Leachate Treatment Plant
Response to Submissions Report

October 2017

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1 INTRODUCTION

Veolia Environmental Services (Australia) Pty Limited (Veolia) owns and operates the Woodlawn Bioreactor and Crisps Creek Intermodal Facility (IMF). The IMF services the Bioreactor by transferring containers of compressed waste sourced from Sydney from rail to road for disposal at the Bioreactor. The Bioreactor, which is located approximately 40 km south of Goulburn and 50 km north of Canberra, is a major putrescible landfill that services the Sydney metropolitan area.

The Bioreactor was originally approved to accept up to 500,000 million tonnes of putrescible waste per annum. However, in 2012, an increase in maximum throughput to 1.13 mtpa was approved. Key drivers for the increase were the consistent demand for the disposal of approximately 2 million tpa of Sydney's putrescible waste, decreasing landfill capacity in the Sydney metropolitan area, and the slow uptake of alternative waste technology.

Veolia submitted a proposal with the Department of Planning and Environment (DPE) to modify the Woodlawn Bioreactor development approval (DA31-02-99 and MP10_0012) to include key elements of the LTLM Strategy and notice as follows:

- The construction of a leachate treatment plant to process leachate from the Bioreactor, Evaporation Dam 3 North (ED3N) and Evaporation Dam 3 South (ED3S) to an agreed standard
- The discharge of all treated leachate into Evaporation Dam 1 (ED1) which will become the primary leachate storage facility
- The use of mechanical evaporation (and possibly heating) equipment (up to 4) when necessary
- To ensure the integrity of Evaporation Dam 1 (ED1) against leakage prior to the discharge of treated effluent into ED1.

An environmental assessment (EA) was prepared to support the proposed modification to the development consent under Section 75W of the *Environment Planning and Assessment Act 1979* (EP&A Act). The EA also identifies that Veolia has addressed the potential environmental impacts of the proposal.

The modification application and EA were on notification from Tuesday 4 July 2017 until Tuesday 25 July 2017. Nine submissions were received for the proposed modification. A response to these submissions has been provided in Section 3 of this report.

2 NOTIFICATION AND CONSULTATION

2.1 NOTIFICATION

The modification application and EA were on notification from Tuesday 4 July 2017 until Tuesday 25 July 2017.

2.2 CONSULTATION POST NOTIFICATION

Veolia has consulted with a number of government agencies and the local community, as part of the modification assessment process. The purpose of this consultation was to discuss the status of the proposed LTP, and where possible, address concerns raised in submissions received. Table 2.1 below summarises the consultation with government agencies.

2.2.1 Government Agencies

Table 2-1 Government Agency Consultation

Agency	Consultation	Comments
Department of Planning and Environment	Meeting – 2 Aug 2017 and 12 Sep 2017 Letter – 31 Jul 2017	Discussed submissions received to date and expected comments from DPE
Environment Protection Authority	Meeting – 12 Sep 2017 Phone conference – 24 Aug 2017 Letter – 5 Sep 2017 Phone conference – 4 Oct 2017	Discussed EPA submission and proposed strategy to address concerns, including removing addendum from modification and separation of water types within ED1, enabling the progressive testing and rectification of the dam as required. Discussed the results of the revised water balance and long term effluent management from LTP including timeframe to dewater the ED3 dams Also discussed intention to use ED3 dams to store the treated effluent if required.
Water NSW	Phone conference – 4 Sep 2017 and 3 Oct 2017	Discussed proposed strategy to address concerns, including removing addendum from modification and separation of water types within ED1, with newly lined ED1 coffer dam minimising the chance of off-site water quality impacts. Also discussed the effluent criteria from a long term water quality perspective, as Woodlawn will still remain zero discharge site.

2.2.2 Local Community

Veolia regularly attends the Tarago and District Progress Association Inc. (TADPAI) meetings to provide updates on various operational and development activities at Woodlawn. The TADPAI submission to the proposed modification was discussed at the meeting held on 16 August 2017 and it was clarified that their main concern related to ensuring that the road upgrade requirements were not removed from the consent. Veolia confirmed that the road upgrade requirements would remain and discussed the potential regional customers currently enquiring about delivering waste to the site.

3 RESPONSE TO THE SUBMISSION RECEIVED

A total of 9 submissions were received during the notification period, including one local community group response.

This section provides the details of each submission and issue raised, and the corresponding responses and clarification to each submission as well as a reference to the EA and supporting technical specialist reports (where applicable).

3.1 GOVERNMENT AGENCY SUBMISSIONS

Submissions on the proposed modification were received from the following government agencies:

- Environment Protection Authority (EPA)
- Department of Primary Industries (DPI)
- Water NSW
- Department of Planning and Environment (DPE)
- Office of Environment and Heritage (OEH)
- South East Local Land Services
- Division of Resources and Geosciences – Department of Planning and Environment
- Roads and Maritime Services (RMS)

Table 3-1 provides a detailed response to the issues raised by these government agencies. It is noted that submissions where no issues were raised have not been included in this table.

3.2 COMMUNITY SUBMISSIONS

The local community group, Tarago and District Progress Association Inc. (TADPAI) also submitted a response to the proposed modification. Table 3-1 also provides a detailed response to the issues raised by TADPAI in their submission.

Table 3-1 Responses to comments made in submissions received

Comments	Response	Reference
EPA		
1. Leachate Treatment System		
It is a condition of the Woodlawn Bioreactor's environment protection licence (EPL 11436) that the Leachate Treatment Plant (LTP) be capable of continuously treating at least 4L/s of leachate. The application states that the LTP will be capable of treating "up to" 4 L/s. The EPA requests that the Proponent provides clarification as to what contingencies have been built into the design to ensure that the LTP is capable of continuously treating at least 4 L/s, including what measures will be employed to maintain treatment capacity during periods where maintenance and repairs are taking place.	The design capacity of the proposed LTP is 4.05L/s and includes multiple by-pass lines which allows for staged maintenance and repairs, whilst keeping the facility operational. The LTP design capacity is based on the best available information on leachate generation and the required extraction rate from the void as well as the ability to treat volume currently stored in ED3. The average required extraction rate from the void has been calculated to be 3L/s, which decreased to about 2L/s over time once the waste level exceeds the height of the piezometer water level in the void. The initial treatment for stored volume in ED3 will be 1L/s, which will increase as the void requirements decrease until all existing volume in ED3 has been treated. At this point in time the LTP processing requirements for the site are likely to reduce to between 2 and 3 L/s.	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission Report)
2. Leachate/Water Balance		
The application includes two water balances, both prepared by WSP (Parsons Brinckerhoff). The first is dated 22 July 2016 and was prepared for Veolia to determine whether ED1 and ED2 can provide adequate storage for Veolia's treated leachate and stormwater over the next 40 years of projected operation. The second water balance is dated 23 December 2016 and was prepared for Heron Resources for the purpose of	Veolia has engaged WSP (Parsons Brinckerhoff) to complete a revised water balance to provide further clarity regarding the proposed modification and to reflect discussions with EPA following their submissions. The scope of the revised water balance model includes: - Discharge rate of 4L/s to new coffer dam that will be constructed in	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission

Comments	Response	Reference
developing a water management strategy for the proposed Woodlawn Mine. Both water balances acknowledge concurrent operation of the bioreactor and the mine. The original water balance was previously submitted to the EPA by Veolia as part of its consultation on the Long-Term Leachate Management Strategy. It concluded that: *"…overflows from ED1 and ED2 can only be prevented if Heron Resources uses water from ED1 at 15 L/s without the use of mechanical evaporator, and 10 L/s with the mechanical evaporators during the worst case leachate production under the wet climate sequence similar to 1947 to 2015 with a pan factor of 0.6, when water is transferred from ED3 cells at 1 L/s. Even under the dry climate sequence similar to 1976 to 2015, Heron Resources might have to reuse the water from ED1 at a rate of 14 L/s without mechanical evaporator, and at 8.5 L/s with mechanical evaporators operating at ED1 and ED2."* Given the importance of the model's assumptions about Heron Resources water use, the EPA requested that Veolia provide confirmation, being a written commitment from Heron Resources, that it will use 15 L/s of treated water in its processing operations. This written confirmation was provided by Heron Resources on 1 September 2016 stating that "*the usage rate from the evaporation dam would be in excess of 15 to 20 litres per second*". The EPA provided its in-principle support for the Long-Term Leachate Management Strategy based on this commitment. The EPA is concerned to see that the second water balance provides a significantly reduced estimate of Heron Resources predicted water usage.	the southern section of ED1 - Implementation of aggressive evaporation techniques on ED1 to remove water including 2 x 75kW Atomisers, each with a throughput rate of 25L/s and assumed to be operating 30% of the time - Separation of mine water and treated effluent within ED1 utilising new coffer dams in the southern section of ED1 - Heron water usage assumed to be 7L/s as worst case scenario (note that Heron's assumed water use is between 7.9 and 10 L/s(as provided in Heron letter to Veolia) and include 2L/s of treated effluent, 5L/s of mine water from ED1 and ED2 - Additional mechanical sprayers to be utilised in ED3 lagoons to maintain capacity in existing ED3 lagoons until the LTP is operational and to reduce volume over time - Existing leachate treatment system to be maintained at an additional 2L/s for first 12 months operation of new LTP to reduce leachate levels in the void and maximise landfill gas production. As detailed in Veolia's letter, the average required leachate extraction rate is expected to reduce to between 2 and 3L/s over time once the waste level exceeds the height of the peizometric water level within the bioreactor. This will allow for the further treatment of stored volumes from ED3 in addition to the natural and mechanical evaporation. However, for the water balance modelling, a worst case scenario of leachate extraction of 4L/s from the void has estimated. Section 7.3 of the revised water balance shows that the timeframe required to empty all the water in ED3N is within 5 years.	Report) Section 7.1 and 7.3 of the Revised water balance – September 2017 (Appendix A of this Submission Report) Heron letter to Veolia (Appendix C3 of this Submission Report)

Comments	Response	Reference
It concludes that "*the net project demand is likely to vary between 7.2 L/s and 10.9 L/s.*" Despite this, the application asserts that "*The additional water balance confirmed that Evaporation Dams 1 and 2 have sufficient capacity under all climatic conditions (including a worst-case scenario) to accommodate the water related requirements of both projects without mechanical evaporators.*" It is unclear how this conclusion can be drawn when there does not appear to be an equal or compensatory reduction in the inputs into the dams. In this respect, the EPA is concerned that the second water balance may have underestimated inputs into ED1 and ED2. Specifically, it unclear whether the model accounts for: a) Contributions from ED3 (Veolia must progressively dewater the ED3 dams at a continuous rate of 1 L/s); and b) Higher rates of pumping that may be required at the start of the project to reduce leachate levels in the landfill void (i.e. leachate that has built up in the waste mass that must be removed to restore flow within the gas extraction network). In order to allow a proper assessment, the Proponent should clarify these points and provide a copy of the model's raw input data. The EPA also notes that the original water balance models dam levels from 2018 to 2058, whilst the second water balance only models dam levels to 2029 (the expected date that mining will cease). The EPA requests that the Proponent provides additional information to demonstrate that the evaporation dams will not overflow in the period	Simulated results in section 7.1 of the revised water balance show a new 150ML coffer dam within the footprint of ED1 is sufficient to manage treated effluent for a 4 year period. The revised water balance indicates that once the new coffer dam reaches free board level volumes, ED3N dams will be able to be used to store treated effluent from LTP. ED3N dams will be individually assessed for permeability using in-situ testing techniques to prove they meet the required permeability standards already approved for the site before storing treated effluent.	

Comments	Response	Reference
between 2030 and 2058.		
The application includes a seepage investigation report prepared by AECOM. Preparation of the report was a condition of EPL 11436. The report: a) Assesses the geophysical conditions underlying and surrounding ED1 and ED2; b) Assesses the integrity of the liner mechanism for ED1 and ED2; c) Assesses the identified points of liner failure/faults; d) Assesses the pathways for the migration of pollutants from ED1 and ED2 into the surrounding environment (including into Allianoyonyiga Creek and Crisps Creek); e) Assesses the current nature and extent of groundwater and surface water pollution caused by ED1 and ED2; and f) Recommends control and remediation measures to improve the integrity of ED1 and ED2, prevent the occurrence of seepage from ED1 and ED2, and repair or make good any groundwater or surface water pollution caused by ED1 and ED2. The EPA has reviewed the AECOM report and the Peer Review prepared by Earth2Water Pty Ltd and is firmly of the view that both ED1 and ED2 should be lined with a high-density polyethylene (HDPE) liner, as per AECOM's recommendations. The EPA's reasons for this are as follows: 1. The existing dams were not constructed with an engineered liner of any type/method; 2. There is strong evidence that the dams are leaking and that the rate of	ED2 is not the subject of this proposed modification as no changes to water management in this dam are proposed. This dam will continue to be managed by Heron in accordance with the existing approval requirements. To ensure the integrity of ED1 against leakage prior to the discharge of treated effluent into ED1, Veolia will sub-divide ED1 into separate coffer dams (commencing with the southern regions of ED1) to contain the effluent from the LTP. The HDPE lining specification outlined in the AECOM report will be adopted for any coffer dams to be used to contain treated effluent. The Ecological Risk Assessment (ERA) will be jointly managed by Heron and Veolia given our overlapping responsibilities for overall site water management. The ERA will be performed in accordance with the National Environmental Protection Measure (NEPM) and the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000). The aquatic ecology (required for ERA) studies will be completed by the end of 2017 which will enable the completion of the data review phase in the first quarter of 2018. The additional surface and groundwater quality studies will be conducted at the same time but will include any additional analytes required by the ERA team. The ERA process would be conducted over a two day period on site and it would therefore be expected that the final report would be available by end of April 2018.	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission Report) Section 6.1 of Appendix H of Environmental Assessment report for the proposed modification Heron letter to EPA dated 15 August 2017 (Appendix C2 of this submission report)

Comments	Response	Reference
seepage is likely to increase once the dams are filled and hydraulic head pressures increases; 3. The locations of the seepage points and preferential pathways are not well known and their comprehensive delineation is unlikely to be successful; 4. The claimed permeability of the dam floor materials cannot be relied upon given the permeability results are of re-moulded (mixed and compacted) samples and are not necessarily representative of in-situ conditions, where preferential pathways due to lenses or bands of more permeable, granular material may be present; and 5. Much of ED1 and parts of ED2 are known to be underlain by high permeability coarse grained sediments which are likely to be a significant preferential pathway for contaminant migration towards Crisps Creek.		
The EPA does not support the further investigation as proposed by Earth2Water Pty Ltd.	Noted	
The EPA is of the view that the ecological risk assessment proposed by the Proponent is an appropriate means of determining the remedial measures for seepage that has already left the dams, but is not relevant in the context of assuring against future seepage.	Noted	
It is recommended that DPE seek a construction plan and program for lining ED1 and ED2, including details on how residual water that is currently stored in the dams will be managed.	ED1 will be sub-divided into separate coffer dams (commencing with the southern regions of ED1) to contain the effluent from the LTP. These coffer dams will be individually assessed for permeability using in-situ testing techniques to prove they meet the required	Veolia letter to EPA dated 5 September 2017 (Appendix

Comments	Response	Reference
	permeability standards already approved for the site and therefore identical to that of ED3SS, which currently stores partially treated leachate. In the event the in-situ permeability testing demonstrates remediation and reworking of the dam is required to meet the permeability criteria as approved by the EPA in ED3SS, then this of in-situ clay and/or the import and addition of clay until retesting, or adopting the HDPE lining specification outlined in the AECOM report. A Quality Control Assurance assessment will be completed to demonstrate the integrity of each coffer dam.	C1 of this Submission Report)
The EPA will be writing to Veolia separately about its program for further investigating and completing remedial measures for seepage that has already left the dams.	Noted	
4. Transfer of Water Between ED1 and ED2		
The original Long-Term Leachate Management Strategy proposed to store stormwater and treated leachate separately. It was proposed that treated leachate be discharged to ED1 and stormwater to ED2. The EPA understands that it is now proposed to discharge both stormwater and treated leachate to ED1. The rationale for this departure from the original strategy is unclear to the EPA and should be further justified by the Proponent. Further, the new water balance prepared for Heron Resources shows that ED1 will overflow on multiple occasions unless water (i.e. treated leachate	As discussed above, Veolia will subdivide ED1 to manage mine water and treated effluent separately and no treated effluent will be transferred from ED1 to ED2. Therefore, this proposed modification is consistent with the original Long-Term Leachate Management Strategy (LTLMS) as stormwater and treated effluent will be managed separately. ED2 will remain the contingency measure for stormwater if required, and treated effluent will be managed in the southern part of ED1 separate to the existing mine water in ED1.	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission Report) Section 8 of the

Comments	Response	Reference
and bioreactor stormwater) is deliberately transferred from ED1 to ED2. In this regard, ED2 should be considered an integral part of the bioreactor's proposed leachate management system.		December 2016 water balance
5. Mechanical Evaporation		
The Proponent's intentions with respect to the use of mechanical evaporators are unclear. The application states that up to four mechanical evaporation units would be required for worst-case leachate production under the wet climate scenario, however it only commits to the use of "a minimum of three evaporators or other equivalent evaporative devices will be utilized when the leachate treatment plant commences operations". This should be further explained in the context of the project water balances. Veolia has previously advised the EPA that it would continuously operate three mechanical evaporators within the ED3 dam network providing an additional outflow of 1.1L/s, which would halve the timeframes indicated within the water balance to dewater those dams. It is the EPA's expectation that the three evaporators the Proponent has committed to using in this application will be additional to the three evaporators it had previously committed to using on ED3. The EPA also notes that the water balance assumes that the mechanical evaporator units will evaporate a minimum of 28% of the treated leachate that is pumped through them and that some individual units will be operated continuously. Veolia has previously acknowledged that it is not yet achieving continuous operation of its existing evaporators (installed at ED3N), but stated that it is investigating new evaporation technologies	Veolia will implement aggressive evaporation techniques to remove water in ED1 over a 5 to 10 year period. This will include 2 X 75KW Atomisers, which have a throughput of 25L/s each and are expected to operate 30% of the time based on weather conditions. Based on the annual evaporation average of 28%, around 120ML can be evaporated per annum. The benefit of increasing the evaporation rate to reduce volume will enable the site to formulate a rehabilitation strategy of the dam. Additional evaporators to be utilised within the ED3 lagoons includes pontoon based atomisers to each of the storage lagoons. The systems will be able to operate in all wind conditions. Estimated throughput and evaporation show that the existing dams will last until September 2018. The revised water balance shows that with the timeframe required to empty all the water in ED3N is within 5 years and with implementation of aggressive evaporation techniques, mine water in ED1 will drop to 10ML in 6 years.	Section 7.2 and 7.3 of revised water balance – September 2017 (Appendix A of this Submission report)

Comments	Response	Reference
and setups, including: • Alternate spraying equipment, such as atomisers; • Alternate setup to existing sprayer units to direct the spray onto exposed areas of the dam floor, to maximise operations and evaporation loss over the surface area of ED1; • Establishment of multiple areas for spraying around and within ED1 footprint; • Installation of additional mechanical evaporator capacity over and above the number modelled in the existing water balance; and • Technologies to capture or control spray/mist to further enhance evaporation to enable continuous operation. The EPA previously requested that any new operational proposals resulting from these investigations be included and justified in any modification application. This does not appear to have been done in the current application.		
6. Proposal to Construct Interim Leachate Storage Dam		
The application includes a proposal to construct a new 140ML coffer dam within ED1 to provide additional storage capacity for leachate discharged from the existing leachate treatment system. The Proponent claims that the additional storage is required because existing storage areas will reach capacity before the Long-Term Leachate Treatment System is operational. The EPA does not support the construction of additional storage for leachate treated through the existing treatment system, except under extenuating circumstances where emergency containment is required to prevent overflow of existing storage areas. This is largely because of the	As discussed above, the addendum proposing additional short term storage capacity in ED1 has now been withdrawn from this modification. As a means of managing existing leachate levels in the void and to improve landfill gas collection efficiency, the leachate extraction rate was increased over the past 12 months to an average of 3.9 L/s. This has resulted in ED3S-S filling at faster rate than was previously anticipated. In response to EPA's comments, Veolia will now manage the existing	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission Report Revised water

Comments	Response	Reference
environmental management legacy the storage dams create once full. It is noted that Veolia obtained approval from DPE in 2016 to construct another additional storage dam (ED3S-S) for the same purpose. ED3S-S provided 111 ML of treated leachate storage capacity and Veolia anticipated it would last approximately 16 months (under a wet climate sequence scenario). In the event that the dam filled more quickly than anticipated, Veolia proposed the following contingencies: 1. Implementation of additional measures to increase evaporation rate, such as mechanical evaporation equipment and/or biological systems; 2. Investigate the use of heat from the onsite power station; and, if necessary; and 3. Create additional storage (i.e. another coffer dam) within ED3S. The EPA requests that the Proponent explain what contingencies have been implemented to date and the reasons why ED3S-S has filled at a faster rate than anticipated, given the wet climate sequence scenario referenced has not eventuated in the eleven months since the dam was commissioned.	treated leachate storage through the existing infrastructure by investing in further evaporation equipment with the ED3 lagoons. As discussed above, additional pontoon based atomisers will be utilised in each of the ED3 lagoons and these systems will be able to operate in all wind conditions. On the basis of this additional evaporation equipment and a reduced extraction rate from the void to 3L/s prior to the operation of the LTP, the existing lagoons along with ED3SS are expected to have sufficient capacity for storage based on current treatment until September 2018.	balance – September 2017 (Appendix A of this Submission report)
The EPA notes Veolia's intention to progressively remove and treat partially treated leachate from the dam, should it be approved, once the long-term treatment facility is operational. The EPA is concerned about the length of time it will take to completely dewater the dam, particularly under a wet climate sequence scenario. The EPA requests that Veolia provides details about options that may exist for increasing the rate at which the dam could be dewatered.	As discussed above, the addendum proposing additional short term storage capacity in ED1 has now been withdrawn from this modification. Regarding existing volumes in ED3, the treatment rate from ED3 into the LTP will increase following the drop in the leachate extraction rate requirements from the void over time until all ED3 volume has been treated. Additional evaporators to be utilised within the ED3 lagoons includes pontoon based atomisers to each of the storage lagoons. The systems	Section 7.2 and 7.3 of the revised water balance – September 2017 (Appendix A of this Submission Report)

Comments	Response	Reference
	will be able to operate in all wind conditions. Estimated throughput and evaporation show that the existing dams will last until September 2018. Further, Section 7.3 of the revised water balance shows that the timeframe require to empty all the water in ED3N is within 5 years.	
Finally, the impact of constructing the new coffer dam has not been considered in either of the two water balances submitted with the application. The EPA considers this a critical issue, given that the coffer dam will sacrifice at least 140 ML of storage capacity within ED1 for at least 12 years (i.e. the time taken to dewater the new dam under a dry climate sequence scenario). The water balance should be update to reflect this.	As discussed above, the addendum proposing additional short term storage capacity in ED1 has now been withdrawn from this modification.	
7. Air Quality Impacts		
The Air Quality Impact Assessment (AQIA) submitted with the application does not consider odour impacts from treated leachate stored in ED2. This is because it was prepared in the context of ED2 only receiving stormwater. Given that the Proponent now proposes to store treated leachate in ED2 as well as ED1, the AQIA should be updated to consider odour emissions from ED2 as well. Further, the AQIA prepared for the construction and operation of the coffer dam in ED1 assumes that the dam surface area is 15,000 m2.Elsewhere in the application document it is stated that the proposed dam will have an area of 45,000 m2. This should be clarified by the Proponent and, if necessary, the AQIA should be updated to reflect the	As discussed above, this modification does not seek to change the approved water management arrangements for ED2. Treated effluent from LTP will not be stored in ED2 and will instead be stored in new coffer dams constructed in southern sections of ED1, separate to the existing mine water. ED2 will only be used for stormwater if required as a contingency measure. Therefore there is no need for further updates to the AQIA.	Section 4.2 of the Environmental Assessment report for the proposed modification

