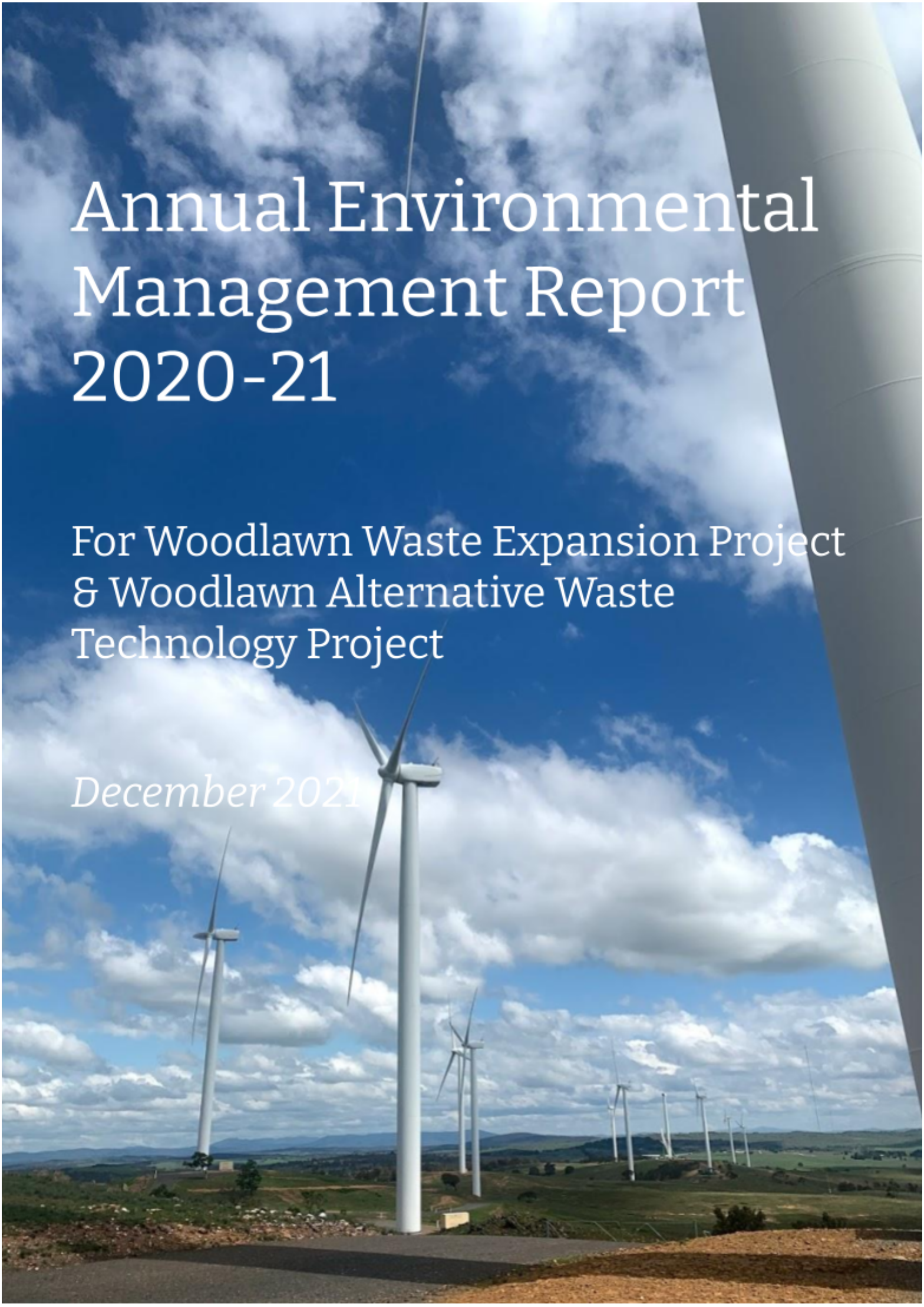
Annual Environmental Management Report 2020-21

For Woodlawn Waste Expansion Project & Woodlawn Alternative Waste Technology Project

December 2021



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0	Draft	• Woodlawn Eco-Precinct Site Management • ANZ Environmental Compliance Team	November 2021
1	Final	• NSW Department of Planning, Industry and Environment	December 2021

