WOODLAWN BIOREACTOR

Independent Audit
Leachate and Water Management System

Prepared for:

Veolia Environmental Services Pty Ltd

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PREPARED BY

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Maxwell Infrastructure (Management) Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
Draft 1	18 May 2021	Duncan Barnes	Renae Gifford	Renae Gifford
Final	4 June 2021	Duncan Barnes	Renae Gifford	Renae Gifford

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DOCUMENT REFERENCES

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1 Introduction

1.1 Background to Site

Veolia Australia and New Zealand (Veolia) owns and operates the Woodlawn Bioreactor (the Development), which forms part of the 6000 hectare Woodlawn Eco-precinct. The Development is situated 250 kilometres south west of Sydney in the NSW Southern Highlands (refer to **Figure 1**). The Development consists of a former open cut mine void, where waste landfilling and landfill gas extraction occurs. The Development has been operating since September 2004 and has a capacity of 33 million cubic meters (m^3).

Waste is transferred to the Bioreactor via road and rail. Waste from local businesses and councils are sent to the Development via road. Waste in containers is also sent from Sydney via train and then transferred to trucks at the Crisps Creek Intermodal Facility near Tarago.

The Woodlawn site is a previous copper-zinc mine operating as a below ground and open cut mining operation. Associated facilities include evaporation dams and tailings storage facilities. Heron Resources (Heron) now operate the mine.

Veolia's current operation includes evaporation and leachate dams, some of which are co-managed by Veolia and Heron (including ED1). Veolia also operates a leachate treatment system and commissioned a Leachate Treatment Plant (LTP) in October 2018. The first discharge of treated leachate from the LTP to ED1 Coffer Dam started on 26 April 2019.

The Department of Planning, Industry and Environment (DPIE) approved Project Approval (10_0012) on 16 March 2012 to increase the landfill capacity and input limit from 500,000 tonnes per annum (TPA) to 1,130,000 TPA. DPIE has granted a number of modifications (MODs) to this consent since, being:

- PA 10_0012 MOD1: Modification for changing the site water and leachate management to allow the use of ED2 for the main storm water storage and ED3S for treated leachate storage;
- PA 10_0012 MOD2: To alter surface water and leachate management in December 2017. This modification includes requirements for an LTP, Coffer Dam and future volumes of existing Dams (ED1 and ED3N);
- PA 10_0012 MOD3: Modification to enable the construction and operation of a Solid Recovered Fuel (SRF) processing area within the Woodlawn Eco Precinct; and
- PA 10_0012 MOD4: In regards to bushfire impacted waste acceptance.

1.2 Audit Scope

This Independent Environmental Audit (Audit) covers the period from the day after the last audit ended (12 March 2020), until 11 March 2021 (last day of SLR Consulting Australia's [SLR's] onsite Auditing).

Condition 18R, Schedule 2 of Project Approval MP 10_0012, as modified, outlines the requirement to complete an Independent Audit of the Leachate and Water Management System (LWMS).

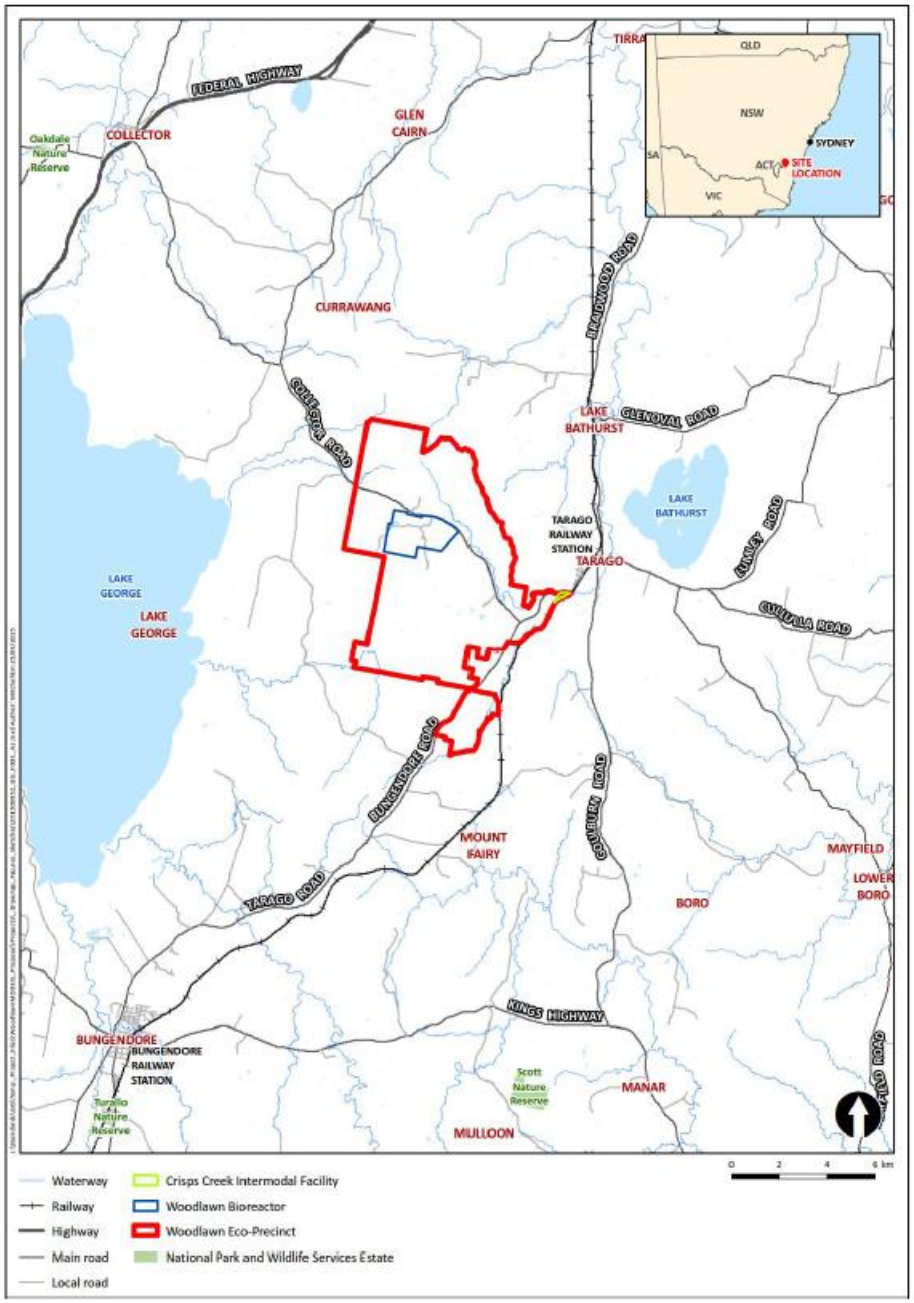


Figure 1 Woodlawn Bioreactor and Eco-Precinct Location

AUDITING

Independent Audit

The Audit will be undertaken in accordance with the following PA condition:

