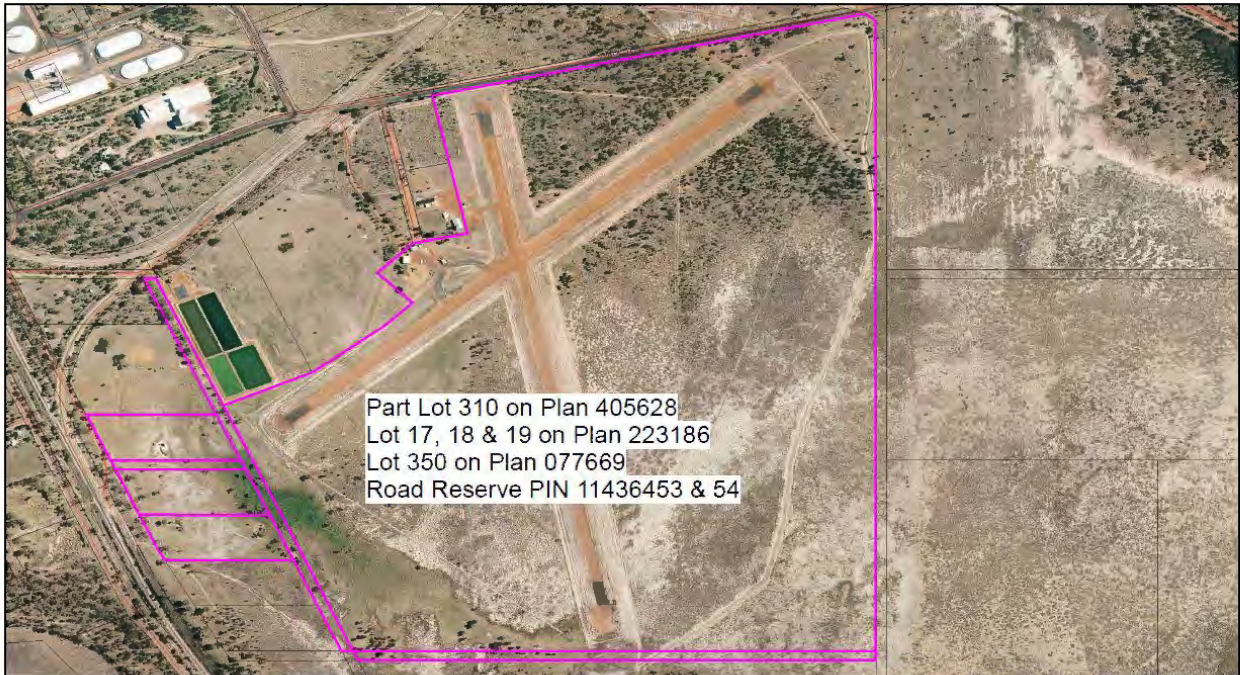


Figure 4: Lands reported under the Contaminated Sites Act 2003 (purple line).

(9) Key Finding: The Delegated Officer notes that sewage facilities are listed under the Department of Environment Regulation 2014 *Contaminated sites guidelines assessment and management of contaminated sites* as a potentially contaminating industry type.

(10) Key Finding: The Delegated Officer notes that the outcomes of investigations required under the *Contaminated Sites Act 2003* may inform the uncertainty, assumptions and findings of the risk-based assessment process.

5.3 Planning approvals

No development/ planning approval for the Wagin sewage facility operations at the Premises is recorded by the Shire of Wagin (correspondence with the Shire of Wagin 19 May 2016).

Under *Shire of Wagin town planning scheme no.2 district zoning scheme*, 1 March 2005 the Premises is zoned public purposes sewage treatment works. The Premises is vested with the Minister for Water for the use of sewage treatment. Under Section 6 of the *Planning and Development Act 2005* the public works are exempt from development/ planning approval. Figure 5 describes the surrounding land uses as zoned under the *Shire of Wagin town planning scheme no.2*.

The discharge of treated sewage is to the Kersley Road reserve (Lot 350 on Plan 77669) before potentially travelling across land occupied by the Shire of Wagin for the regional airport (Lot 310 on Plan 405628), crossing road reserve and entering the A Class nature reserve known as Slippery Lake. The discharge of treated sewage may also impact on part of Lot 17 and Lot 18 on Plan 223186 (land zoned 'rural' under the *Shire of Wagin town planning scheme no.2*).

Correspondence received from the Shire of Wagin dated 21 August 2017 confirmed that there are no matters or decisions regarding planning approvals or the Town Planning Scheme that relate to the Premises.

5.4 Part V of the EP Act

5.4.1 Applicable regulations, standards and guidelines

The overarching legislative framework for the assessment of the Application and Review is the EP Act and EP Regulations. The 'Guidance Statements' that inform this assessment of the Application and Review are detailed in Appendix 1 of this Decision Report.

5.4.2 Works approval and licence history

No works approvals have been granted for the Premises. The Licence Holder has been granted licence number L6316/1991/13 (Existing Licence) and previous versions of Licence L6316/1991 to operate the sewage facility since 1991. During this time licence number L6316 has been reissued thirteen times. Two amendments to the Licence have occurred since 2010:

- On 7 June 2012 the Licence was amended to include the Environmental Improvement Plan (EIP) Conditions as set out below:
 - 14 (a) *The licensee shall submit to the Director an Environmental Improvement Plan by 31 December 2013.*
 - (b) *The Environmental Improvement shall incorporate actions and associated completion dates to achieve the objective of meeting the ANZECC water quality guidelines for surface water discharge of effluent into the lake by the 31 December 2017.*
 - 15 *The licensee shall complete the actions in the approved Environmental Improvement Plan by the dates specified.*
- On 29 April 2016 the expiry date of the Licence was amended in accordance with the *Notice of amendment of licence expiry dates Section 59B(9) and Section 59(1)(k) Environmental Protection Act 1986 Licensed Prescribed Premises*. The expiry date was amended to Monday 31 October 2033.

5.4.3 Compliance inspections and compliance history

A compliance inspection of the Premises was undertaken by the then DER Inspectors on 23 June 2016. The inspection did not identify any new non-compliances with the Conditions of the Existing Licence.

A breach of Section 58 of the EP Act, contravening Condition 14(a) of the Existing Licence, was recorded on 5 February 2014 and managed in accordance with the DER 2013 *Enforcement and prosecution policy* under Incident and Complaints Management System item 31585. The item concerned the requirements of the EIP Condition, specifically:

- an EIP was not submitted by the Licence Holder until 17 April 2014 in the form of a Draft EIP 2014;
- the Draft EIP 2014 submitted by the Licence Holder did not include actions that would result in treated sewage discharges meeting the ANZECC water quality guidelines for surface water discharge by 31 December 2017; and
- the Final EIP submitted by the Licence Holder on 25 November 2015, supported by the correspondence Water Corporation 2017, maintained an approach to managing the discharge of treated sewage that was not consistent with the requirements of Condition 14(b).

(12) Key Finding: The Delegated officer notes that the EIP Condition set in the Existing Licence is addressed through Section 9.5 and 10.1.5 of this Decision Report.

6. Modelling and monitoring data

The following monitoring and modelling data sources are considered within this Decision Report and primarily inform the risk assessment for Discharge to land (treated sewage):

- AERs submitted by the Licence Holder that contain the monitoring data required by the Existing Licence; and
- the Final EIA 2015 and Final TI 2015 including attachments.

Monitoring data provided in AER 2014, AER 2015, AER 2016 and AER 2017 covering consecutive 1 July through 30 June reporting periods was considered within this Decision Report. The AERs provide the following data in accordance with the relevant Condition of the Existing Licence:

- Condition 4: monthly cumulative volumes of treated sewage discharged to the drainage channel;
- Condition 7: monthly contaminant concentrations within treated sewage discharged to the drainage channel; and
- Condition 9: monthly contaminant loads within treated sewage discharged to the drainage channel.

The Final EIA 2015 and Final TI 2015, undertaken by Hydrobiology Pty Ltd, provide the following data, secured over the period August 2014 to March 2015:

- groundwater levels and quality around Slippery Lake via the installation of six groundwater monitoring bores and undertaking MODFLOW modelling;
- surface water sampling from the sewage facility, Wagin town site groundwater abstraction program discharge drain, Slippery Lake and the reference site Gundaring Lake for physical and chemical parameter; ecological parameters and geochemical speciation modelling at Slippery and Gundaring Lake;
- a treated sewage discharge water balance assessment; and
- Slippery Lake habitat vegetation change and multi-spectral imagery groundwater dependence analysis.

The monitoring locations used within the Final EIA 2015 and Final TI 2015 around the Premises are detailed in Figure 6, excluding the Gundaring Lake reference site. The conclusions made within the Final EIA 2015, supported by the Final TI 2015, include:

- no evidence of treated sewage impacting the salinity, nutrient levels or native vegetation of Slippery Lake;
- no indications of impacts from treated sewage on the levels of hydrocarbons, metals, pesticides or herbicides within Slippery Lake;
- no discernible impact on the faecal bacteria levels in Slippery Lake from the treated sewage. The Wagin town site groundwater abstraction program that discharges via an overland open drain to the northeast corner of Slippery Lake displayed higher faecal bacteria levels;

- the majority of the treated sewage is processed by evaporation and evapotranspiration before the drainage channel reaches Slippery Lake;
- an area of approximately half a hectare within the boundary of the Class A Nature Reserve supports healthy paperbark (*Melaleuca spp.*) and grasses that may be influenced by the lower salinity treated sewage discharge and could be considered of higher environmental value than other surrounding vegetation;
- the EIA concluded the treated sewage discharge has a neutral to beneficial impact on the values of the Slippery Lake A Class Nature Reserve; and
- the application of the ANZECC and ARMCANZ 2000 as default trigger values is not recommended for the sewage facility and Slippery Lake context, that 'revised ANZECC guidelines' are being drafted and that the 'revised ANZECC guidelines' should be used to derive site specific trigger values.

The Final EIA 2015 and Final TI 2015 were reviewed by the then DER technical experts. The Technical Expert Reports dated 10 March 2016 and 9 August 2016 are attached in Appendixes 6 and 7 of this Decision Report. In conclusion the technical expert reviews found:

'Technical investigations that have been undertaken on behalf of Water Corporation are deficient as they have not adequately assessed contaminants of environmental concern in the wastewater, have not adequately identified current and potential impacts on environmental receptors, have not indicated whether the current wastewater discharge practices are sustainable, and have not indicated appropriate concentration limits and targets for the wastewater discharge' (Technical Expert Report dated 10 March 2016).

- (13) Key Finding: The Delegated Officer notes that assumptions and uncertainty are inherent to any modelling outputs and scientific process, the accuracy of the outputs are dependent on the robustness of the data, the process used and natural variability that can occur within the studied system.**
- (14) Key Finding: The Delegated Officer notes that assumptions and omissions identified within the Final EIA 2015 risk assessment process include:**
- (a) the relationship between treated sewage discharge and potential phosphorus loading induced cyanobacteria blooms within Slippery Lake.**
 - (b) the potential accumulation, conversion and bioavailability of phosphorous through anaerobic sulphate reduction within the sediment pore-water.**
 - (c) potential risks to water birds, as receptors, with consideration of impacts via bioaccumulation of metals and direct impacts from cyanotoxins.**
 - (d) algae concentrations, including cyanobacteria and cyanotoxins within the treated sewage discharge.**
 - (e) water balance modelling of the required evaporation area for treated sewage discharge is based on average daily discharge rates (Final TI 2015, page 62).**
 - (f) the risk from pathogens to environmental or human receptors to constitute a Risk Event:**
 - 'The lack of a direct surface water discharge to the lake from the TWW discharge would also mitigate the potential for faecal bacterial or other pathogens to impact lake waters (Slippery Lake)'* (Final EIA 2015, page 20).
 - (f) no emission targets or limits for the treated sewage discharge to protect the values of Slippery Lake are recommended.**

(15) Key Finding: The Delegated Officer considers that the monitoring data and investigations presented within the Final EIA 2015 and Final TI 2015 demonstrate:

(a) impacts from the discharge of treated sewage to the drainage channel and the Slippery Lake ecosystem are foreseeable:

'... there is a potential for contamination of lake waters through groundwater inflow with groundwater travelling in a south-easterly direction' (Final TI 2015, page 4).

(b) direct connectivity via overland flow from Discharge Point L1 to Slippery Lake is reasonably foreseeable under some circumstances.

(c) the discharge of treated sewage from the Premises is only one component of many factors that influence the environmental values of Slippery Lake.

(d) that while the conclusions of the Final EIA 2015 are reasonable from the perspective of a short-term environmental snapshot, they do not adequately consider the longer term chronic impacts of the discharge.

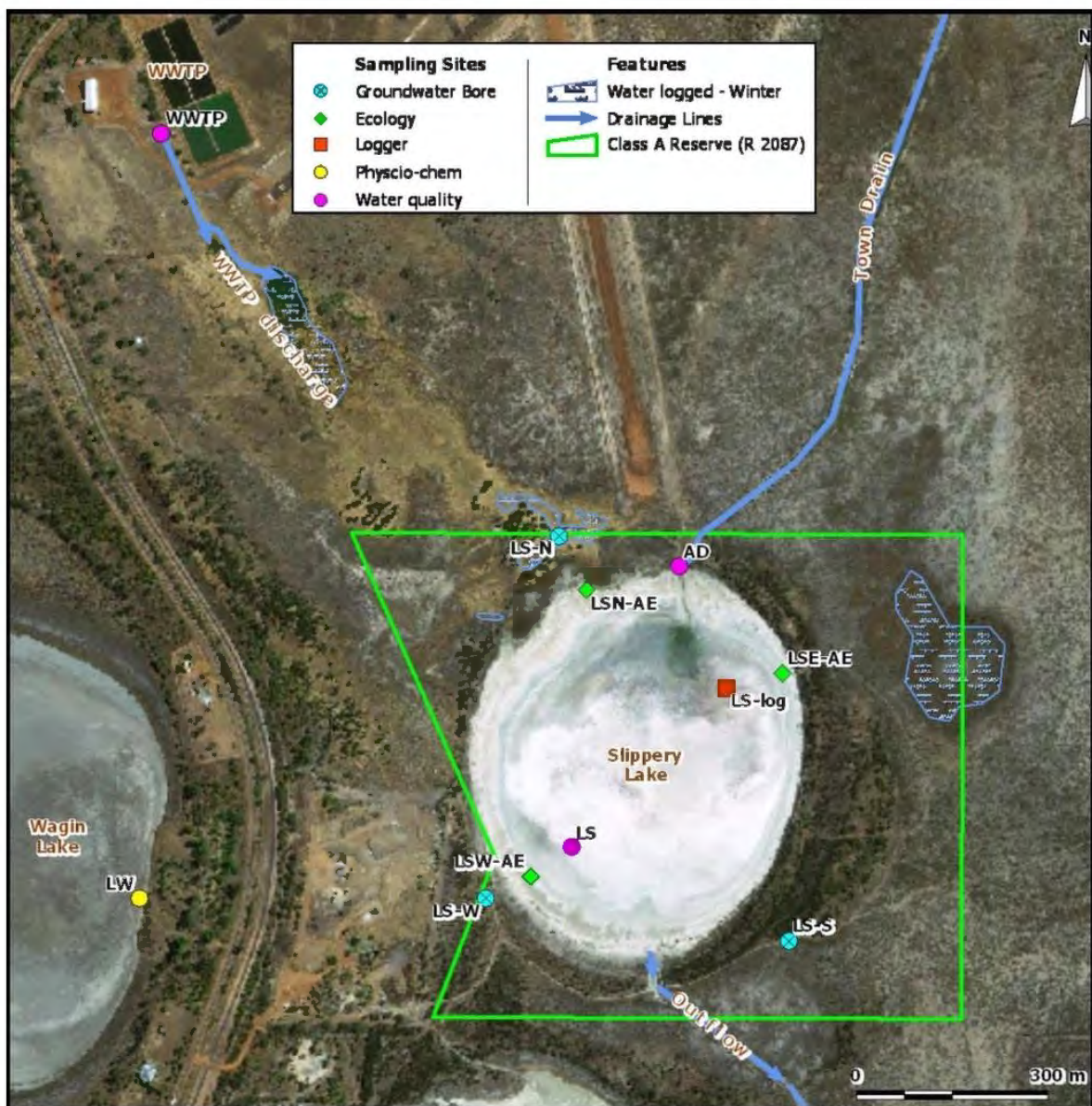


Figure 6: Monitoring locations for the environmental impact assessment (source: Final TI 2015, page 6).

6.1 Monitoring of discharges to land

The quantity and quality of treated sewage discharge from the Premises is summarised in Table 4 using data from the AER 2014, AER 2015, AER 2016 and AER 2017. Appendix 1 of the Final TI 2015 also contains data for the quality of treated sewage discharge from the Premises over the period July 2014 to February 2015; this data is summarised in Table 6.

Table 6: Wagin sewage facility treated sewage discharge quality summary (source: Final TI 2015).

Sample period	Ammonium (mg/L)	Total nitrogen (mg/L)	Total phosphorus (mg/L)	Total suspended solids (mg/L)	Total dissolved solids (mg/L)
17/07/2014	6.7	20	8	-	-
14/08/2014	0.1	22-23	7.2-7.5	94-98	490-495
26/09/2014	2.4	9.5	2.8	-	-
30/10/2014	11	25	8.8	-	-
19/11/2014	0.4	13	11	92	630
11/12/2014	2.7	14	15	-	-
15/01/2015	0.4	38	13	-	-
24/02/2015	0.1	21	11	180	850
Average	2.975	20.07143	9.942857	136	740
Standard deviation	3.93655	9.532526	3.942443	62.2254	155.5635

(16) Key Finding: The Delegated Office considers that the results presented within Table 4 are relatively consistent with the results presented in Table 6, supporting Key Finding 4.

6.2 Monitoring of discharges to groundwater

There are currently no groundwater monitoring bores located within the Premises and there are no groundwater monitoring requirements within the Existing Licence.

As part of the Final EIA 2015 and Final TI 2015 process six groundwater monitoring bores were installed at the locations depicted in Figure 6 around Slippery Lake. The groundwater monitoring bore construction details are summarised in Table 7 and nutrient monitoring data is summarised in Table 8. Only shallow groundwater monitoring bores were monitored as part of the Final EIA 2015. The Delegated Officer assumes that the omission of deep groundwater monitoring is based on the geological profile, where the pallid grey clay layer forms a confining layer (see Section 8.5 of this Decision Report). All shallow bores were constructed with a slotted screen length of 2 m and top of casing between 248.0 and 248.3 mAHD (Final TI 2015, page 16). The groundwater monitoring data was used to inform a MODFLOW 2005 groundwater flow model to assess the potential impacts of the treated sewage discharge on the water table around Slippery Lake.

The Final EIA 2015 and Final TI 2015 found that:

- groundwater flows in a south east direction and was observed around Slippery Lake between zero and 4 mbgl.
- for all groundwater monitoring results total nitrogen was <1 mg/L and total phosphorus was <0.25 mg/L.
- during winter the catchment between the sewage facility and Slippery Lake can be

water logged and diffuse connection of groundwater and surface can occur.

- during winter and saturated periods it is possible that treated sewage discharges via surface flow directly into Slippery Lake.
- Slippery Lake was observed to dry out over summer.
- Slippery Lake is subject to agricultural runoff, airport runoff, discharge of groundwater abstraction from around the Wagin town site and potentially leachate from a Class II landfill located less than 100 meters to the west of Slippery Lake.
- the modelled elevation of groundwater levels, as a result of the discharge of treated sewage, at the boundary of the Class A nature reserve, excluding the effect of evaporation was 7 cm.
- the hydraulic load of treated sewage discharge is predominantly processed in the environment by evaporation, evapotranspiration and infiltration before entering Slippery Lake.
- overflow from Slippery Lake into the lower catchment is a rare event and reported to occur at a frequency of less than once every few decades.

Table 7: Groundwater monitoring bore construction summary (source Final TI 2015).

Bore	Description	Drilled depth (m BGL)	Top of casing (mAHD)
LSS-S	Southern monitoring well – shallow	6.5	248.031
LSS-D	Southern monitoring well – deep	22.8	248.026
LSW-S	Western monitoring well – shallow	5.5	248.176
LSW-D	Western monitoring well – deep	23.5	248.226
LSN-S	Northern monitoring well – shallow	6.7	248.268
LSN-D	Northern monitoring well – deep	17.2	248.283

Table 8: Groundwater monitoring bore nutrient data summary (source Final TI 2015).

Date	Total nitrogen (mg/L)			Total phosphorus (mg/L)		
	Bore north (LS-N)	Bore west (LS-W)	Bore south (LS-S)	Bore north (LS-N)	Bore west (LS-W)	Bore south (LS-S)
Sept 2014	n/a	0.9	0.7	n/a	0.04	0.05
Nov 2014	0.3	0.1	0.1	0.15	0.12	0.1
Feb 2015	0.4 - 0.7	0.6	0.2	0.19	0.19	0.22

(17) Key Finding: The Delegated Officer considers that the groundwater monitoring data is insufficient to make definitive conclusions on the likelihood of contaminants migrating through the shallow aquifer to Slippery Lake as a result of seepage from the Wagin WWPT infrastructure or from the discharge to land (treated sewage) within the Kersley Road reserve.

(18) Key Finding: The Delegated Officer notes that the depth to groundwater is not stated within the Final EIA 2015 or Final TI 2015 in mBGL or mAHD. Subsequently depth to groundwater at the Premises has been inferred from the available data that includes local topography, hydrogeology around Slippery Lake and pond construction plans.

6.3 Monitoring of surface water

Excluding Discharge Point L1 there are no surface water monitoring sites located within or outside of the Premises in the Existing Licence. As part of the Final EIA 2015 and Final TI 2015 process surface water sampling was undertaken at:

- the emission point from the sewage facility;
- the receptor Slippery Lake;
- the reference site Gundaring Lake; and
- the Wagin town site groundwater abstraction program drain discharge point at the northeast corner of Slippery Lake.

Select contaminants from the surface water monitoring are presented in Table 9 below. The data provides a snapshot of the nutrient status from July 2014 to February 2015 for the Wagin sewage facility, Airport drain (*incorporates discharge from the Wagin groundwater abstraction program*) and Slippery Lake.

Table 9: Water quality monitoring result summary from Final TI 2015 for nutrients and select metals (*all results in mg/L*).