Contents

Definitions/Abbreviations

AEMR	Annual Environmental Management Report
BTT	Banksmeadow Transfer Terminal
CoR	Chain of Responsibility
CTT	Clyde Transfer Terminal
DPIE	NSW Department of Planning, Industry and Environment
EMP	Environmental Management Plan
EIS	Environmental Impact Statement
EP&A	Environmental Planning and Assessment Act 1979 (and Regulations)
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
ERP	Emergency Response Plan
IEA	Independent Environmental Audit
IMF	Crisps Creek Intermodal Facility
IOA	Independent Odour Audit
LEMP	Landfill Environmental Management Plan
LFG	Landfill Gas
LMP	Leachate Management Plan
LTP	Leachate Treatment Plant
LWMS	Leachate and Water Management System
MBT	Woodlawn Mechanical Biological Treatment Facility
MWOO	Mixed Waste Organic Output
MOP	Mining Operations Plan
NMMP	Noise Monitoring Management Plan
OEMP	Operational Environmental Management Plan (MBT)
PA	Project Approval
POEO	Protection of the Environment Operations Act 1997 (and Regulations)
RRO	Resource Recovery Order
RRE	Resource Recovery Exemption
SMA	Sydney Metropolitan Region
SWMP	Soil and WaterManagement Plan
TADPAI	Tarago and District Progress Association Inc
TPA	Tonnes per annum
Veolia	Veolia Australia and New Zealand
WIP	Woodlawn Infrastructure Plan
WOO	Woodlawn Organic Outputs

Executive Summary

This Annual Environmental Management Report (AEMR) has been prepared in accordance with the Woodlawn Waste Expansion Project under Project Approval (PA) 10_0012 and the Alternative Waste Technology Project under PA 06_0239, as well as relevant legislative requirements and industry best practices .

On instruction from the NSW Department of Planning, Industry and Environment (DPIE), the requirements under each PAhave been combined in this AEMR to comprise collectively the 2020-21 reporting period respectively for:

- PA 10_0012 (Schedule 7, Condition 5) for the Woodlawn Bioreactor Bioreactor)and the Crisps Creek Intermodal Facility (IMF); and
- PA 06_0239 (Schedule 4, Condition 5)for theWoodlawn Mechanical Biological Treatment Facility (MBT).

This AEMR details the environmental performance of the Bioreactor, , which incorporates the Woodlawn Bioenergy Power Station (Power Station) and the Leachate Treatment Plant (LTP), the IMF and MBT for the reporting period as a summary of environmental monitoring conducted in keeping with the PAs, as well as corrective actions resulting from any non-compliances identified and/or other findings from regulatory inspections, external and internal audit programs.

This Report covers the period of 9 September 2020 to 8 September 2021 as the anniversary date from the commencement of expanded operations at the Bioreactor.

Part 1 Introduction

1.1 Eco-Precinct Overview

Veolia Australia and New Zealand (Veolia) own and operate the Woodlawn Eco-Precinct (Eco Precinct), which is located approximately 40 kilometres (km) south of Goulburn and 50 km north of Canberra, comprising the Bioreactor, the Power Station, the LTP, the IMF, the MBT, as depicted in **Appendix 1** and a solar farm.

1.1.1 Woodlawn Bioreactor

The Bioreactor was the first stage of the Eco Precinct developed by Veolia and has been in operation since September 2004The Bioreactor is approved to accept a maximum input of 1.13 million tonnes per annum (tpa) of putrescible waste.

Waste is deposited into the void of a remnant open cut mine, approximately 33 million cubic metres (m^3) in capacity. With the use of optimal moisture and temperature conditions, the Bioreactor achieves enhanced degradation to produce landfill gas, collected through a vast network of infrastructure within the landfill.

Methane is extracted from the landfill gas within the Power Station, which commenced operating in 2008, for conversion and supply as electricity into the energy grid.

Waste to the Bioreactor comes from the Sydney Metropolitan Region (SMA) via theIMF, also owned and operated by Veolia and via road from neighbouring councils and businesses.

1.1.2 Crisps Creek Intermodal Facility

The IMF forms an integral part of the logistical operations of the Eco-Precinct, and is located 8km from the Bioreactor in the township of Tarago, adjacent to the Goulburn- Bombala Railway line.