Condition 18R of Schedule 4 of the MP 10_0012, as modified:

18R. Within six months of commissioning the LTP and annually thereafter, unless otherwise agreed to by the Secretary, the Proponent shall commission and pay the full cost of an independent assessment of the leachate and water management system. This audit must be conducted by a suitably qualified, experienced and independent expert whose appointment has been endorsed by the Secretary. During the audit, this expert must:

- *(a) consult with the EPA, Water NSW and the Secretary;*
- *(b) assess actual performance against the assumptions and predictions made in the project water balance prepared by WSP dated September 2017. This must include:*
  - *i. actual versus predicted inputs and outputs into and out of each dam;*
  - *ii. actual versus predicted mechanical evaporation from each dam;*
  - *iii. actual versus predicted rainfall and evaporation; and*
  - *iv. the actual versus predicted volume of water or treated leachate stored in each dam.*
- *(c) Assess actual versus predicted performance of the LTP. This must include:*
  - *i. Actual versus target effluent quality; and*
  - *ii. Actual versus target throughput.*
- *(d) determine whether the leachate and water management system is achieving its intended objectives; and*
- *(e) Outline all reasonable and feasible measures that may be required to improve water and leachate management of the site.*

It is noted that Condition 18R b) pertains to the accuracy of the WSP site Water Balance undertaken in 2017 (updated in May 2020). This Water Balance (like all Water Balances) is based on a number of assumptions which are prone to change over time. In addition, many inputs and outputs are never going to be exactly the same as what was assumed within the Water Balance. As such, SLR believes that Condition 18R b) cannot be assessed completely in accordance with the DPIE *Independent Audit Guideline (June 2018)* and the respective compliance status of the items within this condition should be read and interpreted in this context.

The layout of the Development is shown on **Figure 2**.

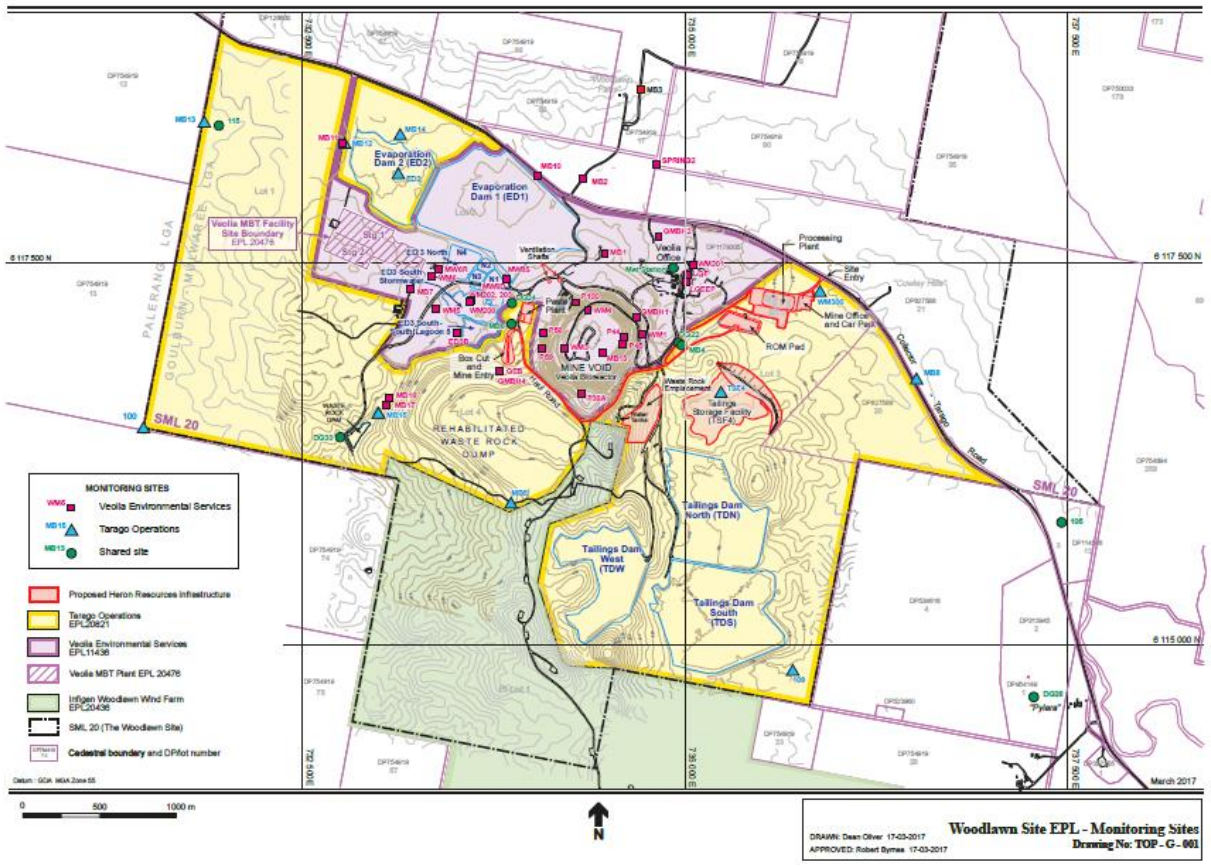


Figure 2 Layout of the Woodlawn Bioreactor

1.3 Key Site Contacts

Contact details for key personnel at the Development are provided in **Table 1** below:

Table 1 Contact Details for Key Woodlawn Personnel

Name	Role	Telephone	Email
Marea Rakete	Woodlawn Environmental Officer	(02) 8588 1362	Marea.rakete@veolia.com

1.4 Audit Methodology

The Audit was undertaken onsite by Renae Gifford (Lead Auditor) and Duncan Barnes (Water Specialist) of SLR, with the site component completed on 26 March 2021. The SLR Audit team are independent of Veolia as defined under Section 3.3 of the NSW Government's (2018) *Independent Audit Guideline*.

Information was provided by Veolia prior to, during and following the Audit. SLR also sourced some information from the Veolia website.

The methodology for the Audit consisted of the following key steps:

- Consultation with relevant government agencies as per the Audit requirements prior to the site component;
- Reviewing key documents/data provided by Veolia prior to the Audit;
- Site component of the Audit – including inspections and discussions with key Veolia operational personnel;
- Introductory and close out meetings;
- Review of additional relevant documentation/data/information obtained while onsite during the inspection or provided by Veolia after the site inspection; and
- Client review and comment on the draft Audit Table and Audit Report.

Photographs taken during the site inspections are included in **Appendix A**. Evidence was viewed and collected as part of the Audit, including monitoring records, reports and correspondence. While this key evidence has been referenced in **Section 2**, it has not been attached to this Audit report.

The Audit has been completed as per the *Independent Audit Guideline* (DPIE, May 2020).

The Audit team assessed the documentation outlined in **Section 2**.