Comments	Response	Reference
correct dam surface area.		
8. Contingency measures in the event mining activities cease earlier than expected		
The water balances for the project rely heavily on Heron Resources using water from the evaporation dams in its mining operation. It is recommended that the Proponent provides further details about what contingency measures could be employed in the event mining operations cease earlier than expected.	Refer to response to "Leachate /Water Balance" above. The revised water balance being prepared by WSP in response to the submissions to this modification takes a conservative approach to Heron's water usage, assuming 7L/s, compared with their estimates of 7.9 to 10.2 L/s. This 7L/s is made up of 2L/s of treated effluent from the LTP, 5L/s of mine water from ED1 and ED2. In the event that mining ceases earlier Veolia will be able to manage the water with the use of additional evaporators. The revised water balance shows that the timeframe required to empty all the water in ED3N is within 5 years and with the implementation of aggressive evaporation techniques, water in ED1 North dam will drop to 10ML in 6 years. This will provide additional capacity to store the treated effluent from LTP in ED3N dams if required. Further, by this time and if required there will be the space to build more than one coffer dam within the ED1 footprint to store the treated effluent from the LTP.	Revised water balance – September 2017 (Appendix A of this Submission Report)
9. Project Timeframes		
As noted above, it is a condition of EPL 11436 that the new leachate management system be operational by 31 December 2017. The EPA understands that this is also a condition of the Project Approvals (MP 10_0012 MOD1 and DA 31-02-99 MOD 2).	As previously discussed with the EPA, the planning approval process is on the critical path for the project and therefore there was a risk that the project timeframe proposed in the original long-term leachate management strategy may not be able to be met.	Veolia letter to EPA dated 28 September 2017 (Appendix

Comments	Response	Reference
Veolia's commitment to the project and to this deadline was an important consideration in the EPA's regulation of odour impacts from the Woodlawn Bioreactor and its decision not to take further regulatory action in response to odour complaints received from the Tarago community during 2016. The EPA is extremely disappointed to see that the Proponent is now estimating that the new system is unlikely to be operational until then end of 2018 without an adequate justification being provided and will be writing to Veolia separately about this issue.	Veolia submitted a letter to the EPA on 28 September 2017 regarding this matter separate to the planning modification process.	C4 of this Submission Report)
DPE		
General		
1. Please confirm the draft boundary plan in the long term leachate plan is up to date and whether Veolia owns ED2. Landowners consent must be provided for all the lots which are the subject of the modification prior to the modification being determined.	Veolia confirms that we are still the owner of the land subject to this modification.	Veolia letter to DPE dated 31 July 2017 (Appendix C5 of this Submissions Report)
2. Please ensure all references to evaporation dams are correct.	Noted	
3. Please provide a plan which illustrates the existing and proposed leachate storage dams and stormwater storage dams.	Figure 3 on page 12 of the Environmental Assessment report for the proposed modification provides details of the existing leachate storage systems and figure 1.2 on page 3 of revised water balance – September 2017 provides details for the proposed leachate storage	Figure 3 in section 1.2 of the Environment

Comments	Response	Reference
	dams. Effluent from LTP will be stored in ED1 coffer dam within ED1 footprint. Appendix B of this submission report provides the details of the existing surface water management system. No changes are proposed for the stormwater storage system as part of this modification.	Assessment report Figure 1.2 of the revised water balance – September 2017 (Appendix A of this Submission Report)
ED1 and ED2 dam Integrity		
4. In accordance with AECOM's Seepage Investigation (dated May 2017) it is noted that although the current seepage velocity from the dam is low, it could increase if the driving hydraulic head was increased via the increase of water stored in the dams. Whilst the seepage velocity from the dams is low, it could increase if the driving hydraulic head was increased via the increase of water stored in dams. Whilst the seepage investigation notes the installation of a HDPE liner is complex, it does not state that it is not possible. The Department along with the Environment Protection Authority and NSW Water considers that lining both ED1 and ED2 is required as : a) the existing dams were not constructed with an approved geotechnical methodology; b) seepage appears to be occurring at ED1 and ED2; c) groundwater seepage may increase if more leachate/water is stored	To ensure the integrity of ED1 against leakage prior to the discharge of treated effluent into ED1, Veolia will sub-divide ED1 into separate coffer dams (commencing with the southern regions of ED1) to contain the effluent from the LTP. The HDPE lining specification outlined in the AECOM report will be adopted for any coffer dams to be used to contain treated effluent.	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission report) Section 6.1 of Appendix H of Environmental Assessment report for the proposed

Comments	Response	Reference
in the dams; and d) the water balance requires the transfer of leachate between the two dams.		modification
5. It is noted that an ecological risk assessment has been recommended to evaluate the potential for environmental harm due to the existing seepage from the dams. Please detail when the ecological risk assessment is proposed to be conducted.	The Ecological Risk Assessment (ERA) will be jointly managed by Heron and Veolia given our overlapping responsibilities for overall site water management. The ERA will be performed in accordance with the National Environmental Protection Measure (NEPM) and the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000). The aquatic ecology (required for ERA) studies will be completed by the end of 2017 which will enable the completion of the data review phase in the first quarter of 2018. The additional surface and groundwater quality studies will be conducted at the same time but will include any additional analytes required by the ERA team. The ERA process would be conducted over a two day period on site and it would therefore be expected that the final report would be available by end of April 2018.	Heron letter to EPA dated 15 August 2017 (Appendix C2 of this Submission report)
ED1 140ML Coffer Dam (Coffer Dam)		
6. Please detail why the coffer dam is required and the anticipated timeframes for when the existing dams will reach capacity. 7. Please details how long the coffer dam will provide storage for. 8. Page 4 of the Woodlawn Addendum to Modification Application states *'final design including the precise thickness and mix of insitu/exsitu clay materials will be based on the results of site testing, survey and design considerations*'. Limited information on how the coffer dam will be	As discussed above, the addendum proposing additional short term storage capacity in ED1 has now been withdrawn from this modification. Based on submissions received on this modification, Veolia will now manage the existing treated leachate storage through the existing infrastructure by investing in further evaporation equipment with the ED3 lagoons.	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission report)

Comments	Response	Reference
constructed has been provided. Please confirm whether a geotechnical investigation or electromagnetic survey has been carried out to establish the thickness of the clay in the subsoils. The Construction Environment Management Plan (CEMP) that has been submitted as part of the modification should include the construction details and management measures of the coffer dam. 9. Page 4 of the Woodlawn Addendum to modification Application states *'Given that area will be appropriately lined consistent with contemporary standards, the findings of the recent seepage investigation are not considered specifically relevan*t.' Please detail how 'contemporary standards' is defined. As leachate is proposed to be stored in ED1, the Department considers that AECOM's seepage investigation should be considered to ensure a consistent management approach is adopted.		Revised water balance – September 2017 (Appendix A of this Submission Report)
Storage Capacity		
10. Please provide a contingency plan should Heron dewater but no longer extract water at the rates anticipated. The Department considers Veolia must have ability to manage its leachate and surface water generated independently of Heron.	Refer to response to "Leachate /Water Balance" in the EPA response. The revised water balance being prepared by WSP in response to the submissions to this modification takes a conservative approach to Heron's water usage, assuming 7L/s, compared with their estimates of 7.9 to 10.2 L/s. This 7L/s is made up of 2L/s of treated effluent from the LTP, 3L/s of mine water from ED1 and 2L/s of mine water from ED2. In the event that mining ceases earlier Veolia will be able to manage the water with the use of additional evaporators. The revised water balance shows that the timeframe required to	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission Report) Revised water balance –

Comments	Response	Reference
	empty all the water in ED3N is within 5 years and with the implementation of aggressive evaporation techniques, mine water in ED1 will drop to 10ML in 6 years. This will provide additional capacity to store the treated effluent from LTP in ED3N dams if required. Further, by this time and if required there will be the space to build more than one coffer dam within the ED1 footprint to store the treated effluent from the LTP.	September 2017 (Appendix A of this Submission Report)
11. Please detail how the dewatered mine water will be treated should it be deemed to be contaminated with leachate.	The dewatering of mine water is not the subject of this modification and will be managed by Heron within ED2 based on the strategy agreed between Heron and the EPA.	
12. Page 2 of the Modification Application states that *'the use of mechanical evaporation (and possibly heating) equipment when necessary'.* Please detail when the use of evaporators would be considered 'necessary'. It is noted than the Parsons Brickerhoff (PB) water balance dated July 2016 states that up to four evaporators will be required, however the PB water balance dated December 2016 states that evaporators would no longer be required. Please explain the inconsistency between the two water balances and the modification application.	Veolia will implement aggressive evaporation techniques to remove water in ED1 over a 5 to 10 year period. This will include 2 X 75KW Atomisers, which have a throughput of 25L/s each and are expected to operate 30% of the time based on weather conditions. Based on the annual evaporation average of 28%, around 120ML can be evaporated per annum. The benefit of increasing the evaporation rate to reduce volume will enable the site to formulate a rehabilitation strategy of the dam. Additional evaporators to be utilised within the ED3 lagoons includes pontoon based atomisers to each of the storage lagoons. The systems will be able to operate in all wind conditions. Estimated throughput and evaporation show that the existing dams will last until September 2018.	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission Report) Revised water balance – September 2017 (Appendix A of this

Comments	Response	Reference
	Veolia engaged WSP to prepare a revised water balance that provides further clarity regarding the proposed modification, including evaporative capacity for the evaporation dams. The revised water balance shows that the timeframe required to empty all the water in ED3N is within 5 years and with the implementation of aggressive evaporation techniques, mine water in ED1 will drop to 10ML in 6 years.	Submission Report)
13. Given ED1 is proposed to store leachate, it is unclear how stormwater storage will be managed and whether there is enough stormwater storage capacity at the site.	This modification does not seek to change the approved water management arrangements for stormwater or ED2. That is, stormwater will be managed in ED3 within the implementation of additional evaporators and only transferred to ED2 if required as a contingency measure.	Section 8 of the December 2016 water balance (Appendix –B of Environmental Assessment report)
14. Please provide further details on why the long-term measure is required and the shortfall in leachate storage.	As discussed above, the addendum proposing additional short term storage capacity in ED1 has now been withdrawn from this modification and the revised water balance is attached to this submission report to provide clarity regarding the proposed modification.	Revised water balance – September 2017 (Appendix A of this Submission Report)
Leachate Quality		
15. Page 18 of the Modification Application states that the proposal	Table 7 in the Environmental Assessment report for the proposed	Section 4.2 of

<table>
<tr><th>Comments</th><th>Response</th><th>Reference</th></tr>
<tr><td>includes 'the construction of a leachate treatment plant (LTP) to process leachate from the Bioreactor, Evaporation Dam 3 North (ED3N) and Evaporation Dam 3 South (ED3S) to an agreed standard'. Please detail the anticipated quality of the treated leachate from the LTP and provide monitoring criteria.</td><td>modification provides details of the final treated effluent criteria.

Table 7: Final treated leachate target values
<table><tr><th>Parameter</th><th>Units</th><th>Maximum</th></tr><tr><td>pH</td><td>--</td><td>6.5-8.5</td></tr><tr><td>Conductivity</td><td>µS/cm</td><td>--</td></tr><tr><td>COD</td><td>mg/L</td><td>2,500</td></tr><tr><td>BOD</td><td>mg/L</td><td>10</td></tr><tr><td>Total Phosphorus</td><td>mg/L</td><td>13</td></tr><tr><td>Ammonia</td><td>mg/L</td><td>10</td></tr><tr><td>Nitrate</td><td>mg/L</td><td><1,500</td></tr><tr><td>TSS</td><td>mg/L</td><td>5</td></tr><tr><td>TDS</td><td>mg/L</td><td>30,000</td></tr><tr><td>Chloride</td><td>mg/L</td><td>5,000</td></tr></table>
Discussed proposed strategy with Water NSW, including removing addendum from modification and separation of water types within ED1, with newly lined ED1 Coffer dam minimising the chance of off-site water quality impacts.

Also discussed the effluent criteria from a long term water quality perspective, as Woodlawn will still remain zero discharge site.</td><td>Environmental Assessment report

Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission Report)</td></tr>
<tr><td>Odour Assessment</td><td></td><td></td></tr>
<tr><td>16. The odour assessment must clearly illustrate on a plan the nearest sensitive receiver including the type of receiver i.e. resident , school etc.</td><td>Figure 4.1.1 and Table 4.2.1 in this Response to Submissions Report provides details of the nearest sensitive receiver.

The properties of “Woodlawn”, “Cowley Hills” and “Pylara” are all Veolia-owned residences and as such, could be considered to be</td><td>Figure 4.1.1 and Table 4.2.1 of this Submission</td></tr>
</table>

Comments	Response	Reference
	'Project-related' residences. However, in the interests of minimising odour and dust impacts on the surrounding area, the odour and dust impact from both current and proposed project operations have been assessed at all surrounding residences, including 'Project-related' residences.	Report
17. Please confirm whether the odour modelling considered the cumulative impacts from the coffer dam and ED1.	The odour modelling is consistent with the proposed modification as presented in this response to submissions report.	Section 4.2.1 of the Environmental assessment report for the proposed modification
18. Please detail how many odour complaints were lodged in 2014, 2015, 2016 and 2017.	The number of odour complaints received over the past four years is provided below: **Year** **No of complaints** 2014 23 2015 63 2016 88 2017 (YTD) 16	
19. Please detail how the coffer dam and the long-term leachate storage proposal will improve the landfill biogas rates and reduce odour impacts.	As discussed above, the addendum proposing additional short term storage capacity in ED1 has now been withdrawn from this modification.	
Regional Waste		

Comments	Response	Reference
20. The Department requires more information in relation to regional waste to justify the modification request. In its determination of the landfill expansion, the Planning Assessment Commission raised concern that increasing the regional waste limits could undermine the waste efforts of surrounding Councils. As such, Condition 6, Schedule 3 of MP 10_0012 was imposed. The modification application does not provide an assessment of the potential sources of the regional waste or how the requirements of Condition 6, Schedule 3 have been addressed. Accordingly, the Department requests the following information be provided: a) the need for the modification; b) potential sources of the regional waste; c) demonstrate that the additional regional waste from each Local Government Area of territory government would results in a net environmental benefit; d) the impact on the capacity of other facilities in the region; e) impacts on any state or territory resource recovery strategies or initiatives; f) impacts on the bioreactor and its ability to accept waste from Sydney; and g) whether the road upgrades as per Schedule 6 of MP 10_0012 have been completed.	Veolia has received numerous requests for the receipt of regional waste at Woodlawn, which have the potential for regional waste volumes to exceed the current 50,000 tpa limit. These include Queanbeyan Council, Palerang Council, Visy, and regional waste contractors services the ACT and local area.	Section 2.1.1 of the Environmental Assessment report for the proposed modification

Comments	Response	Reference
WaterNSW		
1. If leachate is added to ED1 (without lining of the floor), this will potentially cause treated leachate to seep from the dam. When the seepage flows under the Collector Road, although staying within the Woodlawn Eco-Precinct, it potentially leaves the Woodlawn bioreactor Project Site (as defined by the Site EPL and Major Project Consent). This negatively affects the Project's ability to have a neutral or beneficial effect on water quality on the site	To ensure the integrity of ED1 against leakage prior to the discharge of treated effluent into ED1, Veolia will sub-divide ED1 into separate coffer dams (commencing with the southern regions of ED1) to contain the effluent from the LTP. The HDPE lining specification outlined in the AECOM report will be adopted for any coffer dams to be used to contain treated effluent.	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission report) Section 6.1 of Appendix H of Environmental Assessment report for the proposed modification
2. The Long Term Leachate Management Solutions Report (Veolia, July 2016), defines the leachate from the Membrane Bioreactor (MBR) to a target average quality, that satisfies an odour perspective, but not a long term water quality perspective.	Discussed proposed strategy with Water NSW, including removing addendum from modification and separation of water types within ED1, with newly lined ED1 coffer dam minimising the chance of off-site water quality impacts. Also discussed the effluent criteria from a long term water quality perspective, as Woodlawn will still remain zero discharge site.	Section 4.2 of Environmental Assessment report Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this

Comments	Response	Reference
		Submission Report)
3. Water NSW considers the method to ensure ED1 and ED2 integrity (including any interim dam in ED1) should involve HDPE lining of the evaporation dam floor.	As discussed above, the HDPE lining specification outlined in the AECOM report will be adopted for any coffer dams in ED1 that will be used to store treated effluent. ED2 will not be used to store treated leachate.	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission report) Section 6.1 of Appendix H of Environmental Assessment report for the proposed modification
4. The proposed modification to discharge treated leachate from the bioreactor (and also pumping of dewatered mine water from Woodlawn mining operations by Heron Resources) would fill ED1 back to over 85% dam capacity. This volume of water will place a large area of water and increased hydraulic head back on the underlying aquifer system. A comparison of groundwater monitoring bore (MB10) standing water level (SWL) from 1996 to 2016 with the pond storage in water balance for ED1 (Parson Brinkerhoff, 22 July 2016), shows a strong correlation	Noted The revised water balance being prepared by WSP is based on the separation of existing mine water and treated effluent within ED1 as well as aggressive evaporation techniques within ED1 to remove water within a 5 to 10 year period. This will include 2 X 75KW Atomisers, which have a throughput of 25L/s each and are expected to operate 30% of the time based on weather conditions. Based on the annual evaporation average of 28%, around 120ML can be evaporated per annum. The benefit of increasing the evaporation	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission Report)

Comments	Response	Reference
between ED1 storage volume and the SWL of the groundwater in monitoring bore MB10. A significant increase in the volume of contaminated mine water or leachate in ED1 will potentially increase the amount of seepage discharged under the dam towards Crisps Creek.	rate to reduce volume will enable the site to formulate a rehabilitation strategy of the dam. Further to this, the dewatering of mine water is not the subject of this modification and will be managed by Heron within ED2 based on the strategy agreed between Heron and the EPA.	
5. Woodlawn LTP Modification EIA prepared by SG Haddad Advisory (dated May 2017) is recommending than an Ecological Risk Assessment be prepared to inform appropriate measures to either mitigate the potential for harm or remediate groundwater contaminated due to seepage. Water NSW is concerned that allowing management of seepage from ED1 by an Ecological Risk Assessment means the downstream pH buffering capacity of the alluviums must be maintained. Water NSW considers increased dam head, anecdotally means increased flow of seepage. It is not defined how much additional flow can be buffered, and if the buffering fails what is potential impact on surface flow in Crisps Creek.	The proposed modification now involves the separation of waters in ED1 and additional evaporation such that the dam head will not increase significantly and therefore risk of seepage will not increase as a result of this modification. On this basis, the Ecological Risk Assessment provides an appropriate mechanism for assessing and managing these dams.	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission report) Heron letter to EPA dated 15 August 2017 (Appendix C2 of this Submission report)
6. Evaporation Dams ED1 and ED2 Seepage Investigation Report (AECOM, 18 May 2017) detailed significant further field investigation including electromagnetic (EM) survey. The 2001 Woodlawn AEMR also detailed conductivity profiles in the upper catchment of Crisps Creek, soon after mining ceased. The compatibility between the two assessments, recent AECOM EM survey (dated May 2017) and 2001 EM profile is not clear. The most	Noted	

Comments	Response	Reference
recent AECOM analysis shows lower conductivity values in the area south of Crisps Creek, with more elevated levels under Crisps Creek. The 2001 EM Survey had a 80 mS/m conductivity contour showing the development of a main plume to the east of the dam (but south of the watercourse), with increased conductivity levels (between 60-80mS/m) near the drainage line. The previous extremity of the 2001 EM survey (1050 metres downstream) appeared further to be further east than the existing works. The recent documents (AECOM 2017) refer to the monitoring for 20 years. Potentially most of this monitoring is referring to the residual load that exists in the underlying alluvial sediments after the mine evaporation dams were operated at low levels. The original groundwater seepage of the dams predominately occurred in the first few years of monitoring when the Woodlawn mine was operational.		
7. Adding treated leachate to ED1 may remobilise the heavy metals on the floor of ED1. It is noted in the Heron Mining 2015 AEMR, that when large rainfall occurred in 2013, conductivity in ED1 increased *'probably as a result of runoff from the dam floor to the main body of the dam'*.	As noted above, mine water and treated effluent will be managed in separate areas within ED1. Coffer dams initially in the southern area of ED1 will be developed to store effluent from the LTP. The HDPE lining specification outlined in the AECOM report will be adopted for any coffer dams to be used to contain treated effluent.	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission report)
8. Veolia should detail contingencies to manage the bioreactor leachate, without treated effluent being used by Heron Resources mining operations on the site. If the mine does commence, and the mine workings are dewatered, the water balance shows ED1 & ED2 will be	The revised water balance being prepared by WSP in response to the submissions to this modification takes a conservative approach to Heron's water usage, assuming 7L/s, compared with their estimates of 7.9 to 10.2 L/s. This 7L/s is made up of 2L/s of treated effluent from	Revised water balance – September 2017 (Appendix

Comments	Response	Reference
run at almost maximum capacity with very little extra capacity if there are consecutive years with high rainfall. The management of ED1 and ED2 also require suitable contingencies for the various outcomes that could occur. These include: - if the mine commences and continues as planned; - if the mine commences and then ceases to operate; - if the mine commences and no longer has a use for the treated leachate, or alternatively requires lesser quantities of treated leachate. All these scenarios impact the long term risk of pumping treated leachate into ED1 and ED2.	the LTP, 5L/s of mine water from ED1 and ED2. In the event that mining ceases earlier or Heron does not use the treated effluent, Veolia will be able to manage the water with the use of additional evaporators. The revised water balance shows that the timeframe required to empty all the water in ED3N is within 5 years and with the implementation of aggressive evaporation techniques , mine water in ED1 will drop to 10ML in 6 years. This will provide additional capacity to store the treated effluent from LTP in ED3N dams if required. Further, by this time and if required there will be the space to build more than one coffer dam within the ED1 footprint to store the treated effluent from LTP.	A of this Submission Report)
DPI		
DPI considers that further assessment is required to clarify the current situation and to inform the future remedial actions to comply with the site Environment Protection Licence.	Noted, refer to response to EPA submission	
The main risks identified with the activity are impacts of leachate seepage on nearby groundwater users and groundwater dependent ecosystems. To inform future remediation approaches, an ecological risk assessment has been proposed by the specialist consultant engaged by the proponent. DPI supports this proposal and recommends the assessment include third	Noted, refer to response regarding commitment to an Ecological Risk Assessment below	

Comments	Response	Reference
party users and ecosystems in the vicinity.		
In addition, the report indicates that the leachate volumes generated and proposed to be pumped are substantial and as such, require authorisation to account for the identified take of water. Licensing action may be required to bring the landfill operation into compliance with water management legislation.	Noted, refer to response below regarding water licensing on site	
Recommendations		
1. Provide clarification of the method of "rectification of dam integrity" identified in the Aecom Seepage Investigation Report as the consultant within the same document precluded the lining of the evaporation dams (as being complex and cost prohibitive) and discounted the construction of a cut-off trench (due to the depth to groundwater and thickness of the low permeability soils).	The HDPE lining specification outlined in the AECOM report will be adopted for any coffer dams to be used to contain treated effluent.	Veolia letter to EPA dated 5 September 2017 (Appendix C1 of this Submission report) Section 6.1 of Appendix H of Environmental Assessment report for the proposed modification
2. Undertake the proposed risk assessment to better inform the likelihood of adverse impacts having arisen from the historic ongoing seepage	The Ecological Risk Assessment (ERA) will be jointly managed by Heron and Veolia given our overlapping responsibilities for overall site	Heron letter to EPA dated 15

Comments	Response	Reference
from the evaporation dams being investigated. 3. Expand the monitoring network to provide superior coverage (spatially and at depth) to the current arrangement so that the ecological risk assessment can be thoroughly validated as proposed by Aecom. This should occur in conjunction with the risk assessment, as well as the rectification of dam integrity (once the methodology is clarified). 4. Consult DPI Water in respect of the ecological risk assessment to ensure the study is sufficiently robust to meet the requirements of the NSW Aquifer Interference Policy. The investigation should consider the distribution of groundwater users and dependent ecosystems in the vicinity of the project, as well as the improvements in the monitoring network stated by Aecom to be necessary to validate the risk assessment. 5. Provide all historic information (including hydrogeological and geotechnical consultants reports and data) relevant to the project to ensure efficient assessment of any upcoming activities can be undertaken.	water management. This work will include: - an aquatic ecology study of Crisps Creek downstream of the evaporation dams; - identification of any groundwater fauna existing below or in the vicinity of the evaporation dams; and - additional surface and groundwater sampling using the specific monitoring points contained in the 2017 AECOM Dam Integrity study. The ERA will be performed in accordance with the National Environmental Protection Measure (NEPM) and the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000) and relevant government agencies, including DPI will be consulted as part of the process. The aquatic ecology (required for ERA) studies will be completed by the end of 2017 which will enable the completion of the data review phase in the first quarter of 2018. The additional surface and groundwater quality studies will be conducted at the same time but will include any additional analytes required by the ERA team. Veolia would consult with DPI as part of the ERA process. The ERA process would be conducted over a two day period on site and it would therefore be expected that the final report would be available by end of April 2018.	August 2017 (Appendix C2 of this Submission Report)
6. Confirm or seek appropriate licensing arrangements for the Woodlawn Bioreactor as an aquifer interference activity (a project having the potential to contaminate groundwater) and account for the take of water (up to 126 ML/y) by the proposed operations. All take must be	The extraction of groundwater does not form part of this proposed modification. However, separate to this modification process, Veolia will discuss directly with DPI water licensing requirements for the site.	