Waste from the SMA is transported, in shipping containers,via rail to the IMF, where they are unloaded and transferred to the Bioreactor by road trailers. The IMF is approved to accept 900,000tpa from Sydney.

1.1.3 Woodlawn Leachate Treatment Plant

The LTP, which commenced operations in 2018, extracts and treats leachate from the Bioreactor using a reverse osmosis and chemical process. Treated leachate is then transferred to the ED1 Coffer Dam located within the Eco Precinct. The LTPfacilitates an improvement in environmental and operational performance by:

- allowing the extraction and treatment of greater volumes of leachate from the landfill void
- helping reduce the generation of odour from untreated leachate, and
- enabling more efficient gas extraction to maximise the waste to energy benefits of the Power Station.

1.1.4 Woodlawn Mechanical Biological Treatment Facility

The MBT Facility, which is located to the north-west of the Bioreactor, has been operating since 2017and is approved to accept 280,000 tpa of mixed waste (240,000 tpa of mixed waste and 40,000 tpa of garden waste). Approximately 143,000 tpa of mixed waste is accepted from an amalgamation of councils in the SMA, namely the Southernand Northern Sydney Regions of Councils.

The incoming waste is processed to extract recyclable materials or produce compost derived from mixed waste organic outputs (MWOO). The MWOO compost is matured on site with the intention to rehabilitate the remnant Woodlawn mine through application under a Resource Recovery Order (RRO) and Exemption (RRE) however a ban imposed by the NSW Environment Protection Authority (EPA) in October 2018 forbids the application to land of this type of material.

Consequently, Veolia was granted a revised RRO and RRE on 14 May 2020, permitting a trial of the use of Woodlawn Organic Outputs in the rehabilitation of tailings dams at the neighbouring Woodlawn Zinc Copper mine. The trial commenced in February 2021.

1.1.5 Woodlawn Solar Farm

A 2.3 megawatt (MW) solar farm, operational since 2019, is located adjacent to the MBT Facility. The electricity generated from this installment is directly utilised in MBT operations, and excess distributed for the Bioreactor operations. This infrastructure follows Veolia's commitment towards increasing resource recovery and energy efficiency at the Eco Precinct.

1.2 Key Eco Precinct Personnel

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1.3 Legislative Requirements

The main legislative instruments governing the environmental performance and activities undertaken at the various facilities within the Eco Precinct include the *Environmental Planning and Assessment Act 1979* (the EP&A Act) administered by the DPIE, and the *Protection of the Environment Operations Act 1997* (POEO Act) administered by the EPA, as well as their respective associated regulations.

In addition to the 2 PAs, 3 Environment Protection Licences (EPLs) issued by the EPA, under the POEO Act, regulate the operational activities conducted at the Bioreactor, IMF and MBT respectively. Monitoring activities undertaken at all these facilities are reflected in the EPLs, consistent with PA requirements.

Environmental Management Plans (EMP) have also been prepared and approved by DPIE to reflect the requirements of the PAs and EPLs for the operation of these facilities as follows:

- *Landfill Environmental Management Plan for the Woodlawn Bioreactor* (LEMP) (Veolia, August 2018)
- *Environmental Management Plan for Crisps Creek Intermodal Facility* (EMP) (Veolia, September 2016)
- *Operational Environmental Management Plan for Woodlawn Mechanical Biological Treatment Facility* (OEMP) (Veolia, January 2017)

These 3 documents concentrate on key environmental issues identified in the environmental assessment undertaken for the 3 facilities and set out the criteria for managing and monitoring environmental parameters such as water quality, waste, traffic, air quality, greenhouse gases, noise, landscape and vegetation and emergency response.

The above requirements stipulate the performance standards that need to be met to maintain compliance at the 3 facilities, and those relevant to the preparation of this AEMR are provided in **Table 1.3.1** and **Table 1.3.2** below.

***Table 1.3.1* Bioreactor and IMF conditions relevant for the preparation of this AEMR**

Schedule 7 - Environmental Management, Reporting and Auditing	
Condition	**Annual Environment Management Review**
5	One (1) year after the commencement of expanded operations, and annually thereafter, the Proponent shall prepare an Annual Environmental Management Report (AEMR) to review the environmental performance of the project to the satisfaction of the Director-General. This review must: **a)** describe the operations that were carried out in the past year; **b)** analyse the monitoring results and complaints records of the Project over the past year, which includes a comparison of these results against the • relevant statutory requirements, limits or performance measures/criteria; • monitoring results of previous years; and • relevant predictions in the EA; **c)** identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance; **d)** identify any trends in the monitoring data over the life of the Project; and **e)** describe what measures will be implemented over the next year to improve the environmental performance of the Project.