1.4.1 Introductory and Closeout Meetings

Introductory and close out meetings were held for the Audit. At the opening meeting introductions were made by each of the meeting attendees and personnel from Veolia provided background details regarding the Development to SLR. During the close-out meeting a general discussion about initial findings and recommendations was undertaken. **Table 2** lists those present at these meetings.

Table 2 Meeting Attendees

Name	Role	Comment
Renae Gifford	SLR Lead Auditor	Present at opening and closing meeting
Duncan Barnes	SLR Mine Site Water Specialist	Present at opening and closing meeting

1.5 Consultation Requirements

Table 3 outlines stakeholder consultation completed for the Audit, undertaken in accordance with the Audit Guidelines and Condition 18R of Schedule 4 of the MP 10_0012, as modified.

Table 3 Stakeholder Consultation for the Audit

Regulatory Authority	Contact Details	Comment
Department of Planning, Industry and Environment (DPIE) – Planning Services	Bruce Zhang Senior Environmental Assessment Officer Industry Assessments Department of Planning, Industry and Environment 0292746137 E Bruce.Zhang@planning.nsw.gov.au	Email sent from SLR to DPIE on 23 February 2021. No response was received.
Environment Protection Authority (EPA)	Nick Feneley Senior Operations Officer Regulatory Operations NSW Environment Protection Authority 0475 823 299	Email sent from SLR to EPA on 23 February 2021. Response received 25 May 2021.
Water NSW	Jim Caddey Catchment Assessments Officer (Goulburn) Water NSW 02 4824 3401	Email sent from SLR to EPA on 23 February 2021. Response received 14 April 2021.

1.5.1 Water NSW

Table 4 outlines Water NSW comments provided to SLR on 14 April 2021 relating to the Audit.

Table 4 Water NSW Comments Relating to the Independent Audit

Aspect	Comment
Water Modelling	Identify any discrepancies or deviations between the model and what is happening prior to any major problems occurring.

1.5.2 EPA

Table 5 outlines Water NSW comments provided to SLR on 25 May 2021 relating to the Audit.

Table 5 EPA Comments Relating to the Independent Audit

Aspect	Comment
Water Modelling	The previous audit didn't sufficiently quantify water balance inputs and outputs to determine if additional physical measures are required on-site.
Water Modelling	The independent audit should also consider the original water balance which condition 18R of Schedule 4 of Project Approval MP 10_0012 was based on.

2 Documents Reviewed and Referenced

Key documentation reviewed as part of the Audit includes:

- Project Approval MP 10_0012, as modified;
- Woodlawn Annual Reports;
- Monitoring results;
- WSP Woodlawn Water Balance Performance Review;
- Monthly Reports for the Leachate Treatment Plant (LTP);
- Environmental Management Plans; and
- Complaints Register.

3 Assessment of Compliance

The terms used in the Audit to describe the level of compliance of the site with the relevant approval documentation are outlined in **Table 6**. These are requirements of the DPIE *Independent Audit Guideline* (June 2018).

Table 6 Compliance Assessment Criteria

Assessment	Criteria
Compliant	The auditor has collected sufficient verifiable evidence to demonstrate that all elements of the requirement have been complied with within the scope of the audit.
Non-compliant	The auditor has determined that one or more specific elements of the conditions or requirements have not been complied with within the scope of the audit.
Not triggered	A requirement has an activation or timing trigger that has not been met at the time when the audit is undertaken, therefore an assessment of compliance is not relevant.

4 Approvals and Documentation Assessed

Audit findings and recommendations relating to Condition 18R of Schedule 4 of the MP 10_0012, as modified, are outlined in **Section 5** of this report.

4.1 Previous Audit Recommendations

This is the second audit of Condition 18R. The first was undertaken last year, during March 2019. The status of the previous audit recommendations is outlined in **Table 7**, below.

Table 7 Status of Audit Recommendations

Rec. No.	Audit Recommendation	Comments	Status
1	Develop a long-term water usage plan with Heron following development of their site Water Balance. Seek to integrate the Veolia and Heron Water Balances as best as possible in future iterations.	The Heron site is now in Care and Maintenance. As such, this previous recommendation is no longer applicable.	No Longer Applicable
2	Continue to seek opportunities to optimise the dam evaporation systems to maximise the removal of leachate from the system (e.g. positioning of mechanical evaporators, evaporator maintenance etc).	Evidence was provided to demonstrate that Veolia undertakes numerous informal measures to promote evaporation (e.g. spraying discharges into the dams and the construction of an evaporation pan within dam ED1). Works have also been undertaken to improve the availability of the evaporators in ED1 and the ED3N dams.	Completed
3	Continue to improve and optimise the LTP operation with the assistance of suitably qualified experts (as required).	The monthly LTP reports demonstrate that the system is continuously being improved and optimised. Evidence of this includes using the LTD as a pre-treatment to the LTP. SLR were advised that site personnel receive technical support from the national and international Veolia team.	Completed
4	Continue upgrades to the foam management system and monitor the aeration tanks to ensure that a foaming incident does not occur again.	A deluge system has been installed on the aeration and anoxic tanks. This system has performed well to date with no new foaming incidents in during the audit period. SLR were advised that SCADA and CCTV systems are being developed to improve the monitoring and maintenance of the system.	Completed
5	Continue to Monitor the impact of the Bioreactor on the surrounding community through an analysis of complaints registered with the site, to be included in the next Annual Review.	Complaints included in the 2020-2021 Woodlawn Annual Report. A copy of complaints record was provided. The record identifies the nature of the complaint and response / action undertaken. SLR were advised that Veolia continues to follow the complaint investigation process and that a new odour management system is being developed.	Ongoing

Rec. No.	Audit Recommendation	Comments	Status
6	Continue to seek opportunities for leachate minimisation as the operation progresses and changes in the future.	During the previous audit period, Veolia installed sumps and pumps to capture runoff from the void batters before mixing with leachate. In addition, they also installed numerous bunds and a cross-bank at the top of void to prevent runoff from entering it. This was proven using current and historical aerial images. During the audit period this system has been further refined by installing better pump systems on the sumps and are in the process of upgrading the SCADA system which is used to monitor this system including any leaks and overflows.	Completed

4.2 Project Approval PA 10_0012

Only condition 18R of Schedule 4 of Project Approval MP 10_0012, as modified, was assessed as part of this Audit. This is the primary approval for the Development. The Project Approval was first granted on 16 March 2012, with Modifications 1 to 4 granted on 9 September 2016, 22 December 2017 and 16 March 2020.

5 Audit Findings

Table 8 outlines the findings of the Independent Audit and proposed recommendations.