Sample date	Sample location	Total nitrogen	Total phosphorus	Mercury	Selenium
17/07/2014	Airport drain	0.1	0.01	N/A	N/A
	Wagin sewage facility	20	8		
	Slippery Lake	4.4	0.12		
13-14/08/2014	Airport drain	1.7	0.09	<0.0001	0.58
	Wagin sewage facility	22-23	9.3-9.4	<0.0001	<0.5
	Slippery Lake	4.5	0.52	<0.0001	<0.5
25-26/09/2014	Airport drain	0.2	<0.01	N/A	N/A
	Wagin sewage facility	3.5	0.02		
	Slippery Lake	9.5	2.8		
30/10/2014	Airport drain	0.2	0.01	N/A	N/A
	Wagin sewage facility	25	8.8		
	Slippery Lake	3.2-3.3	0.03-0.04		
19/11/2014	Airport drain	0.8-0.9	0.42	<0.0005	0.89-0.94
	Wagin sewage facility	13	0.07-0.14	<0.0005	0.4
	Slippery Lake	5.0	11	<0.0005	0.24
11/12/2014	Airport drain	0.9	0.02	N/A	N/A
	Wagin sewage facility	14	12		
	Slippery Lake	9.6-10	0.29		
15/01/2015	Airport drain	<0.1	<0.01	N/A	N/A
	Wagin sewage facility	38	13		
	Slippery Lake	120	0.58		
24/02/2015	Airport drain	0.6	0.03	<0.0001	<0.5
	Wagin sewage facility	21	11	<0.0001	<0.5
	Slippery Lake	N/A	N/A	N/A	N/A

(19) Key Finding: The Delegated Officer considers that the data indicates the discharge of treated sewage is not a significant contributor of mercury or selenium to the Slippery Lake catchment.

(20) Key Finding: The Delegated Officer considers that the discharge of treated sewage is a significant contributor of nutrients to the Slippery Lake catchment.

6.4 Monitoring of local ecosystem

There are no ecosystem monitoring sites located within the Premises and there are no ecosystem monitoring requirements within the Existing Licence.

Investigations of Slippery Lake documented within the Final EIA 2015 and Final TI 2015 found that:

- salt tolerant flora species (e.g. salt bush) dominate the fringing vegetation;
- the lake and adjacent vegetation provides a refuge for biota including algae, zooplankton, macroinvertebrates and avian fauna which are primarily present during winter; and
- no macrophytes were observed in the lake.

As part of the Final EIA 2015 and Final TI 2015, process water balance calculations, remote sensing of vegetation and aquatic ecological assessments of benthic algae, zooplankton and macroinvertebrates were undertaken.

Water balance calculations were combined with data from remote sensing of vegetation to conclude:

'... that loss to evaporation/ evapotranspiration, dilution in ambient groundwater and amelioration within the soil profile mitigate any impacts to Slippery Lake from the TWW discharge' (Final TI 2015, page 64).

The evaporation area required to accommodate the discharge to land of treated sewage in the absence of transpiration was modelled to the areas depicted in Figure 7 below. Subsequently the required evaporation area was mapped against the area where the discharge of treated sewage could promote vegetation growth, as depicted in Figure 8 below.

Aquatic benthic algae were identified as the dominant form of primary production within Slippery Lake and Gundaring Lake. Slippery Lake exhibited a higher diversity of species. No macrophytes were observed within Slippery Lake while *Ruppia sp.* were observed during winter within Gundaring Lake (Final TI 2015, pages 67 and 78).

A greater number of zooplankton species were identified within Gundaring Lake (total 8) than Slippery Lake (total 6). The number of species encountered during any one sampling event fluctuated between four and six between both lakes (Final TI 2015, page 68).

The number of macroinvertebrate species identified within Slippery Lake and Gundaring Lake varied between sampling events. Species richness increased from two to eight species in Slippery Lake, while increasing from five to six species in Gundaring Lake over the September and November sampling events (Final TI 2015, pages 71).

The Final EIA 2015 and Final TI 2015 process did not investigate larger fauna, specifically birds however, the following observation was made:

'... the number of bird species utilising the [Slippery] lake during the wet season appeared to be significantly greater than at upstream and downstream reference lakes; Gundaring and Parkeyerring' (Final TI 2015, page 80).

(21) Key Finding: the Delegated Officer considers that avian fauna (birds) are a potential receptor of foreseeable impacts to the Slippery Lake ecosystem as a result of the discharge of treated sewage and these have not been adequately considered within the Final EIA 2015.

(22) Key Finding: the Delegated Officer notes the observation from Final TI 2015:

'TP [total phosphorus] was significantly higher in the [sewage facility] discharge than the other sites and slightly higher in Slippery Lake than the other lakes' (page 78, Final TI 2015).

(23) Key Finding: the Delegated Officer considers that based on the Technical Expert Advice and due to the catchment for the discharge of all treated sewage being Slippery Lake that all phosphorus within treated sewage discharged from the Wagin sewage facility must be considered as bioavailable. Over time phosphorus from the discharge of treated sewage will enter and accumulate within Slippery Lake. Anoxic conditions within the sediment pore-water can affect the form and bioavailability of phosphorus and result in the periodic release of phosphorus into the water column.

Figure 7: Modelled evaporation footprint for the discharge of treated sewage for summer, winter and annual average (source: Final TI 2015, page 63).

Figure 8: Mapped vegetation footprint promoted by the treated sewage discharge (source: Final TI 2015, page 64).

7. Consultation

Consultation by DWER and the then DER was undertaken consistent with Section 57(2a) of the EP Act with interested parties, specifically the then Department of Parks and Wildlife now Department of Biodiversity, Conservation and Attractions (DBCA) on behalf of the Conservation and Parks Commission (CPC) and the Shire of Wagin. Consultation with stakeholders is summarised in Appendix 2 of this Decision Report. Consultation with the Licence Holder is summarised in Appendix 3 of this Decision Report.

8. Location and siting

8.1 Siting context

The Wagin town site is located approximately 230 km south east of Perth. The Wagin town site is located within the Wheatbelt, a region of Western Australia predominantly used for agricultural activities. The Premises is located within the Shire of Wagin approximately 1.2 km south east of the town centre. The Shire of Wagin has a population of approximately 1900 people. The sewage facility infrastructure is located adjacent to the western, southern and north-western boundaries of the Premises and approximately 75 to 100 m in from the eastern boundary of the Premises.

8.1.1 Location inspection

On 29 August 2017 a DWER officer visited the locality and inspected the Kersley Road Reserve, adjacent road reserves and access to lands north of Slippery Lake within the possible footprint of the discharge of treated sewage.

Table 10 below details the rainfall for the two months prior to the inspection and informs the level of surface water observed during the inspection. Plates 1 to 9 below depict observations during the inspection. Figure 9 depicts the locations of the relevant lands and images in the plates. The inspection observed the following:

- The northern most part of Kersley Road reserve is an open unvegetated drain accessible from the adjacent private property (Lot 1 on Plan 51587 and Lot 19 on Plan 223186) and via an unlocked gate within Kersley Road reserve.
- An approximately five-foot-high wire fence limits access to the drain approximately 120 m south of the discharge from the sewage facility before the drain enters an area of dense tall grasses/ reeds primarily within the Kersley Road reserve and extending into the Wagin airport reserve.
- Land south of (Lot 1 on Plan 51587 and Lot 19 on Plan 223186) is generally accessible from the west (Brockman Road), land is generally unfenced, or fencing is dilapidated. Stock fencing surrounds parts of Lots 17 and 18 on Plan 223186.
- Land south of (Lot 1 on Plan 51587 and Lot 19 on Plan 223186) was generally saturated with surface water up to 10 cm deep throughout the areas observed up to the boundary of Slippery Lake, consistent with the maximum footprints highlighted in the Final EIA 2015 and depicted in Figures 7 and 8.
- The Wagin landfill and the Wagin airport infrastructure were contained within approximately six to seven-foot-high wire fences limiting access.



Plate 1: Kersely Road Reserve (south).



Plate 2: Treated sewage Discharge Point L1.



Plate 3: Kersely Road Reserve (south).



Plate 4: Kersely Road Reserve (south).



Plate 5: View within drainage channel (south).



Plate 6: View within drainage channel (west).



Plate 7: View within drainage channel (north).

Plate 8: View within drainage channel (east).



Plate 9: View west of Slippery Lake Nature Reserve from groundwater monitoring bore GW3.

(24) Key Finding: the Delegated Officer notes that:

- (a) prior to the installation of fencing in 2018, see Figure 1, human access and use of the lands within the path of the drainage channel was reasonably foreseeable and unrestricted; and**
- (b) surface water connectivity from the Wagin sewage facility to Slippery Lake is reasonably foreseeable under certain conditions.**

Table 10: Weekly cumulative rainfall for two months prior to inspection (source Bureau of Meteorology, Wagin Station 10647).

Timeframe	Week 1 st - 7 th	Week 8 th - 15 th	Week 16 th - 23 rd	Week 24 th - 30 th / 31 st
July	20.4 mm	3.4 mm	24 mm	21.6 mm
August	14.8 mm	44 mm	9 mm	1.1 mm

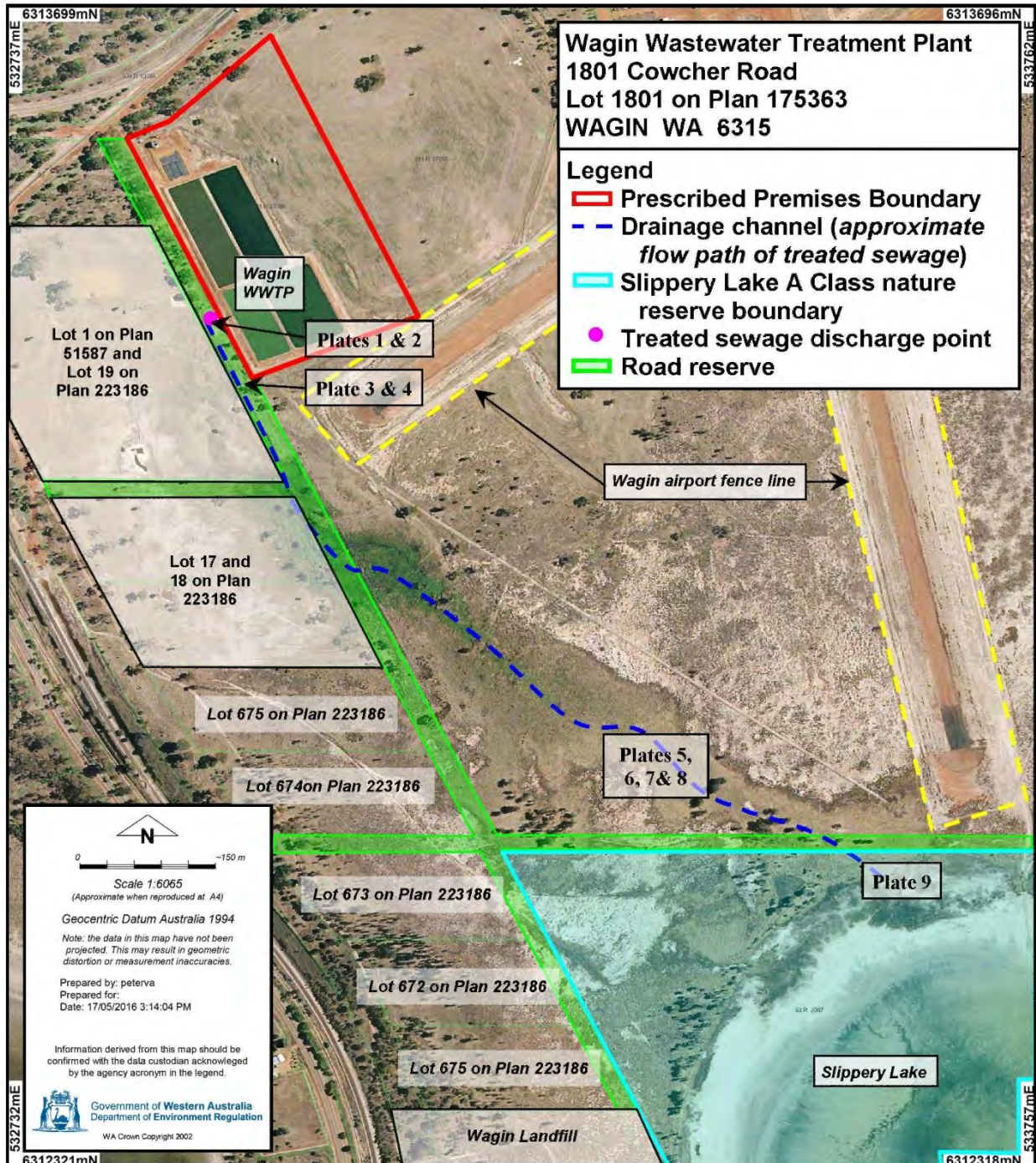


Figure 9: Map of plate locations relative to the Wagin sewage facility and Slippy Lake.

8.2 Residential and sensitive human receptors

The distances to residential and public sensitive receptors are described in Table 11 below and depicted in Figure 9 and Appendix 4.

Table 11: Receptors and distance from sewage facility infrastructure.

Sensitive Land Uses	Distance from Prescribed Activity
Residential Premises	The closest residences are located approximately 360 m west of the sewage facility infrastructure with additional residences located further west and northwest. A residence is also located approximately 750 m south of the sewage facility infrastructure (See map in Appendix 4 of this Decision Report).
Rural zoned land	Directly west of the Premises across the Kersley Road Reserve a number of lots are zoned "rural" for at least 0.5 km. Directly west Lot 1 on Plan 51587 and Lot 19 on Plan 223186 contain agricultural infrastructure, including a shed and livestock and have unrestricted access to the drainage channel.
Industrial zoned land	Directly north across road and railway reserve offices/ buildings exist from approximately 260 m north of the sewage facility infrastructure.
Wagin Airport (Lot 310 on Plan 405628)	Directly east of the Premises, the airstrip extends east from approximately 50 m south of the sewage facility infrastructure and offices/ buildings are located approximately 300 m east of the sewage facility infrastructure. Lands in the southwest corner of Lot 310 on Plan 405628 where the drainage channel passes through do not have access restrictions.
Lots 673, 674 and 675 on Plan 223186, road reserves and Lot 63 on Plan 233158.	Vacant land, being Lots 673, 674 and 675 on Plan 223186, and Lot 63 on Plan 233158 (Slippery Lake Nature Reserve) including where the drainage channel passes through do not have any access restrictions or infrastructure.

(25) Key Finding: the Delegated Officer notes that no general public use or agricultural use of the drainage channel or Slippery Lake is known to occur. The installation of new fencing and signage is considered adequate to reasonably deter general public use of the environment and contact with lands receiving the discharge of treated sewage prior to Slippery Lake.

8.3 Environmental receptors and specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are described in Table 12.

Table 12 also identifies the distances to other ecosystem values that do not fit the definition of a specified ecosystem.

Table 12: Environmental values.

Specified ecosystems	Distance from the Premises
Geomorphic Wetlands	Slippery Lake (Lot 63 on Plan 233158) is located approximately 800 m south east down hydraulic gradient from the discharge to treated sewage. Slippery Lake is an A Class Nature Reserve vested with the CPC under Section 19 of the CALM Act for the protection of flora and fauna.
Parks and Wildlife Managed Lands and Waters	
Threatened Ecological Communities	The boundary to numerous Threatened Ecological Communities are located approximately 1.5 to 2.3 km south and south east of the Premises down gradient of the catchment for Slippery Lake.

Ecosystem values	Distance from the Premises
Threatened / Priority Fauna	A vulnerable mammal, being listed on the Schedule 3 <i>Wildlife Conservation (Specially Protected Fauna) Notice 2015</i> was identified near the northern boundary of Slippery Lake in 2016 and conservation dependant mammals listed on the Schedule 6 <i>Wildlife Conservation (Specially Protected Fauna) Notice 2015</i> were identified near the southern boundary of Slippery Lake in 2017.

The Wheatbelt region, historically dominated by vegetated woodland, has been largely cleared for agricultural activities. Due to the widespread land clearing the region is impacted by rising groundwater tables and associated salinity. The Slippery Lake A Class Nature Reserve ecosystem is impacted by salinity and water logging from rising groundwater that has resulted in the remaining vegetation being degraded.

The ecological significance of wetlands in the region were assessed within Penn 1997. While not specifically naming Slippery Lake, the 'Wagin Lakes' were considered by Penn 1997. The Wagin Lakes, while being acknowledged as largely cleared of surrounding native vegetation were considered to be of moderate significance to faunal populations and providing habitat linkage. This includes the Coblinine River system. The habitat of the 'Wagin Lakes' was considered to be of particular value to water bird species; this was despite salinisation and the wetlands generally being surrounded by cleared land with some lakes having connectivity to remnant bushland.

8.4 Groundwater and water sources

Slippery Lake forms part of the Coblinine River sub-catchment that is within the upper Hardy Inlet - Blackwood River catchment. A series of nearby saline lakes along the Coblinine River, that runs north east to southwest, are rarely interconnected by surface water. Slippery Lake overflows into the Coblinine River at a frequency of less than once per decade. The distances to potential groundwater and water sources identified proximate to the Premises are described in Table 13.

Table 13: Groundwater and water sources.

Groundwater and water sources	Distance from Premises	Environmental Value
Slippery Lake (surface water)	800 m south east.	A Class Nature Reserve
Groundwater	<p>Depth of groundwater around Slippery Lake is 0 – 4 mBGL (perched aquifer) and >18 mBGL (confined aquifer).</p> <p>Depth of groundwater at the sewage facility is conservatively assumed to be at a depth of 4-6 mBGL based on the soil profile established within Final EIA 2015.</p> <p>No abstraction bores have been identified within 800 m of the Premises.</p>	<p>Perched aquifer is connected to Slippery Lake. No abstraction of groundwater is considered foreseeable between the sewage facility and Slippery Lake due to:</p> <ul style="list-style-type: none"> the relatively short distance; salinity estimated between 8,000 and 20,000 TDS mg/L; excess groundwater already available via the Wagin town site groundwater abstraction program (100's kL/ day) (URS 2011, page 6); and abundance of similar quality groundwater in the region.
Major perennial watercourse: Coblinine River (surface water)	Approximately 2.4 km south east (flowing from the north east to the south west)	Part of the Hardy Inlet - Blackwood River Catchment. Surface water connection between Slippery Lake and the Coblinine River is considered a rare event.

(26) Key Finding: The Delegated Officer considers, based on experience, that mounding of groundwater below the ponds is possible and if mounding occurs it could be in the order of 20 cm.

8.5 Soil type

Surrounding land is generally flat with a slight local gradient at the Premises from north south. Results from groundwater monitoring bores drilled around Slippery Lake (Final TI 2015) found the soil profile as generally described in

Table 14. The pallid clays form a confining layer and overlie yellow and gravelly sandy clays that are expected to occur above granitic bedrock.

Table 14: Soil and sub-soil characteristics south side of Slippery Lake (source Final TI 2015, page 47).

Soil Type	Depth below ground level
Sandy clay with coarse fragments	0 m to 4 mBGL
Sandy clay with coarse grained sands	4 mBGL to 6 mBGL
Pallid grey clay zone (forming a confining layer)	6 mBGL to 18 mBGL
Gravelly sandy clay with weathered granitic material	18 mBGL to >23 mBGL (<i>termination depth for drilling</i>)

8.6 Meteorology

Annual evaporation exceeds rainfall at the Premises for most of the year as depicted by the data in Figure 10 and Figure 11. This influences the volume of treated sewage discharged to the environment across the year and persistence of treated sewage as surface water once discharged. Winds from the south to east are more dominant during the morning periods that may subsequently direct odour towards most receptors (see Figure 12). Winds from the west are more dominant during the afternoon periods that may subsequently direct odour towards the airport (see Figure 13).

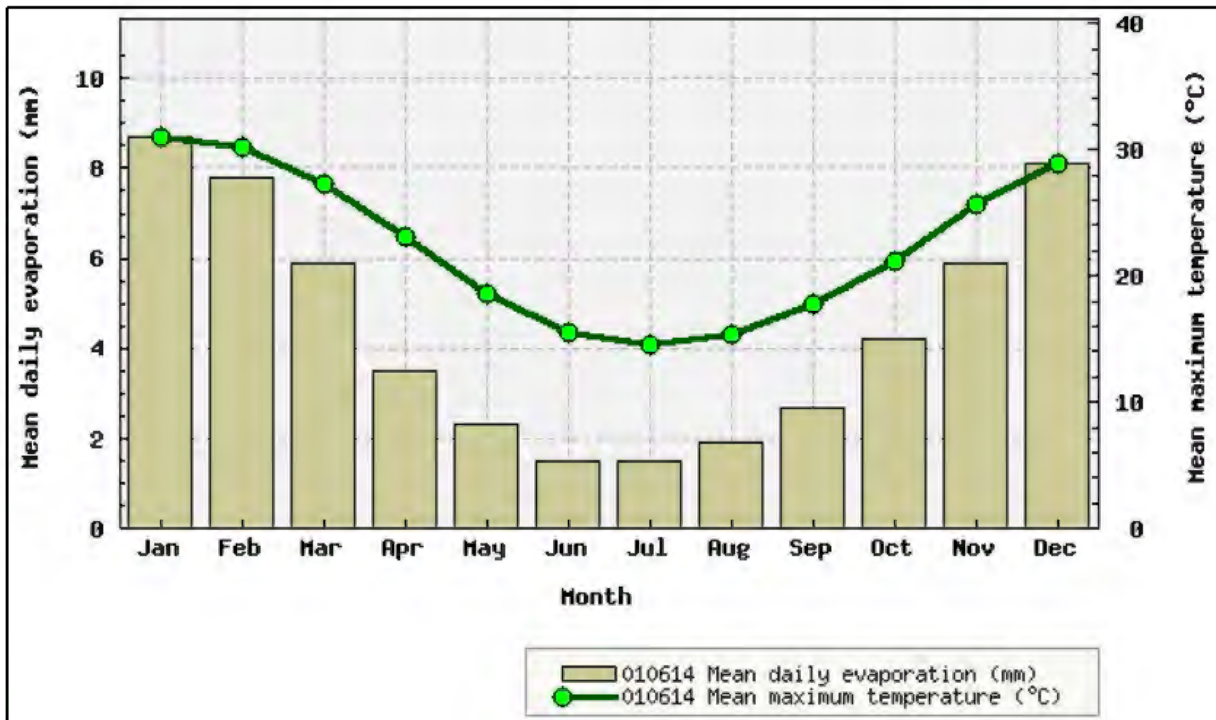


Figure 10: Mean daily pan evaporation and mean maximum temperature at Narrogin (location 10614, ~45 km north of Wagin) (source: Bureau of Meteorology).