***Table 1.3.2* MBT conditions relevant for the preparation of this AEMR**

Schedule 4 - Environmental Management, Reporting and Auditing	
Condition	**Annual Reporting**

5	Every year from the date of this approval, unless the Director-General agrees otherwise, the Proponent shall submit an AEMR to the Director-General and relevant agencies. The AEMR shall: **a)** identify the standards and performance measures that apply to the development; **b)** include a summary of the complaints received during the past year, and compare this to the complaints received in previous years; **c)** include a summary of the monitoring results for the development during the past year; **d)** include an analysis of these monitoring results against the relevant: • Impact assessment criteria; • Monitoring results from previous years; and • Predictions in the EIS; **e)** identify any trends in the monitoring results over the life of the development; **f)** identify any non-compliance during the previous year; and **g)** describe what actions were, or are being taken to ensure compliance.

Table 1.3.3 summarises the list of environmental approvals in place for the Bioreactor, IMF and MBT.

***Table 1.3.3* Environmental Approvals**

Description	Permit Number
Conditions of Development Consent: The Woodlawn Waste Management Facility (issued by DPIE) and subsequent modifications.	31-02-99
Project Approval: *Woodlawn Waste Expansion Project* (issued by DPIE) and subsequent modifications.	10_0012
Project Approval: *Woodlawn Alternative Waste Technology Project* (issued by DPIE) and subsequent modification.	PA 06_0239
Special (Crown & Private Lands) Lease 20 (SML 20) (issued by the Department of Primary Industries)	SML 20
Woodlawn Bioreactor Environment Protection Licence (issued by EPA)	11436
Crisps Creek IMF Environment Protection Licence (issued by EPA)	11455
Woodlawn MBT Environment Protection Licence (issued by EPA)	20476
Woodlawn Organic Outputs Acid Mine Tailings Trial Exemption 2020 (issued by EPA)	N/A
Woodlawn Organic Outputs Acid Mine Tailings Trial Order 2020 (issued by EPA)	N/A
Water Access Licence: Willeroo Borefield (issued by Water NSW)	40WA411642
NSW Phylloxera Exclusion Zone Permit	OUT11/5415

1.4 Responsibilities

- Environmental monitoring for the Bioreactor, IMF and MBT was undertaken and/or supervised by Ark Du (Landfill Engineer), Marea Rakete (Woodlawn Environmental Officer), Christian Chang (MBT Process Engineer) and Reza Rafiee (MBT Process Engineer) in this reporting period.
- Environmental reporting for the Bioreactor, IMF and MBT was undertaken and/or supervised by Marea Rakete (Woodlawn Environmental Officer), Christian Chang (MBT Process Engineer) and Tobias Stanley (Woodlawn Bioreactor and Bioenergy Manager).
- Analysis of collected samples were performed at Australian Laboratory Services Pty Ltd (ALS), a NATA accredited laboratory.
- The Odour Unit Pty Ltd (TOU) was appointed to conduct the annual Independent Odour Audit for the Bioreactor, IMF and MBT during the reporting period. The audit team was approved by the DPIE.
- SLR Consulting Australia Pty Ltd (SLR) was appointed to conduct the annual Independent Leachate and Water Management System Audit for the Bioreactor, IMF and MBT during the reporting period. The audit team was approved by the DPIE.
- Ramboll Consulting was appointed to conduct the 3-yearly Independent Environmental Audit for the Bioreactor and IMF during the reporting period. The audit team was approved by the DPIE.

Part 2 Environmental Monitoring and Management

2.1 Environmental Management

This section presents the monitoring undertaken at the Bioreactor, IMF and MBT throughout the reporting period in accordance with the requirements of the PAs, as detailed in the respective EMPs. Where specific monitoring requirements or locations were not stipulated by the PAs, the monitoring requirements under the respective EPLs have been adopted to measure performance of implemented site controls to manage the environmental risks parameters assessed for the Eco Precinct sites.