Table 8 Independent Audit Findings

Condition Number	Condition	Compliance Status	Evidence		Recommendation
			Predicted	Actual	
Project Approval MP 10_0012 MOD 2 Schedule 2 Condition 18R					
18R	Within six months of commissioning the LTP and annually thereafter, unless otherwise agreed to by the Secretary, the Proponent shall commission and pay the full cost of an independent assessment of the leachate and water management system. This audit must be conducted by a suitably qualified, experienced and independent expert whose appointment has been endorsed by the Secretary. During the audit, this expert must:	Compliant	This Independent Audit is the third audit to be conducted against this condition. The first was conducted in 2019, with an audit period from 5 November 2018 to 20 March 2019. This Audit was commissioned by Veolia on 10 February 2020, 12 months since the last audit. SLR are qualified, experienced and independent experts, endorsed by DPIE on 16 February 2021 (refer to **Appendix D** for the DPIE endorsement letter).		-

Condition Number	Condition	Compliance Status	Evidence		Recommendation
			Predicted	Actual	
a)	Consult with the EPA, Water NSW and the Secretary;	Compliant	This Independent Audit is the third audit to be conducted against this condition. The EPA, Water NSW and DPIE were consulted during the Independent Audit (refer to **Section 1.5**).		-
b) i)	Assess actual performance against the assumptions and predictions made in the project Water Balance prepared by WSP dated September 2017. This must include: actual versus predicted inputs and outputs into and out of each dam	Not Compliant [1]	Refer to Appendix B for details of predicted Water Balance (original and latest version) inputs and outputs from each dam and what has actually occurred. <u>Non-compliant:</u> Actual inflows were higher in many of the dams (including ED3N2, ED3N3, ED3N4, ED3SS and ED1) due to the additional transfer of water / leachate around the site as a result of significant rainfall during the audit period. Actual outflows are generally slightly higher than what was predicted due to Veolia also undertaking numerous informal measures to promote evaporation (e.g. spraying discharges into the dams and the construction of an evaporation pan within dam ED1). In addition, many of the pump availability rates are slightly conservative in the water balance model. The potential long-term consequences of differences between what was predicted in the WSP Water Balance and the actual performance of the system are having too much leachate on-site which can't be disposed of and not meeting the Project Approval (MP10_0012) requirements (refer to Condition D below). The potential short-term consequences are additional costs associated with managing the additional leachate volumes including the construction of additional water storages and evaporation systems.		**Rec 1:** Seek to develop a contingency plan to empty the dams if the revised water balance report indicates that the Project Approval (MP 10_0012) requirements will likely not be achieved. It is recommended that this contingency plan be developed in consultation with the relevant Regulators. Due the higher rainfall and lower evaporation in 2020 and 2021, the target dates for the emptying of certain dams shall be reassessed and discussed with the relevant Regulators and extension shall be considered as a contingency.

[1] It is noted that Condition 18R b) pertains to the accuracy of the updated WSP site Water Balance undertaken in 2020. This Water Balance (like all Water Balances) is based on a number of assumptions which are prone to change over time. In addition, many inputs and outputs are never going to be exactly the same as what was assumed within the Water Balance. As such, SLR believes that Condition 18R b) can't be assessed completely in accordance with the DPIE *Independent Audit Guidelines (May 2020)* and the respective compliance status of the items within this condition should be read and interpreted in this context.

Condition Number	Condition	Compliance Status	Evidence		Recommendation
			Predicted	Actual	
ii)	Actual versus predicted mechanical evaporation from each dam	Compliant [2]	The actual mechanical evaporation from each dam is not easily measurable. Veolia currently undertakes monthly monitoring of dams, which can be used to provide an approximate indication of dam evaporation. The operation of the floating evaporators and dam inflow spray locations are selected based on real time weather data including the wind direction, wind speed, temperature, humidity and the time of the day. Calibration of the dam evaporation (both natural and mechanical) is detailed in Table 5-1 of the updated Water Balance. The model results in dams ED3N2, ED3N3 and ED3SS correlated well to the actual observed data, however, the uncalibrated model was consistently lower than the metered water level at dam ED3N4. Assumptions were then tweaked in the model to achieve a similar modelled water surface level to the measured surface water level. As detailed in Condition i) actual evaporation is generally slightly higher than what was predicted due to Veolia also undertaking numerous informal measures to promote evaporation (e.g. spraying discharges into the dams and the construction of an evaporation pan within dam ED1). In addition, many of the pump availability rates are slightly conservative in the water balance model. The mechanical evaporation from the ED1 Coffer Dam could not be assessed due to complexities associated with the geomembrane liner. Refer to Appendix B for details of the predicted Water Balance evaporation system (original and latest version) and what has actually occurred.		**Rec 2:** Continue to seek opportunities to optimise the dam evaporation systems to reduce the volume of the stored leachate and legacy mine drainage (e.g. positioning of mechanical evaporators, evaporator maintenance, evaporator operational time etc).

[2] It is noted that Condition 18R b) pertains to the accuracy of the updated WSP site Water Balance undertaken in 2020. This Water Balance (like all Water Balances) is based on a number of assumptions which are prone to change over time. In addition, many inputs and outputs are never going to be exactly the same as what was assumed within the Water Balance. As such, SLR believes that Condition 18R b) can't be assessed completely in accordance with the DPIE *Independent Audit Guidelines (May 2020)* and the respective compliance status of the items within this condition should be read and interpreted in this context.

Condition Number	Condition	Compliance Status	Evidence		Recommendation
iii)	Actual versus predicted rainfall and evaporation	Compliant	The updated WSP report included three climate sub-sets (wettest, driest and average): 1. Wettest (1950-1959), a sequence with 4 years of annual rainfalls > 1000 mm 2. Driest (1979-1988), a sequence with 5 years of annual pan evaporation > 1500 mm 3. Average (1963-1972), a sequence with annual rainfalls < 900 mm and annual pan evaporation between 1000 mm to 1500 mm.	Annual rainfall and evaporation data were assessed from the on-site weather station for the audit period from 12 March 2020 to 11 March 2021. The rainfall and pan adjusted evaporation totals for the assessment period was 882mm and 593mm respectively (with a pan evaporation of 988mm). These totals do not fit perfectly into any of the three climate sub-sets but do indicate that the audit period was generally wetter than average with very low rates of evaporation. These conditions would make it significantly more difficult to empty the leachate dams. It is noted that a significant rainfall event did occur in late March immediately after the audit period. This rainfall will be accounted for in next years audit.	-

iv)	The actual versus predicted volume of water or treated leachate stored in each dam	Not Compliant [3]	Refer to Appendix B for details of predicted Water Balance dam water volumes and the actual dam volumes. Non-compliant: The results indicate that the combined volume of water / leachate stored in the dams (636ML) is higher than what was predicted in the water balance for the wettest climate scenario (584ML) and significantly higher than what was predicted for the average climate scenario (348ML). This is most likely due to the high rainfall and low evaporation rates experienced at the site over the audit period. However, it may also be a result of the ED1 stage / storage relationship used in the water balance which is different from the most recently derived stage / storage relationship (which will be utilised in future water balances). This dam has very low pH. As such, bathymetric surveys are not considered to be possible in the dam. As such, the stage / storage relationship is derived from historical dam information and is limited to an accuracy of 1m intervals. The volume within ED1 must therefore be interpolated from the available stage/ storage information. This is a limitation of the water balance model, especially given the large surface area and relatively small depth of the dam. The assessment of water / leachate stored in the dams indicates that Veolia could have potential issues emptying the dams in accordance with their objectives. Clarification of whether the dams will be emptied in accordance with the objectives will be provided upon finalisation of the updated site water balance (in progress at the time of the audit).	**Rec 1:** Seek to develop a contingency plan to empty the dams if the revised water balance report indicates that the Project Approval (MP 10_0012) requirements will likely not be achieved. It is recommended that this contingency plan be developed in consultation with the relevant Regulators. Due the higher rainfall and lower evaporation in 2020 and 2021, the target dates for the emptying of certain dams shall be reassessed and discussed with the relevant Regulators and extension shall be considered as a contingency.