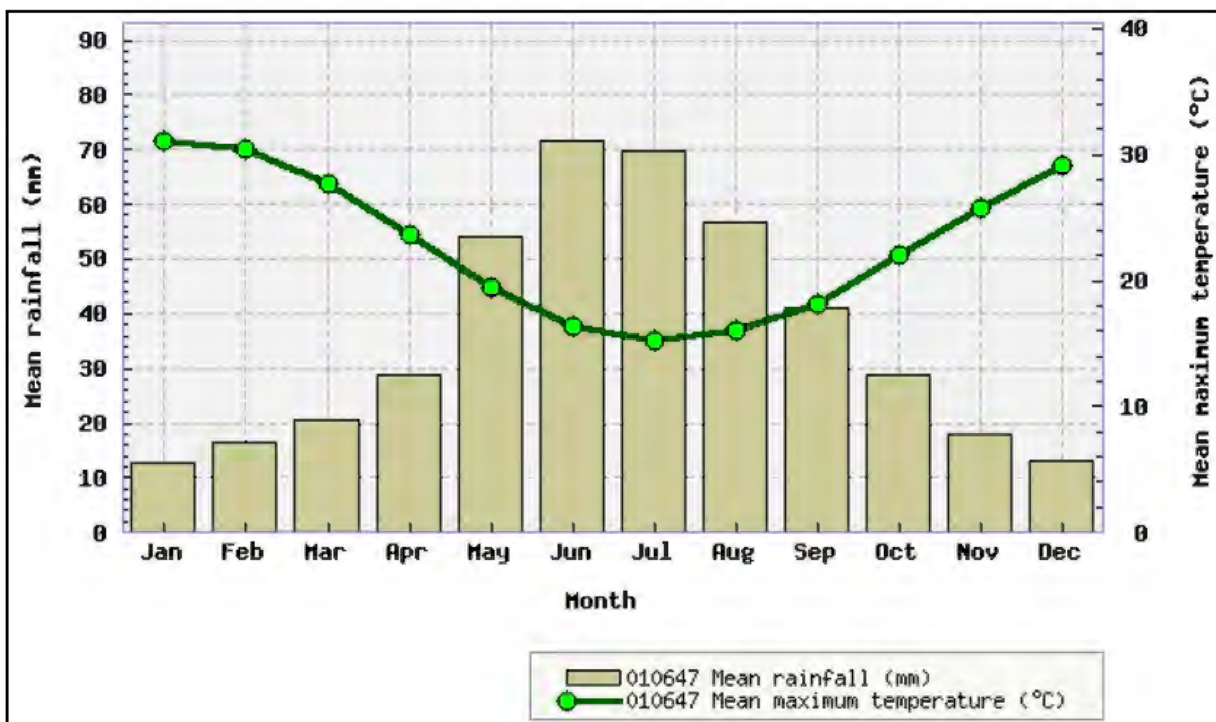


Figure 11: Mean monthly rainfall and mean maximum temperature (location 10647, Wagin) (source: Bureau of Meteorology).

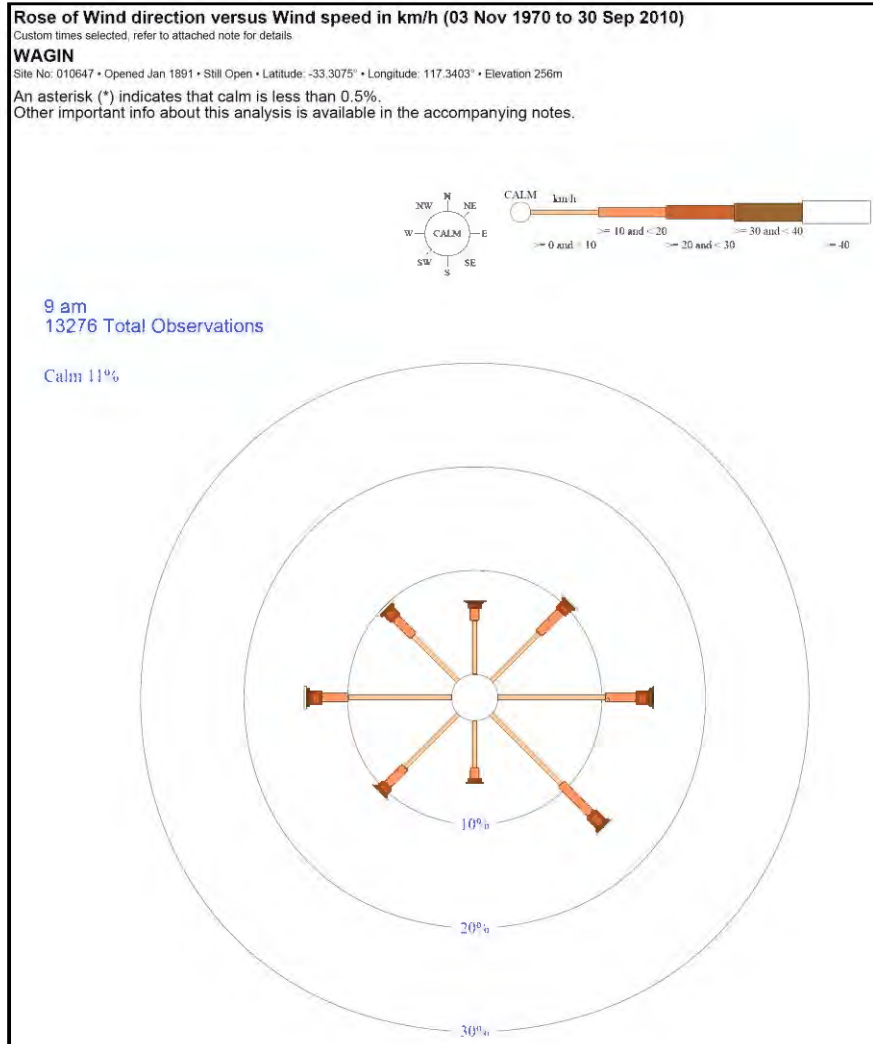


Figure 12: Annual average 9am wind plot (location 10647, Wagin) (source: Bureau of Meteorology).

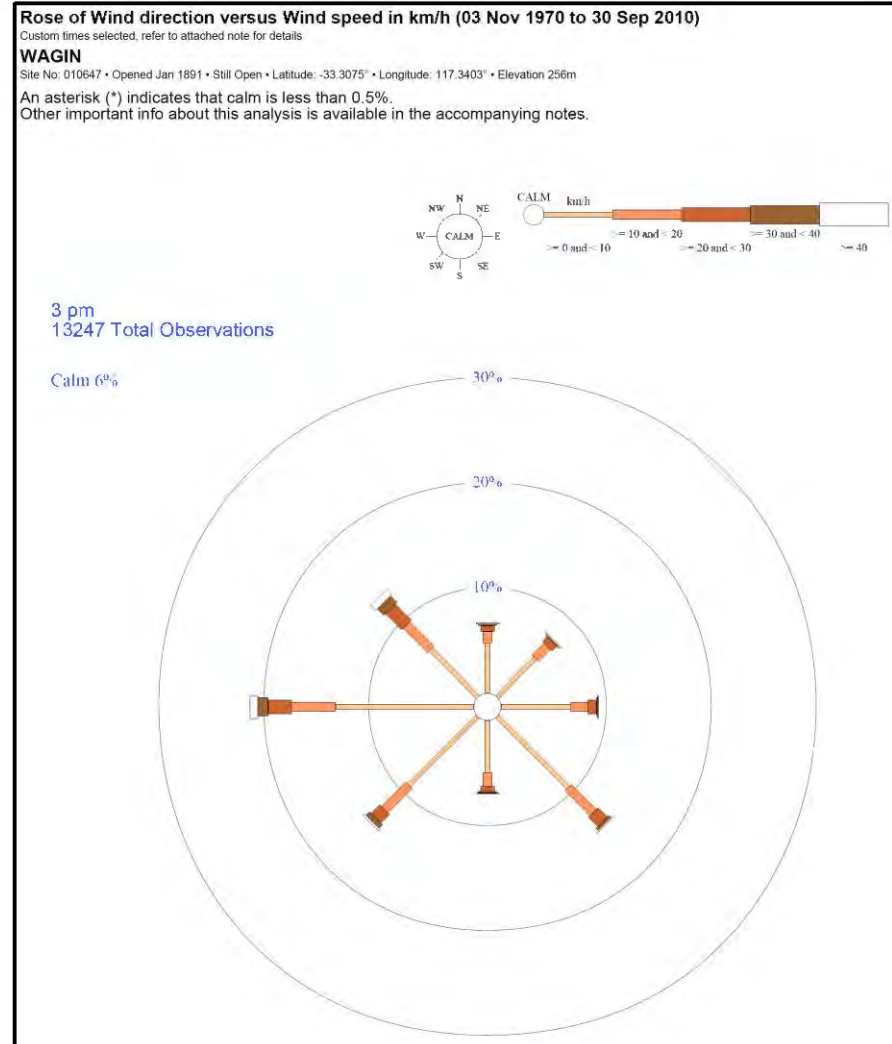


Figure 13: Annual average 3pm wind plot (location 10647, Wagin) (source: Bureau of Meteorology).

9. Risk assessment

9.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event that requires detailed risk assessment. To establish a Risk Event there must be an emission, a receptor that may be exposed to that emission through an identified actual or likely pathway and a potential adverse effect to the receptor from exposure to that emission. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Table 15. The identification of the sources, pathways, receptors to determine Risk Events are set out in Table 15.

Table 15: Identification of emissions, pathway and receptors during operation.

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/ Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Sewage acceptance and treatment	Delivery and treatment of sewage via sewage system to primary, secondary and tertiary ponds.	Discharge to land (containment failure/ overtopping)	Users of receiving lands and Slippery Lake A Class Nature Reserve	Direct discharge/ overland flow	Nutrient loading of soils and waters; suppression of ecosystem services; impacts to fauna and flora; contamination of Slippery Lake. The coincidental event of containment failure and impacts to human receptors is not considered foreseeable	Yes
			Drainage channel environment, Slippery Lake A Class Nature Reserve (aquatic and terrestrial flora/ fauna)	Seepage through soil and within groundwater		Yes
	Noise	People within proximate rural and industrial lands	Air / wind dispersion	Amenity and human health impacts	No	Distance to receptors, scale and type of operations and lack of reasonably foreseeable impact. No known significant emission sources or history of noise emission impacts. Adequately regulated by the <i>Environmental Protection (Noise) Regulations 1997</i> .

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/ Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Sewage acceptance and treatment (continued)	Delivery and treatment of sewage via sewage system to primary, secondary and tertiary ponds (continued).	Odour	People within proximate rural and industrial lands	Air / wind dispersion	Amenity and human health impacts	Yes	The risk event is considered foreseeable, noting the type of operations, having a defined pathway, receptor and potential adverse effects to the receptor/s. See Section 9.6: Odour
		Seepage (through pond liners)	Drainage channel environment/ Slippery Lake A Class Nature Reserve (aquatic and terrestrial flora/ fauna)	Seepage through soil and within groundwater	Nutrient loading of soils and waters; suppression of ecosystem services; impacts to fauna and flora; contamination of Slippery Lake.	Yes	The risk event is considered foreseeable, noting the scale and type of operations, having a defined pathway, receptor and potential adverse effects to the receptor/s. See Section 9.7: Seepage
Treated sewage discharge to land	Discharge of treated sewage to the drainage channel	Discharge to land (treated sewage)	Users of receiving lands and Slippery Lake A Class Nature Reserve Drainage channel environment/ Slippery Lake A Class Nature Reserve (aquatic and terrestrial flora/ fauna)	Direct discharge: overland flow	Amenity and human health impacts Nutrient loading of soils and waters; suppression of ecosystem services; impacts to fauna and flora; contamination of Slippery Lake.	Yes	The risk events are considered foreseeable, noting the scale and type of the operations, having a defined pathway, receptor and potential adverse impacts to the receptor/s. See Section 9.5: Discharge to land (treated sewage)
				Seepage through soil and within groundwater		Yes	
Sludge storage	Dewatering and storage of sludge from ponds	Discharge to land (containment failure/ overtopping)	Users of receiving lands and Slippery Lake A Class Nature Reserve Drainage channel environment/ Slippery Lake A Class Nature Reserve (aquatic and terrestrial flora/ fauna)	Direct discharge: overland flow	Amenity and human health impacts Nutrient loading of soils and waters; suppression of ecosystem services; impacts to fauna and flora; contamination of Slippery Lake.	Yes	The risk events are considered foreseeable, noting the scale and type of the operations, having a defined pathway, receptor and potential adverse effects to the receptor/s. See Section 9.4: Discharge to land (containment failure)
				Seepage through soil and within groundwater		Yes	

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/ Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Sludge storage (continued)	Dewatering and storage of sludge from ponds (continued)	Odour	People within proximate rural and industrial lands	Air / wind dispersion	Amenity and human health impacts	Yes	The risk event is considered foreseeable, noting the type of operations, having a defined pathway, receptor and potential adverse effects to the receptor/s. See Section 9.6: Odour
		Seepage (through liner)	Drainage channel environment/ Slippery Lake A Class Nature Reserve (aquatic and terrestrial flora/ fauna)	Seepage through soil and within groundwater	Nutrient loading of soils and waters; suppression of ecosystem services; impacts to fauna and flora; contamination of Slippery Lake.	Yes	The risk event is considered foreseeable, noting the type of operations, having a defined pathway, receptor and potential adverse effects to the receptor/s. See Section 9.7: Seepage
Management of stormwater ¹	Stormwater management (all)	Discharge to land (stormwater contaminated with sewage and/ or sediment)	Users of receiving lands and Slippery Lake A Class Nature Reserve Drainage channel environment/ Slippery Lake A Class Nature Reserve (aquatic and terrestrial flora/ fauna)	Direct discharge/ overland flow <i>Seepage through soil and within groundwater</i>	Amenity and human health impacts Nutrient loading of soils and waters; suppression of ecosystem services; impacts to fauna and flora; contamination of Slippery Lake.	No	Duration, scale and type of Operations, distance to and density of receptors, and lack of reasonably foreseeable impact. Adequately regulated by <i>Environmental Protection (Unauthorised Discharge) Regulations 2004</i> and general provisions of the EP Act.

Note 1: Where stormwater is relevant to a specific Risk Event within Table 15 stormwater is considered within the assessment for that Risk Event.

9.2 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 16 below. DER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 17 below.

Table 16: 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

Table 17: Risk criteria table.

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

9.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with Table 18 below.

Table 18: 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. 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.

The following Risk Events were established as being reasonably foreseeable in Section 9.1:

- Discharge to land (containment failure) [see Section 9.4].
- Discharge to land (treated sewage) [see Section 9.5].
- Odour [see Section 9.6].
- Seepage [see Section 9.7].

9.3.1 Licence Holder controls

The sewage facility infrastructure controls put in place by the Licence Holder, as they relate to the Risk Event Emission/ Discharge types for the Primary Activities, are detailed in Table 19 and depicted in the Revised Licence (Schedule 1: Premises Maps) and Decision Report (Appendix 5 and 6).

Table 19: Licence Holder infrastructure and operational controls for the Wagin sewage facility.

Risk Event Emission/ Discharge type		Risk Event infrastructure controls	Risk Event operational controls
Section 9.4	Discharge to land - containment failure and overtopping	<p>Inflow/ outflow/ conveyance pipes:</p> <ul style="list-style-type: none"> Plan AE36-L-2 states '<i>PVC pipe to be class SHE sewer pipe with solvent based joints to AS 1260-1984</i>'. <p>Pond profiles:</p> <ul style="list-style-type: none"> Primary pond 1: 128 m (L), 35 m (W) and capacity of 3922 m³; Primary pond 2: 130 m (L), 37 m (W) and capacity of 4842 m³; Secondary pond: 92 m (L), 52 m (W) and capacity of 6847 m³; Tertiary pond: 93 m (L), 34 m (W) and capacity of 4541 m³; and Based on the plans in Appendix 5 and 6 and visual observations of the Premises, the ponds are known to be built into the ground with slightly elevated embankment walls. Sloping of top of pond embankments directs stormwater away from the ponds. 	<p>Monitoring:</p> <ul style="list-style-type: none"> Monitoring of the quantity of sewage entering the Premises from the upstream Union Street pump station using a magnetic flow meter.. <p>Sewage containment infrastructure (ponds):</p> <ul style="list-style-type: none"> Plan AE36-L-2 states '<i>min 400 [mm]</i>', corrected to 300 mm (Water Corporation 2018), pond freeboard from top water level, with direct discharge of treated sewage from the tertiary pond via Discharge Point L1.
Section 9.5	Discharge to land - treated sewage discharge	<p>Ponds:</p> <ul style="list-style-type: none"> Sewage inlet monitoring. Three stage pond based sewage treatment train (<i>primary pond → secondary pond → tertiary pond</i>): <ul style="list-style-type: none"> Effectively operated sewage treatment ponds reduce the contaminant load, specifically biochemical oxygen demand, nitrogen and pathogens; Table 4 summarises the effectiveness of the Wagin sewage facility treatment pond system. Copper dosing. <ul style="list-style-type: none"> Cupricide dosing rate of approximately 0.5 L/day to yield a treated sewage copper concentration of <0.12 mg/L. 200 m PVC pipe within the drainage channel. 	<p>Monitoring:</p> <ul style="list-style-type: none"> Monitoring of the quantity of sewage entering the Premises from the Union Street pump station using a magnetic flow meter. Monitoring of the quantity and quality of treated sewage discharged from Discharge Point L1.
Section 9.6	Odour	None specified.	Desludging was previously undertaken via the 'drain and dry' method.

Risk Event Emission/ Discharge type		Risk Event infrastructure controls	Risk Event operational controls
Section 9.7	Seepage	<p>Ponds:</p> <ul style="list-style-type: none"> ● Hydraulic head (source Plan AE36-L-2): <ul style="list-style-type: none"> ○ Primary pond 1 – 1.05 m (at TWL); ○ Primary pond 2 – 1.07 m (at TWL); ○ Secondary Pond – 1.60 m (at TWL); and ○ Tertiary pond – 1.80 m (at TWL). ● Liner standard/ integrity: <ul style="list-style-type: none"> ○ Pond liner is likely '300 [mm] <i>thick compacted clay lining (if required)</i>' (source: Plan AE36-D-2 in Appendix 5 of this Decision Report) of unknown permeability. ● Separation to groundwater, Plan AE36-L-2 states: <ul style="list-style-type: none"> ○ The soil type: '<i>For soils investigation report see specification</i>'; ○ The floor level of Primary Pond 1 is 250.59 mAHD; ○ The floor level of Primary Pond 1 is 250.60 mAHD; ○ The floor level of Secondary Pond is 249.85 mAHD; and ○ The floor level of Tertiary Pond is 249.55 mAHD. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>(27) Key Finding: Subsequently the Delegated Officer notes that assuming a relatively consistent soil profile (see Section 8.5 of this Decision Report) from Slippery Lack to the sewage facility, the pond floor levels conservatively have a minimum 2 meters separation of 'sandy clay with coarse fragments' from the 'sandy clay with coarse grained sands' above the pallid clay layer and within which, the occurrence of groundwater is considered almost certain.</p> </div>	<p>A Detailed Site Investigation process has been initiated under the provisions of the <i>Contaminated Sites Act 2003</i>. In conjunction with the installation of new groundwater monitoring bores, as specified in Condition 5 of the Revised Licence, the requirements for operational controls will be investigated.</p>

(28) Key Finding: The Delegated Office considers that the lack of documented construction quality assurance and operations controls (such as ambient environmental monitoring) associated with the infrastructure for and discharge from the sewage facility, including the standard and integrity of the clay pond liners, result in an increased likelihood of some Risk Events occurring due to the reduced certainty of the effectiveness of the infrastructure controls.

9.4 Risk Assessment – Discharge to land (containment failure)

9.4.1 Description of discharge to land (containment failure)

Discharge of raw, partially treated and/ or treated sewage may occur from the Wagin sewage facility ponds and/ or pipes via overtopping or structural failure (e.g. *pipeline failure or pond wall collapse*). Any discharges are expected to enter the drainage channel and potentially migrate to Slippery Lake, subject to the volume of the discharge, via overland flow or via seepage into groundwater. The discharge could contain contaminants including heavy metals, nutrients, pathogens, phenols and surfactants. Contaminants could impact the ecosystem functions, flora and fauna within the drainage channel and/ or Slippery Lake. Discharges to land via containment failure are considered foreseeable as one-off events within this risk assessment.

9.4.2 Identification and general characterisation of emission

The Premises receives a continuous load of sewage subject to diurnal and seasonal fluctuations. As sewage proceeds through the treatment ponds some contaminants undergo biological treatment and some contaminants settle to the base of the ponds to form sludge. Generally, as the sewage proceeds through the treatment ponds, the concentration of contaminants decreases. The quantity and quality of sewage, raw or treated, discharge via containment failure will vary depending on the nature of the containment failure, location within the sewage facility, hydraulic load being placed on the sewage facility at the time, effectiveness of the sewage facility treatment process at the time and response time to resolve the containment failure. Table 4 summarises the sewage treatment standard achieved by the Wagin sewage facility.

9.4.3 Description of potential adverse impact from the discharge

Impacts could occur to ecosystem services, flora and fauna health:

- directly via surface water or indirectly via infiltration to groundwater.
- via an increased likelihood of eutrophication, cyanobacterial algal blooms and/ or changes to the trophic structure with Slippery Lake.

9.4.4 Criteria for assessment

The conservation values of the *Conservation and Land Management Act 1984* Slippery Lake A Class Nature Reserve, being the protection of fauna and flora, are considered as an area of high conservation value and special significance.

The ANZECC and ARMCANZ 2000 criteria, specifically Section 3.3 physical and chemical stressors, Section 3.4 Table 3.4.1 trigger values for toxicants and Section 3.5 Table 3.5.1 sediment quality guidelines are not considered applicable as specific consequence criteria to the Slippery Lake ecosystem. The ANZECC and ARMCANZ 2000 criteria are not designed for application to temporary waters and saline lakes (see section 3.1.2.2 of ANZECC and ARMCANZ 2000). Site specific trigger levels are considered appropriate and this approach is supported within ANZECC and ARMCANZ 2000 and the Final EIA 2015 however, at this time there is insufficient information to develop and apply criteria for regulatory purposes.

Therefore, consequences will be considered with regards to impacts from the discharge of containment failure to the values of the Slippery Lake A Class Nature Reserve, including the aquatic ecosystem, riparian vegetation, flora and fauna.

9.4.5 Licence Holder controls

The controls implemented by the Licence Holder are set out in row 'Section 9.4' of Table 19. In addition, the Licence Holder uses an electronic maintenance procedure scheduling tool. Maintenance procedures include infrastructure checks and observations of operations with attendance of the Premises occurring on a minimum weekly basis. Desludging occurs on a periodic schedule, usually every 7-10 years based on the type of ponds at the Premises. Desludging last took place in 2012 for Primary Pond 1 and 2013-14 for Primary Pond 2.