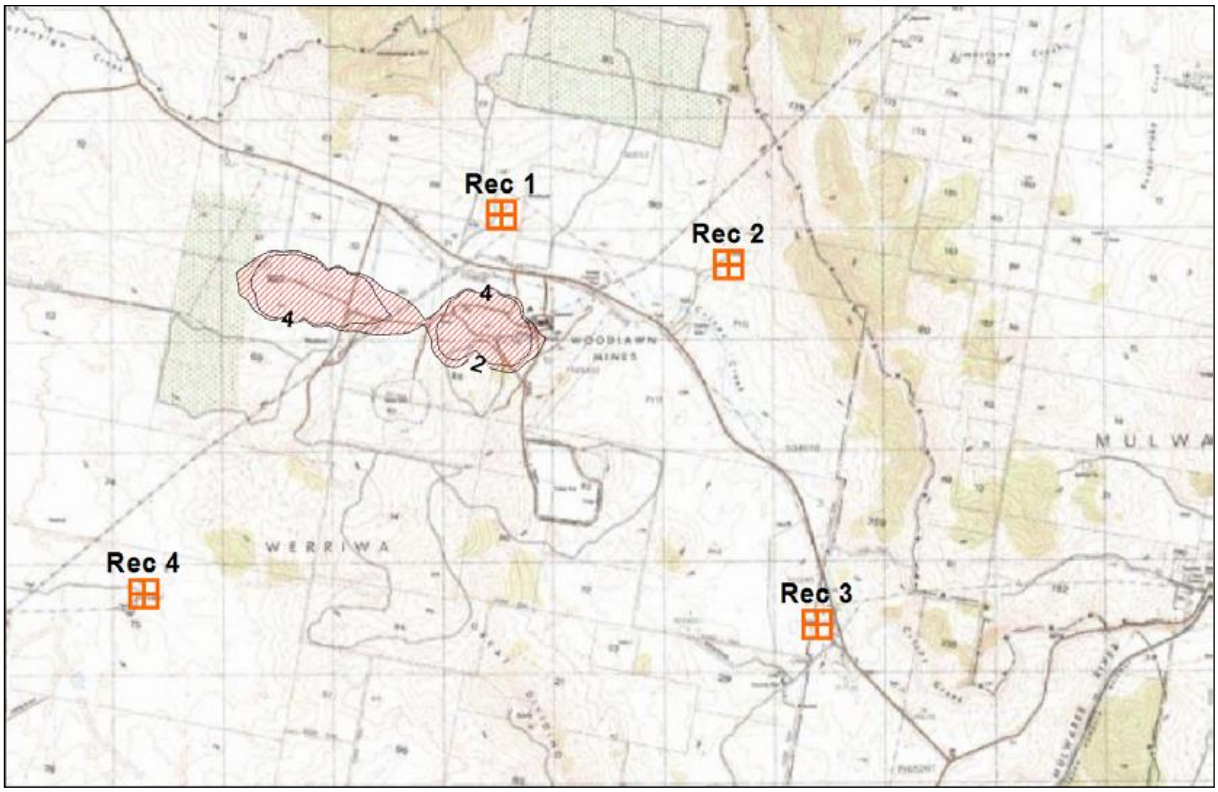
Comments	Response	Reference
licensed with equivalent water entitlement via the allocation of existing licensed entitlement or accessing additional entitlement through trade or controlled allocations		
OEH		
Aboriginal cultural heritage		
OEH notes that there are no Aboriginal cultural heritage sites currently recorded within the proposed leachate treatment plant footprint. OEH is satisfied that the Proponent has undertaken to continue to apply existing approval conditions which include appropriate safeguards if unexpected Aboriginal sites are found during construction. OEH recommends that the Modification consent reflects this undertaking and existing consent conditions	Noted	
South East Local Land Services		
Based on the information provided we recommend consideration be given in relation to obligations under the Biosecurity Act 2015 (NSW) which came into affect 1 July 2017 to minimise biosecurity risks as defined under the objects of the Act.	Noted Veolia is of the view that the proposed LTP does not represent a biosecurity risk as the modification seeks to treat leachate from the bioreactor to an effluent quality that is better than the surrounding mine water. Further to this, the Woodlawn site is a zero discharge site, and treated effluent will be discharged to an area in ED1 that meets previously approved permeability criteria for partially treated leachate. Therefore does not represent a biosecurity risk as defined under the Act.	
TADPAI		

Comments	Response	Reference
Our concern is with the request to remove requirement to seek up front approval for receipt of waste above 50,000 tpa by road. TADPAI has the view that the Secretary approval should still be sought by Veolia, as that approval is linked to conditions that need to be met. Retaining the Secretary's approval step should ensure that all conditions have been satisfied before the 50,000 tpa waste limit is passed.	Through consultation with TADPAI it has been clarified that their main concern related to ensuring that the road upgrade requirements were not removed from the consent. Veolia confirmed that the road upgrade requirements would remain and discussed the potential regional customers currently enquiring about delivering waste to the site.	
TADPAI agrees to the modification request subject to the condition that Secretary Approval be obtained (and all supporting conditions be met) before transporting more than 50,000 tpa by road.	Noted	

4 FIGURES AND TABLES

4.1 FIGURES

Figure 4.1.1- plan showing nearest sensitive receivers



4.2 TABLES

Table 4.2.1

Property Reference	Property Name	Distance to Woodlawn Bioreactor (m)	Elevation (m AHD)
REC 1	Woodlawn Farm	1,600	796
REC 2	Cowley Hills	2,000	794
REC 3	Pylara	4,000	742
REC 4	Torokina	3,700	720

5 CHANGES TO APPLICATION POST NOTIFICATION

This section details changes that have been made to the proposed modification as a result of comments received on the proposal. The changes relate to short and long term measures for the management of water on site.

5.1 WITHDRAWAL OF ADDENDUM

On the basis of the comments received from government agencies and recent discussions with the EPA, the addendum for short term leachate management has been withdrawn from the scope of the planning modification. This is on the basis that existing treated leachate storage will be managed through the existing infrastructure on site and supplemented by additional evaporation equipment within the existing evaporation dams and limiting the extraction rate of leachate from the void. These measures will ensure that the existing dam capacity is sufficient until the LTP is operational.

5.2 SEPARATION OF MINING WATER AND TREATED EFFLUENT INED1

To address concerns raised by government agencies regarding the management of mine affected water compared with treated effluent, Veolia proposes to subdivide ED1 into separate coffer dams to maintain separation between the existing mine water and the treated effluent from the LTP when it becomes operational. Figure 1.2 on page 3 of the revised water balance-September 2017 provides details of area to be used to store treated effluent in the southern part of ED1. These coffer dams will be individually assessed for permeability using in-situ testing techniques to prove they meet the required permeability standards previously approved for ED3SS, which currently stores partially treated leachate.

In the event that in situ permeability testing demonstrates that the in-situ conditions do not meet the permeability criteria as approved by the EPA in ED3SS, then one of the following options will be adopted to ensure the permeability criteria is met:

- Reworking the in-situ clay
- Importing and placement of off site clay
- Installation of an HDPE liner as outlined in the AECOM report

6 APPENDICES

APPENDIX A: REVISED WATER BALANCE – SEPTEMBER 2017

Our ref: PS105723-RES-LTR-01 RevA (Leachate Management by Evaporators)

Your ref: email dated 13/09/2017 from Dr Ark Du

By email
Ark.du@veolia.com

28 September 2017

Dr. Ark Du
Landfill Engineer - Woodlawn
Veolia Australia and New Zealand
Woodlawn Bioreactor
619 Collector Rd Tarago NSW 2580

Dear Ark

Leachate management by mechanical evaporators and the proposed ED1 coffer dam

1. INTRODUCTION

This letter summarises results from modelled water balance for the dams ED1, ED3SS and ED3N based on Veolia's specified inflows, outflows and dam characteristics. Refer to Figure 1.2 for the dam locations. WSP was commissioned by Veolia Australia and New Zealand (Veolia) on 3 September 2017 to undertake simulations using the GOLDSIM based water balance model for ED1, ED3N (1,2,3,4) and ED3SS as per the scope of work and objectives tabulated in Section 1.3.

1.1 PREVIOUS WATER BALANCE ASSESSMENT BY WSP (JUNE 2016)

WSP|Parsons Brinckerhoff (now WSP) undertook a water balance assessment in June 2016 for Veolia's application for regulatory approval to utilise the ED1 and ED2 evaporation dams for treated leachate storage and evaporation (2269623B-RES-LTR-03 Rev0). The main objective of the Veolia nominated scenarios was to assess whether ED1 will overflow over a period of 40 years, if the treated leachate is discharged as per projected schedule (refer to Figure 1.1 for comparison between 2016 and 2017 estimates) under the following three scenarios:

- Scenario A. ED1 does not receive runoff from the Plant Containment Dam (PCD) catchment and groundwater from pit dewatering.
- Scenario B. Condition of Scenario A and water transfer from ED3N and ED3S cells at 1 L/s.
- Scenario C. Condition of Scenario B and groundwater transfer from pit dewatering with concurrent water use by Heron Resources for mineral processing.

The June 2016 modelled assessment suggested that Heron's mining operation may assist Veolia in reducing the water storage requirement for the planned leachate production from 2018 for the next 40 years by using some of the water stored in the dam.

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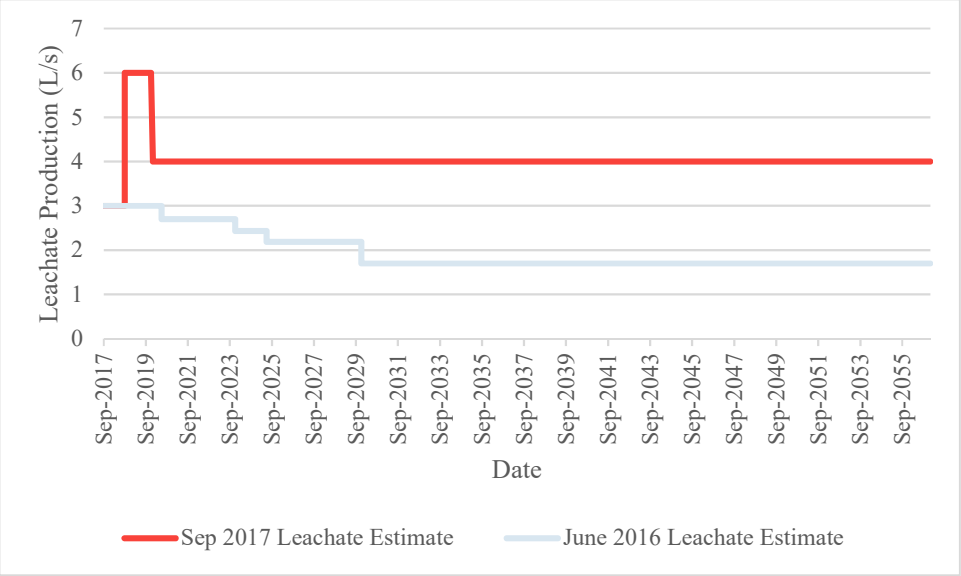

Figure 1.1 Comparison of leachate rates between June 2016 and Sep 2017 estimates (source: Veolia)

1.2 THIS WATER BALANCE ASSESSMENT BY WSP (SEPTEMBER 2017)

Veolia's current strategy is to use ED1 exclusively for its leachate management. A portion of ED1 in south-east corner will house a coffer dam that will be lined for subsequent storage and loss by natural and mechanical evaporation of treated leachate. The remainder of the ED1 dam will be allowed to dry up with the use of mechanical evaporators. Once evaporated, ED1 will be relined to avoid seepage and used subsequently for leachate storage and management. ED1 will only receive runoff from its external catchment including dolerite stockpile area. It will not receive transferred flows from the waste rock seepage dam or the old plant collection dam.

The water balance assessment presented in this report was required by Veolia to support an application to modify the existing ED1 as follows:

- construction of a suitable size of a lined coffer dam (referred to as ED1 Coffer Dam) to store and evaporate treated leachate from its leachate treatment plant from September 2018
- the remainder of ED1 dam (referred to as ED1 North Dam) to be evaporated until dry within next 10 years so that it can be engineered for future leachate management.

These amendments are being proposed by Veolia as a strategy to manage estimated future leachate production as follows:

- The expected leachate production rates are; 3 L/s until August 2018, 6 L/s until December 2019, 4 L/s thereafter as summarised in in Table 1.1.
- The existing ED3N and ED3SS leachate dams (also referred to as lagoons) will continue to receive leachate until the end of 2019 at a rate specified in Table 1.1; 3 L/s until August 2017, 2 L/s until December 2019 and 0 L/s thereafter.
- ED1 Coffer Dam will continue to receive the treated leachate from September 2018 at 4 L/s as summarised in Table 1.1.

Modelled dam characteristics and catchment areas are summarised in Table 1.2. Volume of water and leachate stored in these dams as of 30 August 2017 are summarised in Table 2.1

To enhance evaporation, Veolia intends to use commercially available mechanical evaporators and on-site manufactured floating evaporators. These evaporations pump specified volumes of liquid in the air

in the form of fine particles. Only a fraction of the pumped volume gets evaporated while falling back to the ground from the air. Modelled characteristics of the mechanical evaporators are specified in Table 3.1.

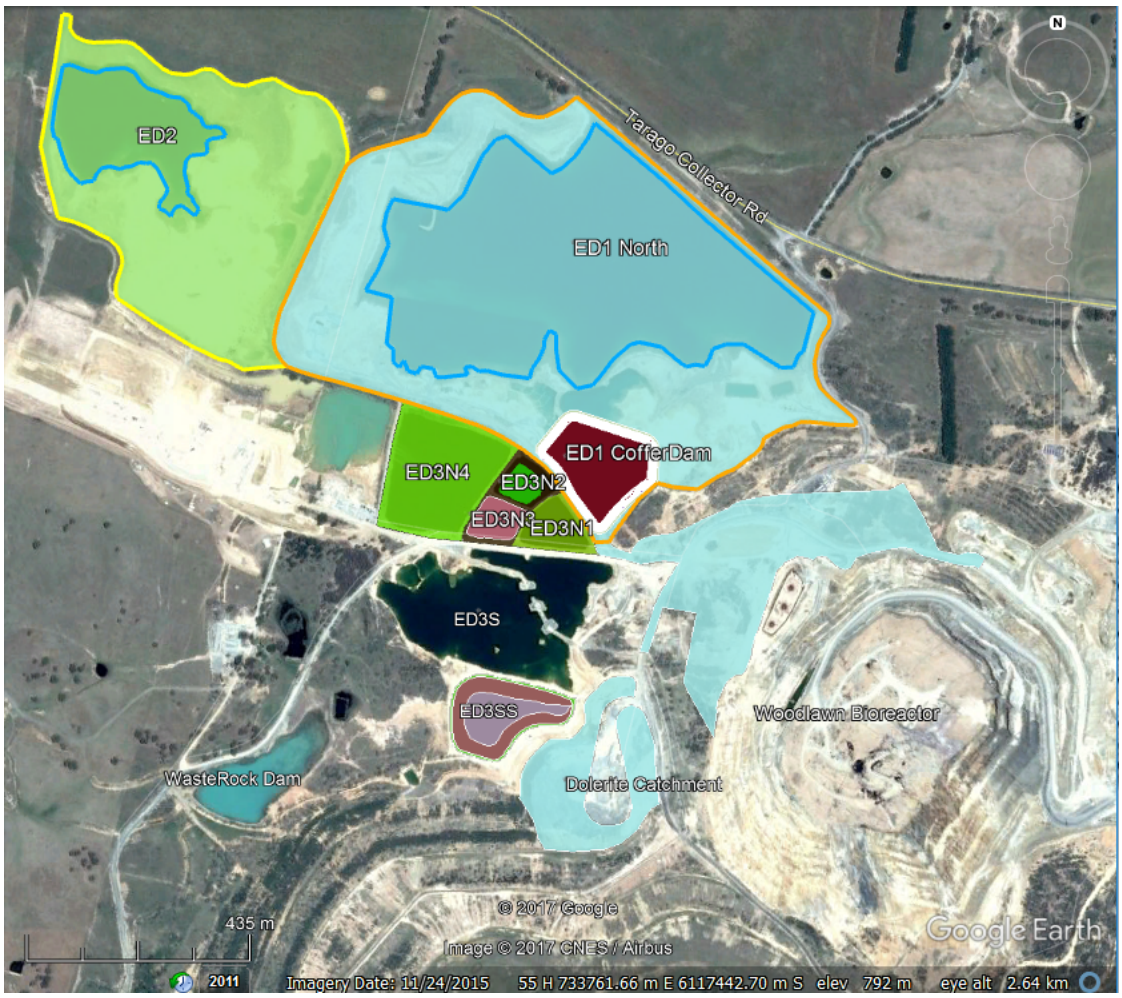

Figure 1.2 Location of dams in relation to Veolia's Woodlawn Bioreactor

Table 1.1 Current estimates of leachate production and distribution (source: Veolia)

DATE	LEACHATE PRODUCTION (L/s)	SUPPLY TO ED1 COFFER DAM (L/s)	SUPPLY TO ED3N, ED3SS (L/s)
September-2017	3	0	3
September-2018 (Commence treatment)	6	4	2
December-2019	6	4	2
January-2020	4	4	0
January-2057	4	4	0

1.3 SCOPE OF WORK

DAM	DAM INPUT	EVAPORATION SYSTEM	OUTPUTS	OBJECTIVE
New ED1 Coffer Dam	Treated water from Leachate Treatment Plant at the rate of 4 L/s and direct rainfall and local runoff	Floating Evaporator Type A × 4	Scenario1: Heron use water at a rate of 2 L/s Natural and assisted evaporation	Estimate the minimum size required for the coffer dam to service for 4-year period without filling.
			Scenario2: No water use by Heron Natural and assisted evaporation	Estimate the minimum size required for the coffer dam to service for 4-year period without filling.
ED1 North Dam with current water storage	Stormwater from its catchment and direct rainfall	75kw Minetek Units - throughput flow 25 L/s each unit.	Scenario2: Natural and assisted evaporation	Estimate number of evaporator units required to empty ED1 in 10 years
ED3N1, ED3N2 and ED3N3	Treated water from the existing leachate treatment dam and direct rainfall and local runoff	Floating Evaporation Unit Type A at ED3N1, ED3N2 and ED3N3	Scenario 2: Natural and assisted evaporation	Estimate the number of required floating evaporator units (Type A and Type B) required to achieve a water volume reduction rate at 1 L/s
ED3N4		Existing Mechanical Evaporator (× 5) at the bank of ED3N4 and Floating Evaporation Unit Type A		
ED3SS		Floating Evaporation Unit Type B x 3		

Table 1.2 Modelled dam characteristics and catchment areas (source: Veolia)

ED3 LEACHATE LAGOONS	LOCATION	WATER LEVEL (m AHD)	VOLUME (m^3)	AREA (m^2)	CATCHMENT (m^2)
ED3SS	Dam Crest	794.12	122,598	22,918	25,900
	Freeboard	793.62	111,446	21,782	
	Base	785.60	0	0	
ED3N Lagoon1	Dam Crest	791.80	26,742	9,065	11,483
	Freeboard	791.30	22,593	8,573	
	Base	787.40	0	4	
ED3N Lagoon2	Dam Crest	791.60	21,477	7,533	9,300
	Freeboard	791.10	18,080	7,104	
	Base	787.50	0	0	
ED3N Lagoon3	Dam Crest	791.50	17,789	6,757	8,900
	Freeboard	791.00	14,796	6,304	
	Base	787.80	0	0	
ED3N Lagoon4	Dam Crest	791.80	123,540	41,315	45,900
	Freeboard	791.30	104,210	39,720	
	Base	786.20	0	1	
ED1 North	Dam Crest	790.00	1,867,259	500,876	656,600
	Freeboard	788.80	1,274,241	484,006	
	Base	784.60	0	0	
ED1 Coffer Dam	Dam Crest	792.50	150,418	33,011	33,011
	Freeboard	792.00	134,223	31,761	
	Base	787.00	0	22,166	

2. CURRENT DAM VOLUMES

Veolia currently is planning to keep storing leachate to ED3N lagoons (1,2,3,4) and ED3SS at a rate of 3 L/s from September 2017 to August 2018 and at a rate of 2 L/s from September 2018 to December 2019. No leachate will be stored in these cells from January 2020.

Based on current volume as of 30 August 2017, available storages in the ED3 lagoons and ED3SS to the freeboard level is insufficient to store the planned leachate supply till December 2019 without losing water via natural and assisted evaporation by the proposed use of mechanical evaporators.