Condition Number	Condition	Compliance Status	Evidence	Recommendation
c) i)	Assess actual versus predicted performance of the LTP. This must include: Actual versus target effluent quality	Not Compliant	The LTP was commissioned in October 2018. The first discharge of treated leachate to the ED1 Coffer Dam was on 26 April 2019. Non-Compliant: Information contained within the monthly LTP reports indicates that the majority of the effluent water quality parameter targets (detailed in the site Leachate Management Plan) have been achieved. Ammonia and BOD are the key odour parameters and these are generally undetectable. However, there has been regular exceedances of COD with some isolated exceedances of Total Phosphorous, Nitrates and pH. This primarily occurred due to the ongoing optimisation of the LTP system including the fluctuation in feed leachate quality. No specific LTP incidents occurred during the audit period. A foam management system has been installed in response to the foaming issue that occurred in November 2019. Inlet leachate quality is often poorer than what was assumed when the water quality targets were developed. SLR were advised that Veolia has been in close consultation with the EPA regarding the LTP. The Leachate Treatment Dam (LTD) is now being used as a pre-treatment to the LTP to further improve the quality of treated leachate. SLR were advised that they undertake weekly testing in a Nata accredited lab and daily testing on-site.	**Rec 3:** Continue to improve and optimise the LTP operation with the assistance of suitably qualified experts (as required). **Rec 4:** Consider engaging a suitably qualified specialist to re-assess the LTP water quality targets as there appears to be a strong case to reduce some of these targets.
ii)	Actual versus target throughput	Not Compliant	Non-compliant: The LTP started discharging treated effluent into the ED1 Coffer Dam on 26th April 2019. Information contained within the monthly LTP reports indicates that during the annual audit period the average throughput has been 3.3 L/s. This throughput rate is less than the 4 L/s predicted in the Water Balance. During late November early December the LTP experienced heavy amounts of foam in the anoxic tanks limiting the process throughput in order to prevent overflows. The cause of sudden high amounts of foam is suspected to be related to an increase of highly biodegradable COD in the feed. The following steps were taken to alleviate this influx	**Rec 3:** Continue to improve and optimise the LTP operation with the assistance of suitably qualified experts (as required).

[3] It is noted that Condition 18R b) pertains to the accuracy of the updated WSP site Water Balance undertaken in 2020. This Water Balance (like all Water Balances) is based on a number of assumptions which are prone to change over time. In addition, many inputs and outputs are never going to be exactly the same as what was assumed within the Water Balance. As such, SLR believes that Condition 18R b) can't be assessed completely in accordance with the DPIE *Independent Audit Guidelines (May 2020)* and the respective compliance status of the items within this condition should be read and interpreted in this context.

Condition Number	Condition	Compliance Status	Evidence		Recommendation
			including: (1) upgraded the deluge system in the anoxic tanks, (2) changed the source of the deluge system and (3) reduced the COD levels where possible in the feed water. These steps have allowed Veolia to ramp up treatment volumes and steps are being taken to ensure should this happen again there are contingencies in place. SLR were advised that Veolia will sacrifice throughput to ensure water quality which has occurred during the audit period due to the variability of the feed and an increase in nutrients.		
d)	Determine whether the leachate and water management system is achieving its intended objectives	Compliant	1. Construction of a suitably sized and lined coffer dam (referred to as ED1 Coffer Dam) to store and evaporate treated leachate from its leachate treatment plant from September 2018 for 4- year period without filling.	The LTP started discharging effluent (treated leachate) to the ED1 Coffer Dam on 26 April 2019. The ED1 Coffer Dam has been constructed and is now receiving treated leachate from the LTP. The Water Balance concludes that the ED1 Coffer Dam "is not predicted to fill up to 80% of the freeboard level volume in any climatic sequence based on the assumed evaporator capacity. Assuming no water usage by Heron, the peak predicted water storage in the dam occurs during the wettest climatic scenario when 84.97 ML is stored (approximately 54% of the total dam capacity to freeboard level). By 2023 less than 40% of the dam capacity to freeboard volume is reached during the wettest climatic sequence". The volume of treated leachate stored in the ED1 Coffer Dam was 98.63 ML at the time of the audit. Although different to what was predicated in the site water balance this volume is well below the total storage volume of 189.35ML.	-
		Not Triggered	2. In accordance with Condition 18S of the Project Approval (MP 10_0012), as modified, the volume of mine water stored in ED1 must be no more than 10 ML by 31 December 2023.	ED1 North not only receives runoff from its external catchment, but also receives water from the Plant Collection Dam (PCD) and Waste Rock Dam (WRD). The results indicate that the volume of mine drainage stored in ED1 (270ML) is higher than what was predicted in the water balance for the wettest climate	**Rec 1:** Seek to develop a contingency plan to empty the dams if the revised water balance report indicates that the Project Approval (MP 10_0012) requirements will likely not be achieved. It is recommended that this contingency plan be developed in consultation with the relevant Regulators.

Condition Number	Condition	Compliance Status	Evidence		Recommendation
				scenario (250ML) and significantly higher than what was predicted for the average climate scenario (90ML). This is most likely due to the high rainfall and low evaporation rates experienced at the site over the audit period. However, it may also be a result of the ED1 stage / storage relationship used in the water balance which is different from the most recently derived stage / storage relationship (which will be utilised in future water balances). This dam has very low pH. As such, bathymetric surveys are not considered to be possible in the dam. As such, the stage / storage relationship is derived from historical dam information and is limited to an accuracy of 1m intervals. The volume within ED1 must therefore be interpolated from the available stage/ storage information. This is a limitation of the water balance model, especially given the large surface area and relatively small depth of the dam. The assessment of mine drainage stored in ED1 indicates that Veolia could have potential issues emptying ED1 in accordance with Condition 18S of the Project Approval (MP 10_0012). Clarification of whether ED1 will be emptied in accordance with Condition 18S of the Project Approval (MP 10_0012) will be provided upon finalisation of the updated site water balance (in progress at the time of the audit). The future water storage in the ED1 North dam was investigated during the latest revision of the Water Balance by WSP. The updated Water Balance concluded that "Dam ED1 does completely empty by 2023 for the driest climatic sequences. Considering this dam receives stormwater runoff from external catchments, sustaining this dam as completely empty may be difficult. For the wettest climatic sequence, the	Due the higher rainfall and lower evaporation in 2020 and 2021, the target dates for the emptying of certain dams shall be reassessed and discussed with the relevant Regulators and extension shall be considered as a contingency.