The Delegated Officer has inferred that based on compliance with Condition 1 of Existing Licence the Licence Holder undertakes pond maintenance with regards to stormwater, containment capacity and levels, vegetation and capturing floating debris. This risk assessment has reviewed the controls set out in row 'Section 9.4' of Table 19. This risk assessment has also considered that:

- No spillways are constructed within the ponds and all ponds gravity feed into the next pond; and
- No automatic overflow detection system or high level alarms are in place.

9.4.6 Key findings

The Delegated Officer has reviewed the information regarding discharge to land (containment failure) and has found:

(29) One event of overtopping is known to have occurred at the Premises, being in February 2017 from the eastern embankment of Primary Pond 2 and coinciding with a reported three day rainfall event of 185.6 mm; and

(30) That any hydraulic overloading of the sewage facility will almost certainly be directed through Discharge Point L1 and that overtopping of a pond will only occur in circumstances such as a system blockage.

9.4.7 Consequence

If impacts from discharge to land (containment failure) occur, the Delegated Officer has determined that the impact to ecosystem services will be a short-term impact to an area of high conservation value and special significance. Therefore, the Delegated Officer considers the consequence of discharge to land (containment failure) to be **Major**.

This determination has considered that a discharge to land (containment failure) would not be an ongoing event and would be of limited duration.

9.4.8 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of discharge to land (containment failure) resulting in a consequence will probably not occur in most circumstances. This determination has considered the operational history of the Premises, Licence Holder's controls and the temporary nature of a one-off containment failure event. Therefore, the Delegated Officer considers the likelihood of impact from discharge to land (containment failure) for the environment to be **Unlikely**.

9.4.9 Overall rating of discharge to land (containment failure)

The Delegated Officer has compared the consequence and likelihood ratings described above with the Risk Rating Matrix (Table 16) and determined that the overall rating for the risk of impacts from discharge to land (containment failure) is **Medium**.

9.5 Risk Assessment – Discharge to land (treated sewage)

9.5.1 Description of discharge to land (treated sewage)

The discharge of all treated sewage from the Premises is planned year-round from the sewage facility via Discharge Point L1 to the 200 m PVC pipe and into the drainage channel. Discharges of partially treated/ raw sewage are considered foreseeable from the sewage facility due to variations in hydraulic loads or should upset conditions occur.

Fate of the discharge will vary due to the volume of, and time of year that, the discharge occurs and capacity of the receiving environment to assimilate contaminants without negative impact to receptors. The discharge will enter the drainage channel and potentially migrate to Slippery Lake via overland flow under saturated soil conditions. Generally, discharge to land of treated sewage will seep into soils between the end of the 200 m PVC pipe and Slippery Lake, a portion of which will enter the groundwater before foreseeably migrating to Slippery Lake (seepage is considered separately in Section 9.7 of this Decision Report).

The discharge could contain contaminants including heavy metals, nutrients, pathogens, phenols and surfactants. Contaminants could impact the ecosystem services, flora and fauna within the drainage channel ecosystem and/ or Slippery Lake and could impact the health and wellbeing of people who come into contact with the discharge. Potential impacts to both the environment and public health are considered in this risk assessment.

9.5.2 Identification and general characterisation of discharge

The Premises receives a continuous load of sewage subject to diurnal and seasonal fluctuations. As sewage proceeds through the treatment ponds some contaminants undergo biological treatment and some contaminants settle to the base of the ponds as sludge. Generally, as the sewage proceeds through the treatment ponds the concentration of contaminants decreases.

Table 4 and Figure 2 summarise the quantity and quality of treated sewage discharged from the Premises over the period 2013 to 2017. The quantity and quality of discharges exhibit a significant level of variation (standard deviation) throughout the year. Discharges to land could be in the order of 10s to 100s of kilolitres/ day of treated sewage with contaminants generally being within the range of concentrations and magnitude described in Table 4 and Figure 2. The following factors are considered to indicate that the treated sewage discharge, at times, is likely to contain concentrations of contaminants at levels elevated beyond those indicated by the average and maximum values within Table 4:

- level of deviation observed in the contaminant concentration results;
- level of variability observed in the volumes of treated sewage discharged; and
- relative paucity of data, being 12 samples per year, relative to the level of fluctuation observed in the quantity and quality of treated sewage discharged.

Based on the data presented in Table 4, the average annual load from the discharge of treated sewage of total nitrogen is 1265.1 kg and of total phosphorus is 635.3 kg. On average the treated sewage exceeds concentrations of 1,000 cfu/ 100 mL *Escherichia coli* and at times exceeds 24,000 cfu/ 100 mL *Escherichia coli*.

9.5.3 Description of potential adverse impact from the discharge (nutrients) – environment

Impacts from nutrients within the discharge of treated sewage could occur to ecosystem services and the flora and fauna within the drainage channel and within Slippery Lake. Expert technical advice was sought within DWER (see Appendixes 6 and 7 of this Decision Report) and concluded that it is foreseeable for discharges of nutrients (phosphorus) to result in toxic cyanobacteria blooms within Slippery Lake. Cyanotoxins, being derived from cyanobacteria, are harmful to fauna, such as macroinvertebrates and bird species. This hypothesis takes into consideration that in saline aquatic ecosystems rises in salinity can result in macrophytes being replaced by benthic algal mats. When accompanied by increases in phosphorus concentrations phytoplankton can then replace benthic algal mats that in turn can result in blooms of toxic cyanobacteria.

The Delegated Office notes that in support of this hypothesis that the Final EIA 2015 documented:

- *'No live macrophytes were observed within the wetted zone of Slippery Lake throughout the study period. Primary productivity in the lake was dominated by benthic algae communities'* (Final EIA 2015, page 30).
- *'During the winter months, a large number of water birds were observed to utilise the area'* (Final EIA 2015, page 30).
- *'... the number of bird species utilising the lake during the wet season appeared to be significantly greater than at the upstream and downstream reference lakes'* (Final EIA 2015, page 80).

Expert technical advice within DWER has identified that available data indicates that the Slippery Lake ecosystem has transitioned into being algal dominated. Therefore, there is an increased likelihood that relatively small increases in nutrient concentrations within Slippery Lake could result in toxic blooms of cyanobacteria.

9.5.4 Description of potential adverse impact from the discharge – public health

Impacts to human health may arise from contact with waters contaminated with pathogens from the discharge to land (treated sewage) and/ or from toxins associated with blooms of cyanobacteria. Expert technical advice was sought within DWER and concluded that:

- *'The factors of primary health concern for human contact with water in the lake are the presence of potentially pathogenic microorganisms and toxins that may be associated with blooms of cyanobacteria';*
- *'... levels of coliform bacteria in the water should not exceed 1000 cfu/100 mL to minimise potential health risks associated with contact with the lake water';* and
- *'... concentrations of algal cells in excess of 15 000 cells/mL [source: ANZECC & ARMCANZ 2000, Table 5.2.2] in lake water are also a potential health risk'.*

9.5.5 Description of potential adverse impact from the discharge – other contaminants

Other contaminants may directly impact or bio-accumulate in the environment and impact on the health of and ecosystem services provided by flora and fauna. Potential impacts from other contaminants were not specifically assessed in this risk assessment due to a range of factors including: a lack of information to characterise the contaminant within the discharge; a lack of information to establish a reasonably foreseeable Risk Event; and primarily the risk assessments for nutrient and pathogens within the treated sewage are considered more appropriate to establish an overall risk rating for the discharge of treated sewage as a Risk Event. This is consistent with item 21 of the *Guidance Statement: Risk Assessments*.

The following items have been identified within the scope of other contaminants:

- Metals mercury and selenium:
 - Expert technical advice was sought within DWER and concluded that '*... both selenium and mercury can be methylated by sulfate-reducing bacteria in highly eutrophic benthic sediments which can increase the mobility, bioavailability and toxicity of these elements in aquatic ecosystems*'.
 - Sampling results were provided by Licence Holder for the Narrogin Wastewater Treatment Plant (NWWTP), a similar type of sewage treatment facility. All four samples over 2012-2013 for mercury were below the limit of detection (<0.0005 mg/L). No samples were taken for selenium.
 - Mercury and selenium monitoring results from the monitoring program as part of the Final EIA 2015, summarised in Table 9 of this Decision Report. Monitoring results indicate that the Wagin sewage facility is not a significant or primary contributor of selenium or mercury to the Slippery Lake catchment.
- Metals copper:
 - A very limited data set is available from the Final EIA 2015 process to inform the risk assessment. Samples of 14, 130 and 190 µg/L total copper were recorded in the treated sewage and indicates that the average annual load from the discharge of treated sewage of copper 6 kg.
 - Figure 2 indicates that total copper levels in the treated sewage discharge ranged from <50 µg/L to over 250 ug/L over the period 2014 to 2016. This is equitable with the values recorded in the Final EIA 2015 process.
 - Table 3.4.1 of ANZECC and ARMCANZ 2000 describes values for 80% level of species protection of fresh and marine waters of 2.5 µg/L and 8 µg/L respectively. Excessive levels of copper are known to be toxic to aquatic organisms.
- Metals aluminium:
 - No alum dosing (to reduce phosphorus levels) takes place at the Wagin sewage facility. If dosing were to occur concentration data for the NWWTP indicates and total of 30 g/ day is discharged for the Wagin sewage facility, equivalent to approximately 11 kg/ year.
 - Table 3.4.1 of ANZECC and ARMCANZ 2000 describes values for 80% level of species protection of fresh waters of 0.15 g/ L.

- Endocrine disrupting chemicals: no monitoring data is available.
- Pesticides: limited monitoring data for the NWWTP indicates that in total <0.2 g/ day is discharged from the Wagin sewage facility.
- Surfactants: limited monitoring data for the NWWTP indicates that in total approximately 45 g/ day is discharged from the Wagin sewage facility.
- Biochemical oxygen demand (BOD): maximum results of 140 mg/L and average results of 25 mg/ L to 30 mg/ L (see Table 4) are discharged from the Wagin sewage facility. These values indicate that at times the Wagin sewage facility is not effectively treating the sewage. BOD was not considered during the Final EIA 2015 process.
- Total suspended solid (TSS): maximum results of 380 mg/L and average results of 100 mg/ L to 150 mg/ L (see Table 4) are discharged from the Wagin sewage facility. These values indicate that at times the Wagin sewage facility is not effectively treating the sewage and/ or is subject to high loads of algal growth. As documented with the AER 2016 high levels of TSS are correlated to high algal concentrations that are subsequently being targeted by copper dosing.

The potential for impacts, from other contaminants within the discharge to land (treated sewage), to receptors will be reassessed if new information becomes available to inform the risk assessment.

9.5.6 Criteria for assessment

Environment

The conservation values of the *Conservation and Land Management Act 1984* Slippery Lake A Class Nature Reserve, being the protection of fauna and flora, are considered as an area of high conservation value and special significance.

The ANZECC and ARMCANZ 2000 criteria, specifically Section 3.3 physical and chemical stressors, Section 3.4 Table 3.4.1 trigger values for toxicants and Section 3.5 Table 3.5.1 sediment quality guidelines are not considered applicable as specific consequence criteria to the Slippery Lake ecosystem. The ANZECC and ARMCANZ 2000 criteria are not designed for application to temporary waters and saline lakes (see section 3.1.2.2 of ANZECC and ARMCANZ 2000). Site specific trigger levels are considered appropriate and this approach is supported within ANZECC and ARMCANZ 2000 and the Final EIA 2015 however, at this time there is insufficient information to develop and apply criteria for regulatory purposes.

Therefore, consequences will be considered with regards to impacts from the discharge of containment failure to the values of the Slippery Lake A Class Nature Reserve, including the aquatic ecosystem, riparian vegetation, flora and fauna.

Public health

The specific consequence criteria being considered with regards to the potential impacts to human receptors is ANZECC and ARMCANZ 2000, Section 5.2 *Guidelines for users in Australia* (Table 5.2.2) with regards to secondary contact criteria and nuisance organisms.

9.5.7 Licence Holder controls

The controls implemented by the Licence Holder are set out in row 'Section 9.5' of Table 19. In addition, the Delegated Officer has inferred that based on compliance with Condition 1 of Existing Licence the Licence Holder undertakes pond maintenance with regards to

stormwater, containment capacity and levels, vegetation and capturing floating debris.

This risk assessment has reviewed the controls set out in row 'Section 9.5' of Table 19. In addition the fencing of the land area outside of the Premises (depicted in Figure 1) that receives the discharge is considered as a control with regards to public health.

(31) Key Finding: The Delegated Officer notes that the Licence Holder will undertake further investigations into the potential impacts to the environment under the provisions of the *Contaminated Sites Act 2003* (see Section 5.2 of this Decision Report).

9.5.8 Key findings

The Delegated Officer has reviewed the information regarding discharge to land (treated sewage) and has found:

- (32) No alum dosing, chlorination or filtration of the treated sewage takes place prior to discharge.**
- (33) The Wagin sewage facility treated sewage cannot currently meet the ANZECC and ARMCANZ 2000 secondary contact criteria for *Escherichia coli* of 1000 cfu/100 mL.**
- (34) The current load of nutrients, particularly phosphorus, being discharged to the Slippery Lake catchment, increases the likelihood of cyanobacterial blooms.**

9.5.9 Consequence

Environment

If impacts from the discharge to land (treated sewage) occur, then the Delegated Officer has determined that the impact of the discharge to land (treated sewage) will be a short term impact to an area of high conservation significance. Therefore, the Delegated Officer considers the consequence of the impacts from the discharge to land (treated sewage) to the environment to be **Major**.

A reduction in the consequence to the environmental receptor from mid to long term down to short term impacts is considered appropriate based on the historical impacts to the receptor and the broader range of factors continuing to influence the health of the receptor.

Public health

If impacts from the discharge to land (treated sewage) occur, then the Delegated Officer has determined that the impact to human health will be of specific consequence criteria (ANZECC and ARMCANZ 2000, Section 5.2) being significantly exceeded. Therefore, the Delegated Officer considers the consequence of the impacts from the discharge to land (treated sewage) to human health to be **Severe**.

9.5.10 Likelihood of consequence

Environment

Increasing the likelihood of impact to environment occurring is (see Key Finding 23) that the catchment for the discharge of all treated sewage is Slippery Lake and the nature of anaerobic sulphate reduction within the sediment pore-water that all phosphorus within treated sewage discharged from the Wagin sewage facility must be considered as bioavailable and that over time phosphorus from the discharge of treated sewage migrates into Slippery Lake.

The Delegated Officer has determined that the likelihood of short term impact to an area of high conservation significance occurring could be at some time. Therefore, the Delegated Officer considers the likelihood of impact to Slippery Lake from the discharge to land (treated sewage) to the environment be **Possible**.

Public health

The Delegated Officer has determined that the likelihood of impacts to human health from specific consequence criteria (ANZECC and ARMCANZ 2000, Section 5.2) being significantly exceeded could occur at some time. Therefore, the Delegated Officer considers the likelihood of impact to Slippery Lake from the discharge to land (treated sewage) to human health to be **Rare**.

This decision takes into consideration the land affected by the discharge, location of fencing and subsequently, how reasonably human access to impacted land could occur.

9.5.11 Overall rating of discharge to land (treated sewage)

The Delegated Officer has compared the consequence and likelihood ratings described above with the Risk Rating Matrix (Table 16) and determined that the overall rating for the risk of discharge to land (treated sewage) is **High (Environment)** and **High (Public Health)**.

(35) The Delegated Officer considers that:

- (a) the nutrient concentration levels being discharged to the environment are not acceptable for the protection of environmental values; and**
- (b) the high risk to the environment is not consistent with the conservation of flora and fauna of the Slippery Lake A-Class Nature Reserve; and**
- (c) the risk from the continued discharge of treated sewage at the current quality and quantity is unacceptable.**

9.6 Risk Assessment – Odour

9.6.1 Description of odour emissions

Odour may be generated by the acceptance, storage and treatment of sewage wastes, removal and processing of sewage sludges. Sewage wastes can contain high loads of biochemical oxygen demand (BOD) and can also contain aromatic molecules; both can result in potentially odourous emissions. Odour emissions during the storage and treatment of sewage waste can be accentuated where pond waters undergo uncontrolled anaerobic reaction and/ or are overloaded with contaminants beyond the hydraulic and treatment capacity of the ponds; considered as foreseeable abnormal operating conditions.

9.6.2 Identification and general characterisation of emission

Odour emissions that impact receptors are expected to be periodic, of low frequency and short to medium term duration. Abnormal operating conditions may give rise to higher frequency and duration emission events. Wind plots presented in Figures 10 and 11 indicate the pathway via the airshed towards receptors is only present at some times.

9.6.3 Description of potential adverse impact from the emission

Odour can impact the amenity value for the receptor and can have secondary health impacts. Meteorological factors are expected to have a significant influence on the pathway for odour emissions and therefore the potential level of impact on receptors. Residential receptors are expected to be more sensitive than industrial receptors.

9.6.4 Criteria for assessment

No specific consequence criteria are applicable. The health, welfare, convenience, comfort and amenity of receptors are relevant in determining the consequence of odour emissions. The closest residential receptors are identified at 0.36 km from the sewage facility infrastructure. No odour complaints are noted on DWER's files in relation to the Premises.

9.6.5 Licence Holder controls

The controls implemented by the Licence Holder are set out in row 'Section 9.6' of Table 19. Desludging occurs on a periodic schedule, usually every 7-10 years based on the type of ponds at the Premises. In addition, the Delegated Officer has inferred that based on compliance with Condition 1 of Existing Licence the Licence Holder undertakes pond maintenance with regards to stormwater, containment capacity and levels, vegetation and capturing floating debris.

This risk assessment has reviewed the controls set out in row 'Section 9.6' of Table 19. This risk assessment has also considered that there is no chemical dosing based control system for pH.

9.6.6 Key findings

The Delegated Officer has reviewed the information regarding the potential impacts from odour emissions and has found:

(36) Under normal operating conditions odour emissions from the liquid waste facility should not impact receptors.

(37) Under normal operating conditions the pH of liquids within the pond system should be maintained between 6.5 and 8.5 to reduce the likelihood of odour emissions occurring.

9.6.7 Consequence

If impacts from the emission of odour occur, then the Delegated Officer has determined that the impact of the emission of odour will be local scale mid-level impact to amenity. Therefore, the Delegated Officer considers the consequence of the impacts from the emission of odour occur to be **Moderate**.

9.6.8 Likelihood of consequence

The Delegated Officer has determined that the likelihood of the emission of odour occurring and impacting receptors will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of impacts arising from the emission of odour to be **Unlikely**.

9.6.9 Overall rating of odour emissions

The Delegated Officer has compared the consequence and likelihood ratings described above with the Risk Rating Matrix (Table 16) and determined that the overall rating for the risk of impacts arising from the emission of odour is **Medium**.

9.7 Risk Assessment – Seepage

9.7.1 Description of seepage

Seepage from the sewage facility ponds is expected to occur continuously, the rate being subject to the permeability of the pond liner, substrate, separation distance to groundwater and subsequent hydraulic and biogeochemical processes within the pathway to Slippery Lake. Sewage and sewage sludge wastes could contain contaminants including heavy metals, nutrients, pathogens, phenols and surfactants that may be mobilised within seepage. All seepage is assumed to migrate to the superficial aquifer, located within the sandy clay with coarse grained sands above the pallid clays (≤ 6 mBGL) and flow towards Slippery Lake. Vegetation could be impacted prior to groundwater reaching Slippery Lake. The permeability of the pond liners and substrate has not been determined to inform the rate of groundwater flow. The hydraulic conductivity within the soil profile between approximately 4 and 6 mBGL (Sandy clay with coarse grained sands) is unknown and estimated at between 1 and 10 m/day (Final TI 2015, page 21), in the absence of large macropores.

9.7.2 Identification and general characterisation of emission

Seepage is expected to occur continuously from the sewage ponds and irregularly from the sludge drying hardstand. The rate of seepage from ponds will be subject to the hydraulic head within the ponds (0.96 – 1.79 m), permeability of the liner and soils (not known) and depth to groundwater (estimated 4 – 6 mBGL) and rate of groundwater flow within the superficial aquifer (not known). Mounding of groundwater below the ponds at the Premises is considered likely and estimated to be in the order of approximately 20 cm. Preferential flow paths for groundwater may occur within parts of the shallow soil profile. Some contaminants are expected to be bound within the local clayey soils, the capacity of local soils to bind contaminants will reduce with time as loading increases. Nitrogen and phosphorus are expected to be the main contaminants of concern within the seepage. The presence of an anaerobic seepage plume from the ponds could occur and would increase the likelihood of contaminants migrating along the pathway to Slippery Lake.

The boundary of the A Class Nature Reserve is approximately 650 m and an additional 150 m to the shoreline of Slippery Lake.

9.7.3 Description of potential adverse impact from the emission

Contaminants within the sewage could impact ecosystem services between the sewage facility and Slippery Lake and to the aquatic ecosystem of Slippery Lake, primary the influence of phosphorus and potential for cyanobacteria blooms to impact Slippery Lake. Expression of groundwater into Slippery Lake has been identified as occurring at certain times of year:

‘The direct connection between [Slippery] lake levels and the groundwater levels to the north and west confirm that the lake is a groundwater “window” (Final TI 2015, page 62).

Potential impacts are discussed in more detail in Section 9.5.3 of the Decision Report.

9.7.4 Criteria for assessment

The conservation values of the *Conservation and Land Management Act 1984* Slippery Lake A Class Nature Reserve, being the protection of fauna and flora, are considered as an area of high conservation value and special significance.

The ANZECC and ARMCANZ 2000 criteria, specifically Section 3.3 physical and chemical stressors, Section 3.4 Table 3.4.1 trigger values for toxicants and Section 3.5 Table 3.5.1 sediment quality guidelines are not considered applicable as specific consequence criteria to

the Slippery Lake ecosystem. The ANZECC and ARMCANZ 2000 criteria are not designed for application to temporary waters and saline lakes (see section 3.1.2.2 of ANZECC and ARMCANZ 2000). Site specific trigger levels are considered appropriate and this approach is supported within ANZECC and ARMCANZ 2000 and the Final EIA 2015 however, at this time there is insufficient information to develop and apply criteria for regulatory purposes.

Therefore, consequences will be considered with regards to impacts from the discharge of containment failure to the values of the Slippery Lake A Class Nature Reserve, including the aquatic ecosystem, riparian vegetation, flora and fauna.

9.7.5 Licence Holder controls

The controls implemented by the Licence Holder are set out in row 'Section 9.7' of Table 19.

This risk assessment has reviewed the controls set out in row 'Section 9.7' of Table 19. This risk assessment has also considered that:

- The Licence Holder has not been able to demonstrate the construction specifications or hydraulic conductivity of the pond clay liners;
- No ambient groundwater monitoring around the sewage facility pond infrastructure has previously taken place to help determine if seepage is occurring and may be causing an impact; and
- Following consultation with the Licence Holder on the draft Revised Licence a Detailed Site Investigation process has been initiated under the provisions of the *Contaminated Sites Act 2003*; in conjunction with the installation of new groundwater monitoring bores the requirements for any additional operational controls may be investigated.