The Environmental Monitoring Programs (EMP) are used to facilitate monitoring requirements, which enable the continuous measuring and assessment of suitability, adequacy and effectiveness of on-site environmental management measures. These requirements are summarised in **Table 2.1.1**, **Table 2.1.2** and **Table 2.1.3** and discussed in the subsections below.

Table 2.1.1 **Bioreactor Monitoring Requirements**

PA/EMP Reference	Type of Monitoring	Frequency	Commentary
Schedule 4, Condition 3	Site Inspection	Daily	Ongoing basis
Schedule 4, Condition 7	Odour Audit	Annually	Condition satisfied , independent odour audit conducted February 2020
Schedule 4, Condition 11	Dust Monitoring	Monthly	Ongoing basis
Schedule 4, Condition 12/ Air Quality and Greenhouse management Plan	Odour – Site inspections	Daily or as required	Ongoing basis
Schedule 4, Condition 17/ Soil and Water management Plan/EPL	Surface water monitoring Groundwater monitoring Dam Level Survey	Quarterly/ Annually/ Monthly	Ongoing basis
Schedule 4, Condition 18/ Leachate Management Plan	Leachate pond monitoring and Leachate recirculation monitoring	Annually	Ongoing basis
Schedule 4, Condition 19/ Noise Management Plan	Noise Monitoring	As required	Not triggered
Schedule 4, Condition 22	Meteorological monitoring	Continuous	Ongoing basis

Schedule 4, Condition 23/ Landscaping and Vegetation Management Plan	Site Inspections	Weekly housekeeping	Ongoing basis
Schedule 4 Condition 24/ Pest ,Vermin & Noxious Weed Management	Site Inspections	Weekly housekeeping	Ongoing basis
Schedule 4, Condition 3	Site Inspection	Daily	Ongoing basis

Table 2.1.2 **Crisps Creek IMF Monitoring Requirements**

PA/EMP Reference	Type of Monitoring	Frequency	Commentary
Schedule 5, Condition 5	Litter control	Daily	Ongoing basis
Schedule 5 Condition 6/ Pest ,Vermin & Noxious Weed Management Plan	Site Inspections	Weekly housekeeping	Ongoing basis
Schedule 5, Condition 9	Odour Audit	Annually	Condition satisfied , independent odour audit conducted February 2020
Schedule 5, Condition 15	Noise Monitoring	As required	Not triggered

Table 2.1.3 **MBT Monitoring Requirements**

PA/EMP Reference	Type of Monitoring	Frequency	Commentary
Schedule 3, Condition 29 EPL Condition M4	Meteorological monitoring	Continuous	Ongoing basis
Schedule 3, Condition 23 & 24 EPL Condition M2.2	Depositional Dust Monitoring	Monthly	Ongoing basis
Schedule 3, Condition 25 & 26 EPL Condition L4	Operational noise monitoring	As required	Condition satisfied
Schedule 3, Condition 20 EPL Condition M2.3	Surface Water Monitoring	Quarterly	Ongoing basis
EPL Condition L2.4	Discharge Monitoring	Daily during any discharge	Ongoing basis
Schedule 3, Condition 20 EPL Condition M2.3	Groundwater Quality Monitoring	Quarterly	Ongoing basis
Schedule 3, Condition 20 EPL Condition M2.3	Leachate Monitoring	Six monthly	Ongoing basis
EPL Condition O5.3	Leachate Level	Weekly or as required	Ongoing basis
Schedule 3, Condition 6 EPL Condition L3.1	Waste volume monitoring	Daily	Ongoing basis

Schedule 3, Condition 9	Site Inspection and Housekeeping	Weekly	Ongoing basis
Schedule 3, Condition 10	Pest and Vermin Checks	Every two months	Ongoing basis
Schedule 3, Condition 29 EPL Condition M4	Meteorological monitoring	Continuous	Ongoing basis

2.2 Environmental Performance Measurement

Based on the risk predictions in the environmental assessments undertaken for the 3 facilities, the implemented control measures described in the EMPs have become the criteria to determine the environmental performance of the respective operations. These are summarised in **Table 2.2.1.**