Table 2.1 Estimated water volumes in ED3 lagoons and ED1 as of 30 August 2017 (source: Veolia)

DAM	INITIAL RL (m AHD)	INITIAL VOLUME (m^3)	STORAGE AVAILABLE TO FREEBOARD LEVEL (m^3)	DAYS TO FILL TO FREEBOARD LEVEL AT 3 L/S
ED3SS	793.21	102,677	8,769	34

DAM	INITIAL RL (m AHD)	INITIAL VOLUME (m^3)	STORAGE AVAILABLE TO FREEBOARD LEVEL (m^3)	DAYS TO FILL TO FREEBOARD LEVEL AT 3 L/S
ED3N1	790.61	16,912	5,681	22
ED3N2	791.10	18,080	0	0
ED3N3	790.73	13,126	1,670	6
ED3N4	790.57	76,058	28,152	109
ED1	786.70	380,161	894,080	N/A

3. MECHANICAL EVAPORATORS

Table 3.1 lists the characteristics for the Existing, Minetek, Type A and Type B Evaporators provided by Veolia. The seasonal variation of water loss through Existing Mechanical Evaporators were related to monthly potential evaporation based on data provided by Veolia that were used in the June 2016 assessment (Table 3.2). The Existing Mechanical Evaporators are expected to be similar to TurboMist (http://www.turbomist.com/products). The same relationship was used for the Minetek unit without scaling.

The monthly evaporation characteristics for the floating evaporator Type A and Type B units were scaled from the characteristics for Existing Mechanical Evaporators to achieve Veolia's estimated average annual rate of water loss from the volume passing through the units for 2016-2017 period. Refer to Table 3.2 for the monthly scaled evaporation loss rates for Type A and Type B and Minetek units.

Table 3.1 Characteristics of modelled mechanical evaporator types

EVAPORATOR TYPE	MINETEK 400/200	TYPE A	TYPE B	EXISTING MECHANICAL EVAPORATOR
Applied quantity	1	1	1	1
Rated flow (L/min)	1500	126	86	350
Expected loss rate (L/min) at 100% availability	420	25	6.0	98
Availability % planned	Up to 70	70	70	Up to 70
Actual flow through (L/min) in 2016-2017 (source: Veolia)	Not installed	126	86	168 (due to pump restrictions)
Availability % in 2016-2017	Not installed	80	50	34
Evaporator flow (L/s) in 2016-2017		1.68	0.72	0.95
Average loss (L/s) in 2016-2017		0.33	0.05	0.27
% loss /year in 2016-2017		20%	7%	28%
Achieved loss rate (L/ min) in 2016-2017		19.9	3.0	16.20

Table 3.2 Relationship between potential evaporation and evaporation as % of the inflow volume through the mechanical evaporators

MONTH	POTENTIAL EVAPORATION (mm/day)	POTENTIAL EVAPORATION (mm/month)	% OF INFLOW EVAPORATED BY THE EXISTING MECHANICAL EVAPORATOR	% OF INFLOW EVAPORATED BY THE TYPE A EVAPORATOR	% OF INFLOW EVAPORATED BY THE TYPE B EVAPORATOR
1	5.9	180.1	40.0	28.8	7.3
2	4.5	136.4	36.8	26.5	6.7
3	3.9	119.2	35.3	25.4	6.4
4	2.3	71.2	30.2	21.8	5.5
5	1.4	43.4	26.1	18.8	4.8
6	0.9	27.9	22.8	16.4	4.2
7	1.1	32.0	23.8	17.2	4.4
8	1.7	52.5	27.6	19.9	5.0
9	2.6	79.7	31.3	22.6	5.7
10	3.7	112.4	34.7	25.0	6.3
11	4.6	139.8	37.0	26.7	6.8
12	5.8	175.1	39.6	28.5	7.2

4. MODELLLING APPROACH

The GOLDSIM based model for Woodlawn Site was modified to suit required simulations as per the scope of work outlined in Section 1.3 and schematically represented in Figure 4.1 as follows:

- Rainfall and natural evaporation is applied to all dams.
- Runoffs from the catchment of ED1 outside of the water filled surface were calculated using a volumetric runoff coefficient of 0.1.
- Runoffs from the catchments of ED3SS, ED3N1, ED3N2, ED3N3 and ED3N4 from area within the dam walls were calculated using a runoff coefficient of 1.0.
- Potential seepage loss from the dam floors were not considered in the simulations.
- Types of evaporators as per Section 1.3 were applied when running scenarios with evaporators.
- Natural evaporation was assumed to occur at a daily potential rates calculated by applying a pan factor of 0.60 to the pan evaporation data.
- Leachate input to ED3 dams was set to 3 L/s from September 2017 to August 2018 and at 2 L/s from September 2018 to December 2019. Leachate input to ED3 dams were stopped from January 2020.
- Leachate input to ED1 Coffer Dam was applied at 4 L/s from September 2018.
- Simulations were run from 01/09/2017 to 31/12/2027 at a daily time step.
- Future climate scenarios were based on climatic sequences presented in Section 6.

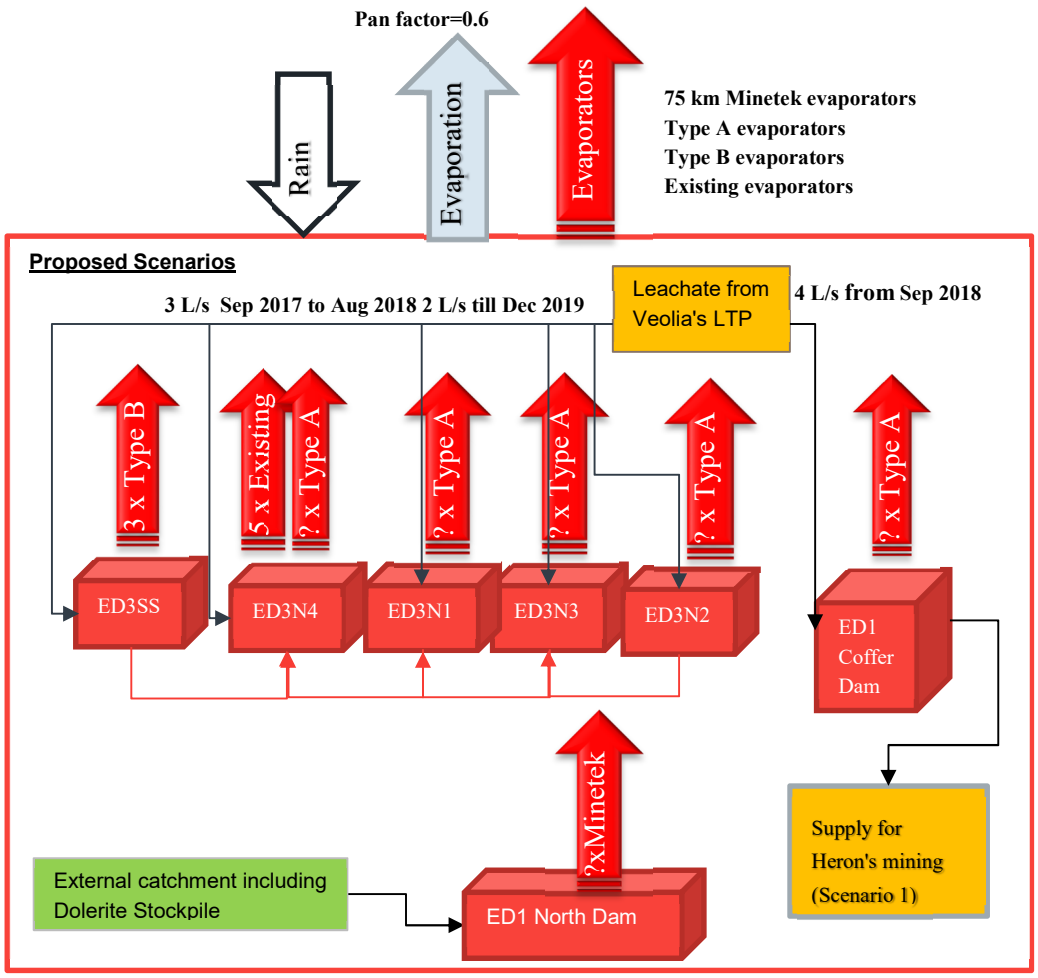

Figure 4.1 Schematic representation of modelled dams in GOLDSIM

5. WATER BALANCE MODEL VALIDATION

The site water balance for Woodlawn was validated based on recently built ED3SS leachate dam, which was operated from 11 Sep 2016 to date. Veolia provided the as-built bathymetric data for ED3SS (Figure 5.1), climatic data (Figure 5.2) and measured leachate flow (Figure 5.3) from 11 Sep 2016 to 11 Sep 2017. Simulated water storage in ED3SS, natural evaporation from ED3SS and required transfer of leachate to ED3N and loss by mechanical evaporator trialled by Veolia are also presented in Figure 5.3. Veolia confirmed that mechanical evaporators were operated in the dam from June 2017. Veolia also transferred leachate into ED3N lagoons to manage the leachate. The simulated results were obtained by using a pan factor of 0.6, direct rainfall runoff from within the dam footprint area and without any seepage loss from the dam floor. The water balance model was assumed to be representative for the purpose of scope of works presented in Section 1.3.

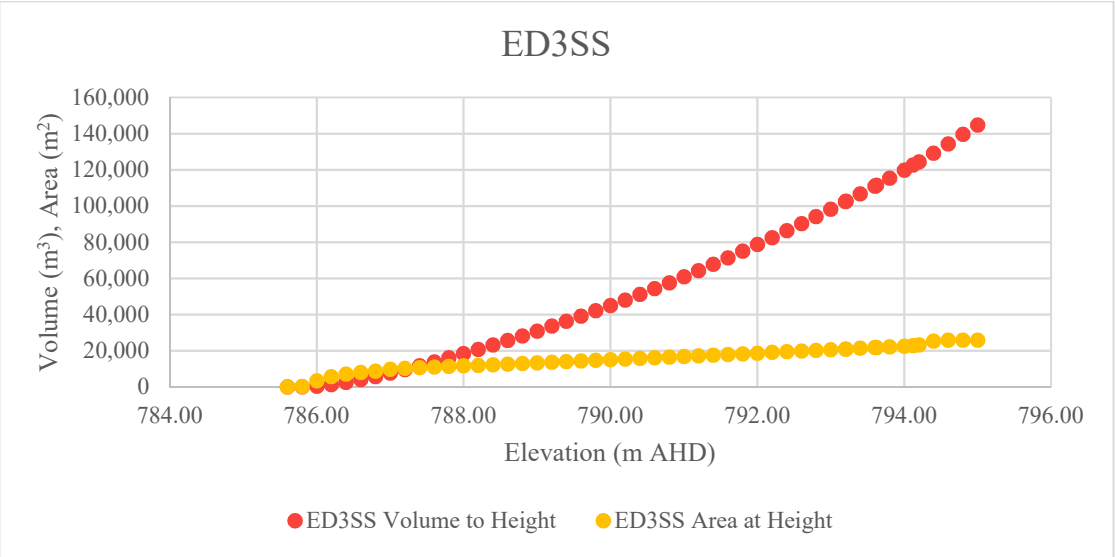

Figure 5.1 ED3SS bathymetric data used in simulations (source: Veolia)

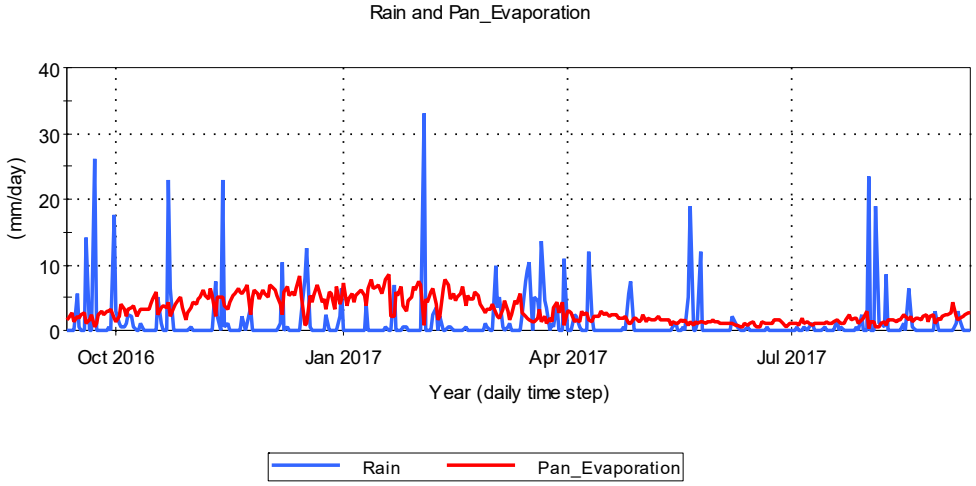

Figure 5.2 Daily rain and pan evaporation data from 11September 2016 to 11 September 2017 (source: Veolia)

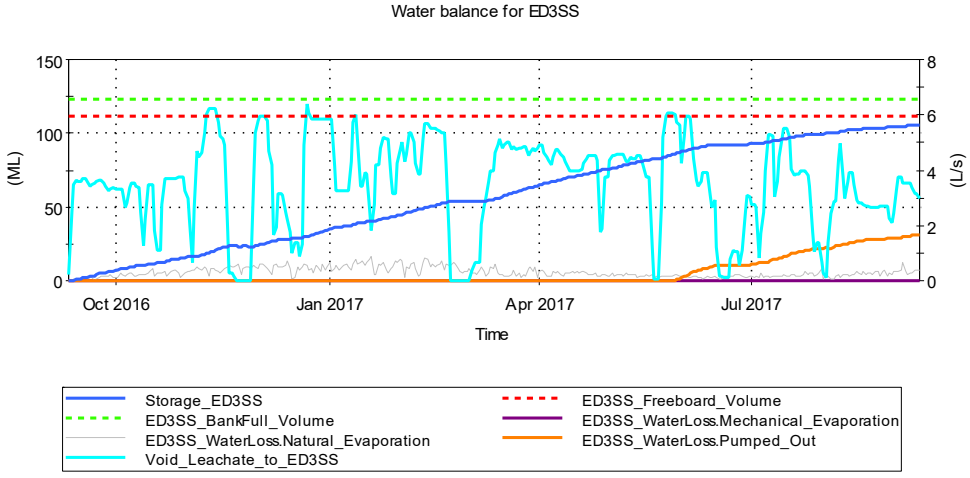

Figure 5.3 Simulated daily results from 11September 2016 to 11 September 2017 for ED3SS

6. CLIMATE SEQUENCES

The following sub-sets of climate sequences were used in assessing modelled scenarios:

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 1200 mm.

The annual sequences are shown in Figure 6.1 for rainfall and Figure 6.2 for pan evaporation. Note that the long-term averages for annual rainfall and pan evaporation from 1932 to 2016 are 683 mm and 1,231mm respectively.

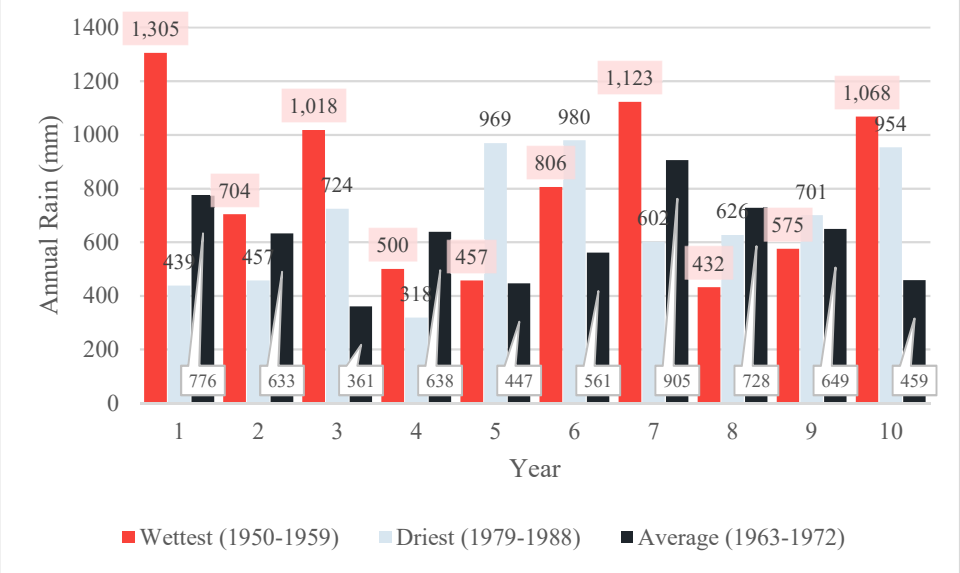

Figure 6.1 Annual sum of daily rainfall sequences used in modelling scenarios

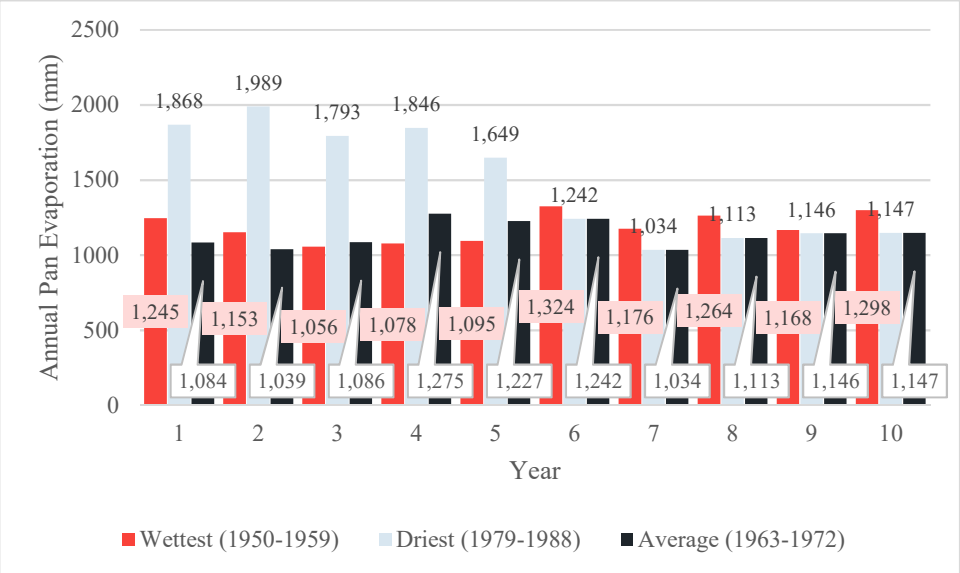

Figure 6.2 Annual sum of daily pan evaporation sequences used in modelling scenarios

7. SIMULATED RESULTS

7.1 ED1 COFFER DAM

The objective of the simulations was to estimate required size of ED1 Coffer Dam (referred to as ED1CD) so that the leachate supply at 4 L/s to the dam can be managed for 4 years without being at full capacity. Veolia provided a preliminary design for a coffer dam with a bank full capacity of 150 ML. This coffer dam will be situated within the footprint of ED1 thus splitting the dam into ED1 North and ED1 Coffer Dam. Veolia wanted to test the following two scenarios:

- ED1CD-Scenario1 assumes that Heron will use treated leachate in ED1CD at a rate of 2 L/s.
- ED1CD -Scenario2 assumes that Heron will not use the treated leachate from ED1CD.

Details of ED1 Coffer Dam scenarios and results are summarised in Table 7.1. The scenarios were assessed based on the time to reach the freeboard level volume. Daily simulated results for each of the scenarios are presented in charts from Figure 7.1 through to Figure 7.15.

The feasible solutions are as follows:

- The proposed 150 ML Coffer Dam may be able to service for the intended 4-year period, if Heron uses water from the coffer dam at a rate of 2 L/s and 4 x Type A Evaporators are used simultaneously for 70% of the time every year.
- One and a half cells of 150 ML Coffer Dam may be required to service the intended 4-year period, if Heron does not use water from the coffer dam and a total of 5 x Type A Evaporators are used simultaneously for 70% of the time every year.
- Three cells of 150 ML Coffer Dam may be required to service the intended 4-year period, if Heron does not use water from the coffer dam and evaporators are not used.