Condition Number	Condition	Compliance Status	Evidence		Recommendation
				dam requires 27% of its total storage capacity to cater for direct rainfall and catchment runoff at the end of 2023. Modelling of this dam could be further refined if information regarding water transfer from the PCD and WRD were provided. Also, details and assumptions for the new evaporation pad may provide further storage capacity".	
		Not Triggered	3. In accordance with Condition 18T of the Project Approval (MP 10_0012), as modified, ED3N must be emptied of effluent from the existing leachate system by 31 December 2022.	The future water storage in the ED3N dams was investigated during the latest revision of the Water Balance by WSP. The updated Water Balance concluded that "The future design simulation results indicated dams ED3N2, ED3N3 and ED3N4 collectively had enough capacity to cater for future leachate and rainfall inputs. The mechanical evaporators at ED3N4 dried out this dam in 2022 based on the average climatic sequence and in 2024 based on the wettest climatic sequence". The results indicate that the volume of leachate stored in the collective ED3N dams (82.88ML) is lower than what was predicted in the water balance for the wettest climate scenario (94.4ML) but higher than what was predicted for the average climate scenario (62.5ML). This is most likely due to the high rainfall and low evaporation rates experienced at the site over the audit period. It is noted that this Condition does not come into effect until 31 December 2022 which allows Veolia to comply with this condition at the time of this audit. ED3N1 has already been emptied. However, the assessment of leachate stored in the ED3N dams indicates that Veolia could have potential issues emptying the dams in accordance with Condition 18T of the Project Approval (MP 10_0012). Clarification of whether the ED3N dams will be	**Rec 1:** Seek to develop a contingency plan to empty the dams if the revised water balance report indicates that the Project Approval (MP 10_0012) requirements will likely not be achieved. It is recommended that this contingency plan be developed in consultation with the relevant Regulators. Due the higher rainfall and lower evaporation in 2020 and 2021, the target dates for the emptying of certain dams shall be reassessed and discussed with the relevant Regulators and extension shall be considered as a contingency.

Condition Number	Condition	Compliance Status	Evidence		Recommendation
				emptied in accordance with Condition 18T of the Project Approval (MP 10_0012) will be provided upon finalisation of the updated site water balance (in progress at the time of the audit).	
		Compliant	4. Install floating evaporators in ED3N1, ED3N2, ED3N3, ED3N4 and ED3SS to manage leachate from September 2017 through to December 2019.	This objective is no longer triggered as it is now 2021. As was the case during the previous audit period, floating evaporators have already been installed in ED3N2, ED3N3, ED3N4 and ED3SS. In addition, dam water inflows are sprayed into the dams to further increase evaporation rates. The operation of the floating evaporators and dam inflow spray locations are selected based on real time weather data including the wind direction, wind speed, temperature, humidity and the time of the day. It is noted that evaporation is no longer required in ED3N1 as it now only receives water from direct rainfall runoff.	-
		Compliant	5. Operate effectively without adversely impacting on the surrounding community.	The Complaints Register provided during the audit indicates there was 39 odour complaints during the audit period, from 12 March 2020 until 8 March 2021. This is considerably more than the 2020 Audit which had 9. No offsite discharges occurred during the audit period. SLR were advised that Veolia working to improve their odour management system in accordance with the findings of the annual odour audit. This includes changing the gas collection system, creating multiple gas exits and increased capacity.	

Condition Number	Condition	Compliance Status	Evidence		Recommendation
		Compliant	6. Minimise leachate production	During the previous audit period, Veolia installed sumps and pumps to capture runoff from the void batters before mixing with waste. In addition, they also installed numerous bunds and a cross-bank at the top of void to prevent runoff from entering it. This was proven using current and historical aerial images. During the audit period this system has been further refined by installing better pump systems on the sumps and are in the process of upgrading the SCADA system which is used to monitor this system including any leaks and overflows.	-
		Compliant	7. Effectively separate all classes of water	Based on observations during the site inspection, information pertaining to the diversion of runoff and the prevention of seepage through the dam walls SLR believes that leachate and clean water are effectively separated at the facility as best is practically possible. Some water was observed to be ponding in the void as a result of overflows from the void seepage collection system however SLR believes that this is understandable given the extreme rainfall event that occurred prior to the audit (but outside of the audit period) and are confident that improvements made to this system will further minimise the likelihood of stormwater mixing with leachate.	**Rec 5:** Continue to seek opportunities for leachate minimisation as the operation progresses and changes in the future (e.g. improving the void seepage containment system to minimise overflows into the void).
e)	Outline all reasonable and feasible measures that may be required to improve water and leachate management at the site	-	**Rec 1:** Seek to develop a contingency plan to empty the dams if the revised water balance report indicates that the Project Approval (MP 10_0012) requirements will likely not be achieved. It is recommended that this contingency plan be developed in consultation with the relevant Regulators. Due the higher rainfall and lower evaporation in 2020 and 2021, the target dates for the emptying of certain dams shall be reassessed and discussed with the relevant Regulators and extension shall be considered as a contingency. **Rec 2:** Continue to seek opportunities to optimise the dam evaporation systems to reduce the volume of the stored leachate and legacy mine drainage (e.g. positioning of mechanical evaporators, evaporator maintenance, evaporator operational time etc).		

Condition Number	Condition	Compliance Status	Evidence	Recommendation
			Rec 3: Continue to improve and optimise the LTP operation with the assistance of suitably qualified experts (as required). **Rec 4:** Consider engaging a suitably qualified specialist to re-assess the LTP water quality targets as there appears to be a strong case to reduce some of these targets. **Rec 5:** Continue to seek opportunities for leachate minimisation as the operation progresses and changes in the future (e.g. improving the void seepage containment system to minimise overflows into the void) .	

6 Conclusion

Condition 18R of Schedule 4 of the MP 10_0012, as modified, was assessed by this Independent Audit.

This Independent Audit period was generally wetter than average with very low rates of evaporation. These conditions would make it significantly more difficult to empty the leachate dams.

An important occurrence during the audit period was the adjacent Heron site going into 'Care and Maintenance' mode. As such, Veolia cannot rely on Heron using the stored waters in their operations.

In terms of actual performance against the assumptions and predictions made in the project Water Balance included in the report by WSP, dated April 2020, the Development was found to be generally compliant. However, the assessment of water / leachate stored in the dams indicated that Veolia could have potential issues emptying the legacy ED1 mine water in accordance with their objectives. This is most likely due to the high rainfall and low evaporation rates experienced at the site over the audit period. Clarification of whether the dams will be emptied in accordance with the objectives will be provided upon finalisation of the updated site water balance (in progress at the time of the audit).