***Table 2.2.1* Performance Criteria**

Environmental Parameter	Issue	Risk	Control Measure(s)
Air quality (dust and odour)	Emission of air pollutants and odour above the EPA guidelines.	Low level of risk for MBT based on EIS modelling Large buffer distance between the MBT, Bioreactor and sensitive receptors Moderate - High risk for IMF and Bioreactor Sealed containers only at the IMF and full containers not stored	Monthly Dust monitoring and daily use of water cart. Annual Independent Odour Audits including leachate samples for odour assessment. Evaporation Systems. LTP treating all leachate extracted from the void.
Greenhouse gas emissions and energy use	Excessive energy consumption and related GHG emissions compared to similar facilities.	Known consequences with significant offset through generation of electricity from methane produced at the Bioreactor.	Extraction & monitoring of the gas for green energy generation. Compliance reporting under the National Greenhouse and Energy Scheme.
Surface Water	Contamination of surface water due to; Leachate Stored Chemicals	Possible without control measures, but unlikely due to existing approved Surface Water Management Scheme.	Ongoing Surface and Groundwater monitoring, Leachate monitoring.

Groundwater	Contamination of groundwater.	Possible without control measures, however unlikely due to the use of leachate barrier systems and existing Groundwater Management Scheme.	Dam integrity inspections. Dam freeboard control. Leachate Barrier system. 3 monitoring bores were added to the existing groundwater monitoring network and scheduled to mitigate any risk from dam leakage. Stormwater management system.
Noise	Increased noise impacts above the EPA guidelines. Impacts on local residents.	Rare due to the large buffer distance between the Bioreactor and MBT sensitive receivers.	In the event a noise complaint is received, noise monitoring is carried out at the site. All waste processing carried out indoors at MBT Facility. Permitted Operational Hours.
Pest, disease and agriculture related impacts	Introduction of pests and the spread of disease as a result of the proposed expansion.	Possible without control measures, however unlikely due to existing approved, operational management measures.	Routine Site Inspections Vermin control measures in place for Bioreactor, MBT & IMF.
Traffic and transport	Significant impacts on the local Tarago community, impacting levels of service and traffic flow.	The risk is rare due to the relatively low level of truck movements.	Limit the transfer of waste within approved operational hours and implementation of a Transport Code of Conduct. All drivers trained in National Heavy Vehicle Regulatory CoR modules.
Socio economic and visual amenity	Negative impact on existing social conditions and on the economic vitality of the Tarago district; visual amenity	Rare as the Eco Precinct generates employment while amenity impacts are low.	Veolia has well established mechanisms for addressing community concerns and engaging with the

	impacts to sensitive receptors		community to manage any issues raised. A 24hr feedback line exists. Veolia has implemented the Veolia Mulwaree Trust which provides grant funding to Not for Profit organizations in the local region. Location of the site well away from the local road network and from neighbouring properties.
Hazardous Substances	Increased risk to human health and the environment from expansion, especially from dangerous materials and gases.	Rare, as hazardous substances may not be received at the Bioreactor and IMF. Possible as LTP has stores of hazardous substances but unlikely due to controls in place.	All known hazards are understood and managed by Veolia with any incidents dealt with as part of the Emergency Response Plan (ERP) including PIRMP. Dangerous Goods and Hazardous Substance Register/Inventory. All hazardous substances stored according to Australian Standards. Inspection and testing of chemical management infrastructure

2.3 Environmental Monitoring

Veolia undertakes an environmental monitoring program in accordance with the requirements in EPL's 11436, 11455 and 20476. Environmental monitoring is completed in accordance with Veolia's environmental monitoring procedures, which specify the relevant standards and methodologies. EPL monitoring location plans are included in **Appendix 3**.

All monitoring data collected during this reporting period is summarised in **Sections 3.1, 4.1 and 5.1** and tabulated in **Appendix 4**. Graphs of data collected have been developed to assist in the assessment of trends and depict any variability within the monitoring results are presented in **Appendix 5**.

2.3.1 Air Quality

Air quality monitoring, pertaining to odour and dust, was undertaken in accordance with the relevant EMPs to determine whether activities conducted at the Bioreactor, Crisps Creek IMF and MBT affected ambient air quality.

All operations and activities were carried out in a manner to minimise dust at the boundary of the Eco Precinct. These included all access roads from the IMF to the Bioreactor and MBT, and the haul road used for ancillary operations being sealed, the use of water trucks for dust suppression as required and monthly sampling to monitor for the presence and quantity of depositional dust.

The active tipping face in the waste void is kept to a minimum surface area possible to reduce potential fugitive odour emissions.