Table 7.1 Modelled scenarios for ED1 Coffer Dam

SCENARIOS	WATER LOSS IN ADDITION TO THE NATURAL EVAPORATION		CLIMATE	TIME TO REACH FREEBOARD VOLUME (DAYS)
ED1 COFFER DAM 150 ML AT BANK FULL				
SCENARIO 1A	HERON WATER USE AT 2 L/S	NO MECHANICAL EVAPORATORS	WETTEST	782
SCENARIO 1B			DRIEST	967
SCENARIO 1C			AVERAGE	900
SCENARIO 1D		4 X TYPE A EVAPORATORS	WETTEST	1,766
SCENARIO 1E			DRIEST	2,170
SCENARIO 1F			AVERAGE	2,157
SCENARIO 2D	NO WATER USE BY HERON	4 X TYPE A EVAPORATORS	WETTEST	615
SCENARIO 2E			DRIEST	735
SCENARIO 2F			AVERAGE	663
ED1 COFFER DAM 225 ML AT BANK FULL				
SCENARIO 3D	NO WATER USE BY HERON	5 X TYPE A EVAPORATORS	WETTEST	1,519
SCENARIO 3E			DRIEST	1,876
SCENARIO 3F			AVERAGE	1,813
ED1 COFFER DAM 450 ML AT BANK FULL				
SCENARIO 4A	NO WATER USE BY HERON	NO MECHANICAL EVAPORATORS	WETTEST	1,663
SCENARIO 4B			DRIEST	2,014
SCENARIO 4C			AVERAGE	1,856

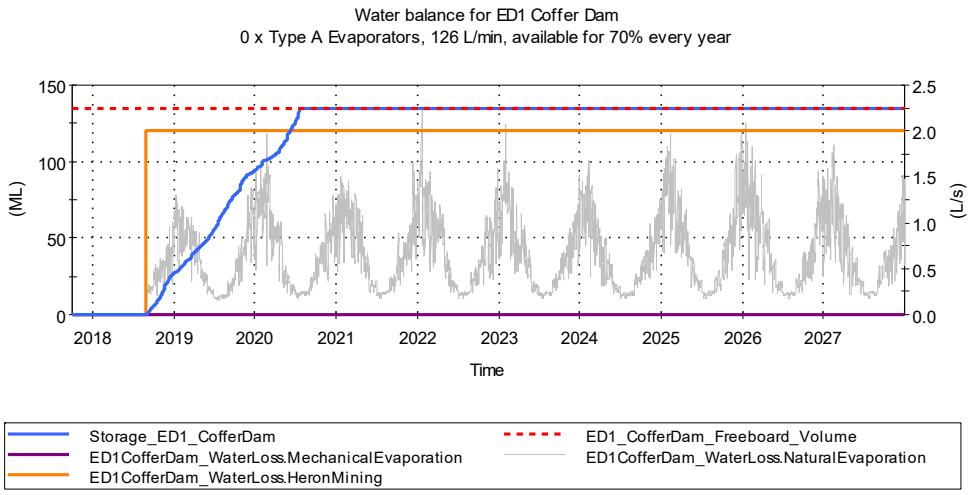

Figure 7.1 Simulated daily time series for the 150 ML ED1 Coffer Dam Scenario 1A

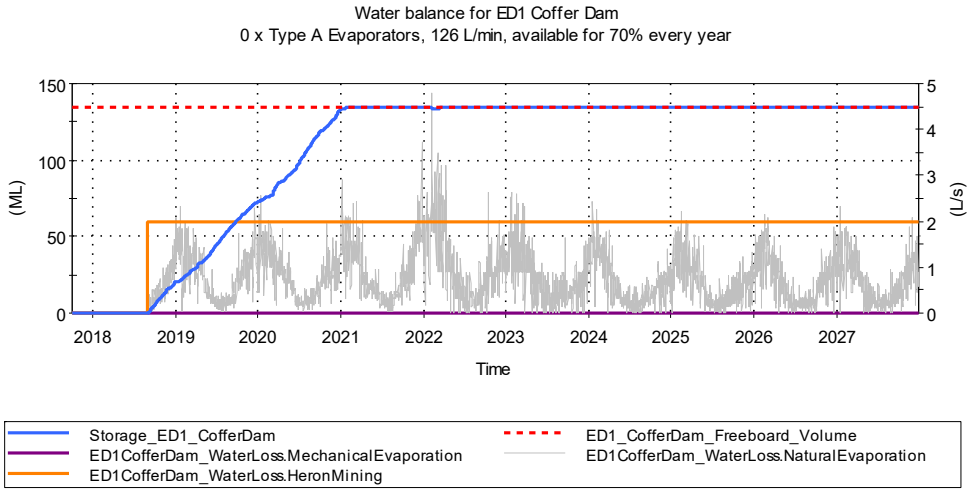

Figure 7.2 Simulated daily time series for the 150 ML ED1 Coffer Dam Scenario 1B

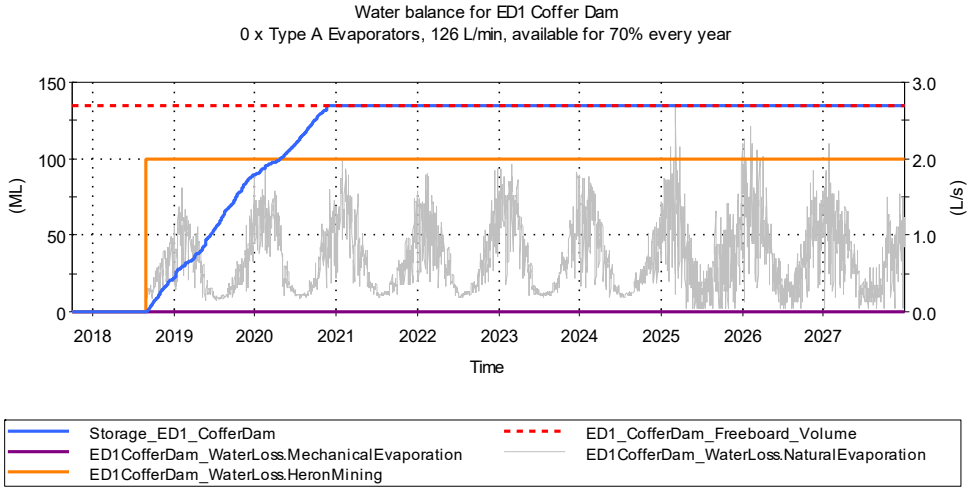

Figure 7.3 Simulated daily time series for the 150 ML ED1 Coffer Dam Scenario 1C

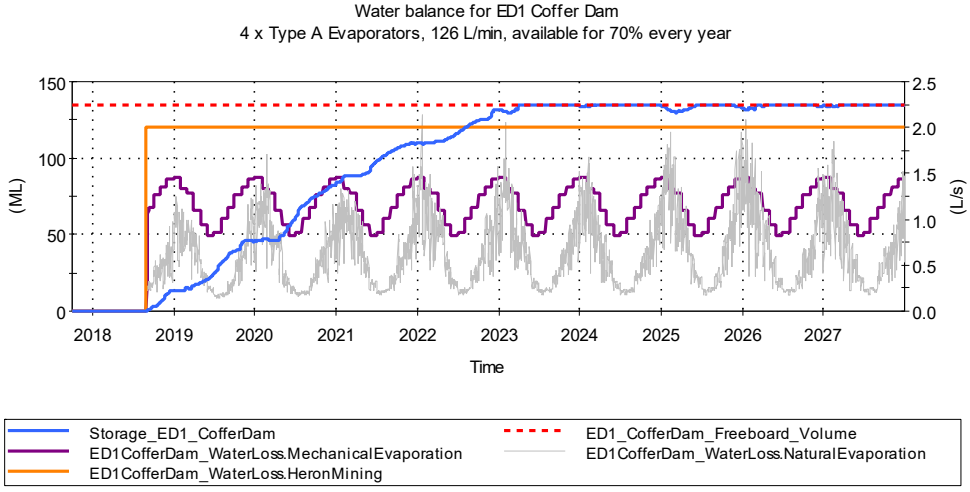

Figure 7.4 Simulated daily time series for the 150 ML ED1 Coffer Dam Scenario 1D

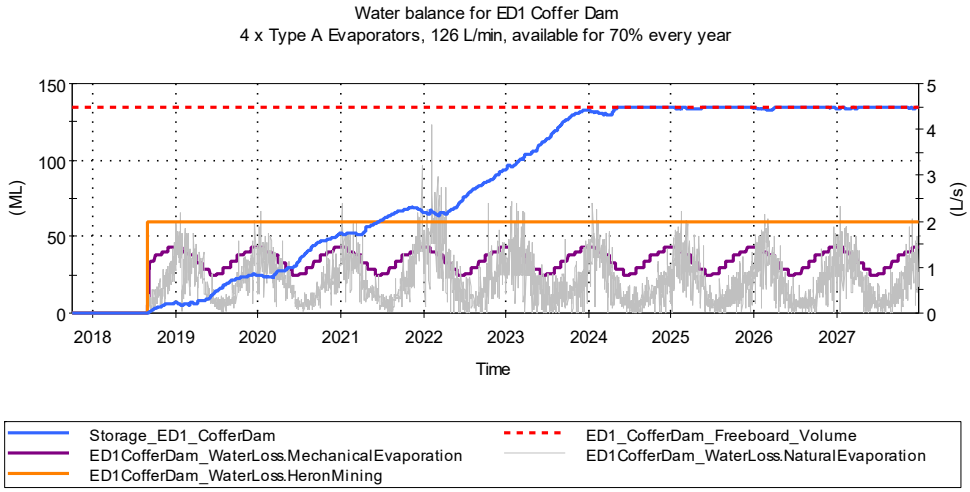

Figure 7.5 Simulated daily time series for the 150 ML ED1 Coffer Dam Scenario 1E

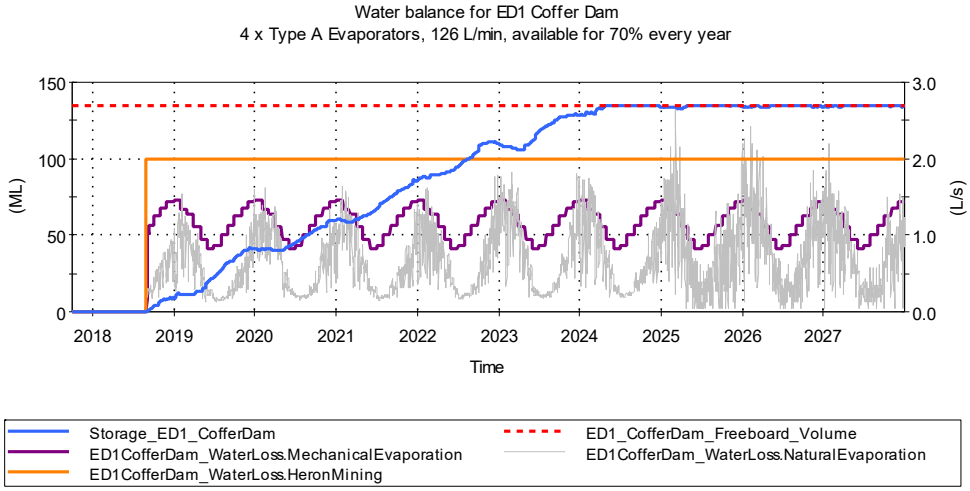

Figure 7.6 Simulated daily time series for the 150 ML ED1 Coffer Dam Scenario 1F

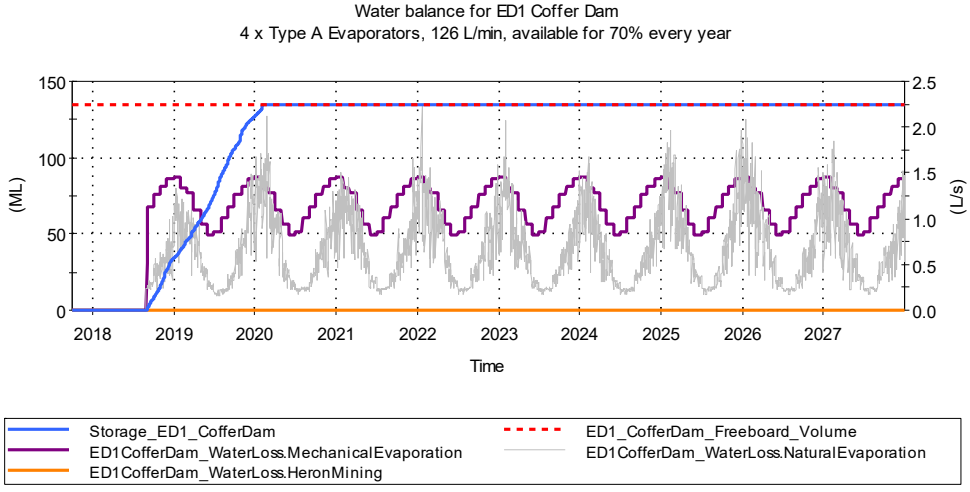

Figure 7.7 Simulated daily time series for the 150 ML ED1 Coffer Dam Scenario 2D

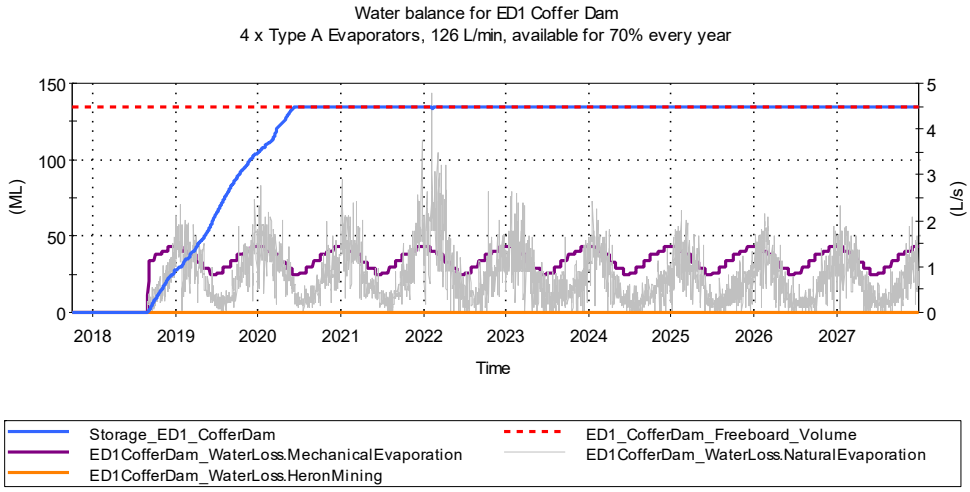

Figure 7.8 Simulated daily time series for the 150 ML ED1 Coffer Dam Scenario 2E

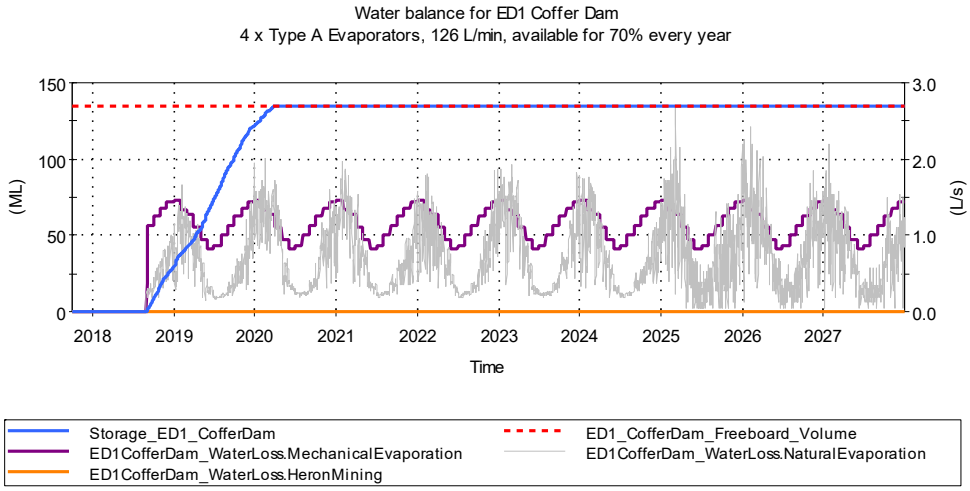

Figure 7.9 Simulated daily time series for the 150 ML ED1 Coffer Dam Scenario 2F

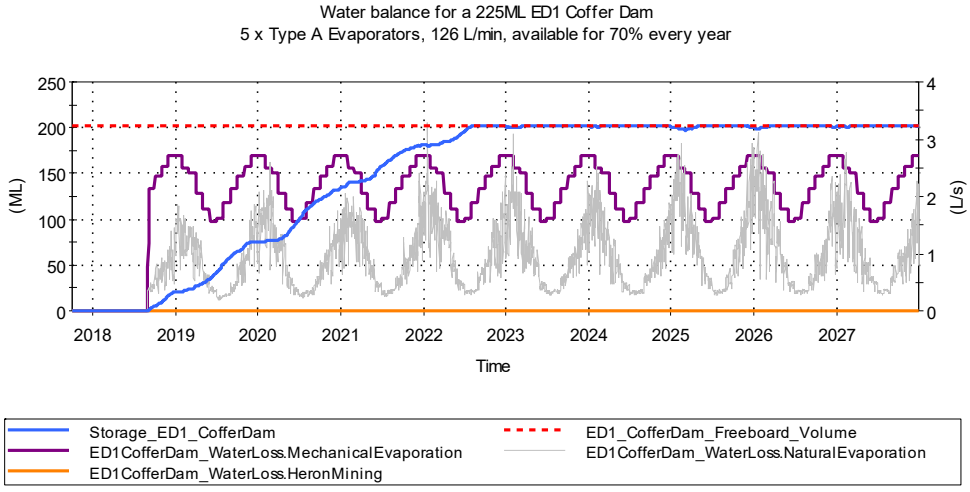

Figure 7.10 Simulated daily time series for the 225 ML ED1 Coffer Dam Scenario 3D

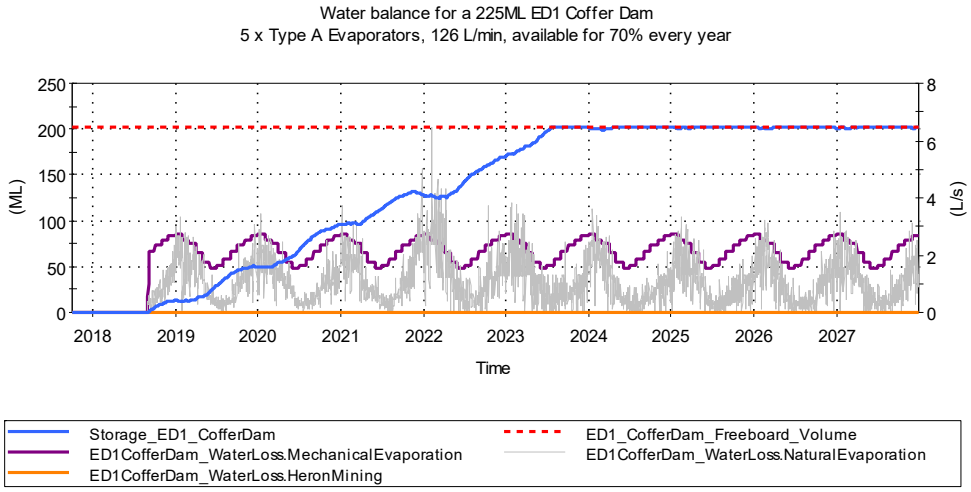

Figure 7.11 Simulated daily time series for the 225 ML ED1 Coffer Dam Scenario 3E

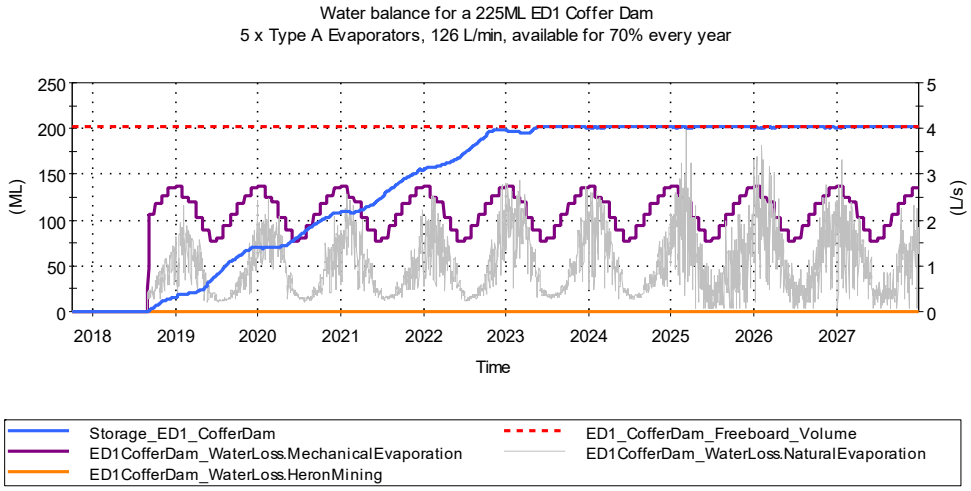

Figure 7.12 Simulated daily time series for the 225 ML ED1 Coffer Dam Scenario 3F

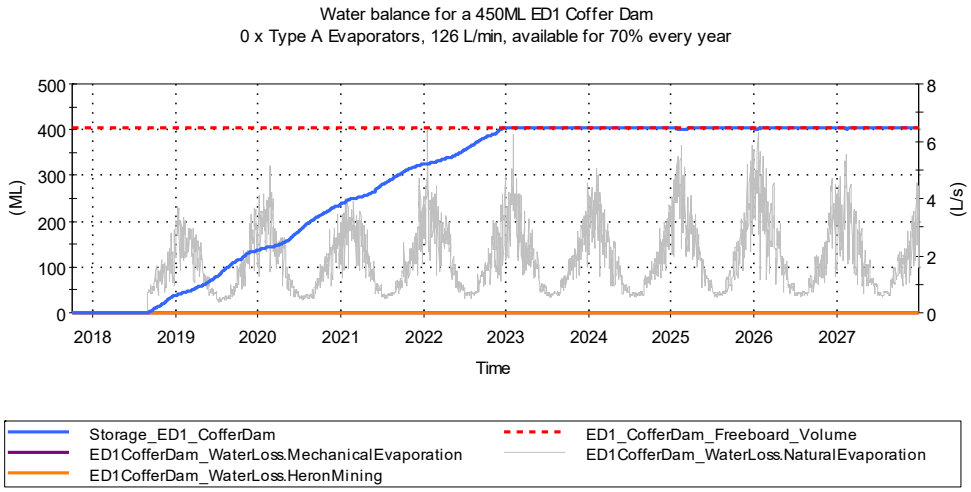

Figure 7.13 Simulated daily time series for the 450 ML ED1 Coffer Dam Scenario 4D

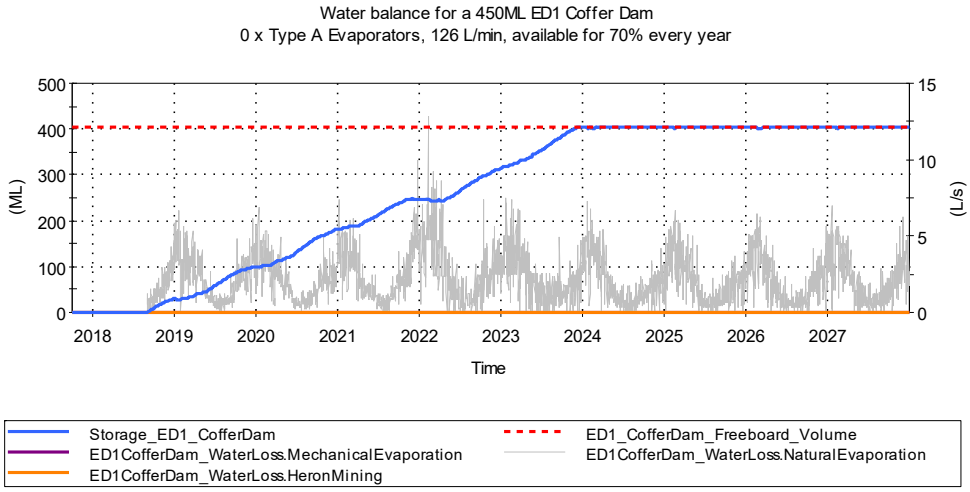

Figure 7.14 Simulated daily time series for the 450 ML ED1 Coffer Dam Scenario 4E

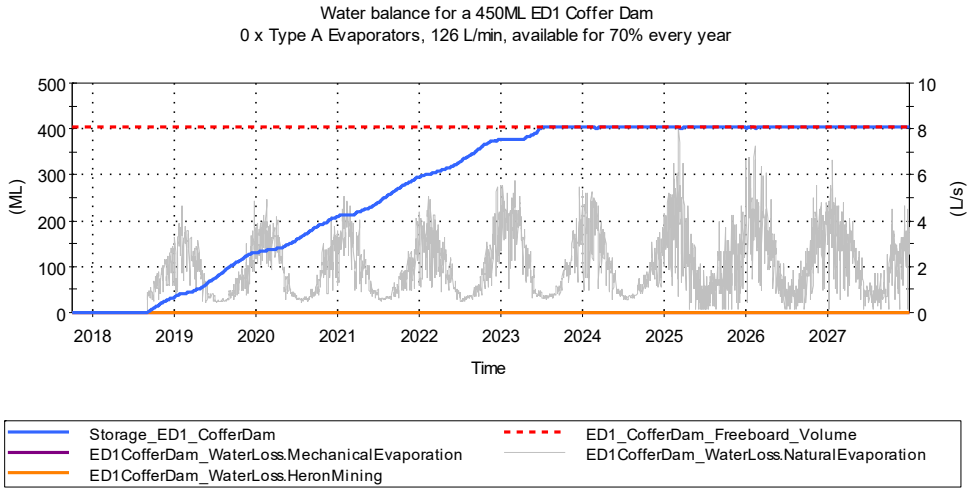

Figure 7.15 Simulated daily time series for the 450 ML ED1 Coffer Dam Scenario 4F

7.2 ED1 NORTH DAM

The objective of the simulation was to estimate how many units of a commercially available evaporators will be required to dry up the water volume currently stored in the dam. This dam has an external catchment of approximately 14.7 ha in addition to its foot print area of 54.3 ha or a net footprint area of 51 ha, if a 150 ML coffer dam is constructed. Given that the rainfall-runoff will still occur from the external catchment into ED1 North Dam, complete drying of the dam may not be possible. The number of evaporators have been estimated based on achieving a minimum water volume of 10 ML.