Several Non-Compliances were identified (refer to **Section 5)** including some small variations in the actual dam inputs and outputs compared to what was predicted in the Water Balance, as well as some issues during the optimisation of the LTP. It is acknowledged that these operational issues are generally to be expected with many inputs and outputs expected to vary slightly from what was assumed within the Water Balance. As such, SLR believes that Condition 18R b) cannot be assessed completely in accordance with the DPIE *Independent Audit Guideline (June 2018)* and the respective compliance status of the items within this condition should be read and interpreted in this context.

Evidence was observed that Veolia does proactively manage water with additional measures implemented to decrease and improve leachate management at the site.

Reasonable and feasible measures that are recommended to improve water and leachate management of the site are provided in **Section 5**.

APPENDIX A

Photographs

Photo 1 – Void (1)

Photo 2 – Void (2)

Photo 3 – Void (3)

Photo 4 – Leachate Treatment Dam

Photo 5 – ED3S (1)

Photo 6 – ED3S (2)

Photo 7 – ED3S (3)

Photo 8 – ED3SS (1)

Photo 9 – ED3SS (2)

Photo 10 – Waste Rock Dam (1)

Photo 11 – ED3N4 (1)

Photo 12 – ED3N4 (2)

Photo 13 – ED3N4 (3)

Photo 14 – ED1 North (1)

Photo 15 – ED1 North (2)

Photo 16 – ED1 North (3)

Photo 17 – ED3N1

Photo 18 – ED3N2

Photo 19 – ED3N3 (1)

Photo 20 – ED3N3 (2)

Photo 21 – ED1 Coffer Dam

Photo 22 – Leachate Treatment Plant (1)

Photo 23 – Leachate Treatment Plant (2)

Photo 24 – Leachate Treatment Plant (3)

Photo 25 – Leachate Treatment Plant (4)

Photo 26 – Leachate Treatment Plant (5)

Photo 27 – Leachate Treatment Plant (6)

Photo 28 – Leachate Treatment Plant (7)

Photo 29 – Leachate Treatment Plant (8)

Photo 30 – Leachate Treatment Plant (9)

APPENDIX B

Dam Input, Output and Storage Data

Dam Input and Output Data (Most Recent Water Balance April 2020)

Dam	Inflows		Outflows	
	Predicted from Water Balance	March 2021	Predicted from Water Balance	March 2021
ED3N2	Rainfall Only	Rainfall and some treated leachate (due to emergency)	Natural Evaporation Mechanical Evaporator Unit Type A (x1), pump rate 2 L/s @ 15% pump availability	Natural Evaporation Mechanical Evaporator Unit Type A (x1), pump rate 2 L/s @ 15% pump availability (SLR were advised that pump availability is planned to be increased).
ED3N3	Rainfall Only	Rainfall and some treated leachate (due to emergency)	Natural Evaporation Mechanical Evaporator Unit Type A (x1), pump rate 2 L/s @ 15% pump availability	Natural Evaporation Mechanical Evaporator Unit Type A (x1), pump rate 2 L/s @ 15% pump availability (SLR were advised that pump availability is planned to be increased).
ED3N4	Rainfall Only	Rainfall and some treated leachate (due to emergency)	Natural Evaporation Mechanical Evaporator Unit Type A (x4), pump rate 2 L/s @ 30% pump availability Mechanical Evaporator Unit Existing (x5), pump rate 2.8 L/s @ 20% pump availability (i.e. pump rate 14 L/s for all 5 units combined)	Natural Evaporation Mechanical Evaporator Unit Type A (x4), pump rate 2 L/s @ 30% pump availability Mechanical Evaporator Unit Existing (x5), pump rate 2.8 L/s @ 20% pump availability (i.e. pump rate 14 L/s for all 5 units combined). SLR were advised that pump availability is planned to be increased. Pump spray system also used at different ED3N dams.
ED3SS	Rainfall Only	Rainfall and effluent from the LTD.	Natural Evaporation Mechanical Evaporation assumption, Type B (x3 Unit), 40% operation time at 1 L/s	Natural Evaporation Mechanical Evaporation assumption, Type B (x3 Unit), 40% operation time at 1 L/s. SLR were advised that two of the mechanical evaporators are estimated to operate at higher than 40%
ED3S	Rainfall and Bioreactor stormwater inflows	Rainfall and Bioreactor stormwater inflows. Pumped water from decline (Heron)	Natural Evaporation Scenario1: No water use by Heron. Scenario2: Heron uses water at 2 L/s. No Mechanical Evaporators	Natural Evaporation Heron is now in care and maintenance so they don't take any water. No Mechanical Evaporators. SLR were advised that some water was pumped out into other dams.

ED1 Coffer Dam	Rainfall and leachate inflow from LTP	Rainfall and treated permeate inflow from LTP	Natural Evaporation Mechanical Evaporator Unit Type A (x5 units), 20% operation time at 4 L/s No seepage loss Scenario1: No water use by Heron. Scenario2: Heron uses water at 2 L/s.	Natural Evaporation Mechanical Evaporator Unit Type A (x5 units), 20% operation time at 4 L/s No seepage loss Heron is now in care and maintenance so they don't take any water.
ED1	Rainfall Only	Rainfall and water from Waste Rock Dam and Plant Collection Dam	Natural Evaporation Mechanical Evaporation (Mine Tek) x 1 Unit, 5% operation time at a pumping rate of 68 l/s.	Natural Evaporation Mechanical Evaporation (Mine Tek) x 1 Unit, 5% operation time at a pumping rate of 68 l/s. SLR were advised that the Mechanical Evaporation system operational time has been increased to 90%. ED1 evaporation pan has been constructed (however required maintenance works were observed during the site inspection).

Dam Input and Output Data (Original Water Balance September 2017)

Dam	Inflows		Outflows	
	Predicted from Water Balance	March 2021	Predicted from Water Balance	March 2021
ED3N2	Treated water from the existing leachate treatment dam and direct rainfall and local runoff	Rainfall and some treated leachate (due to emergency)	Natural Evaporation Floating Evaporation Unit Type A	Natural Evaporation Mechanical Evaporator Unit Type A (x1), pump rate 2 L/s @ 15% pump availability (SLR were advised that pump availability is planned to be increased).
ED3N3	Treated water from the existing leachate treatment dam and direct rainfall and local runoff	Rainfall and some treated leachate (due to emergency)	Natural Evaporation Floating Evaporation Unit Type A	Natural Evaporation Mechanical Evaporator Unit Type A (x1), pump rate 2 L/s @ 15% pump availability (SLR were advised that pump availability is planned to be increased).
ED3N4	Treated water from the existing leachate treatment dam and direct rainfall and local runoff	Rainfall and some treated leachate (due to emergency)	Natural Evaporation Existing Mechanical Evaporator (× 5) at the bank of ED3N4 and Floating Evaporation Unit Type A	Natural Evaporation Mechanical Evaporator Unit Type A (x4), pump rate 2 L/s @ 30% pump availability Mechanical Evaporator Unit Existing (x5), pump rate 2.8 L/s @ 20% pump availability (i.e. pump rate 14 L/s for all 5 units combined). SLR were advised that pump availability is planned to be increased. Pump spray system also used at different ED3N dams.
ED3SS	Treated water from the existing leachate treatment dam and direct rainfall and local runoff	Rainfall and effluent from the LTD.	Natural Evaporation Floating Evaporation Unit Type B x 3	Natural Evaporation Mechanical Evaporation assumption, Type B (x3 Unit), 40% operation time at 1 L/s. SLR were advised that two of the mechanical evaporators are estimated to operate at higher than 40%
ED3S	NA	Rainfall and Bioreactor stormwater inflows. Pumped water from decline (Heron)	NA	Natural Evaporation Heron is now in care and maintenance so they don't take any water. No Mechanical Evaporators. SLR were advised that some water was pumped out into other dams.