The Delegated Officer has reviewed the information regarding the potential controls put in place by the Licence Holder and has found:

- (38) The presence of low permeability liners for the waste containment infrastructure (ponds and sludge drying hardstand) and the permeability of the natural soil profile have not been conclusively established.**
- (39) The text within the Plan AE36-L-2 'For soils investigation report see specification' has no supporting documentation and does not inform the risk assessment.**
- (40) The floor levels of the ponds are likely to achieve a separation distance to groundwater of $\geq 2\text{m}$ based on the pond dimensions submitted by the Licence Holder (pond floor levels estimated to 1.8 mBGL) and the soil profile established in the Final EIA 2015.**

9.7.6 Key findings

The Delegated Officer has reviewed the information regarding the potential impacts from seepage emissions and has found:

- (41) Insufficient information on the controls for seepage increases uncertainty in the risk assessment process.**
- (42) Phosphorus is the primary contaminant of concern for potential impacts from the emission of seepage.**
- (43) It is reasonable to expect some contaminants to be bound within the local**

clayey soils however, there is no information provided by the Licence Holder to indicate the capacity of the local soils to bind contaminants or the current contaminant loading of the soils or groundwater.

9.7.7 Consequence

If seepage occurs, then the Delegated Officer has determined that the impact of seepage on the Slippery Lake ecosystem will be short term to an area of high conservation significance. Therefore, the Delegated Officer considers the consequence of the impacts from seepage to Slippery Lake to be **Major**.

A reduction in the consequence to the environmental receptor from mid to long term down to short term impacts is considered appropriate based on the historical impacts to the receptor and the broader range of factors continuing to influence the health of the receptor.

9.7.8 Likelihood of consequence

The Delegated Officer has determined that the likelihood of major impacts from seepage to Slippery Lake occurring will probably not take place in most circumstances. Therefore, the Delegated Officer considers the likelihood of impacts from seepage to Slippery Lake to be **Unlikely**.

This determination has considered the likelihood of seepage emissions impacting the receptor in isolation of the discharge to land (treated sewage) and on the assumption that the ponds have an effective '300 [mm] *thick compacted clay lining*'.

9.7.9 Overall rating of impacts from seepage

The Delegated Officer has compared the consequence and likelihood ratings described above with the Risk Rating Matrix Table 16 and determined that the overall rating for the risk of impacts from seepage to Slippery Lake is **Medium**.

(44) Key Finding: the Delegated Officer considers that the impact of seepage, when considered cumulatively with the discharge to land (treated sewage), could occur at some time and is Possible. Subsequently, the overall rating for the risk of impacts from seepage to Slippery Lake, when the discharge to land (treated sewage) is occurring, is High. Cumulatively, the risk to the environment from seepage and discharge to land are considered unacceptable.

9.8 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 20 below. Controls are described further in section 10.

Table 20: Risk assessment summary

Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)	
Emission	Source	Pathway/ Receptor (Impact)				
Section 9.4	Discharge to land	Containment failure/ overtopping	Direct discharge to land, seepage to groundwater, to drainage channel/ Slippery Lake	See section 9.3.2, Table 18	Major Unlikely Medium risk	Acceptable subject to proponent controls conditioned / outcomes based controls
Section 9.5	Discharge to land	Treated sewage	Direct discharge to land, seepage to groundwater, overland flow to Slippery Lake	See section 9.3.2, Table 18	Major Possible High risk	Unacceptable
			Direct discharge to land, overland flow and public health	See section 9.3.2, Table 18	Severe Rare High Risk	Acceptable subject to regulatory controls
Section 9.6	Odour	Sewage/ sludge	Air / wind dispersion	See section 9.3.2, Table 18	Moderate Unlikely Medium risk	Acceptable subject to proponent controls conditioned / outcomes based controls
Section 9.7	Seepage	Ponds and sludge drying hardstand	Seepage to groundwater	See section 9.3.2, Table 18	Major Unlikely Medium risk	Acceptable subject to proponent controls conditioned / outcomes based controls
					<i>Cumulative – in conjunction with Discharge to land</i> Major Possible High risk	<i>Cumulative– in conjunction with Discharge to land</i> Unacceptable

10. Regulatory controls

A summary of regulatory controls determined to be appropriate for the Risk Event is set out in Table 21. The risks are set out in the assessment in section 9 and the controls are detailed in this section. DER will determine controls having regard to the adequacy of controls proposed by the Licence Holder. The Conditions of the Licence will be set to give effect to the determined regulatory controls.

Table 21: Summary of regulatory controls to be applied.

Risk Event emission source (see risk analysis in Section 9)	Licence Controls (# references are to sections below setting out details of controls)					
	10.1.1 Waste classification, acceptance and throughput	10.1.2 Waste processing	10.1.3 Infrastructure and equipment	10.1.4 Monitoring requirements	10.1.5 Discharge limits	10.1.6 Record keeping
1. Discharge to land (containment failure)	•	•	•			•
2. Discharge to land (treated sewage)	•	•	•	•	•	•
3. Odour	•		•			•
4. Seepage	•		•	•		•

10.1 Licence L6316/1991/13 controls

All Conditions from the Existing Licence have been deleted and replaced with the following Conditions of the Revised Licence. A copy of the Existing Licence is provided in Appendix 5.

New Condition 1 of the Revised Licence has been included to set the approvals and restrictions for emissions and discharges arising from the Primary Activities at the Premises and to set the scope of defences in accordance with the provisions of the EP Act.

10.1.1 Waste classification, acceptance and throughput

The Delegated Officer considers that Condition 2 of the Revised Licence is appropriate. The provisions of the Condition is consistent with previous approvals under the Existing Licence and Primary Activities undertaken by the Licence Holder.

Grounds: In accordance with DER's *Guidance Statement: Regulatory Principles* and *Guidance Statement: Setting Conditions*, Condition 2 restricts the type and volume of waste approved for acceptance consistent with the approval under the Existing Licence. The limit of 260 m³ is applied with consideration of short term increased inflows, assumed to arise from storm water infiltration within the sewage network and the fixed retention capacity of the sewage facility ponds. An annual average is not considered appropriate due to the level of variability recorded for the inflow volumes and subsequent impacts significant spikes in inflow volumes may have on the operation of the sewage facility. Condition 2 also restricts the methods of waste acceptance to those known to be used by the Licence Holder. These controls reflect the Licence Holder's method of operation and set limits to the scope of this risk assessment process.

10.1.2 Waste processing

The Delegated Officer considers that Condition 3 of the Revised Licence is appropriate. The provisions of the Conditions are consistent with previous approvals under the Existing Licence and Primary Activities undertaken by the Licence Holder.

Grounds: In accordance with DER's *Guidance Statement: Regulatory Principles* and *Guidance Statement: Setting Conditions* Condition 3 is consistent with the Licence Holder's critical stages of the process to treat sewage. The acceptance of sewage and treatment through an alternate process must be considered with regards to Section 53 of the EP Act.

10.1.3 Infrastructure and equipment

The Delegated Officer considers that Conditions 4 and 5 of the Revised Licence are appropriate. Under Condition 6, in addition to the commitments made by the Licence Holder, the maintenance of the pH value within pond waters and groundwater monitoring bore requirements have been included with the Conditions.

Grounds: In accordance with DER's *Guidance Statement: Regulatory Principles* and *Guidance Statement: Setting Conditions*:

- (a) Condition 4 is generally consistent with the Licence Holder's infrastructure commitments to control the process for treating sewage; and
- (b) Condition 5 defines the minimum new groundwater monitoring bore specifications required to help inform the risk of potential impact from emissions of seepage justified through the risk assessment for seepage (see Section 9.7 of this Decision Report). Under Condition 5(b)(iii), included in the provision to construct three new groundwater monitoring bores, is the requirement to assess the permeability of the local soils (different methods are specified to reflect the different soil types) and to log the soil types encountered during bore construction with the appropriate standard.

(45) Key Finding: The Delegated Officer notes that the minimum requirements for the pond liners and the minimum separation distance from the base of the ponds are not specified as infrastructure controls within Condition 4. The presence and adequacy of the controls have not been determined at this time and are addressed through Conditions 5, 10 and 14 of the Revised Licence.

10.1.4 Monitoring requirements

The Delegated Officer considers that Conditions 6, 7, 8, 9 and 10 of the Revised Licence are appropriate. The Delegated Officer considers that:

- Condition 6 is appropriate to ensure accuracy and reliability in the monitoring data required by Conditions 8 and 9.
- Condition 7 is appropriate for considering the hydraulic load placed on the sewage facility infrastructure and when considering the treated sewage discharge quality and quantity. The data may also inform an assessment of seepage rates from the ponds.
- Condition 8 is appropriate for considering the risk to receptors from discharge to land (treated sewage). Additional parameters (copper, oil and grease) are considered appropriate considering the nature of the Primary Activity and relationship between contaminant loads in treated sewage, total suspended solids, copper, algae and risk to receptors.

- Condition 9 is appropriate for considering the integrity of containment systems and risk to receptors from seepage emissions.
- Condition 10 is appropriate for considering the uncertainty regarding the integrity of containment systems and risk to receptors from seepage emissions. Estimating the seepage rate and subsequently the rate of nitrogen and phosphorus emissions from the ponds will be considered in conjunction with groundwater and soil data to inform the risk assessment for seepage emissions.

Grounds: In accordance with DER's *Guidance Statement: Setting Conditions* the monitoring requirements are appropriate to validate assessment predictions and provide assurance of the effectiveness of Conditions for infrastructure and operation, addressing uncertainty and for transparency. Together groundwater standing water levels, groundwater quality results, soil permeability analysis, pond seepage rate assessment and separation distance to groundwater distances will inform the assessment of risk to the environment from seepage (see Condition 14 under Section 10.1.6 of this Decision Report).

10.1.5 Discharge limits

The Delegated Officer considers that Condition 11 of the Revised Licence is appropriate.

Grounds: In accordance with *Guidance Statement: Regulatory Principles* and *Guidance Statement: Setting Conditions* the provisions of the Condition 11 are consistent with the risk assessment for the discharge of treated sewage (see Section 9.5 of this Decision Report). The timeframe for the cessation of discharges of current quality and quantity to Slippery Lake, being until 30 June 2023, is commensurate to the risk of foreseeable impacts from the discharge to land (treated sewage):

- based on the currently available information; and
- takes into consideration the timeframes and potential outcomes of the processes under the *Contaminated Sites Act 2003*.

(46) Key Finding: The Delegated Officer considers that the discharge of treated sewage at the current quality and quantity from Discharge Point L1 is not acceptable and that the timeframe set by Condition 11 is reasonable, commensurate to the risk, for the Licence Holder to undertake investigations in accordance with the *Contaminated Sites Act 2003* and adequately inform an assessment of alternate treated sewage discharge options.

10.1.6 Record keeping and reporting

The Delegated Officer considers that Conditions 12, 13, 14, 15, 16 and 17 of the Revised Licence are appropriate. The Delegated Officer considers that:

- Condition 12 is reasonable and appropriate for records keeping and when / if making information available.
- Condition 13 is reasonable and appropriate should the Licence Holder receive complaints.
- Condition 14 is reasonable and appropriate to inform the risk assessment for seepage. The seepage test results, separation distance to groundwater, permeability test results and methods of calculation will be considered collectively. If the groundwater level is above the base of the pond at the time of the test, this is likely to influence the results. If the seepage rates from the ponds are considered to be too high, additional regulatory controls may be required.

The concentration of total nitrogen is expected to be in the range of approximately 30-40 mg/L and the concentration of total phosphorus is expected to be in that range of approximately 8-9 mg/L within seepage.

Grounds: The risk to groundwater increases with reduced separation distance and increased loads of seepage. If the separation distance is not sufficient, seepage from ponds may be a significant source of groundwater contamination. The report will be used to determine the appropriateness of the pond systems and validate the effectiveness of the control measures (pond liner, hydraulic heads on the liner and separation distance to groundwater). The appropriateness and adequacy of the pond liners, head and separation distance to groundwater will be considered based on the details of the report. Additional controls may be required to mitigate the risk from any ponds that do not have a sufficient separation distance.

- Condition 15 is consistent with the *Guidance Statement: Regulatory Principles* and *Guidance Statement: Publication of Annual Audit Compliance Reports*.
- Condition 16 requires annual submissions, commensurate with the findings of the risk assessments.
- Condition 17 is reasonable and appropriate should a Department Request be made.

Grounds: In accordance with *Guidance Statement: Setting Conditions* the record keeping requirements are appropriate to validate assessment predictions and provide assurance of the effectiveness of Conditions for infrastructure and operation and for transparency.

11. Determination of Licence conditions

The Conditions in the issued Revised Licence in Attachment 1 have been determined in accordance with DWER's *Guidance Statement: Setting Conditions*. Table 22 provides a summary of the conditions to be applied to this licence.

DWER's *Guidance Statement: Licence Duration* has been applied and the issued licence expires in 16 years from date of issue (being 31 October 2033). The expiry date was granted an extension from 31 October 2016 to 31 October 2033 in the Notice of Amendment dated 29 April 2016.

Table 22: Summary of conditions to be applied.

Condition Ref	Grounds
Emissions: Condition 1	This condition is valid, risk-based and consistent with the EP Act. These conditions are valid, risk-based and contain appropriate controls consistent with the EP Act.
Waste classification, acceptance and throughput: Conditions 2	
Waste processing: Condition 3	
Infrastructure and Equipment: Conditions 4 and 5	
Monitoring Requirements: Conditions 6, 7, 8, 9 and 10	
Discharge limits: Condition 11	

Condition Ref	Grounds
Record Keeping and reporting: Conditions 12, 13, 14, 15, 16 and 17	These conditions are valid and 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.

Table 23 lists that the Licence Conditions that have been imposed beyond the commitments of the Licence Holder and that are amendments or additions to the Conditions of the Existing Licence.

Table 23: Summary of conditions applied beyond the commitments of the Licence Holder.

Condition Ref	Elements
Condition 1(a)(i)	As specified against the relevant conditions.
Condition 3(f)	The management of leachate from the sludge drying hardstand
Condition 4 item 2(c) and 2(d)(ii)	Maintenance of stormwater and pond pH range.
Condition 4 item 3(c) and 3(d)(ii)	Maintenance of stormwater and pond pH range.
Condition 4 item 4 (b)	Operation of the copper ioniser dosing.
Condition 4 item 5(c) and 5(d)(ii)	Maintenance of stormwater and pond pH range.
Condition 4 item 8	Groundwater monitoring bores (all).
Condition 5	Groundwater monitoring bores (all).
Condition 6 - 10	Monitoring requirements: <ul style="list-style-type: none"> • Monitoring standards. • Inflow monitoring. • Treated sewage monitoring, additional parameters (copper, oil and grease and algae). • Groundwater monitoring (all). • Seepage monitoring.
Condition 11	Discharge limit.
Condition 12	Record keeping.
Condition 13	Complaints management.
Condition 14	Reporting on seepage risk.
Condition 16	Reporting and specification of monitoring data presentation.
Condition 17	Department Request.

12. Licence Holder's comments

The Licence Holder was provided with the draft Decision Report and draft Revised Licence on 12 March 2018. The Licence Holder provided comments which are summarised, along with DWER's response, in Appendix 3.

13. 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 Revised Licence will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.



Ruth Dowd
Senior Manager Waste Industries
Delegated Officer
under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Key documents

	Document title	In text ref	Availability
1	Penn 1997, <i>A systematic overview of environmental values of the wetlands, rivers and estuaries of the Busselton-Walpole region</i> , Water and Rivers Commission.	Penn 1997	accessed at https://www.water.wa.gov.au/data/assets/pdf_file/0019/5383/9763.pdf
2	Conservation Commission of Western Australia 2011, <i>Position Statement No. 5 June 2011</i> .	<i>Position Statement No. 5 June 2011</i>	accessed at http://www.conservation.wa.gov.au/media/14265/drainage%20ps%205.pdf
3	URS Australia Pty Ltd 2011, <i>An independent feasibility study of treating large saline reserves east of the Darling Escarpment Final Report Contract No. DOW1710</i> .	URS 2011	accessed at https://www.water.wa.gov.au/data/assets/pdf_file/0018/4266/100114.pdf
4	Part V EP Act amended Licence L6316/1991/13 granted 7 June 2012	Existing Licence	DWER records (A513777)
5	Department of Health letter dated 21 March 2014 <i>Re: Shire of Wagin recycled water scheme – Department of Health Approval is now rescinded</i> .	DoH 2014	DWER records (A743597)
6	Water Corporation 2014, <i>Wagin Wastewater Treatment Plant Draft Environmental Improvement Plan</i> (received 28 April 2014).	Draft EIP 2014	DWER records (A752536)
7	Water Corporation 2014, <i>Annual Environmental Report Wagin WWTP 1 July 2013 to 30 June 2014</i> (received September 2014).	AER 2014	DWER records (A801600)
8	Water Corporation letter dated 26 November 2014 <i>Wagin Wastewater Treatment Plant L6316/1991/13: Licence amendment</i> ; includes attached <i>Form P4</i> and <i>Supporting documentation for licence amendment</i> (received 26 November 2014).	Application	DWER records (A838777)
9	Hydrobiology Pty Ltd 2015, <i>Wagin WWTP Environmental Investigations Technical Data Report</i> attachments (received 21 August 2015): <ul style="list-style-type: none"> • <i>Appendix 1 Water quality data summary</i>. • <i>Appendix 3 Benthic algae data</i>. • <i>Appendix 4 Zooplankton data</i>. • <i>Appendix 5 Macroinvertebrate data</i>. 	TI Attachments 2015	DWER records (A966631) <ul style="list-style-type: none"> • (A966632) • (A966630) • (A966629) • (A966634)
10	Water Corporation 2015, <i>Annual Environmental Report Wagin WWTP 1 July 2014 to 30 June 2015</i> (received September 2015):	AER 2015	DWER records (A967454)
11	Water Corporation 2015, <i>Wagin Wastewater Treatment Plant Environmental Improvement Plan</i> (received 25 November 2015).	Final EIP 2015	DWER records (A1038115)
12	Hydrobiology Pty Ltd 2015, <i>Wagin WWTP Environmental Impact Assessment Report to the Department of Environmental Regulation Final – June 2015</i> (received 10 December 2015).	Final EIA 2015	DWER records (A1038117)
13	Hydrobiology Pty Ltd 2015, <i>Wagin WWTP Environmental Investigations Technical Data Report Draft – May 2015</i> (received 10 December 2015).	Draft TI 2015	DWER records (A1157878)

	Document title	In text ref	Availability
14	Hydrobiology Pty Ltd 2015, <i>Wagin WWTP Environmental Investigations Technical Data Report Final – May 2015</i> (received 4 August 2016).	Final TI 2015	DWER records (A1142946)
15	Water Corporation 2016, <i>Annual Environmental Report Wagin WWTP 1 July 2015 to 30 June 2016</i> (received September 2016).	AER 2016	DWER records (A1157878)
16	Department of Environment Regulation letter dated 11 May 2017, <i>Environmental Protection Act 1986 - proposed amendment to licence</i> (sent 11 May 2017).	N/A	DWER records (A1428439)
17	Water Corporation 2017, <i>Annual Environmental Report Wagin WWTP 1 July 2016 to 30 June 2017</i> (received September 2017).	AER 2017	DWER records (A1520787)
18	Water Corporation email dated 13 June 2017 <i>Wagin WWTP L6316 – response to queries re licence amendment application.</i>	Water Corporation 2017	DWER records (A1450027)
19	Department of Water and Environmental Regulation letter to Shire of Wagin dated 10 July 2017, <i>Environmental Protection Act 1986 – Review of Wagin Wastewater Treatment Plant.</i>	N/A	DWER records (A1469436)
21	Department of Water and Environmental Regulation letter to Department of Biodiversity, Conservation and Attractions dated 10 July 2017, <i>Environmental Protection Act 1986 – Review of Wagin Wastewater Treatment Plant.</i>	N/A	DWER records (A1492875)
22	Department of Biodiversity, Conservation and Attractions letter dated 8 August 2017 - <i>Environmental Protection Act 1986 – Review of Wagin Wastewater Treatment Plant.</i>	N/A	DWER records (A1504364)
23	Shire of Wagin letter dated 21 August 2017 – RE: <i>Review of Wagin Wastewater Treatment Plant – Lic. L6316/1991/13.</i>	N/A	DWER records (A1508500)
24	Department of Water and Environmental Regulation letter to Water Corporation dated 12 March 2018	N/A	DWER records (A1638547)
25	Water Corporation letter dated 21 June 2018, <i>Wagin Wastewater Treatment Plant L6316: Further commentary on Draft Licence and Decision Report.</i>	Water Corporation 2018	DWER records (A1696109)
26	Department of Environment Regulation July 2015, <i>Guidance Statement: Regulatory principles.</i>	<i>Guidance Statement: Regulatory principles</i>	accessed at http://www.dwer.wa.gov.au
27	Department of Environment Regulation October 2015, <i>Guidance Statement: Setting conditions.</i>	<i>Guidance Statement: Setting conditions</i>	
28	Department of Environment Regulation August 2016, <i>Guidance Statement: Licence duration.</i>	<i>Guidance Statement: Licence duration</i>	
29	Department of Environment Regulation February 2017, <i>Guidance Statement: Risk Assessments.</i>	<i>Guidance Statement: Risk Assessments</i>	
30	Department of Environment Regulation February 2017, <i>Guidance Statement: Decision Making.</i>	<i>Guidance Statement: Decision Making</i>	
31	Department of Environment Regulation November 2016, <i>Guidance Statement: Environmental Siting.</i>	<i>Guidance Statement: Environmental Siting</i>	
32	Department of Environment Regulation February 2017, <i>Guidance Statement: Land Use Planning.</i>	<i>Guidance Statement: Land Use Planning</i>	

	Document title	In text ref	Availability
33	Department of Environment Regulation May 2016, <i>Publication of Annual Audit Compliance Reports.</i>	<i>Publication of Annual Audit Compliance Reports</i>	
34	Department of Environment Regulation July 2013, <i>Enforcement and prosecution policy</i>	<i>Enforcement and prosecution policy</i>	

Appendix 2: Summary of stakeholder comments

Comments received	Environmental risk	DER consideration of risk:
<ul style="list-style-type: none"> • (the then) Department of Parks and Wildlife, 9 February 2016: In response to referral of the Final EIP 2015 and Final EIA 2015: ‘... based on currently available information, this application for waste water disposal is unlikely to cause any impact to known significant biodiversity values’. 	<ul style="list-style-type: none"> • Discharge to land (treated sewage) 	<ul style="list-style-type: none"> • Further information, in the form of the Technical Expert Reports, was provided to the Department of Biodiversity Conservation and Attractions for consideration.
<ul style="list-style-type: none"> • Department of Biodiversity, Conservation and Attractions (DBCA), 8 August 2017: In response to referral of the Technical Expert Reports (attached to this Decision Report), DBCA: <ul style="list-style-type: none"> (i) ‘... supports the technical reports and interpretation of the general information concerning the underlying threatening process, changes to the nature and composition of the environment at Slippery Lake, and the statements regarding the potential for water birds to be impacted ...’; (ii) ‘... suggests that any monitoring program should focus on potential negative elements derived from the waste water treatment plant as described in the technical reports including the risk of elevated hydro periods caused by increase water flow’; (iii) considers that emission limits ‘should be set at standards that do not exceed environmental limits for wildlife and human health’; (iv) considers that the discharge from the sewage facility is not within the context of the Conservation and Parks Commission <i>Position Statement 5: Drainage</i>; (v) ‘... impacts on lands ... should be either positive or neutral...’ and ‘... due to a lack of data ...’ this cannot be determined. (vi) ‘... supports further investigations prior to approval to determine the level of impacts and risks ... on the environment and human health’. 	<ul style="list-style-type: none"> • Discharge to land (treated sewage) 	<ul style="list-style-type: none"> (i) Noted. (ii) Noted, contaminants in the discharge of treated sewage have been considered in Section 9.5 of this Decision Report and monitoring is required under Condition 8 and Schedule 3 of the Revised Licence. (iii) Noted, limits for human health have been considered in Section 9.3.1 of this Decision Report, being that the ANZECC and ARMCANZ 2000 Section 5.2 secondary contact criteria of <i>Escherichia coli</i> concentration of 1000 cfu/ 100 mL is applicable for the discharge of treated sewage. Limits for ‘wildlife’ have not been established in the context of the discharge and receiving environment in this Decision Report. (iv) Noted. (v) Noted, decisions regarding reasonably foreseeable Risk Events impacting land are detailed in Sections 9.4, 9.5 and 9.7 of this Decision Report. (vi) DWER has established a position on the reasonably foreseeable risk as documented in this Decision Report.