Results (refer to Table 7.2, Figure 7.16, Figure 7.17 and Figure 7.18) from the simulations indicate that 2 units of Minetek 75kw Evaporator with 1500 L/min flow operating for at least 34% every year will be able to dry up the ED1 North Dam to 10 ML within:

- 6 years in the wettest climate
- 2 year in the driest climate
- 3 years in the average climate used in the simulation.

Table 7.2 Modelled scenarios for ED1 North Dam

SCENARIOS	WATER LOSS IN ADDITION TO THE NATURAL EVAPORATION		CLIMATE	TIME TO EMPTY TO 10 ML VOLUME (DAYS)
SCENARIO D	NO WATER USE BY HERON	2 X MINETEK EVAPORATORS	WETTEST	2,058
SCENARIO E			DRIEST	707
SCENARIO F			AVERAGE	1,036

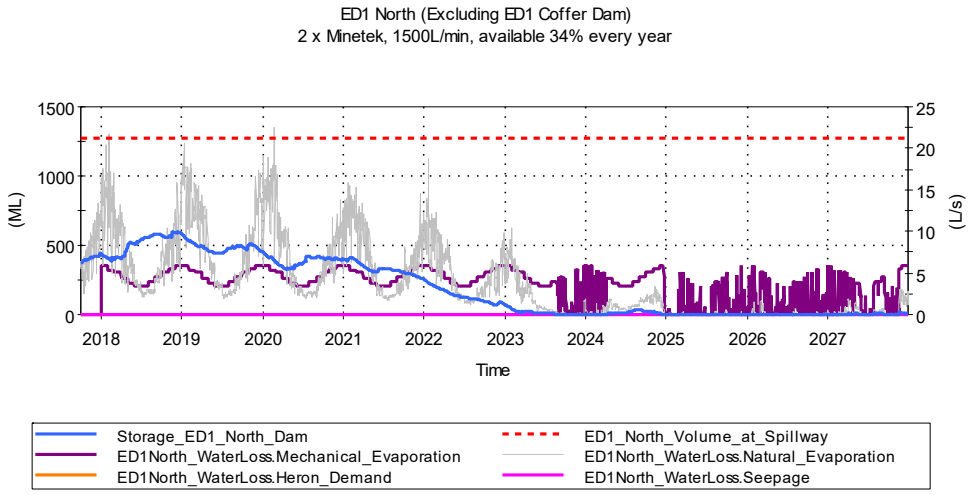

Figure 7.16 Simulated daily time series for ED1 North Dam Scenario D

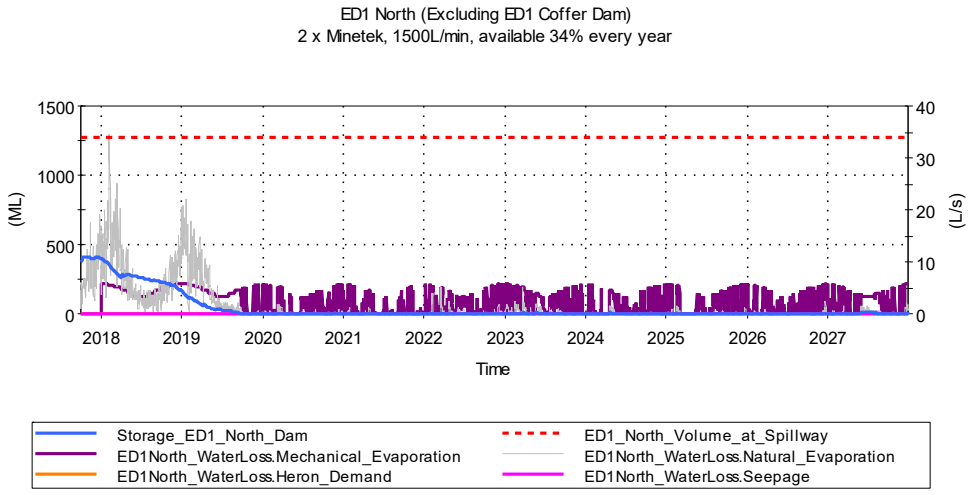

Figure 7.17 Simulated daily time series for ED1 North Dam Scenario E

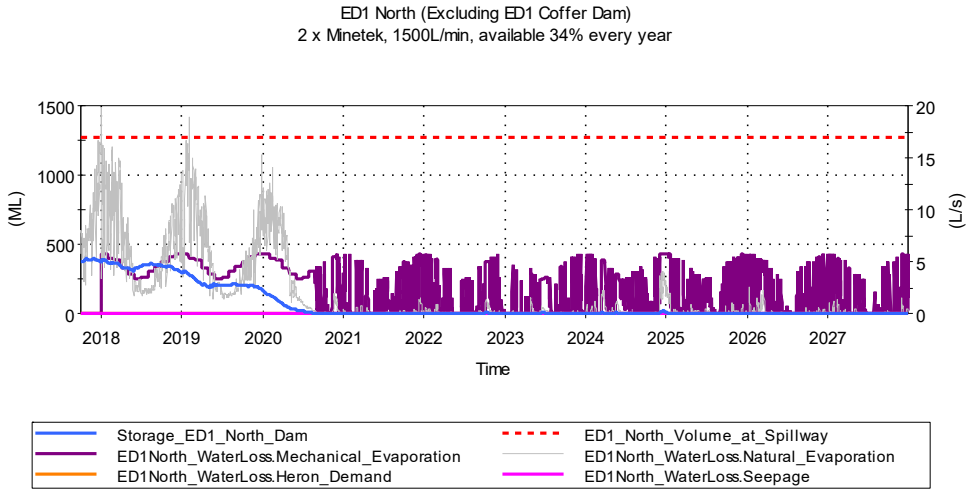

Figure 7.18 Simulated daily time series for ED1 North Dam Scenario F

7.3 ED3 NORTH AND ED3SS DAMS

There were two main objectives of the simulations undertaken for EDN3 and ED3SS dams:

- to estimate number of locally developed evaporators (Type A and Type B) required to maintain water volume below freeboard levels so that leachate disposal can be continued until the end of 2019.
- to estimate duration in days until the dams would become empty, if the evaporators were to continue operating in these dams.

Simulations were undertaken by varying the number of evaporators in the dams until the objectives were achieved.

Leachate input to ED3N and ED3SS will be managed by utilising available volumes below the freeboard level in each dam. Available storages above the freeboard levels to the dam crests are reserved for direct rainfall and local runoffs from the embankment slopes only. Note that freeboard level is 0.5m below the lowest dam crest level at each dam.

Veolia already has 5 x Mechanical Evaporators at ED3N4 and plans to install additional 3 x Type A floating evaporators. Veolia also plans to install 1 x Type A evaporator each at other lagoons of ED3N and 3 x Type B evaporators at ED3SS.

Available storage volume (as of 30 August 2017) below the freeboard level is the largest in ED3N4 and the second largest in ED3SS and the third largest in ED3N1, however altogether the remaining volume to the freeboard is 170 days without accounting for any evaporation (Table 2.1).

For simulation purpose, it was assumed that Veolia will continue to supply leachate to ED3N4 while the evaporators are operating. If required, the leachate will be diverted to other dams in the following order of priority: ED3N1, ED3SS, ED3N3 and ED3N2.

Table 7.3 summarises the results for a revised configuration of evaporators that were found to achieve both objectives. The number of Type A evaporators (flow rate= 126 L/min) were increased from 3 to 11 for ED3N4, keeping the 5 x Existing Mechanical Evaporators (flow rate= 168 L/min). The remainder of the dams had the number and type of evaporators as per Veolia's proposal.

Daily simulated results for the wettest climate sequence (worst case for volume build up) are presented in Figure 7.19 for ED3SS, Figure 7.20 for ED3N1, Figure 7.21 for ED3N2, Figure 7.22 for ED3N3 and Figure 7.23 for ED3N4.

The simulated results presented in Figure 7.23 for ED3N4 illustrates that the leachate during 2018 and 2019 can be supplied to ED3N4 and managed via the proposed number of evaporators operating as per the specification outlined in Table 3.1.

Even without the leachate supply and despite 3 x Type B evaporators operating at ED3SS dam 70% each year, Figure 7.19 illustrates likelihood of volume in ED3SS exceeding the freeboard level if the wettest sequence of climate similar to that from 1950 to 1959 occur in future.

Figure 7.21 for ED3N2 illustrates that the volume in ED3N2 is also likely to exceed the freeboard level as this dam is at freeboard level as of 30 August 2017.

Water volumes in ED3N3 and ED3N4 did not exceed the freeboard level in the simulation for the wettest climate sequence (refer to Figure 7.22 for ED3N3 and Figure 7.23 for ED3N4).

All ED3 dams, except ED3SS, are expected to dry up within 5 years if the proposed mechanical evaporators are kept in operation (Table 7.3). The days to empty the ED3N dams varies from the lowest 839 days for ED3N4 to 1,611 days for ED3N1 dam for the wettest climate sequence

Daily simulated results for other scenarios are presented in charts from Figure 7.24 through to Figure 7.33.

The total number of evaporators required at ED3N4 is 16, which may not be physically feasible to install and operate. The result of this simulation was discussed with Veolia for an alternative strategy. Veolia advised that the alternative strategy would be to increase flow rates through the existing mechanical evaporators. These evaporators are rated at 350 L/min, however, the flow through the evaporators have been limited to 168 L/min due to pump capacity. Veolia may consider increasing the pump capacity as well as increasing the evaporator availability from 34% to as high as 70% if required.

To test the impact of increased flow rate on reduction in number of required Type A evaporators for ED3N4, Scenario D was repeated by doubling the flow rates through the Existing Mechanical Evaporators, increasing the availability to 40% but limiting the number of Type A evaporators to 3. Results for the wettest climate simulation for ED3N4 is presented in Figure 7.34 that achieves similar outcomes as Scenario D results presented in Table 7.3. ED3N4 dam is expected to dry up in 885 days instead of 839 days for Scenario D in Table 7.3.

Figure 7.34 illustrates that by doubling the flow rate through Existing Mechanical Evaporators at ED3N4 has advantage in reducing Type A Evaporator requirement from 11 units to 3 units only.

Table 7.3 Modelled scenarios for ED3 and ED3SS Dams

SCENARIOS	WATER LOSS IN ADDITION TO THE NATURAL EVAPORATION		CLIMATE	TIME TO EMPTY TO 10 ML VOLUME (DAYS)	TIME TO FILL UP TO FREEBOARD (DAYS)	SIMULATED OFFURRENCE OF VOLUME TO DAM CREST (DAYS)
SCENARIO D	ED3SS	3 X TYPE B EVAPORATORS	WETTEST	NOT ACHIEVED	211 (REFER TO FIGURE 7.19)	0
SCENARIO E			DRIEST	NOT ACHIEVED	0	0
SCENARIO F			AVERAGE	NOT ACHIEVED	0	0
SCENARIO D	ED3N1	1 X TYPE A EVAPORATOR	WETTEST	1,611	0 (REFER TO FIGURE 7.20)	0
SCENARIO E			DRIEST	731	0	0
SCENARIO F			AVERAGE	941	0	0
SCENARIO D	ED3N2	1 X TYPE A EVAPORATOR	WETTEST	1,482	8 (REFER TO FIGURE 7.21	0
SCENARIO E			DRIEST	745	0	0
SCENARIO F			AVERAGE	921	0	0
SCENARIO D	ED3N3	1 X TYPE A EVAPORATOR	WETTEST	1,267	87 (REFER TO FIGURE 7.22	0
SCENARIO E			DRIEST	552	0	0
SCENARIO F			AVERAGE	826	0	0
SCENARIO D	ED3N4	11 X TYPE A EVAPORATOR AND 5 X EXISTING MECHANICAL EVAPORATORS	WETTEST	839	0 (REFER TO FIGURE 7.23	0
SCENARIO E			DRIEST	549	0	0
SCENARIO F			AVERAGE	743	0	0