ED1 Coffer Dam	Treated water from Leachate Treatment Plant at the rate of 4 L/s and direct rainfall and local runoff	Rainfall and treated permeate inflow from LTP	Natural Evaporation Floating Evaporator Type A × 4 No Seepage Loss	Natural Evaporation Mechanical Evaporator Unit Type A (x5 units), 20% operation time at 4 L/s No seepage loss Heron is now in care and maintenance so they don't take any water.
ED1	Stormwater from its catchment and direct rainfall	Rainfall and water from Waste Rock Dam and Plant Collection Dam	Natural Evaporation 75kw Minetek Units - throughput flow 25 L/s each unit.	Natural Evaporation Mechanical Evaporation (Mine Tek) x 1 Unit, 5% operation time at a pumping rate of 68 l/s. SLR were advised that the Mechanical Evaporation system operational time has been increased to 90%. ED1 evaporation pan has been constructed (however required maintenance works were observed during the site inspection).

Dam Volumes

Dam	Climatic Sequence	Volume Predicted from April 2020 Water Balance (ML)	Volume Predicted from Original September 2017 Water Balance (ML)	March 2021 Volume (ML)
ED3N2	Wet	16.8	3.0	8.517
	Average	12.5	0.0	
	Dry	7.5	0.0	
ED3N3	Wet	15.6	0.0	13.933
	Average	13.0	0.0	
	Dry	8.8	0.0	
ED3N4	Wet	62.0	0.0	60.43
	Average	37.0	0.0	
	Dry	18.0	0.0	
ED3SS	Wet	50.0	114.0	86.508
	Average	40.0	80.0	
	Dry	30.0	70.0	
ED3S Scenario 1 (Heron Uses 0 L/s)	Wet	154.0	NA	97.718
	Average	150.0	NA	
	Dry	96.0	NA	
ED1 Coffer Dam Scenario 1 (Heron Uses 0 L/s)	Wet	36.0	134.0	98.63
	Average	5.0	134.0	
	Dry	2.0	134.0	
ED1	Wet	250.0	320.0	270.35
	Average	90.0	0.0	
	Dry	5.0	0.0	

APPENDIX C

Audit Certification Form

Development Name	Woodlawn Bioreactor Site
Development Consent No.	Project Approval MP 10_0012, as modified
Description of Development	Bioreactor where landfilling and gas extraction is undertaken
Development Address	Collector Road, Tarago, NSW
Operator	Veolia Environmental Services (Australia) Pty Ltd
Operator Address	Collector Road, Tarago, NSW
Title of Audit	Woodlawn Bioreactor LWMS 2020 Independent Audit

I certify that I have undertaken the independent Audit and prepared the contents of the attached independent Audit report and to the best of my knowledge:

The Audit has been undertaken in accordance with relevant approval condition(s) and in accordance with the Auditing standard AS/NZS ISO 19011:2014 and Post Approval Guidelines – Independent Audits

The findings of the Audit are reported truthfully, accurately and completely;

I have exercised due diligence and professional judgement in conducting the Audit;

I have acted professionally, in an unbiased manner and did not allow undue influence to limit or over-ride objectivity in conducting the Audit;

I am not related to any owner or operator of the development as an employer, business partner, employee, sharing a common employer, having a contractual arrangement outside the Audit, spouse, partner, sibling, parent, or child;

I do not have any pecuniary interest in the Audited development, including where there is a reasonable likelihood or expectation of financial gain or loss to me or to a person to whom I am closely related (i.e. immediate family);

Neither I nor my employer have provided consultancy services for the Audited development that were subject to this Audit except as otherwise declared to the lead regulator prior to the Audit; and

I have not accepted, nor intend to accept any inducement, commission, gift or any other benefit (apart from fair payment) from any owner or operator of the development, their employees or any interested party. I have not knowingly allowed, nor intend to allow my colleagues to do so.

Note.

The Independent Audit is an 'environmental Audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an Audit report produced to the Minister in connection with an environmental Audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.

The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).

Signature	
Name of Lead / Principal Auditor	Renae Gifford
Address	10 Kings Road, New Lambton NSW 2305, Australia
Email Address	rgifford@slrconsulting.com
Auditor Certification (if relevant)	Principal Environmental Auditor
Date:	29 April 2021

APPENDIX D

Endorsement of SLR

VEOLIA ENVIRONMENTAL SERVICES (AUSTRALIA) PTY LTD
Attention: Mr Henry Gundry
Level 4/ 65 PIRRAMA ROAD
PYRMONT New South Wales 2009

DATEWILLBEINSERTEDHERE

Dear Mr Gundry

Woodlawn Bioreactor Expansion Project (MP_0012)
Endorsement of LW&MS Audit Team

I refer to your request, dated 12 February 2021, seeking the Secretary's endorsement of an audit team to undertake the Independent Audit of the Leachate and Water Management System for the Woodlawn Bioreactor Expansion Project (MP10_0012) in accordance with Schedule 4 Condition 18R.

Having considered the qualification and experience of the SLR Consulting Australia Pty Ltd audit team, namely:

- Renae Gifford (Lead Auditor), and
- Duncan Barnes (Water Specialist).

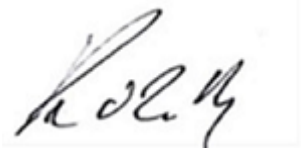
the secretary endorses the appointment of this team to undertake the audit in accordance with the Consent. This approval is conditional on the audit team being independent of the development. The Department reserves the sigh to request an alternative auditor or audit team for future audits.

Please ensure this correspondence is appended to the Independent Audit Report.

Notwithstanding the agreement for the above listed audit team for this Project, each respective project approval or consent requires a request for the agreement to the auditor or audit team be submitted to the Department, for consideration of the Secretary. Each request is reviewed and depending on the complexity of future projects, the suitability of a proposed auditor or audit team will be considered.

If you wish to discuss the matter further, please contact Jennifer Rowe on 0242471851.

Yours sincerely



Katrina O'Reilly
Team Leader - Compliance
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As nominee of the Planning Secretary

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