Comments received	Environmental risk	DER consideration of risk:
<ul style="list-style-type: none"> • Shire of Wagin, 8 August 2017: <ul style="list-style-type: none"> (i) <i>'Slippery Lake is not used by the public'.</i> (ii) There are no matters or decisions regarding planning approvals or the Town Planning Scheme that relate to the Premises. (iii) Understand <i>'... that the Water Corporation is planning to pipe the overflow from the ponds approx. 200m towards Slippery Lake then open drain the overflow further into the Lake'.</i> 	<ul style="list-style-type: none"> • Discharge to land (treated sewage) 	<ul style="list-style-type: none"> (i) Noted, this is considered further in Section 8.2 of this Decision Report. (ii) Noted. (iii) Noted, as per Key Finding 2 of this Decision Report any proposals by the proponent beyond the boundary of the Premises have been excluded from the scope of the risk assessment.

Appendix 3: Summary of Licence Holder's comments on risk assessment and draft conditions

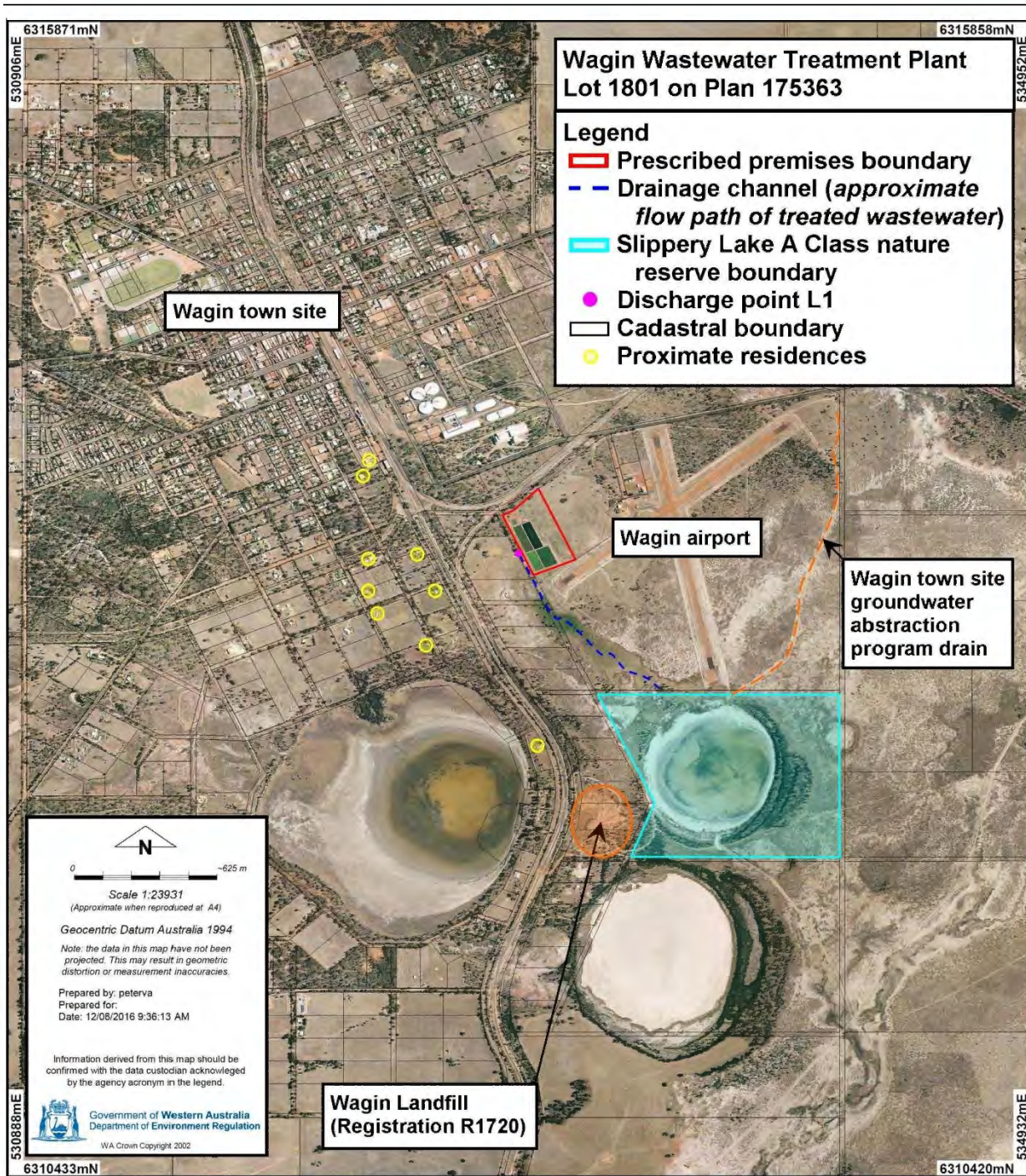
Condition/ Section	Summary of Licence Holder comment	DWER response
<p>Water Corporation submitted a response on 21 June 2018 to the referral of a draft Revised Licence and draft Decision Report dated 12 March 2018. Commentary was received on many areas of the referred documents, including requests for clarification from Water Corporation, comments on operations at the sewage facility, comments on the application on Conditions and the withdrawal of the actions proposed under the Application and within the Environmental Improvement Plan. In addition, Water Corporation made a referral under the <i>Contaminated Sites Act 2003</i> regarding the lands receiving the discharge to land between the Premises and Slippery Lake. Updates and amendments were made throughout the Decision Report consistent with the clarifications, comments changes to the Application and commensurate to regulatory obligations and risk.</p>		
Revised Licence		
Condition 3	Clarification of treatment infrastructure and questioning the level of detail prescribed in some of the conditions.	Condition amended according to clarifications and to provide greater flexibility for sludge management.
Condition 4	Clarification of treatment infrastructure. Questioning the level of detail prescribed regarding sludge management.	Condition amended according to clarifications. Amended to approve 'drain and dry' sludge management.
Condition 5	Date clarification.	Three month period maintained.
Condition 7	Monitoring location clarified.	Condition amended according to clarifications.
Condition 9	Date clarification.	Three month period maintained.
Condition 10	Date clarification. Alternate seepage monitoring method proposed.	Date of completion maintained 31 December 2018 Methodology amended to be consistent with proposed changes and require the primary assumptions and uncertainty in the methodology to be detailed. Results will be considered in conjunction with new groundwater monitoring bore data.

Condition/ Section	Summary of Licence Holder comment	DWER response
<p>Condition 11</p>	<p>Request discharge cessation date of 30 June 2019 not be included and take into consideration commitments consistent with obligations under the <i>Contaminated Sites Act 2003</i> that include:</p> <ul style="list-style-type: none"> • Preliminary site investigation. • Pond seepage investigation and new groundwater monitoring bores. • Development of a sampling, analysis and quality plan for the detailed site investigation process. <p>The entire investigation and planning processes is expected to take approximately two years.</p>	<p>In consideration of the following factors the timeframe for the cessation of discharge has been extended from June 2019 to June 2023:</p> <ul style="list-style-type: none"> • The role the investigations required under the <i>Contaminated Sites Act 2003</i> will play in addressing uncertainties in the risk assessment for discharge to land (<i>particularly along the pathway between Discharge Point L1 and the Slippery Lake environment</i>); • The length of time that the discharge has been occurring in respect to the additional four years approved the Revised Licence. • The broader context of the environment that the discharge is occurring to. <p>The timeframe provides approximately two years for the investigations required under the <i>Contaminated Sites Act 2003</i> to be completed and an additional two years for any appropriate actions to be undertaken. Alternately the investigation may find that the discharge is not unreasonable and the limit may be removed.</p> <p>Removing the discharge limit entirely was not considered appropriate or commensurate to the risk. Replacing the discharge limit with stages of the investigations required under the <i>Contaminated Sites Act 2003</i> or required outcomes was not considered appropriate, valid or consistent with the <i>Guidance Statement: Setting Conditions</i>.</p> <p>The limit is for treated sewage at the current quantity and quality based on the current risk assessment and available information. Outcomes of the investigations required under the <i>Contaminated Sites Act 2003</i> will inform this assessment and appropriate conditions commensurate to risk.</p>
<p>Condition 14</p>	<p>Date comment.</p>	<p>Date specified as 1 March 2019, relatively consistent with timeframe indicated in the referral process.</p>
<p>Premises plan</p>	<p>Updates recommended based on previous comments.</p>	<p>Premises plan updated.</p>

Condition/ Section	Summary of Licence Holder comment	DWER response
Decision Report		
4.2 Operational aspects	Clarification of copper dosing process.	Section amended according to clarifications.
4.3 Infrastructure.	Clarification of copper storm water control infrastructure.	Item deleted, no dedicated storm water management infrastructure is identified at the Premises.
4.4 Environmental Improvement Plan	Clarification of copper dosing process.	Section amended according to clarifications.
4.4 Key Finding	Clarification that no approval for actions associated with the 'infiltration channel' are being sought.	Section edited to read: <i>The Delegated Officer notes that the Licence Holder considers that actions associated with the discharge and receiving environment are provided a defence under Section 53(1)(g) or 53(2)(d) of the EP Act, being 'for the purpose of general maintenance'. No approval is being sought under Section 59(2) of the EP Act (Water Corporation 2017; Water Corporation 2018)</i>
9.3.1 Licence Holder controls	Clarification of copper dosing and monitoring location. Comments regarding monitoring of treated sewage. Clarification of desludging. Clarification of seepage controls and available information.	Section amended according to clarifications. Due to a formatting error the highlighted content was noted to have been interpreted to relate to the Discharge Point L1, rather than the copper dosing unit; section deleted in consideration of the updates to section 4.2. Section amended according to clarifications. Section amended according to clarifications.
9.4.5 Licence Holder controls	Clarification addressing uncertainty in what controls were applicable.	Commentary added to summarise controls and remove uncertainty in controls used by the Licence Holder

Condition/ Section	Summary of Licence Holder comment	DWER response
9.4.6 Key Finding	Clarification about controls and overflow event.	<p>Key Finding 29 was deleted, amended key findings read:</p> <ul style="list-style-type: none"> • <i>One event of overtopping is known to have occurred at the Premises, being in February 2017 from the eastern embankment of Primary Pond 2 and coinciding with a reported three day rainfall event of 185.6 mm; and</i> • <i>that any hydraulic overloading of the sewage facility will be directed through Discharge Point L1 and that overtopping of a pond will only occur in circumstances such as a system blockage.</i> <p>Overtopping event noted to be reported under ICMS 43944.</p>
9.5.7 Licence Holder controls	Clarification addressing uncertainty in what controls were applicable.	Section amended according to clarifications.
9.5.8 Key Finding	Clarification addressing uncertainty in what controls were applicable.	Key Finding deleted.
9.6.5 Licence Holder controls	Clarification addressing uncertainty in what controls were applicable.	Section amended according to clarifications. The absence of a chemical dosing based control system for pH was noted.
9.7.5 Licence Holder controls	Clarification addressing seepage controls.	<p>Section amended and additional statement included:</p> <p><i>Following consultation with the Licence Holder on the draft Revised Licence a Detailed Site Investigation process has been initiated under the provisions of the Contaminated Sites Act 2003; in conjunction with the installation of new groundwater monitoring bores the requirements for any additional operational controls may be investigated.</i></p>
10.1.5 Discharge limits	<p>Request discharge cessation date of 30 June 2019 not be included and take into consideration commitments consistent with obligations under the <i>Contaminated Sites Act 2003</i> (see commentary against Condition 11 above).</p> <p>EIP infiltration channel project withdrawn.</p>	<p>See comments against Condition 11 above. Timeframe for the cessation of discharge has been extended from June 2019 to June 2023.</p> <p>Withdrawal noted and assessment amended accordingly.</p>

Appendix 4: Overview map of Premises



Appendix 5: Copy of Existing Licence granted 7 June 2012

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Environmental Protection Act 1986

AMENDED LICENCE

LICENCE NUMBER: L6316/1991/13

FILE NUMBER: DEC9051

LICENSEE AND OCCUPIER:

Water Corporation
659 Newcastle Street
Leederville WA 6007

NAME AND LOCATION OF PREMISES:

Wagin Wastewater Treatment Plant
Crown Reserve 31096
Wagin WA 6315

Environmental Protection Regulations 1987

CLASSIFICATION(S) OF PREMISES:

Category 54 Sewage Facility

COMMENCEMENT DATE OF LICENCE: Tuesday 1 November 2011

EXPIRY DATE OF LICENCE: Monday 31 October 2016

CONDITIONS OF LICENCE:

As described and attached:

Issued delegated under Section 20
of the *Environmental Protection Act 1986*

Date of Issue: Thursday, 20 October 2011

Date of Amendment: Thursday, 7 June 2012

PRINTED ON RECYCLED PAPER

WESTERN AUSTRALIA

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Environmental Protection Act 1986

LICENCE NUMBER: L6316/1991/13

FILE NUMBER: DEC 9051

PREAMBLE

Applicability

This licence is issued to the Water Corporation for the operation of the Wagin Wastewater Treatment Plant located at Crown Reserve 31096, Wagin as depicted in Attachment 1, which is a prescribed premises within Schedule 1 of the *Environmental Protection Regulations 1987*, as outlined in Table 1.

Table 1: Category under which Wagin WWTP is prescribed.

Category number	Category name	Description
54	Sewage facility	Premises – (a) on which sewage is treated (excluding septic tanks); or (b) from which treated sewage is discharged onto land or into waters.

The Wagin Wastewater Treatment Plant includes, but is not limited to, the following operations:

- (i) The treatment of wastewater in four treatment ponds (two primary ponds in parallel, followed by a secondary and tertiary pond) to a secondary standard, and
- (ii) Discharge of the treated wastewater to the Shire of Wagin, for reuse by irrigation of Public Open Space (POS), and surplus discharge to a nearby salt lake in winter months as depicted in Attachment 2.

Nominal Rated Throughput

The conditions of this licence have been developed based upon the assessment of the plant operating at the following throughput:

- The nominal design capacity: 260m³ (cubic metres) per day

Odour Control

The licensee should manage and operate the premises such that odours emanating from the premises do not unreasonably interfere with the health, welfare, convenience, comfort or amenity of any person.

Emergency, Accident or Malfunction

The licensee should inform the Director as soon as practicable of the identification of any discharge of waste which has occurred as a result of an emergency, accident or malfunction, or extreme weather conditions, otherwise than in accordance with any condition of this licence and has caused or is likely to cause pollution.

Alteration to Premises

Prior to making any significant alterations to the premises which may affect the air, water or noise emissions from the premises the licensee must submit a proposal to the Director accompanied by supporting information and plans which allow the environmental impact of that change to be assessed.

General Requirements

The following statements reflect important sections of the *Environmental Protection Act 1986* and are included for the information of the licensee:

- (i) The licensee should take all reasonable and practicable measures to prevent pollution of the environment.

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- (ii) Noise emissions from operations on site are required to comply with the *Environmental Protection (Noise) Regulations 1997*.
- (iii) The licensee should take all reasonable and practicable measures to prevent or minimise the discharge of waste and the emission of noise, odours or electromagnetic radiation from the premises.
- (iv) The licensee should inform the Director at least 24 hours prior to the commencement of any planned non-standard operations, which may have the potential to cause pollution.

CONDITIONS OF LICENCE

DEFINITIONS

In these conditions of licence, unless inconsistent with the text or subject matter:

"AS or Australian Standard" means the most recent version (unless otherwise stated) of the specified Australian Standard published by Standards Australia International Ltd, Sydney,

"AS/NZS5867 or Australian Standard 5867" means the most recent version and the relevant parts of the Australian and New Zealand series of guidance standards on Water Quality Sampling.

"ANZECC water quality guidelines" means the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000), as amended from time to time, developed under the National Water Quality Management Strategy;

"APHA-AWWA-WEF" means American Public Health Association Water Works Association, Water Environment Federation

"biosolids guideline" means the "Western Australian Guidelines for Direct Land Application of Biosolids and Biosolids Products", (February 2002), Department of Environmental Protection, Water and Rivers Commission, Department of Health;

"BOD or Biochemical Oxygen Demand" means a water quality indicator which is reported in mg/L of oxygen and is a measure of the amount of oxygen used in the biochemical oxidation of organic matter in wastewater or a slurry and is generally tested over a period of 5 days under specified conditions (referred to as BOD₅).

"Director" means Director, Environmental Regulation Division of the Department of Environment and Conservation for and on behalf of the Chief Executive Officer as delegated under Section 20 of the *Environmental Protection Act 1986*;

"Director" and "Department of Environment and Conservation" for the purpose of correspondence means-

"Director" for the purpose of correspondence means-

Regional Manager, Wheatbelt Region
Department of Environment and Conservation

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PO Box 100
Narrogin WA 6312

Telephone: (08) 9621 3400
Facsimile: (08) 9621 3410

"discernible" means capable of being seen, noticed or observed;

"hardstand" means an area with a prepared (sealed) or natural surface which has a low permeability (i.e. having a hydraulic conductivity of less than 10^{-9} metres per second at unit hydraulic gradient) which prevents escapes of any liquids from the surface into the subsoil and groundwater.

"inform" and "advise" means advise by telephone, e-mail or facsimile in writing;

"Landfill Definitions" means the Landfill Waste Classification and Waste Definitions 1996 (As amended December 2009) Department of Environment and Conservation;

"m³/day" means cubic metres per day;

"mg/L" means milligrams per litre.

"NATA" means National Association of Testing Authorities;

"odour sensitive premises" means any land or building that is used as a residence, guest house, hotel, motel, caravan park, school, church, hospital, or as an office or consulting rooms, where such office or consulting rooms are not located in an industrial area; and

"premises" for the purpose of this licence means the Wagin Wastewater Treatment Plant located at Reserve 31096, Wagin, as depicted in Attachment 1.

WATER POLLUTION CONTROL CONDITIONS

MAINTENANCE OF WASTEWATER TREATMENT PONDS

1. The licensee shall manage the wastewater treatment ponds in a manner such that:
 - (a) uncontaminated stormwater runoff resulting from roof and site drainage shall be prevented from entering the wastewater treatment ponds or causing the erosion of outer pond embankments;
 - (b) overtopping of the wastewater treatment ponds shall not occur;
 - (c) there is no discernible seepage loss from the ponds;
 - (d) vegetation (emergent or otherwise) shall be prevented from growing in the pond wastewaters or on the inner pond embankments; and
 - (e) trapped overflows shall be maintained on the discharge from all waste water treatment ponds to prevent carry-over of surface floating matter to subsequent ponds.
2. The licensee shall maintain a sampling point in the outlet pipe from the final treatment pond so that samples can easily be obtained from this point.

DISCHARGE FROM THE WASTEWATER TREATMENT PONDS

3. The licensee shall direct all wastewater from the wastewater treatment ponds for reuse or discharge to a watercourse via the wastewater outlet pipe from the final treatment pond.

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FLOW MONITORING DEVICE

4. The licensee shall maintain a device for measuring monthly cumulative volumes of treated wastewater discharged from the treatment plant to
 - (a) The Shire of Wagin's Reuse Program; and
 - (b) The drainage channel to the salt lake
5. The licensee shall present the monthly flow results in the next Annual Monitoring Report in tabular form.

TREATED WASTEWATER SAMPLING REQUIREMENTS

6. The licensee shall collect all wastewater samples in accordance with the relevant parts of Australian Standard 5667

ENVIRONMENTAL MONITORING PROGRAM

7. The licensee shall conduct a monitoring program which measures the parameters stated in column 2 of Table 2 at the frequency stated in column 3 of Table 2, using the corresponding methods listed in column 4 of Table 2 at the final effluent sample point location.

Table 2: Monitoring parameters

Column 1	Column 2	Column 3	Column 4
Monitoring Site	Parameters to be monitored	Sampling frequency	Method
Outlet pipe from the final pond	(i) pH (ii) Total Dissolved Solids (calculated from conductivity) (iii) Total suspended Solids (iv) Filtered 5-Day Biochemical Oxygen Demand (v) Total-nitrogen (vi) ammonium-nitrogen (vii) Nitrate+Nitrite-Nitrogen (viii) Total-phosphorus (ix) <i>E. coli</i>	Monthly	AS/NZS 5607.1.1998 Standard Methods for Examination of Water and Wastewater - APHA-AWWA-WEF

With the exception of pH and *E. coli*, all measurements are to be reported in mg/L.

8. The licensee shall submit all water samples to a NATA accredited laboratory for the analyses specified in condition 6 and 7 for analysis in accordance with the 'Standard Methods for Examination of water and Wastewater-APHA-AWWA-WEF'.

CALCULATION OF CONTAMINANT LOAD

9. The licensee shall determine the monthly load of each contaminant in the treated wastewater discharged from the final pond (except pH and *E. coli*) using flow weighted data. The loads shall be based on the treated wastewater discharge rates and the concentrations as measured in accordance with conditions 6 and 7. Monthly and annual average loads of the contaminants shall be reported in the annual monitoring report in kilograms per day (kg/day).