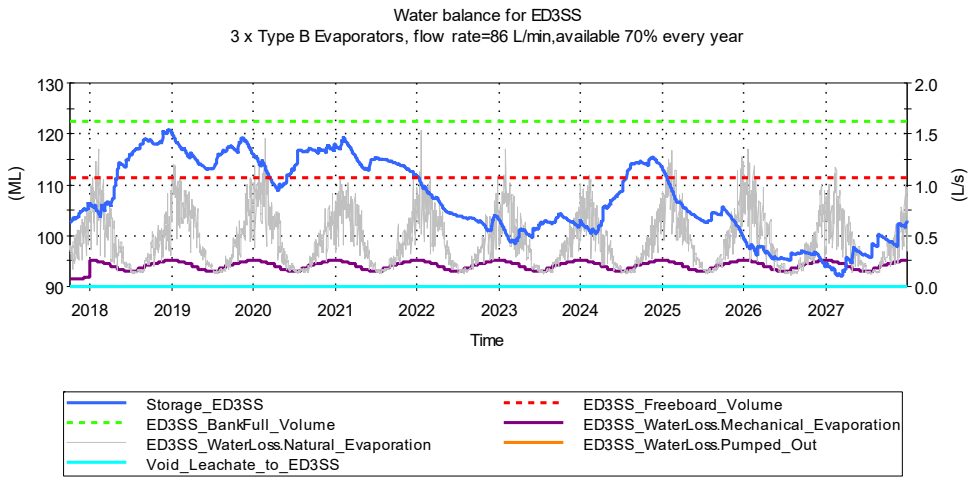

Figure 7.19 Simulated result for ED3SS in the wettest climate sequence

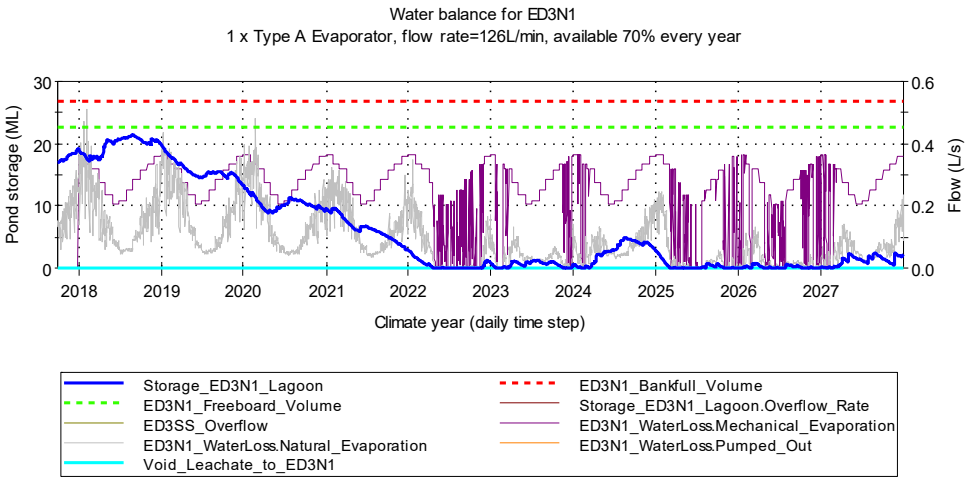

Figure 7.20 Simulated result for ED3N1 in the wettest climate sequence

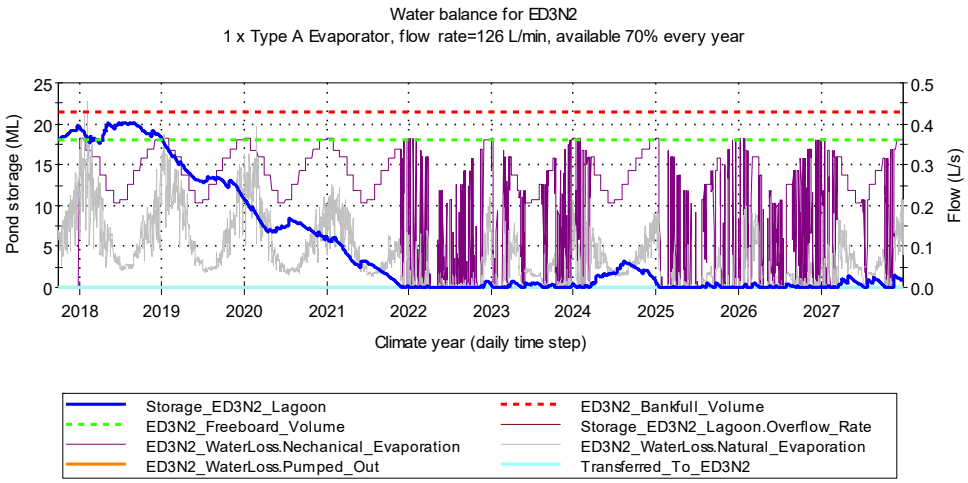

Figure 7.21 Simulated result for ED3N2 in the wettest climate sequence

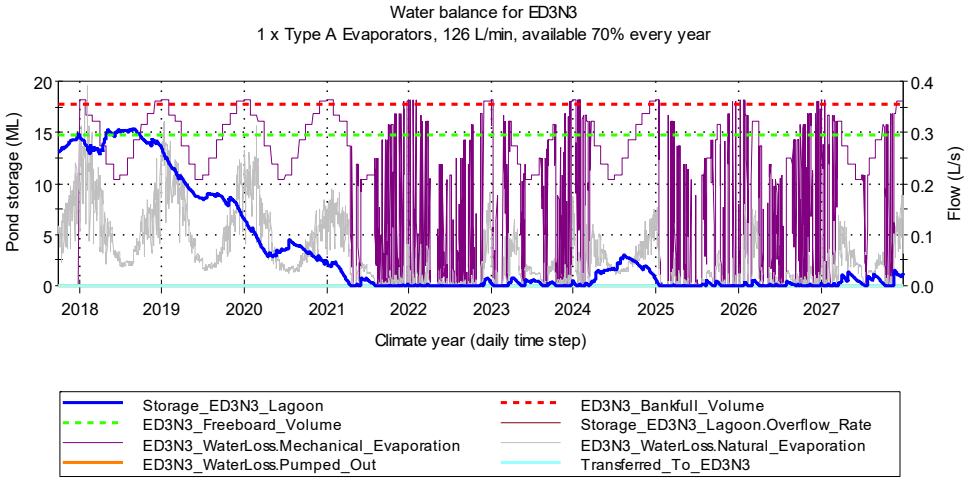

Figure 7.22 Simulated result for ED3N3 in the wettest climate sequence

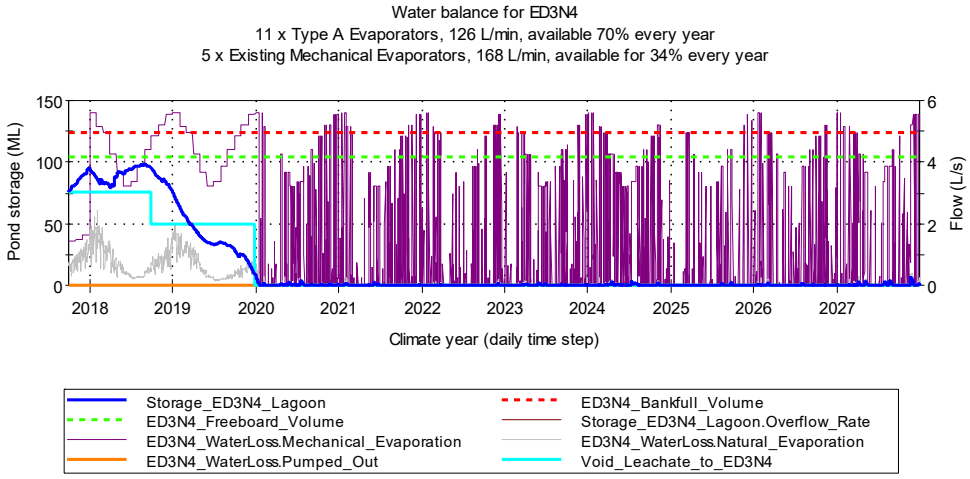

Figure 7.23 Simulated result for ED3N4 in the wettest climate sequence

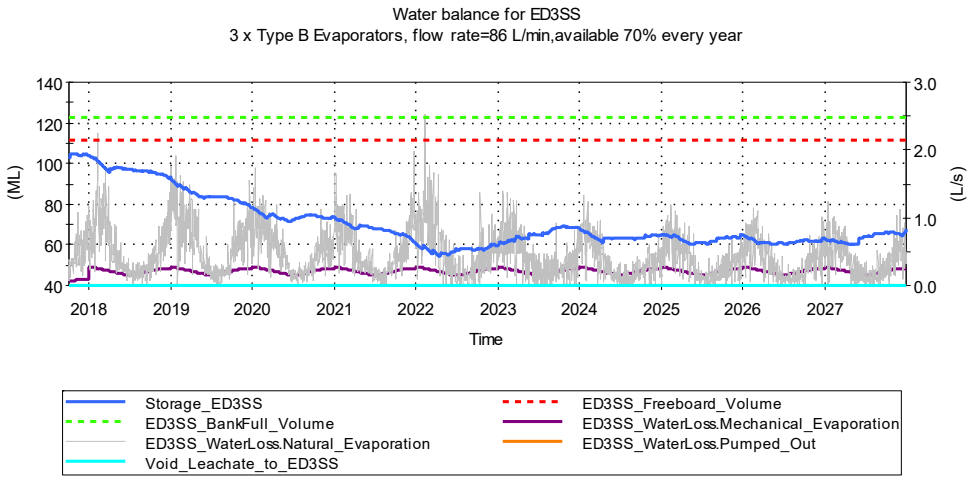

Figure 7.24 Simulated result for ED3SS in the driest climate sequence

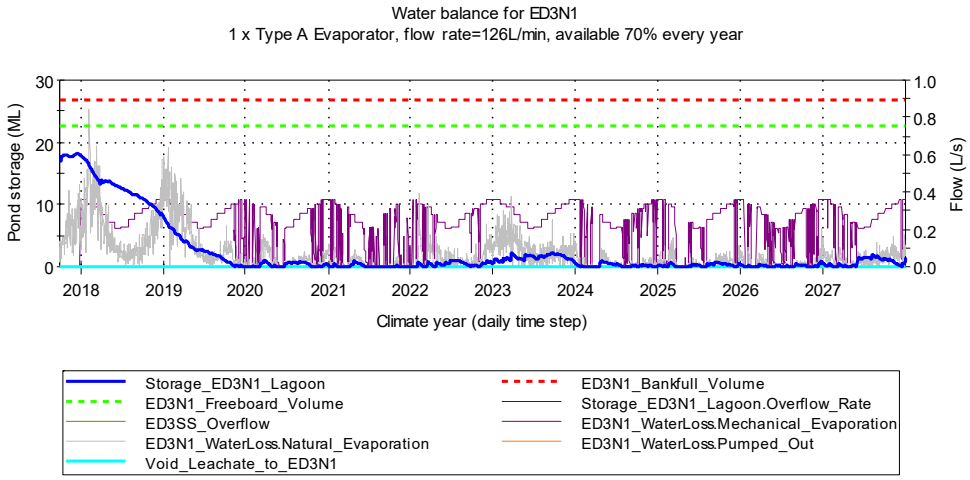

Figure 7.25 Simulated result for ED3N1 in the driest climate sequence

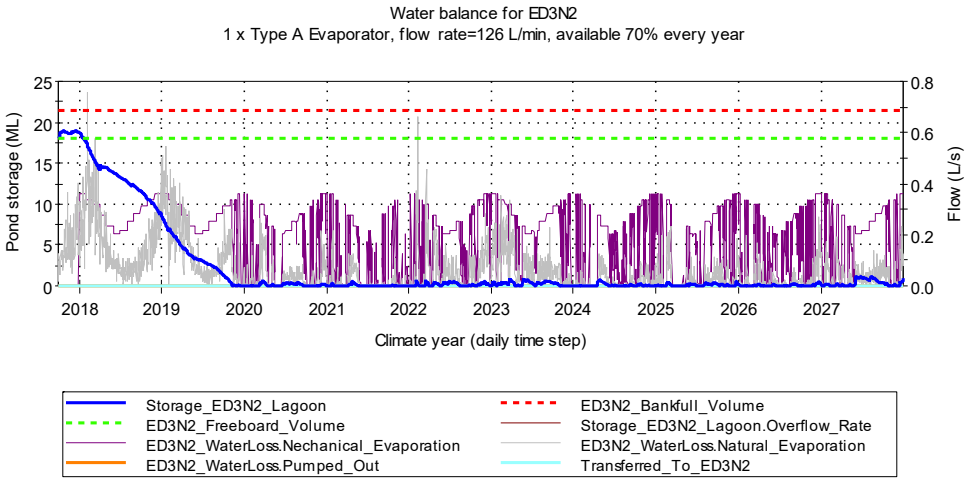

Figure 7.26 Simulated result for ED3N2 in the driest climate sequence

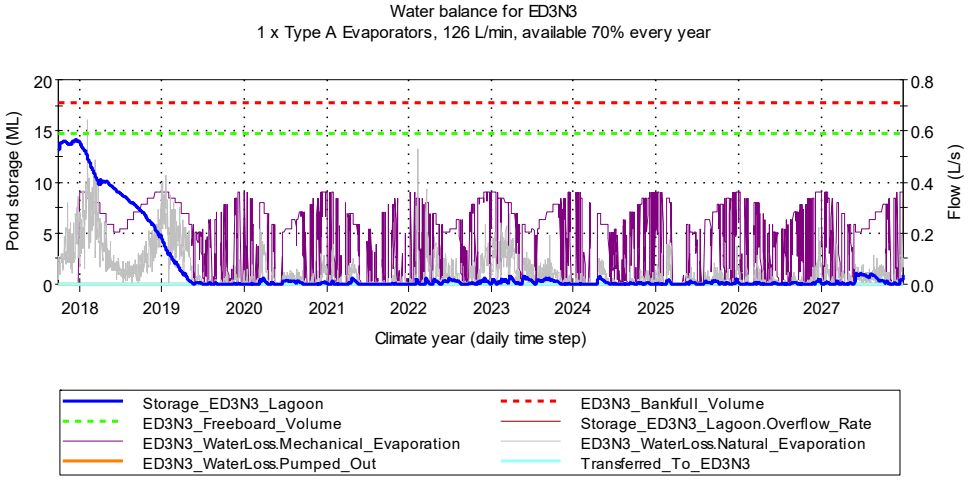

Figure 7.27 Simulated result for ED3N3 in the driest climate sequence

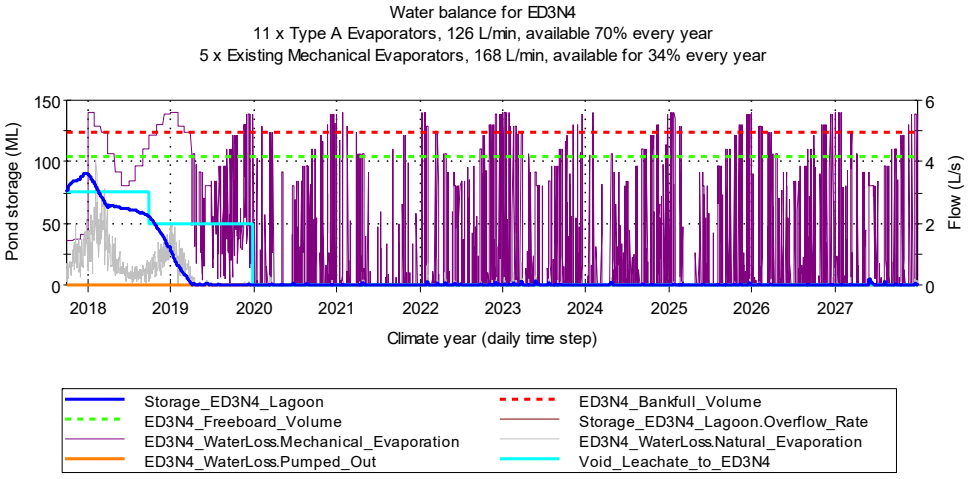

Figure 7.28 Simulated result for ED3N4 in the driest climate sequence

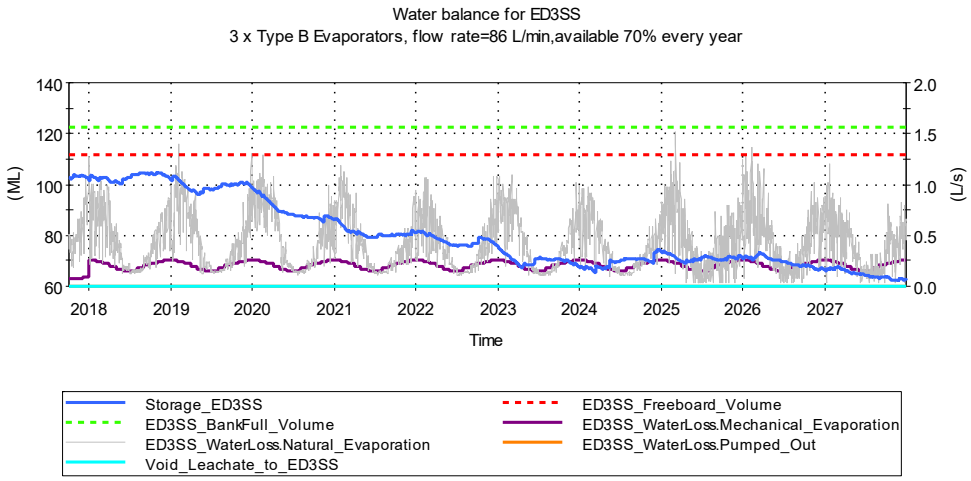

Figure 7.29 Simulated result for ED3SS in the average climate sequence

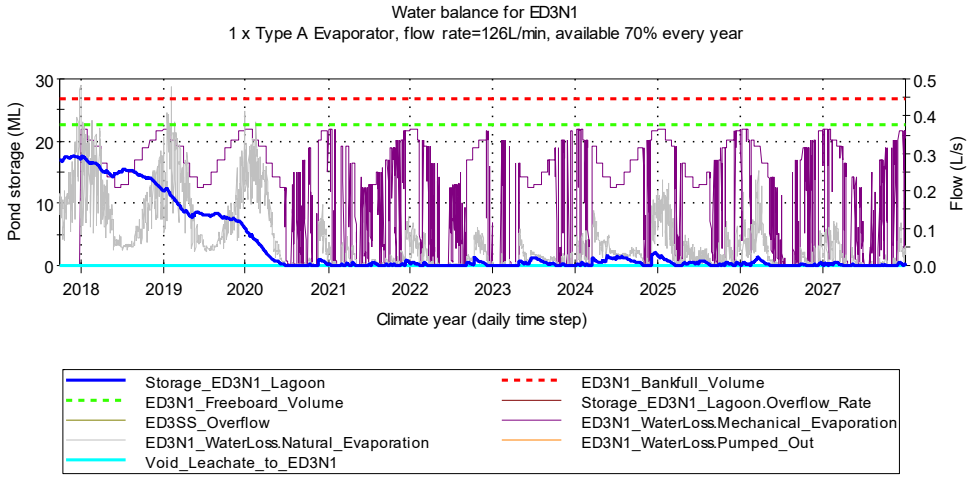

Figure 7.30 Simulated result for ED3N1 in the average climate sequence

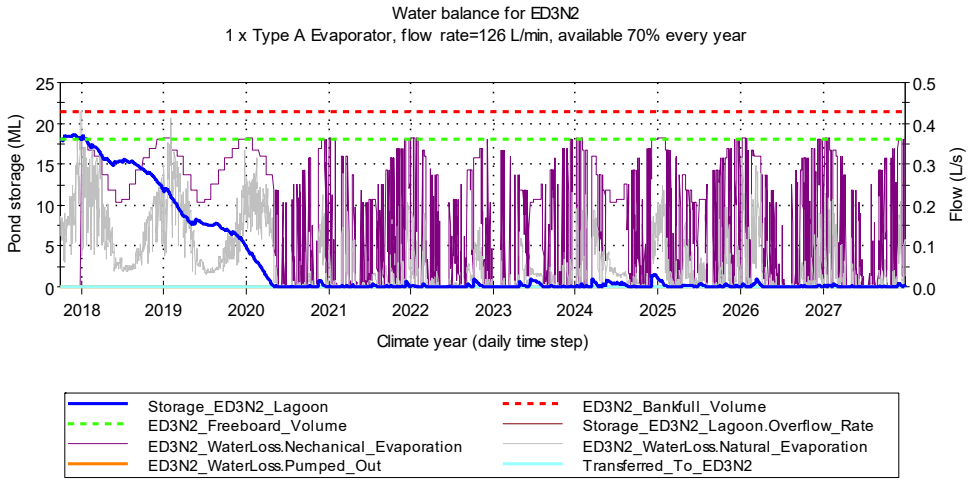

Figure 7.31 Simulated result for ED3N2 in the average climate sequence

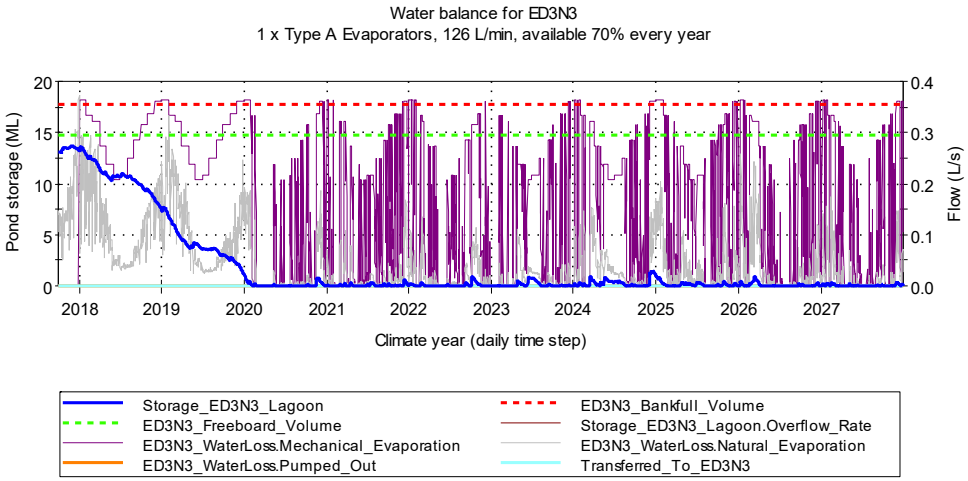

Figure 7.32 Simulated result for ED3N3 in the average climate sequence

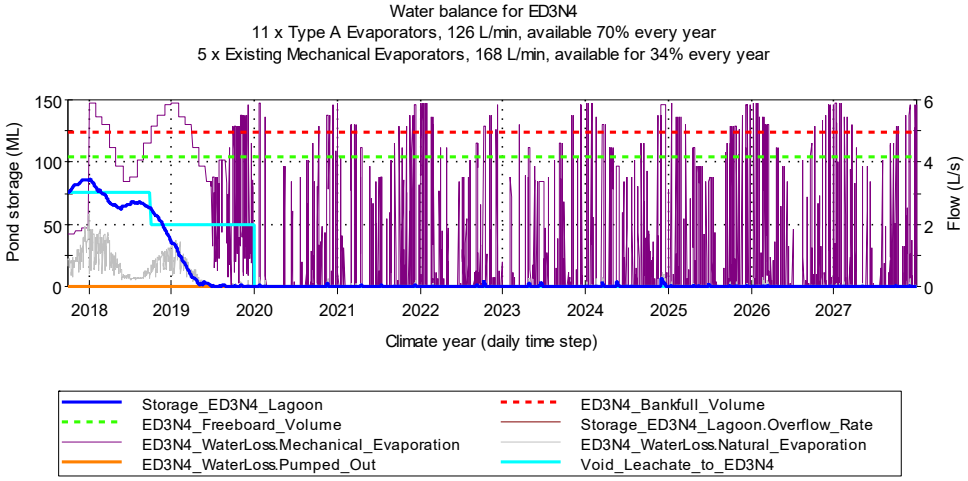

Figure 7.33 Simulated result for ED3N4 in the average climate sequence

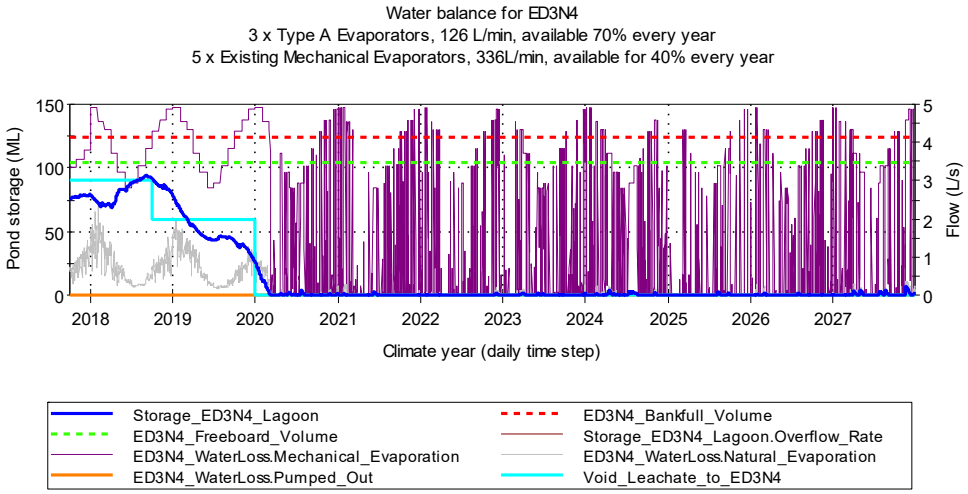

Figure 7.34 Simulated result for ED3N4 in the wettest climate sequence with increased flow rates through Existing Mechanical Evaporators

8. SUMMARY

Water balance assessments were undertaken by WSP for Veolia to estimate:

- required number of proposed mechanical evaporators to manage leachate from September 2017 through to December 2019 using ED3SS and ED3N lagoons. If Leachate were supplied at 3 L/s from September 2017 to August 2018 and at 2 L/s from September 2018 to December 2019, the following number and type of evaporators were found to meet the requirements:
  - 1 x Type A at ED3N1, ED3N2, ED3N3 operating for 70% of the year at a flow rate of 126 L/min
  - 3 x Type B at ED3SS operating for 70% of the year at a flow rate of 86 L/min
  - 5 x Existing Mechanical Evaporator operating for 34% of the year at a flow rate of 168 L/min and 11 x Type A operating for 70% of the year at a flow rate of 126 L/min at ED3N4 or
  - 5 x Existing Mechanical Evaporator operating for 40% of the year at a flow rate of 336 L/min and 3 x Type A operating for 70% of the year at a flow rate of 126 L/min at ED3N4.
- size of proposed ED1 Coffer Dam.
  - The proposed 150 ML Coffer Dam may be able to service for the intended 4-year period, if Heron uses water from the coffer dam at a rate of 2 L/s and 4 x Type A Evaporators are used simultaneously for 70% of the time every year.
  - One and a half cells of 150 ML Coffer Dam may be required to service the intended 4-year period, if Heron does not use water from the coffer dam and a total of 5 x Type A Evaporators are used simultaneously for 70% of the time every year.
  - Three cells of 150 ML Coffer Dam may be required to service the intended 4-year period, if Heron does not use water from the coffer dam and evaporators are not used.
- required number of Mintek mechanical evaporator units to dry up ED1 North Dam in ten years. Two units of Minetek 75kw Evaporator with 1500 L/min flow operating for at least 34% every year will be able to dry up the ED1 North Dam to 10 ML within:
  - 6 years in the wettest climate
  - 2 year in the driest climate
  - 3 years in the average climate used in the simulation.

These results are subject to the climatic sequences, dam and mechanical evaporator characteristics data used in water balance modelling.

Yours sincerely

Aditya Jha
Principal Water Resources Engineer

Carl Kopke
General Manager, Resources West

APPENDIX B: SURFACE WATER MANAGEMENT PLAN

MGA

COLLECTOR ROAD

MAIN ENTRANCE

FROM TARAGO / CANBERRA / GOULBURN / INTERMODAL

ED3 NORTH GROUNDWATER

ED3N2

ED3N3

ED3N1

ED3 SOUTH STORMWATER

TO EVAPORATION DAMS

LEACHATE TREATMENT DAM

3 x 280mm HDPE PN12.5

PUMPING STATION 3 x 132kW PUMPS

3 x 250mm HDPE PN12.5

POND 3 3 x 120kW PUMPS

715

2kW PUMP XYLEM SUBMERSIBLE

110mm HDPE PN12.5

80,000L HOLDING TANK FOR WASHBAY WATER

TRUCK WASHDOWN & CONTAINER WASH AREA

EMERGENCY ASSEMBLY POINT

VISITORS CARPARK

VISITORS ENTRANCE

SEWAGE TREATMENT AREA

RECEPTION

POWER STATION

GATE HOUSE

MAIN OFFICE

SUB-STATION

PLANT DAM

LABORATORY

MESSING ROOM

FLARE

PLANT AREA SILT TRAPS FOR SURFACE WATER RUNOFF

LOAD OUT AREA

WORKSHOP

FLOTATION

DEWATERING

REAGENT SHED

ZINC THICKENER

LEAD & COPPER THICKENER

COPPER LEAD

PROCESS ZINC

PROCESS WATER

TAILINGS THICKENER

TAILINGS THICKENER

SMALL DAM

AREA OF STOCKPILES (VARIOUS MATERIALS)

GRAVEL AREA (VARIOUS SMALL STOCKPILES)

WHEEL WASH LOCATION

TO TAILINGS DAMS

NOTE: REFER ALSO TO LANDTEAM DRAWING No. 201146-CAT1 FOR VOID SURFACE WATER SUB-CATCHMENT DETAILS

Liability limited by a scheme approved under Professional Standards Legislation.

File Name: J:\Surveyors\Jobs\Veolia\16800 Engineering\CAD\16800-451 Surface Water Management Plan.dwg

VEOLIA ENVIRONMENTAL SERVICES

SCALE 1:2500

0 50 100 150 200 250

Metres

ISSUE	AMENDMENT	DRAWN	DATE
A	INITIAL ISSUE	MK	13/04/2016

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Integrated Management System

LandTeam

A1 SHEET

VEOLIA ENVIRONMENTAL SERVICES

WOODLAWN BIOREACTOR
COLLECTOR ROAD, TARAGO

SURFACE WATER MANAGEMENT PLAN
WOODLAWN BIOREACTOR

SURVEYED: N/A
DRAWN: MK
CHECKED: JK

ISSUE A

DRAWING No. 16800-451

DATUM AHD | CONTOUR INTERVAL 1m | DATE 13/04/2016

APPENDIX C: LETTERS

C1-VEOLIA LETTER TO EPA DATED 5 SEPTEMBER 2017

C2-HERON LETTER TO EPA DATED 15 AUGUST 2017

C3-HERON LETTER TO VEOLIA DATED 25 AUGUST 2017

C4-VEOLIA LETTER TO EPA DATED 28 SEPTEMBER 2017

C5-VEOLIA LETTER TO DPE DATED 31 JULY 2017

5 September 2017

ATTN: Mr Nick Feneley
Senior Operations Officer, Waste Compliance
NSW Environment Protection Authority
PO Box 513
Wollongong NSW 2520

Dear Mr. Feneley,

Re: Effluent Management Strategy for Leachate Treatment Plant –Woodlawn Bioreactor

Further to EPA's response to the Department of Planning and Environment's (DPE) consultation on Veolia's DA for the proposed Woodlawn Leachate Treatment Plant (LTP) and following up from a discussion held with yourself on the 24th August 2017, I want to confirm the strategy that Veolia is planning to adopt as part of its commitment to store and manage effluent from the proposed LTP, which we believe now satisfies EPA's concerns.

Our strategy has the following outcomes:

- Manage water volumes in an effective and efficient manner to ensure that water stored onsite does not impact the amenity of the surrounding environment;
- Provides a practical mechanism for the ongoing management of the evaporation dams and integration of recycling initiatives with Heron.

Firstly, we need to make the point that the effluent quality from the proposed MBR process will be of a significantly improved quality compared to the existing stored water in the ED1 system. To that end, a strategy to keep the various water bodies separate is beneficial for the following reasons:

- Quality control from the LTP;
- The beneficial reuse opportunities by Heron for the LTP effluent; and,
- The existing water stored in the evaporation dam can then be subject to a separate management regime, including intensive evaporation to remove stored volumes.

To satisfy EPA concerns, Veolia proposes the following:

1. Sub-divide ED1 into separate coffer dams (commencing with the southern regions of ED1) to contain the effluent from the LTP. These coffer dams will be individually assessed for permeability using in-situ testing techniques to prove they meet the required permeability standards already approved for the site and therefore identical to that of ED3SS, which currently stores partially treated leachate.

In the event the in-situ permeability testing demonstrates remediation and reworking of the dam is required to meet the permeability criteria as approved by the EPA in ED3SS, then this of in-situ clay and/or the import and addition of clay until retesting, or adopting the HDPE lining specification outlined in the AECOM report. A Quality Control Assurance assessment will be completed to demonstrate the integrity of each coffer dam.

2. Water use from the coffer dams to be managed by aggressive evaporation and or water use by Heron Resources. Heron have committed a water use between 7.2 L/s and 10.9 L/s from the entire Evaporation Dam systems.
3. Veolia acknowledge the EPA, DPE, DPI and Water NSW concerns about a rising head on the dam wall. Thus existing mine water in ED1 will have the following management strategy:
    a. Implement aggressive evaporation techniques to remove water over a 5 to 10 year period. Concepts research by Heron Resources and Veolia, involve 2 X 75KW Atomisers, which have a throughput of 25L/s each and will operate 30% of the time based on weather conditions. Estimated, based on 28% annual evaporation average, show that around 120ML can be evaporated per annum. The benefit of increasing the evaporation rate to reduce volume will enable the site to formulate a rehabilitation strategy of the dam. I note that the estimated stored water in the ED1 and ED2 system currently is around 350ML.
    b. Veolia will commit to the Ecological Risk Assessment (ERA) as per the recommendation made in the investigation report prepared by AECOM. The ERA will be jointly managed by Heron and Veolia given overlapping responsibilities for overall site water management and is expected to be completed by the end of April 2018.
4. The EPA has requested clarification as to what contingencies have been built into the design to ensure that LTP is capable of continuously treating at least 4L/s, including what measures will be employed to maintain treatment capacity during periods where maintenance and repairs are taking place. The LTP design capacity is based on the best available information on leachate generation and the required extraction rate from the void. The average required leachate extraction rate has been calculated to be 3L/s which decreases to about 2L/s over time once the waste level exceeds the height of the peizometric water level within the Bioreactor. To allow for the further treatment of stored volumes from ED3, the design capacity is therefore 4L/s. It is also in our interests to maintain the current system concurrently with the LTP, to address a short term increase is treatment capacity to appropriately manage the existing leachate levels and to immediately improve landfill gas collection efficiency. Once the legacy of stored leachate in ED3 is addressed leachate treatment volumes are likely to reduce to between 2 and 3L/s.

    The LTP has been designed with multiple by-pass lines which allows for staged maintenance and repairs, whilst keeping the facility operational. In addition to this, the existing 12ML treatment dam within the void will continue to be used as a buffer system to the new plant, and kept at a low level to manage surges in treatment requirements when required.

Veolia submitted an addendum to the LTP modification for another contingency lagoon in ED1 to store partially treated leachate. On the basis of recent discussions internally and with EPA ,the addendum will be withdrawn from the scope of the planning modification as we believe we can manage existing treated leachate storage through the existing infrastructure by investing in further evaporation equipment within the lagoons. On the basis of this additional evaporation equipment and a reduced extraction rate from the void to 2L/s prior to the operation of the LTP, the existing lagoons are expected to have sufficient capacity for storage based on current treatment until September 2018.

The above strategy will be supported by a water balance in the coming weeks, this letter is to convey our required strategy which appears to be acceptable to EPA based on our discussion, which centered around ensuring separation of the two water sources, to which Veolia agree. This water balance will be based on the strategy outlined above and will confirm the availability of existing ED3 storage capacity as well as the volume of dam capacity required within ED1 to manage the effluent from the LTP.

I look forward to hearing from the EPA as Veolia looks to finalise the planning modification with the DPE, and construction of the new LTP can progress.

Should you require further information or wish to discuss this matter, please contact the undersigned on 02 8588 1364 or henry.gundry@veolia.com.

Yours sincerely,

……

Veolia Australia and New Zealand
Henry Gundry
Woodlawn Facilities Manager

Heron Resources Limited
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15 August 2017

NSW Environment Protection Authority
South East Region
PO Box 622
Queanbeyan NSW 2620

Attention: Michael Heinze

Dear Michael

Woodlawn Dewatering Strategy - Evaporation Dams Environmental Risk Assessment

Thank you for your letter of 20 July 2017 in relation to the Dewatering Strategy. In response to the issues raised in your letter we can confirm the following matters:

We can agree to the additional requirement requested and specifically:

- We have engaged The Odour Unit (TOU) to prepare an Odour Impact Assessment specifically for the dewatering program. The odour dispersal model will be based on the model prepared by TOU for Veolia and will use additional data gathered during the Stage 2A dewatering program. We have obtained Veolia's consent for TOU to use the existing odour model parameters including odour generation values from the Bioreactor operation in order to address your issues in relation to cumulative impacts. This report will be provided to the EPA at the end of Stage 2A, which represents 25 ML.
- We will develop a contingency plan in conjunction with TOU and Veolia which identifies reasonable and feasible odour mitigation measures should unacceptable odour impacts be identified or experienced.
- The Stage 2A dewatering will involve a coffer dam located in the north east corner of ED2. This area is fully clay lined and does not represent an area considered at risk of leakage.
- During Stage 2A we will further progress the treatment method studies that have been underway for some time. The final treatment plant will be capable of treating all waters available on site including pollution control dams, waste waters, tailings dam water and underground water with organic content. The plant will treat all recycled water to a quality suitable for the processing plant as well as other water uses on site. We are currently evaluating several treatment options for the entire operation, both of which involve reverse osmosis as a final treatment process however pre-treatment options are still being evaluated. Trials are ongoing on various pre-treatment processes during Stage 2A, however it is likely that these trials will continue for subsequent stages as well.

We also would like to stress that the activities proposed are entirely consistent with planning approval. The EA commitments Heron to reuse all water contained on site and underground workings to ensure that water from the Willeroo Borefield was used as the last source. The approval covers the use of both ED1 and ED2 as well as stormwater flows and pumping from pollution control ponds into both ED1 and ED2. Although our EPL does not cover ED1, we have ensured that our EPL allows for the operation of the longstanding surface water management system which includes various water transfers to enable the site to remain nil discharge, allows for treatment of waters of different quality and the necessary supply to our new processing facility. The approved water management plan has provided further details on the operation of the surface water management system and recycling and treatment initiatives which will be further refined during the Stage 2 dewatering program.

We anticipate that Stage 2A will continue for about 30 days. As previously advised, we will provide monitoring results to you as obtained with the final report provided shortly after cessation of pumping the agreed 25 ML. Subject to the results of Stage 2A in addition to Stage 1 results we would expect to be able to continue quickly into Stage 2B.

ED1 and ED2 Integrity Assessment

Your letter touches on a number of other issues in relation to Veolia's operation and the Dam Integrity Study. As you are aware, in May 2017 Veolia released a report into the integrity of Evaporation Dams ED1 and ED2 in response to Condition U2 of EPL 1436. The report was prepared by AECOM and included the results of an extensive subsurface investigation involving 14 additional bores, geophysical survey and permeability testing of the existing dam liner.

We intend to utilise ED2 for continued dewatering activities following stage 2A. The AECOM report indicates there was no direct evidence of leakage identified and the integrity of ED2 (and ED1) has a lining that meet permeability guidelines and therefore we do not propose any further work is required. We also note a number of mitigating strategies are available should this be shown to occur. The quality of water from underground is significantly better than it currently contains.

The AECOM made a number of recommendations. The key recommendation was that an Ecological Risk Assessment (ERA) be conducted. We believe that the ERA needs to be completed prior to any decision being made in relation to any potential remediation works. We have discussed this matter with Veolia and can advise that the ERA will be jointly managed by Heron and Veolia given our overlapping responsibilities for overall site water management.

As an ERA is a complex and multidisciplinary exercise, we have outlined below the necessary scope of work for this assessment for your information prior to engaging the necessary consultants. Set out below is our understanding of the scope of work which will form the basis for the consultancy agreements. This has been based on the AECOM recommendation and the guidelines identified in their report.

1. Ecological Risk Assessment Guidelines

AECOM 2017 recommended that an ecological risk assessment, performed in accordance with the National Environmental Protection Measure (NEPM) and the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000) will inform the need for seepage control and validate the proposed approach to reduce seepage risks. The specific guideline referred to is:

> NEPC (National Environment Protection Council), 2011: National Environment Protection (Assessment of Site Contamination) Measure Schedule B(5)a "Guideline on Risk Assessment, National Environment Protection Council".

There are several sections in Schedule B which cover Ecological Investigation Levels (EILs), methods to determine background contaminant levels and resultant trigger values. The EILs are numerical limits that are designed to protect soil and terrestrial flora and fauna and soil microbial processes from experiencing substantial deleterious effects caused by contaminants. Ecological Investigation Levels are the ecological equivalents of the investigation levels that aim to protect human health (HILs) and groundwater (GILs). The guidelines specify that if measured concentrations of contaminants exceed the appropriate EILs then further investigation in the form of an ecological risk assessment that conforms to Schedule B5a (NEPC, 2011) should be conducted. In this instance, Heron and Veolia have determined that it would be appropriate to conduct the risk assessment despite the lack of contaminants found in water below the evaporation dams.

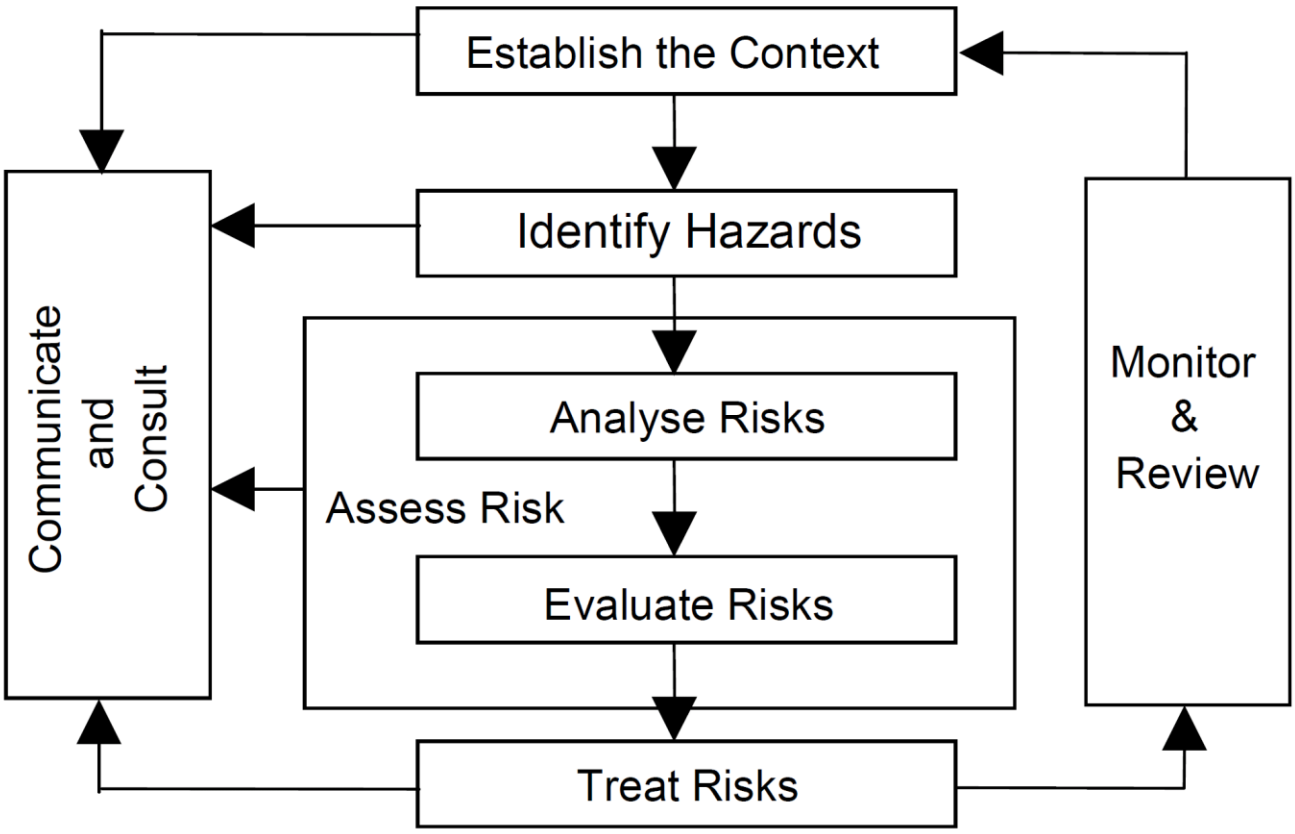
Groundwater and Surface Water Investigation Levels will be based on Australian Guidelines for Freshwater and Marine Water Quality (ANZECC & ARMCANZ, 2000). These guidelines form part of Australia's National Water Quality Management Strategy. The primary objective of the guideline is "to provide an authoritative guide for setting water quality objectives required to sustain current or likely future, environmental values [uses] for natural and semi-natural water resources in Australia and New Zealand".

The ANZECC guidelines are a risk based process designed to allow for the development of appropriate triggers based on ambient water quality and ecological investigations. The default water quality concentrations quoted in ANZECC should not be taken as 'pass' or 'fail' criteria. As stated in Using the ANZECC Guidelines and Water Quality Objectives in NSW (DECC 2006):

"Trigger values are fundamental to using the ANZECC guidelines. The trigger values for different indicators of water quality may be given as a threshold value or a range of desirable values. Trigger values are conservative assessment levels, not pass/fail' compliance criteria. Local conditions vary naturally between waterways and it may be necessary to tailor trigger values to local conditions or 'local guideline levels'. The guidelines provide a process for refining the trigger values and these protocols should always be followed.

The Environmental Risk Assessment must therefore take into account the prevailing geological conditions of the site and surrounding areas. The prevalent sulphide volcanic strata and associated metal rich lenses must be taken into account when assessing natural background conditions. This may lead to variable trigger levels depending on local geology over which surface waters pass or through which groundwater may seep.

The standard used in all minerals industry risk assessments is referred to as MDG1010 published by NSW Trade and Investment - Mine Safety Branch (now part of NSW Planning and Environment). This process is summarised in the following graphic.



Although based on the identification and amelioration of risks in the workplace, it has been adapted to include environmental risks and is widely used in the mining industry. It is particularly relevant in dealing with the most challenging concepts in risk management which is the establishment of risk acceptability. There is no zero risk if a hazard is truly or potentially present. In this case, although there is no direct empirical data that the evaporation dams are leaking, all dams theoretically leak. Risk must be managed to a level that is as low as reasonably practicable, which is referred to in the mining industry as ALARP. The process also involves identifying the consequences of events. This is will be an important factor in the analysis for this particular ERA, particularly given the necessary assumptions discussed in Section 3.

2. Ecological Risk Assessment Data

The monitoring program at Woodlawn is extensive and consists of over 30 years of surface and groundwater monitoring both on site and surrounding the site. This data will form the basis of the proposed Ecological Risk Assessment but will also be supplemented by specific studies tailored to suite both NEPM and ANZECC requirements. This work will include:

- an aquatic ecology study of Crisps Creek downstream of the evaporation dams;
- identification of any groundwater fauna existing below or in the vicinity of the evaporation dams; and
- additional surface and groundwater sampling using the specific monitoring points contained in the 2017 AECOM Dam Integrity study.

ANZECC guidelines suggest that the data required to determine Site Specific Trigger Values is not static, that is, cannot be viewed as a once off assessment. Ambient levels may vary over time or could be seasonally influenced. This is particularly relevant given the natural variability already evident in the water quality of Crisps Creek which has been previously identified from the current long term monitoring data. The receiving waters respond to both seasonal conditions as well as climatic variability given that the site is located in its headwaters. As a result, Crisps creek is largely ephemeral though it flows well during average or above average rainfall years but seasonally dries in below average rainfall years. It is also groundwater fed which provides other influences on water quality, particularly in low flow conditions.

3. Risk Assessment Methodology

The basic methodology will be followed for the Ecological Risk Assessment (ERA) for evaporation dams:

Problem Formulation - this involves clearly identifying the problem and will include an analysis of the AECOM study findings and issues. It will also include identifying the concerns of government agencies both now and in the past.

Analysis - characterisation of potential or existing exposure to stressors and their effects. This will involve additional studies that are designed specifically to obtain direct information in relation to the risks associated with the evaporation dams on site. The scope of this work was identified in Section 2 but can be expanded as required by the risk assessment team.

Risk Characterisation - this involves the process of integrating both existing data and the results of additional studies in order to evaluate exposure and effects information. This process will evaluate two basic elements: exposure and effects. Exposure is the interaction of stressors with receptors. Measures of exposure can include concentrations of contaminants or physical changes in habitat. The analysis of effects evaluates changes in the nature and magnitude of effects as exposure changes.

Ecological risks are estimated from the relationship between exposure and effects and made with varying degrees of uncertainty. For this ERA however, a number of assumptions need to be made as there is no direct evidence that the dams are in fact leaking and therefore exposure and effects could be disputed. There have been several studies that indicate that although direct evidence in the form of acid waters or metals within the groundwater below the dams has not been found, there are other indicators such as elevated sulphate which maybe precursors to leakage. For this ERA, the following assumptions will be made:

- That the dams are leaking but over the past 30 years the sediments have corrected the acidic water and filtered out both the precipitated metals and salt. This is in line with the assumptions made in the AECOM Dam Integrity study.
- The sulphate concentration in the groundwater beneath the dams is not natural and represents contamination.
- There is a risk (to be determined) that these dams over time may leak acid waters into the underlying strata.
- There is a risk (to be determined) that these dams over time may leak metals in to the underlying strata.
- There is a risk (to be determined) that this contaminated groundwater may move off site, that is, beyond the boundaries of the premises.

On the basis of these assumptions, the ERA will determine the risk of adverse environmental consequences of such events and determine appropriate mitigation strategies. Exposure and effects will be considered together because they are both important in estimating risk. When the potential for exposure and effects is low, the risk will be low. When both are high, the risk will be high. The goal will be to use all available information to characterize exposure and effects and to integrate them into an understanding of ecological risks.

Ecological risk assessment is one input to environmental management decisions. Other inputs include stakeholder concerns, availability of technical solutions, benefits, equity, costs, legal mandates, and political issues. For example, a course of action that has the least ecological risk may be too expensive or not technologically feasible. Therefore, while this ERA will provide information to government agencies, it will only form part of the whole decision-making process.

4. Risk Assessment Team

The risk assessment team will include the following personnel categories:

- Heron and Veolia management representatives. These will be decision makers who will be authorised to approve funds as required to enable the implementation of any necessary mitigation measures or controls.
- Heron and Veolia environmental staff to provide advice on the environmental monitoring program and management of any specific environmental investigations undertaken as part of the ERA.
- Dam construction expert with expertise in the construction and remediation of large dam structures.
- Groundwater expert familiar with the mechanisms of water movement within the underlying strata.
- Geology expert familiar with the local geology at Woodlawn. This person is likely to be a Heron employee or contractor engaged in the exploration program on site.
- Surface water expert familiar with the ANZECC NEPM guidelines.
- Aquatic Ecologist who will also undertake specific assessments of the Crisps Creek water way. This person may be supplemented with an additional stygofauna consultant to assess groundwater ecology beneath and surrounding the dams.

Nominated personnel will be engaged in all stages of the ERA, including:

- ❒ Data review.
- ❒ Additional studies required to inform the ERA team.
- ❒ Conduct of the ERA.
- ❒ Production of the final report.

5. Deliverables and Timing

The best time to undertake aquatic ecology studies is Spring to Summer however seasonal studies are often preferred for long term studies to enable assessment of seasonal stream health. In this case, we would propose to complete the aquatic ecology studies by the end of 2017 which will enable the completion of the data review phase in the first quarter of 2018. The additional surface and groundwater quality studies will be conducted at the same time but will include any additional analytes required by the ERA team. The ERA process would be conducted over a two day period on site and it would therefore be expected that the final report would be available by end of April 2018.

The final document would include a summary of the historic data, new data obtained for the ERA and the outcome of the ERA process. The report will be presented to the EPA as the key government stakeholder however we would propose to hold an onsite meeting to present the findings of the ERA to other relevant government agencies. These agencies would include WaterNSW, Department of Primary Industries -Water and both the Mineral Resources and Panning divisions of NSW Planning and Environment

We would be happy to provide additional information or clarification on this proposed ERA scope or arrange a meeting to discuss the contents further at your convenience if required.

Yours sincerely

Andrew Lawry
Chief Operating Officer

CC Henry Gundry
Veolia Environmental Services

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25 August 2017

Mr H Gundry
Woodlawn Facilities Manager
Woodlawn Bioreactor
619 Collector Rd
Tarago, NSW, 2580
By email: henry.gundry@veolia.com

Dear Henry

Re: Water Strategy and Water Balance

Further to our call yesterday, Heron can confirm the following:

- The most recent design of the new process plant estimates a water usage of between 7.9 and 10 litres per second (lps);
- The variance of these data with Veolia's water balance is that we have advanced engineering between the time of Veolia's water balance and Herons water balance.

Regardless of any differences (that are potentially highly variable as a result of assumed weather effects), Herons process has significant flexibility in its water usage.

We confirm that the underlying principle in water management of the site is to work in parallel and agreement with Veolia to ensure nil discharge from the Woodlawn site. As we have discussed, options available may include aggressive evaporation should it be required.

Please contact Brian or me with any further queries.

Regards

Andrew Lawry
Chief Operating Officer

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CANADIAN CONTACT:
1 905 727 8688

28 September 2017

Attn: Matthew Corradin
The Unit Head -Waste Compliance
NSW Environment Protection Authority
PO Box 513
Wollongong NSW 2520

CC: Nick Feneley, Senior Operations Officer - Waste Compliance

Dear Mr. Corradin,

Re: EPL 11436 – Condition U1.1

Veolia Environmental Services (Australia) Pty Ltd (Veolia) refers to the Environment Protection Licence (EPL 11436) for the Woodlawn Bioreactor, and in particular Condition U1.1 which states that:

> *"By 31 December 2017, the licensee must install, commission and implement the longterm leachate management solution detailed in the report titled "Longterm Leachate Treatment Solution Submission Report" submitted to the EPA on 5 August 2016 (as revised)".*

Veolia is committed to the long term leachate strategy referred to in this Condition and has been progressing this project with a key deliverable of enabling the leachate treatment plant (LTP) to be operational in as short a timeframe as possible.

However, as previously advised, the planning approval process is on the critical path for the operation of the LTP. As such, the risk that the project timeline may not be able to be met has been flagged with the EPA and DPE since the original commitment was made to the long term leachate treatment strategy.

Given the complexity of the site, including the progress made over the past twelve months on re-mining activities, and the resulting regulatory framework that involves various government agencies, the planning approval process has taken longer than was originally anticipated.

In order to limit the impact of any potential delays to the overall project delivery timeframe resulting from the complexity of the site, Veolia has committed to contracts for the supply of processing equipment, and therefore taken the risk on the processing technology for the plant.

As you are aware, Veolia submitted a modification application to the Department of Planning and Environment (DPE) for the construction and operation of a leachate treatment plant (LTP) and associated infrastructure in May 2017. This application was submitted following numerous discussions with both the DPE and the EPA regarding the development of the LTP and related activities on site, including the ongoing management of evaporation dams on the site.

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Despite the measures taken by Veolia to minimise the overall project timeframe, the timeframe detailed in the Condition U1.1 will not be able to be met. This position has been communicated to both the EPA and DPE during previous discussions regarding the development of the LTP and is also consistent with information provided in the planning modification application.

We have also provided regular updates to the local community on the progress of the leachate treatment plant development including the control measures being implemented on site while the project is being developed and the revised operational timeframe.

Given the current status of the planning assessment process, it is now estimated that the construction of the LTP will be complete by the middle of 2018, which will be followed by commissioning prior to full scale operations. This timeframe is based on Veolia receiving all planning modification by the end of October to enable construction activities to commence by the end of November 2017.

Based on the current project status and to allow for some contingency in the program if the construction commencement date referred to above is not able to be met as a result of the planning approval process, Veolia formally requests an extension to the timeframe in Condition U1.1 to 31 December 2018.

Should you require further information or wish to discuss this matter, please contact Henry Gundry on (02) 8588 1364 or Amandeep Brar on (02) 4252 0313.

Yours sincerely,

Christine Hodgkiss
General Manager – Growth and Development NSW
Veolia Australia and New Zealand

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31 July 2017

Attn: Chris Ritchie
Director, Industry Assessments
NSW Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

CC: Kate Masters, Senior Planning Officer, Waste Industry Assessments

Dear Mr. Ritchie,

Re: Modification application for the Woodlawn Bioreactor (DA 31-02-99 MOD 3) & (MP10_0012 MOD 2)
Consent of the Landowner

Veolia Environmental Services (Australia) Pty Ltd ("**Veolia**") hereby refers to the modification application for the Woodlawn Bioreactor (DA 31-02-99 MOD 3) and (MP10_0012 MOD 2) located at 619 Collector Road, Tarago NSW.

Veolia is the owner of the Woodlawn Eco Project Site, incorporating the Woodlawn Bioreactor operations and the proposed location for the Leachate Treatment Plant, which is the subject of this modification application.

Should you require further information or wish to discuss this matter, please contact the undersigned on (02) 9841 2902 or christine.hodgkiss@veolia.com.

Yours sincerely,

Veolia Australia and New Zealand
Christine Hodgkiss
NSW General Manager - Growth and Development