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ODOUR

10. The licensee shall ensure that odour emitted from the premises does not unreasonably interfere with the health, welfare, convenience, comfort or amenity of any person who is not on the premises.

SOLID WASTE POLLUTION CONTROL CONDITIONS

POND AND SOLIDS MANAGEMENT

11. The licensee shall dispose of collected vegetation and floating debris from the treatment ponds to a licensed landfill.
12. The licensee shall:
- (a) inform the Director prior to taking a treatment pond offline for maintenance works;
 - (b) inform the Director no less than 14 days prior to the removal of sewage sludge from a treatment pond;
 - (c) where sewage sludge is temporarily stored on-site, direct sewage sludge to a hard-stand area or approved drying bed which:
 - (i) is adequately bunded to prevent surface runoff of leachate or sludge from crossing the boundary of the premises;
 - (ii) where possible, returns sludge leachate from the storage area back to the treatment ponds
13. The licensee shall dispose of sludge and biosolids in accordance with the biosolids guideline or Land Definitions

ENVIRONMENTAL IMPROVEMENT PLAN

- 14 (a). The licensee shall submit to the Director an Environmental Improvement Plan by 31 December 2013.
- (b) The Environmental Improvement Plan shall incorporate actions and associated completion dates to achieve the objective of meeting the ANZECC water quality guidelines for surface water discharge of effluent into the lake by the 31 December 2017.
15. The licensee shall complete the actions in the approved Environmental Improvement Plan by the dates specified in the plan.

MONITORING AND REPORTING

16. The licensee shall provide to the Director, **1 September each year**, an Annual Monitoring Report containing data collected over the previous financial year (**1 July to 30 June**). The report shall contain:
- (a) monitoring data or other collected data required by any condition of this licence;
 - (b) an assessment of data against the targets set or any together environmental guidelines, or policies referred to in this licence and data from the previous years; monitoring;
 - (c) a summary of any data exceeding those targets including information as to why the exceedances occurred (if known) and action taken by the licensee to prevent recurrence of such exceedances;
 - (d) an explanation of the monitoring results with respect to the environmental impacts of the project;

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- (e) a summary of the number and type of complaints received and action taken; and
 - (f) any changes to site boundaries, location of groundwater monitoring bores, surface drainage channels and on-site or off-site impacts or pollution.
- 15 The licensee shall by **1 September** in each year, provide to the Director an Annual Audit Compliance Report in the form in Attachment 3 to this licence, signed and certified in the manner required by Section C of the form, indicating the extent to which the licensee has complied with the conditions of this licence, and any previous licence issued under Part V of the Act for the Premises, during the period beginning **1 July** the previous year and ending on **30 June** in that year.

Officer delegated under Section 20
of the *Environmental Protection Act 1986*

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ATTACHMENT 1: Plan of Premises
 Wagin Wastewater Treatment Plant located at Reserve 31096, Wagin



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Attachment 2 - Discharge salt lake



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ATTACHMENT 3: Annual Audit Compliance Report

SECTION A

LICENCE DETAILS

Licence Number:	Licence File Number:
Company Name:	ACN:
Trading as:	
Reporting period:	to

STATEMENT OF COMPLIANCE WITH LICENCE CONDITIONS

1. Were all conditions of licence complied with within the reporting period? (please tick the appropriate box)

Yes Please proceed to Section C

No Please proceed to Section B

Each page must be Initialed by the person(s) who signs Section C of this annual audit compliance report

INITIAL: _____

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SECTION B

DETAILS OF NON-COMPLIANCE WITH LICENCE CONDITION.

Please use a separate page for each licence condition that was not complied with.

a) Licence condition not complied with?	
b) Date(s) when the non compliance occurred, if applicable?	
c) Was this non compliance reported to DEC?	
<input type="checkbox"/> Yes <input type="checkbox"/> Reported to DEC verbally Date _____ <input type="checkbox"/> Reported to DEC in writing Date _____	<input type="checkbox"/> No
d) Has DEC taken, or finalised any action in relation to the non compliance?	
e) Summary of particulars of non compliance, and what was the environmental impact?	
f) If relevant, the precise location where the non compliance occurred (attach map or diagram)	
g) Cause of non compliance	
h) Action taken or that will be taken to mitigate any adverse effects of the non compliance	
i) Action taken or that will be taken to prevent recurrence of the non compliance	

Each page must be initialed by the person(s) who signs Section C of this annual audit compliance report

INITIAL: _____

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SECTION C - SIGNATURE AND CERTIFICATION

This Annual Audit Compliance Report may only be signed by a person(s) with legal authority to sign it. The ways in which the Annual Audit Compliance Report must be signed and certified, and the people who may sign the statement, are set out below. Please tick the box next to the category that describes how this Annual Audit Compliance Report is being signed. If you are uncertain about who is entitled to sign or which category to tick, please contact the licensing officer for your premises.

If the licence holder is	The Annual Audit Compliance Report must be signed and certified:
An individual	<input type="checkbox"/> by the individual licence holder; or
	<input type="checkbox"/> by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
A firm or other unincorporated company	<input type="checkbox"/> by the principal executive officer of the licensee; or
	<input type="checkbox"/> by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
A corporation	<input type="checkbox"/> by affixing the common seal of the licensee in accordance with the Corporations Act 2001; or
	<input type="checkbox"/> by two directors of the licensee; or
	<input type="checkbox"/> by a director and a company secretary of the licensee; or
	<input type="checkbox"/> if the licensee is a proprietary company that has a sole director who is also the sole company secretary – by that director; or
	<input type="checkbox"/> by the principal executive officer of the licensee; or
	<input type="checkbox"/> by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
A public authority (other than a local government)	<input type="checkbox"/> by the principal executive officer of the licensee; or
	<input type="checkbox"/> by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment and Conservation.
A local government	<input type="checkbox"/> by the chief executive officer of the licensee; or
	<input type="checkbox"/> by affixing the seal of the local government.

It is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give information on this form that to their knowledge is false or misleading in a material particular. There is a maximum penalty of \$50,000 for an individual or body corporate.

We declare that the information in this annual audit compliance report is correct and not false or misleading in a material particular.

SIGNATURE: _____ SIGNATURE: _____

NAME: (printed) _____ NAME: (printed) _____

POSITION: _____ POSITION: _____

DATE: ____/____/____ DATE: ____/____/____

SEAL (if signing under seal)

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Appendix 6: Technical Expert Report 10 March 2016



Government of **Western Australia**
Department of **Environment Regulation**

REPORT

Technical Expert

Advice on Environmental Assessment and Improvement Plans for wastewater disposal to Slippery Lake in Wagin prepared for Industry Regulation

Version: Final

10 March 2016

Info base number



Document control

Document version history

Date	Expert name / position	Version	Role
10 March 2016	Mr Steve Appleyard	Draft	Author
10 March 2016	Mr Andrew Miller	Final	Reviewer

Corporate file information

File number and/or name	File owner or custodian	File location
DER2016/000916	Industry Regulation	Objective server

Technical Expert (Advice/Report)



Produced and published by
Department of Environment Regulation
168 St Georges Terrace, Perth, Western Australia

Template Version 6, May 2015

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Accessibility This document is available in alternative formats and languages upon request.

Technical Expert (Advice/Report)



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Expert's details

Personal details: Author

Name	Mr Steve Appleyard
Employer	Department of Environment Regulation
Position title	Principal Hydrogeologist
Classification level	SC5
Recognised field of expertise	The author is recognised as an expert by the Department of Environment Regulation in hydrogeology and geochemistry

Qualifications and experience

The qualifications and experience and technical capability relevant to the provision of this advice is as follows:

Qualification

Qualification	Year obtained	Additional comments
Ph.D. in Hydrogeochemistry	1987	

Professional experience

Employer	Position	Tenure
Various since 1982		

Other – Publications/memberships/associations etc

Author of more than 40 peer-reviewed papers.

Adjunct Professor in the School of Earth and Environment, University of Western Australia

Associate Editor of the international science journal "Earth and Environmental Sciences"

Purpose of this report, limitations and disclaimer

This is technical expert advice prepared by experts employed within the Department of Environment Regulation for the purposes set out in the "Advice summary details" and should not be used for any other purpose.

The State of Western Australia and Department of Environment Regulation and their servants and agents expressly disclaim liability, in negligence or otherwise, for any act or omission occurring in reliance on the information contained in this document, or for any incident or consequential loss or damage of such act or omission.

In preparing this report the technical experts have considered the request made, the information and materials provided in support of the request, literature relevant to the field, and other evidence the expert is aware of and can access through their expert capacity.

The report is based on the information provided to the experts, which is summarised in the "Advice summary details". Relevant materials that were not provided could materially change the advice. The requesting organisation needs to use appropriate judgment about the information that is relevant to the request, and the possible implications of any information that was not provided.

Where requests made require input from more than one area of technical expertise, the advice will be provided separately. Each advice will consider technical issues relevant to the specific field of expertise. No effort is made to integrate the issues raised by different technical fields. It is the responsibility of the regulatory organisation requesting the advice to determine how to weight the various matters they need to consider, and the relevance of the advice on any particular matter to making their decisions.

The interpretation of this technical expert report, and decisions about how the advice it contains should be considered in undertaking regulatory functions are matters for the recipient organisation to determine. The Department of Environment Regulation accepts no responsibility for the use or misuse of the advice, or the consequences of decisions made in reference to it.

The advice provided is limited to technical expert advice, and author(s) **have not** considered any aspect of regulatory matters that could come within the scope of legislation administered by the Department of Environment Regulation, either currently or at some time in the future. As such, the report does not purport to represent the Department of Environment Regulation's views on how such matters may be considered by the Department of Environment Regulation in its regulatory capacity. If advice is required on the Department of Environment Regulation's position on how it would consider matters relevant to its regulatory functions, a separate request for advice must be made.

Advice summary details

TO:	Ruth Dowd – Industry Regulation (Waste Industries)
PREPARED BY:	Steve Appleyard
REVIEWED BY:	Andrew Miller
SUBJECT	Environmental Assessment and Improvement Plans for wastewater disposal to Slippery Lake in Wagin

* The details of these experts is summarised below (see Expert's details).

This advice was prepared for Ruth Dowd in response to the request dated 1 March 2016. I have provided advice according to the scope below.

Scope of advice
Advice on potential impacts and risks associated with discharge of treated effluent from the Wagin wastewater treatment plant into Slippery Lake.

In support of this request, Industry Regulation (Waste Industries) made the following materials and documents available. These materials form the basis of this technical expert advice.

Material / document name	Type of resource / description
Water Corporation 2015, <i>Wagin Wastewater Treatment Plant Environmental Improvement Plan</i> .	Electronic document (A1038115)
Hydrobiology Pty Ltd 2015, <i>Wagin WWTP Environmental Impact Assessment Report to the Department of Environmental Regulation Final – June 2015</i>	Electronic document (A1038117)
Hydrobiology Pty Ltd 2015, <i>Wagin WWTP Environmental Investigations Technical Data Report Draft – May 2015 (including appendices)</i>	Electronic document (A1038118)
Email dated 10 February 2016 from the Department of Water to Department of Environment Regulation, <i>Wagin Wastewater Treatment Plant</i>	Electronic document (A1056370)

In preparing this advice I have considered the information provided with the request. I have also:

- Undertook a literature review of relevant information.

My expert advice is as follows:

Responses to queries from Waste Industries:

- Public contact with water in Slippery Lake should be discouraged due to the presence of anaerobic sediments with pore water that contains elevated concentrations of dissolved ammonia, sulfides and organic carbon. Levels of coliform bacteria in excess of 1000 cfu/100mL and enterococci microorganisms in excess of 230 cfu/100 mL in lake water are a potential public health risk and should be referred to the Department of Health for further advice. Concentrations of algal cells in excess of 15 000 cells/mL in lake water are also a potential health risk and should also be referred to the Department of Health for advice;
- The most significant environmental risk for the wetland is the formation of toxic cyanobacterial blooms due to excessive inputs of N and P. There are also potential risks for bird populations from selenium and mercury inputs to the lake, but this risk has yet to be assessed;
- Recommended interim discharge limits for N, P and BOD for treated effluent from the treatment plant are 30, 15 and 5 mg/L respectively. These values should be revised if ongoing monitoring and modelling suggests that N and P concentrations in the water column in the lake were to exceed 1.5 and 0.1 mg/L respectively for long periods as a result of discharge from the treatment plant; and
- Technical investigations that have been undertaken on behalf of Water Corporation are deficient as they have not adequately assessed contaminants of environmental concern in the wastewater, have not adequately identified current and potential impacts on environmental receptors, have not indicated whether the current wastewater discharge practices are sustainable, and have not indicated appropriate concentration limits and targets for the wastewater discharge.

1. Potential public health and environmental impacts of wastewater disposal to Slippery Lake

The reports that were prepared by Hydrobiology have correctly identified Slippery Lake as having a highly altered ecosystem due to progressive salinization of the system. This has been caused by regional rises in the elevation of the water table associated with historical land clearing for agriculture. The change in salinity is likely to have caused large changes in biogeochemical processes that take place in sediments beneath the lake, and the interaction of sediment pore-water with water in the lake is likely to have also significantly altered the profile of potential public health and environmental risks associated with the lake.

1.1 *Water quality criteria for public access to the lake*

It is likely that the increased salinity (and sulfate content) of groundwater discharge to Slippery Lake has caused sulfate reduction to become the dominant biogeochemical process for metabolising organic carbon in the lake sediments, and will have

generated a large amount of black, organic- and sulfide-rich material at the bottom of the lake. As a consequence of this, there is a high probability that pore-water in lake sediments will greatly exceed the ANZECC 2000 water quality criteria for recreational use of the lake for at least ammonium, sulfides and dissolved organic matter (refer to Table 5.2.3 in the ANZECC 2000 guidelines; ANZECC, 2000). This would mean that human contact with the lake should be discouraged, although the Department of Health would have to provide additional advice on the potential health significance of this issue, and on whether signage would be required to limit public contact with lake water and sediments. Potential public health risks associated with anaerobic, sulfidic sediments in Slippery Lake are likely to have been exacerbated by the discharge elevated nutrient concentrations in the treated sewage effluent that discharges into the lake.

The factors of primary health concern for human contact with water in the lake are the presence of potentially pathogenic microorganisms and toxins that may be associated with blooms of cyanobacteria (see the following section for more detail about this issue). As indicated by the Department of Health, levels of coliform bacteria in the water should not exceed 1000 cfu/100 mL to minimise potential health risks associated with contact with the lake water (refer to Table 5.2.2 in the ANZECC 2000 guidelines). Table 5.2.2 in the ANZECC 2000 guidelines also indicates that public contact with water in the lake should be avoided if the concentration of enterococci microorganisms exceeds 230 cfu/100 mL and if the density of algal cells in the water exceeds about 15 000 cells/mL. As levels of *E. coli* in the effluent ditch from the wastewater treatment plant periodically exceed 1000 cfu/100 mL, signage or fencing may be required to minimise the risk of public contact with water in the ditch.

1.2 *Environmental criteria associated with the discharge of N, P and BOD to the lake*

The Hydrobiology reports have correctly indicated that the ANZECC 2000 water quality guidelines for aquatic ecosystems are of limited value for assessing the potential environmental effects of the discharge of wastewater to Slippery Lake. This is because Slippery Lake is a highly altered aquatic system which is changing progressively over time due to the effects of salinization. However, the ANZECC 2000 guidelines also provide a methodology for developing site-specific water quality criteria which has not been done for this site.

Investigations by the Department of Environment (DoE, 2005) have indicated that as the salinity of lakes like Slippery Lake in the WA wheatbelt increase, vegetation in the wetlands shifts from being dominated by aquatic macrophytes like *Ruppia* species to benthic algal mats, with a change in state taking place somewhere in the salinity range of 20-90 g/L total dissolved solids (Fig. 1). If the increased salinity is accompanied by increases in phosphorus inputs, the aquatic macrophytes are replaced by phytoplankton rather than benthic algal mats if the concentration of P in the lake lies somewhere in the range of 50 to 150 µg/L (Fig.1). Under these conditions, there is a high risk that toxic cyanobacteria would form blooms in the lake and could harm water birds that use the lake as a source of food. Toxic cyanobacteria also have the potential to cause health problems for humans, pets, wildlife and livestock that come into skin contact with a bloom of some species of these microorganisms.

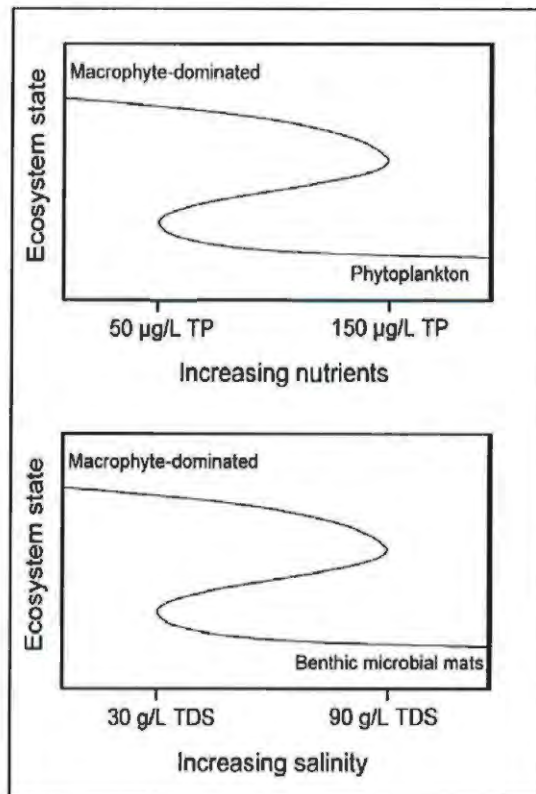


Figure 1. Potential stable states for Wheatbelt salt-lake ecosystems based on salinity and phosphorus loading (from DoE, 2005)

The Environmental Assessment Plan that was prepared by Hydrobiology indicates that Slippery Lake currently only algal species, suggesting that the lake has passed the ecological transition point from aquatic macrophyte to algal dominance. Under these conditions, there is a high risk that relatively small increases in nutrient concentrations in water in the lake could increase the risk of toxic blooms of cyanobacteria occurring.

Typically, a range of field and laboratory based studies are required to develop site-specific nitrogen and phosphorus water quality criteria to reduce the risk of toxic cyanobacteria blooms taking place in a water body. However, in the absence of such studies at Slippery Lake, it is recommended that a statistical approach is used to set interim license conditions for wastewater discharge to this lake. In this approach it is assumed that the monitoring of the quality of treated effluent from the Wagin treatment plant that has been undertaken until now establishes a baseline. Nitrogen, phosphorus and Biological Oxygen Demand (BOD) concentrations that exceed the 80th percentile values can be considered to be significant outliers in this dataset that may have the potential to cause environmental impacts in Slippery Lake that would require further investigation. These values can therefore be used as interim license conditions for discharge from the Wagin wastewater treatment plant.

Using the monitoring data that have been provided, the 80th percentile N, P and BOD concentrations for wastewater discharge from the Wagin wastewater treatment plant have been determined to be about 30, 15 and 5 mg/L respectively. Using these values as license conditions will help determine the potential contribution of the wastewater treatment plant to environmental conditions on Slippery Lake, but does not account for other potential sources of nutrient inputs such as the effects of agricultural runoff and the ongoing discharge of pumped groundwater effluent to the lake from dewatering operations that are taking place to limit the effects of the rising water table in Wagin. However, it is likely that discharge from the wastewater treatment plant is the dominant source of nutrients that are input into the lake.

It is recommended that these values are only used as interim discharge license conditions as they are not necessarily protective of environmental receptors in Slippery Lake. Consequently, an additional assessment using a chemical mixing model to determine what would be acceptable nutrient concentrations in the wastewater discharge given target concentrations in the water column in the lake that takes into account other nutrient inputs to the lake (from direct groundwater discharge and from the direct discharge of saline effluent pumped from groundwater in Wagin). Work undertaken by the Victorian EPA (Vic EPA, 2010) recommends nitrogen and phosphorus concentrations in the water column in wetlands like Slippery Lake should be maintained below 1.5 and 0.1 mg/L respectively for as long as possible to limit the risk of algal blooms occurring in the wetland, and these concentration limits could be used in such a mixing model. If this target is not attainable, the proponents should develop site-specific nutrient concentration targets for the lake that would limit the risk of toxic algal blooms taking place.

1.3 *Potential environmental impacts of toxic chemical species in wastewater discharge*

Treated wastewater contains a range of chemical constituents at concentrations that are potentially harmful to environmental receptors in Slippery Lake. Although many of these chemical constituents (particularly many metals) would be removed by the infiltration of wastewater through sulfidic sediments before contact with lake water, levels of selenium and mercury in the wastewater discharge have the potential to be at concentrations that can be sufficiently biomagnified in local food webs in the lake to affect shore- and wading-birds that utilise the lake as a source of food.

This is because both selenium and mercury can be methylated by sulfate-reducing bacteria in highly eutrophic benthic sediments which can increase the mobility, bioavailability and toxicity of these elements in aquatic ecosystems. This is especially the case in eutrophic saline wetlands which are essentially closed systems where ongoing inputs of these elements and high rates of evapotranspiration have the potential to cause a high rate of biomagnification of selenium and mercury in local food webs (Wurtsbaugh *et al.*, 2012).

As it is likely that there is also a significant input of mercury into Slippery Lake from atmospheric deposition, it is important that the contribution from the wastewater treatment plant is measured. Similarly, it is likely that the discharge of 600 m³/day of saline groundwater from dewatering in Wagin is also contributing selenium to the lake. Therefore it is recommended that mercury and selenium concentrations in the effluent ditch are measured to determine the role the wastewater treatment plant is playing in discharging these elements to the lake.

Given that no water quality criteria have been specifically developed for saline wetlands like Slippery Lake, it is recommended that existing ANZECC 2000 water quality criteria for mercury and selenium are used to set discharge limits for the Wagin wastewater treatment plant. Additionally, given the level of degradation of the wetland it is recommended that criteria for protecting 80% of the species are used. On this basis, the recommended discharge limit for mercury is 1.4 µg/L and the recommended discharge limit for selenium is 17 µg/L.

Irrespective of the contribution of the wastewater treatment plant, it is recommended that additional sampling is undertaken in Slippery Lake to determine whether selenium and mercury levels in the lake pose a risk to the health of birds that use the lake as a source of food. Investigations on similar saline wetlands in the USA have indicated that water quality sampling in these wetlands does not provide a good indicator of the threat that selenium and mercury poses to the health of bird populations, and it is generally recommended that the levels of these elements in bird tissue or in invertebrates that form part of the diet of the birds are tested instead (Evers *et al.*, 2008; Utah DEQ, 2008). On the basis of these studies and in the absence of any site-specific information, the following levels of mercury in bird tissue or dietary items (aquatic macroinvertebrates and insects) are considered to be of environmental concern for birds that utilise Slippery Lake as a source of food:

Element	Bird Feathers (µg/g)	Bird Eggs (µg/g)	Diet (µg/g)
Mercury	40	1.3	0.16
Selenium	-	16	5.7

2. Limitations of the environmental impact assessment undertaken for Slippery Lake

The nationally-recognised steps for assessing and regulating a wastewater discharge to a surface water body like Slippery Lake are outlined in a flowchart in Figure 2.

This flowchart and additional details provided by the Queensland Department of Environment and Heritage Protection (Queensland DEHP, 2009) provides a useful framework to assess the information provided by Water Corporation and its consultants for determining the potential public health and environmental impacts of wastewater discharge to Slippery Lake.

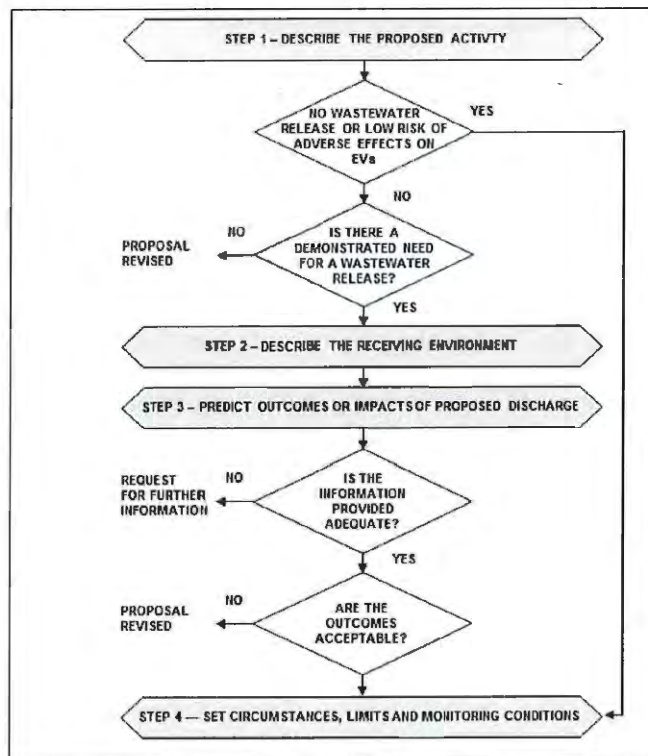


Figure 2. Process for assessing and regulating the impacts of wastewater discharge to a surface water body (from Queensland DEHP, 2009)

2.1 Step 1- Describe the wastewater discharge

The Queensland DEHP guidelines indicate that the following information should be provided in Step 1 of the wastewater discharge assessment process:

- Define the magnitude of the wastewater discharge
- Identify contaminants of concern in the wastewater
- Assess the characteristics of the proposed release
- Confirm use of best practicable measures
- Indicate level of risk that the wastewater discharge poses to receptors based on its characteristics

From the information provided and the discussion in previous sections in this memo, it is clear that Water Corporation has largely moved on from this step as wastewater discharge has been already taking place to Slippery Lake for a prolonged period. However, insufficient information has been provided about potential contaminants of concern in the wastewater, or whether the proposed discharge method (via infiltration to the lake) would meet the criteria of being the best applicable measure to protect environmental receptors in the lake. These information gaps would make it difficult for Water Corporation to justify why wastewater discharge to Slippery Lake should be allowed to continue.

2.2 Step 2 – Describe the receiving environment

The Queensland DEHP guidelines indicate that the following information should be provided in Step 2 of the wastewater discharge assessment process:

- Provide all relevant information on the receiving environment
- Identify all relevant environmental values and water quality objectives
- Ensure that other inputs of contaminants from the catchment are considered

Much of the work in the Hydrobiology reports addresses issues in this assessment step. A lot of information has been provided about water quality and the aquatic receptors in Slippery Lake, but the most sensitive receptor group (bird populations that utilise the lake) was not identified. As discussed in previous sections in this memo, nutrient and other contaminant inputs to Slippery Lake from other sources in the catchment have not been quantified. This is a major information gap, as it is not currently possible to identify the total loads of contaminants of concern that are being input to the lake, which would affect the discharge limits that may be set for wastewater inputs to the lake.

2.2 Step 3 – Predict the impacts of wastewater releases

The Queensland DEHP guidelines indicate that the following information should be provided in Step 3 of the wastewater discharge assessment process:

- Assess whether contaminants in the wastewater are potentially toxic
- Consideration of mixing zones between the discharge point and the surface water body
- Predict the assimilative capacity of the receiving water body and the sustainability of the wastewater discharge
- Justify the choice and application of predictive models that are used in the assessment
- Consider other potential impacts on the surface water body

Issues outlined in the above dot points have been largely neglected in the Hydrobiology reports, which means that no objective criteria could be set for contaminant concentrations, loads and associated effects that can be used to set targets and license conditions for wastewater discharge at the site. Consequently, in the absence of any other information, I have used statistical methods and literature values to provide interim criteria for nutrient, selenium and mercury concentrations in environmental media that could be used to set interim license conditions for wastewater discharge at the site until additional information has been made available. The Hydrobiology reports seem to conclude that site-specific water quality criteria are not necessary as the current level of biodiversity of the Slippery Lake is a good indicator of the health of the system. This is not necessarily the case as eutrophic water bodies can have a high level of productivity and a moderate level of biodiversity, but are not necessarily healthy and can cause significant impacts of sensitive receptors like bird populations.

2.2 Step 4 – Set conditions, limits and monitoring requirements

The Queensland DEHP guidelines indicate that the following information should be provided in Step 4 of the wastewater discharge assessment process:

- Set any conditions related to the approved wastewater release
- Derive end-of-pipe (discharge point) limits from approved release loads and characteristics
- Include a monitoring program for the receiving environment
- Include reporting requirements for the approved activity

Although there is an existing license for the site with environmental monitoring conditions, it is recommended that this is reviewed in light of the information gaps identified above.

References

- ANZECC (Australian and New Zealand Conservation Council), 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Volume 1: The Guidelines*. National Water Quality Management Strategy Paper No 4. The report is available from web site www.environment.gov.au.
- DoE (Department of Environment), 2005. *The Ecology of Wheatbelt Lakes*. Water Notes for River Management, No. WN 33. The document is available from web site www.water.wa.gov.au
- Evers, D.C., Savoy, L.J., DeSorbo, C.R., Yates, D.E., Hansom W., Taylor, K.M., Siegel, L.S., Colley, J.H., Vogel, H.S., Schoch, N., Goodale, M.W. and Fair, J., 2008. Adverse effects from environmental mercury loads on breeding common loons. *Ecotoxicology*, **17**, 69-81. The paper is available from web site www.researchgate.net.
- Utah Department of Environmental Quality (DEQ), 2008. *Development of a Selenium Standard for the Open Waters of the Great Salt Lake*. Utah DEQ Technical report available from web site http://www.deq.utah.gov/locations/G/greatsaltlake/gsl_wqsc/GLS_Selenium_Standards/index.htm.
- Queensland DEHP, 2009. *Wastewater Release to Queensland Waters*. DEHP Technical guideline EM 112 available from web site www.ehp.qld.gov.au
- Vic EPA, 2010. *Environmental Quality Guidelines for Victorian Lakes*. Vic EPA Publication 1302 which is available from web site www.epa.vic.gov.au.
- Wurtsbaugh, W.A., Marcarelli, A.M. and Boyer, G.L., 2012. *Eutrophication and Metal Concentrations in Three Bays of the Great Salt Lake (USA)*. Final Report for 2009 to the Utah Division of Water Quality, Salt Lake City, Utah, 70pp.

In addition to the information in the “Purpose of this report, limitations and disclaimer” section, important limitations relevant to this specific advice are detailed under “Specific limitations of this advice” below.

Specific limitations of this advice

This advice was produced assuming that the information provided in the reviewed reports is correct.

Expert’s details

Personal details: Reviewer

Name	Andrew Miller
Employer	Department of Environment Regulation
Position title	Senior Manager Contaminated Sites
Classification level	SC5
Recognised field of expertise	The reviewer is recognised as an expert by the Department of Environment Regulation in Contaminated Sites.

Qualifications and experience

The qualifications and experience and technical capability relevant to the provision of this advice is as follows:

Qualification

Qualification	Year obtained	Additional comments
B Eng. (Civil)	1991	

Professional experience

Employer	Position	Tenure
Department of Environment Regulation	Contaminated Sites	2005 - present
Golder Associates	Environmental Consultant	2002-2005
Parsons Brinkerhoff	Environmental Consultant	1992-2002

Other – Publications/memberships/associations etc

Member Australian Land and Groundwater Association

Contaminated Environments Network

Member of the technical working group for CRC Technical Report No 34: A practitioners guide for the analysis, management and remediation of LNAPL

Signatures

Author Name Steve Appleyard	Signature
Position Principal Hydrogeologist	Date 10 March 2016
Reviewer Name Andrew Miller	Signature 
Position Senior Manager Contaminated Sites	Date 10 March 2016

Appendix 7: Technical Expert Report 9 August 2016



Government of **Western Australia**
Department of **Environment Regulation**

REPORT

Technical Expert

*Advice on Environmental Assessment and Improvement Plans
for wastewater disposal to Slippery Lake in Wagin – Additional
advice prepared for Industry Regulation*

Version: Final

9 August 2016

Infobase number



Document control

Document version history

Date	Expert name / position	Version	Role
9 August 2016	Mr Steve Appleyard	Draft	Author
9 August 2016	Mr Andrew Miller	Final	Reviewer

Corporate file information

File number and/or name	File owner or custodian	File location
DER2016/000916	Industry Regulation	Objective server

Technical Expert (Advice/Report)



Produced and published by
Department of Environment Regulation
168 St Georges Terrace, Perth, Western Australia

Template Version 6, May 2015

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Accessibility This document is available in alternative formats and languages upon request.

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Expert's details

Personal details: Author

Name	Mr Steve Appleyard
Employer	Department of Environment Regulation
Position title	Principal Hydrogeologist
Classification level	SC5
Recognised field of expertise	The author is recognised as an expert by the Department of Environment Regulation in hydrogeology and geochemistry

Qualifications and experience

The qualifications and experience and technical capability relevant to the provision of this advice is as follows:

Qualification

Qualification	Year obtained	Additional comments
Ph.D. in Hydrogeochemistry	1987	

Professional experience

Employer	Position	Tenure
Various since 1982		

Other – Publications/memberships/associations etc

Author of more than 40 peer-reviewed papers.
Adjunct Professor in the School of Earth and Environment, University of Western Australia
Associate Editor of the international science journal "Earth and Environmental Sciences"

Purpose of this report, limitations and disclaimer

This is technical expert advice prepared by experts employed within the Department of Environment Regulation for the purposes set out in the “Advice summary details” and should not be used for any other purpose.

The State of Western Australia and Department of Environment Regulation and their servants and agents expressly disclaim liability, in negligence or otherwise, for any act or omission occurring in reliance on the information contained in this document, or for any incident or consequential loss or damage of such act or omission.

In preparing this report the technical experts have considered the request made, the information and materials provided in support of the request, literature relevant to the field, and other evidence the expert is aware of and can access through their expert capacity.

The report is based on the information provided to the experts, which is summarised in the “Advice summary details”. Relevant materials that were not provided could materially change the advice. The requesting organisation needs to use appropriate judgment about the information that is relevant to the request, and the possible implications of any information that was not provided.

Where requests made require input from more than one area of technical expertise, the advice will be provided separately. Each advice will consider technical issues relevant to the specific field of expertise. No effort is made to integrate the issues raised by different technical fields. It is the responsibility of the regulatory organisation requesting the advice to determine how to weight the various matters they need to consider, and the relevance of the advice on any particular matter to making their decisions.

The interpretation of this technical expert report, and decisions about how the advice it contains should be considered in undertaking regulatory functions are matters for the recipient organisation to determine. The Department of Environment Regulation accepts no responsibility for the use or misuse of the advice, or the consequences of decisions made in reference to it.

The advice provided is limited to technical expert advice, and author(s) **have not** considered any aspect of regulatory matters that could come within the scope of legislation administered by the Department of Environment Regulation, either currently or at some time in the future. As such, the report does not purport to represent the Department of Environment Regulation's views on how such matters may be considered by the Department of Environment Regulation in its regulatory capacity. If advice is required on the Department of Environment Regulation's position on how it would consider matters relevant to its regulatory functions, a separate request for advice must be made.

Advice summary details

TO:	Ruth Dowd – Industry Regulation (Waste Industries)
PREPARED BY:	Steve Appleyard
REVIEWED BY:	Andrew Miller
SUBJECT	Environmental Assessment and Improvement Plans for wastewater disposal to Slippery Lake in Wagin – Additional advice

* The details of these experts is summarised below (see Expert's details).

This advice was prepared for Ruth Dowd in response to the request dated 1 March 2016. I have provided advice according to the scope below.

Scope of advice
Additional information to evaluate the EIA document for the proposal that was provided by Hydrobiology Pty Ltd on behalf of Water Corporation.

In support of this request, Industry Regulation (Waste Industries) made the following materials and documents available. These materials form the basis of this technical expert advice.

Material / document name	Type of resource / description
Water Corporation 2015, <i>Wagin Wastewater Treatment Plant Environmental Improvement Plan</i> .	Electronic document (A1038115)
Hydrobiology Pty Ltd 2015, <i>Wagin WWTP Environmental Impact Assessment Report to the Department of Environmental Regulation Final – June 2015</i>	Electronic document (A1038117)
Hydrobiology Pty Ltd 2015, <i>Wagin WWTP Environmental Investigations Technical Data Report Draft – May 2015 (including appendices)</i>	Electronic document (A1038118)
Email dated 10 February 2016 from the Department of Water to Department of Environment Regulation, <i>Wagin Wastewater Treatment Plant</i>	Electronic document (A1056370)

In preparing this advice I have considered the information provided with the request. I have also:

- Undertook a literature review of relevant information.

My expert advice is as follows:

Additional Advice

I consider that the EIA is deficient in the following areas:

(i) Sensitive receptors and contaminants of concern have not been adequately identified and assessed in the EIA

The EIA document has not identified the most sensitive environmental receptors of discharges to Slippery Lake which are the bird populations that use the lake as a source of food and not the aquatic plant communities or macroinvertebrate assemblages in the lake which are likely to be subject the same stresses from salinization and eutrophication as other saline wetlands in agricultural catchments in the area. By contrast, bird populations that use saline wetlands as a source of food are more likely to be affected by trace constituents within the wastewater discharge (particularly by selenium and mercury) rather than by elevated nutrient concentrations.

Research from the USA (see e.g. Lemly, 2004; Utah Department of Environmental Quality, 2011; Wurtsbaugh, 2009) indicates bird populations in endorheic saline wetlands in regions with a semi-arid climate that receive ongoing wastewater discharges are susceptible to poisoning by selenium and mercury derived from discharges to the lake and atmospheric deposition. This is because these elements can be biomagnified in local food webs (algae/brine shrimp or brine flies/ birds) and can cause developmental problems in bird embryos. Additionally, the discharge of nutrients and dissolved organic carbon in treated sewage creates suitable conditions for naturally occurring microbes in wetland sediments to convert inorganic mercury into methylmercury which is more toxic and more readily biomagnified in ecosystems than inorganic compounds of this element.

(ii) The effects of bioaccumulation and biomagnification of wastewater constituents on sensitive receptors have not been adequately assessed

As Slippery Lake is essentially a closed system which is subject to intense evaporation, non-biodegradable chemical constituents that are discharged in wastewater will remain in the lake and have the potential to bioaccumulate within macroinvertebrates and algae and be biomagnified within local food webs. Consequently, relatively low concentrations of some chemical constituents such as selenium and mercury in wastewater discharges have the potential to affect bird populations that use the lake as a source of food.

Recent work by the US EPA has indicated that water quality analysis is not necessarily a good indicator of the potential impacts of selenium and mercury on wildlife health, and this agency has instead recommended the use of criteria based on tissue analysis (bird eggs, macroinvertebrates samples etc.) to assess this factor. An assessment of the potential bioaccumulation of selenium and mercury in animal tissue has not been undertaken in Slippery Lake.

(iii) The sustainability of nutrient discharges to Slippery Lake has not been assessed

On the basis of water quality sampling and an assessment of the trophic status of Slippery and Gundaring Lakes, Hydrobiology has concluded that the current trophic status of Slippery Lake is likely to be similar to other lakes in the region. However, this assessment has not considered whether the current inputs of nutrients from wastewater discharge are sustainable and has not determined what the “sinks” for nitrogen and phosphorus removal from the wetland ecosystem are.

Given that the above factors are only likely to affect the health of the Slippery Lake ecosystems slowly over a period of time (i.e. they are chronic in nature), it is unlikely that there would be a significant changes to the current status of the wetland if the current wastewater discharge were allowed to continue for a few years. Potential impacts on bird health could be managed in the short-term by implementing measures to limit bird access to the wetland (e.g. through the use of bird scaring measures). However, additional studies would be required to determine the fate of nutrients, selenium and mercury in the wetland ecosystem if wastewater discharge to the lake were to continue on a long-term basis.

References

Lemly, A.D., 2004. Aquatic selenium pollution is a global environmental safety issue. *Ecotoxicology and Environmental Safety*, **59**, 44-56. The paper is available from web site www.fs.fed.us

Utah Department of Environmental Quality, 2011. *Ecosystem Assessment of Mercury in the Great Salt Lake, Utah 2008*. UDEQ Technical Report which is available from web site www.deq.utah.gov

Wurtsbaugh, W.A., 2009. Biostromes, brine flies, birds and the bioaccumulation of selenium in Great Salt Lake, Utah. *Natural Resources and Environmental Issues*, **15**, Article 2. The paper is available from www.researchgate.net.

In addition to the information in the “Purpose of this report, limitations and disclaimer” section, important limitations relevant to this specific advice are detailed under “Specific limitations of this advice” below.

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Expert's details

Personal details: Reviewer

Name	Andrew Miller
Employer	Department of Environment Regulation
Position title	Senior Manager Contaminated Sites
Classification level	SC5
Recognised field of expertise	The reviewer is recognised as an expert by the Department of Environment Regulation in Contaminated Sites.

Qualifications and experience

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Contaminated Environments Network
Member of the technical working group for CRC Technical Report No 34: A practitioners guide for the analysis, management and remediation of LNAPL

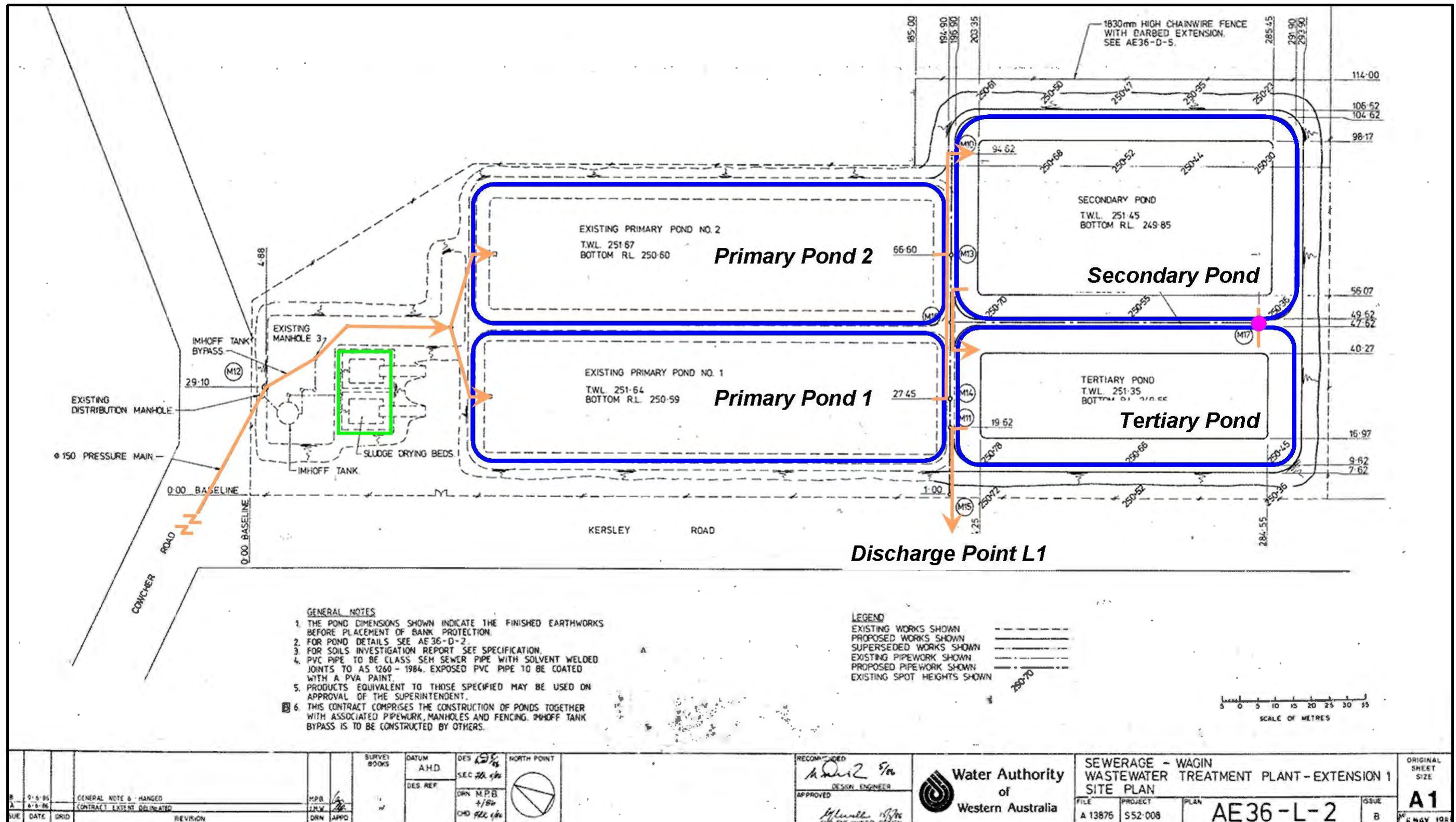
Signatures

Author Name Steve Appleyard	Signature
Position Principal Hydrogeologist	Date 9 August 2016
Reviewer Name Andrew Miller	Signature <i>amiller</i>
Position Senior Manager Contaminated Sites	Date 9 August 2016

Technical Expert (Advice/Report)



Appendix 9: Copy of Wagin sewage facility as constructed pond detail Plan AE36-L-2



Attachment 1: Revised Licence L6316/1991/13