Landfill gas (LFG) capture network has been installed and expanded in accordance with the Woodlawn Infrastructure Plan. Biofiltration system is installed along the rock/waste interface to minimize odour emission. Leachate extraction from the waste is maintained to reduce the impact of leachate on LFG capture. Maintain evaporation of stored leachate on site to reduce the odour footprint. All leachate from the void is treated via the LTP to achieve higher effluent quality and minimize odour potential.

All operational buildings at the Woodlawn MBT facility are enclosed and equipped with Odour Control ducting connected to Biofilters. The Biofilters are inspected on a regular basis in accordance with the O&M manuals to maintain suitable moisture, air flow rate and pressure of the air from the buildings for maximum air quality and odour control.

Veolia operates the Bioreactor to maximise the production of landfill gas for generation of renewable energy at the Power Station, where 7 generators have been installed and commissioned, with 2 auxiliary flares as back up treatment of landfill gas emissions captured. The generators and flares satisfy the design, installation and operational requirements within the Bioreactor PA and EPL.

An annual independent odour audit (IOA) is used to assess the effectiveness of odour control measures and to identify improvements to existing odour management practices at the site.

2.3.2 Noise

Any noise emissions from the site with the potential to impact on nearby sensitive receivers remain within the criteria specified in the Projects Consent Conditions. Veolia have implemented a number of noise minimising measures below:

- Waste filling operations below the ground levels
- Road Transport – Code of Conduct
- Waste operations within the approved specified hours
- Acoustic enclosures
- Use of hearing protection in restricted areas

Any noise emission incidents or complaints received will be managed and the appropriate corrective actions applied as outlined in the noise monitoring and management protocol within the NMMP.

2.3.3 Soil, Water & Leachate

The processes and management of water quality is documented and implemented on site in accordance with each facility's respective EMP. The EMPs provide guidance on the management of surface and stormwater systems such as drainage and pumping networks to divert clean water from any water that has come in contact with waste or leachate, as required under the Bioreactor and MBT Projects Approvals.

Clean surface and stormwater collected from within the void is pumped to Evaporation Dam 3 South (ED3S) for evaporation.

Water that has come into contact with waste and/or leachate is pumped to the onsite Leachate Treatment Plant for treatment and transferred for storage in the coffer dam in Evaporation Dam (ED1) for evaporation and potential use as process water for Heron Resources, should they recommence mining operations. The existing leachate aeration dam is used as a contingency. Mechanical evaporators may be used to assist evaporation and are controlled by wind direction sensors to prevent the drifting of sprayed liquids from the premises.

Treated leachate is transferred to Evaporation Dams, including ED 3 North (ED3N), ED3SS and ED1 cofferdam for evaporation. Mechanical evaporators may be used to assist evaporation and are controlled by wind direction sensors to prevent the drifting of sprayed liquids from the premises.

Soil monitoring is not undertaken as there is minimal risk of further contamination from water sources given the degraded nature of the disturbed mine site. However, erosion and sediment control measures have been implemented onsite to ensure storage water storages are protected from contaminated run-off.

2.3.4.1 Leachate Treatment System

The Leachate treatment system continued to be maintained and operated to optimise the Bioreactor conditions for treatment of leachate, other wastewaters and stormwater entering the void. Excess leachate was extracted, treated and transferred for storage in ED3 lagoons 1, 2, 3, 4 & 5 (ED3N-1, ED3N-2, ED3N-3 & ED3N-4, ED3SS).

Following a prolonged period with minimal rainfall and favourable conditions for evaporation, the contents of ED3N-1 was pumped to other dams in the ED3N network. ED3N-1 was cleaned and prepared as a mixing reservoir for various site waters. The aim was for Heron to use this mix of site waters for mineral processing. The use of site waters by Heron will assist with Veolia's site water balance. This plan has been impacted by Heron going into care and maintenance. ED3N-1 remains empty.

The construction of the Leachate Treatment Plant (LTP) was completed and commissioned in September 2018. An average throughput of 3.06L/s or 264.4m3/day was achieved during the reporting period. The long term management of the ED3N dams will be to remove the stored liquid by 31 December 2022.

Leachate from waste via Veolia's Sydney transfer facilities continued to be the only liquid imported into the void during this reporting period and was processed through the leachate treatment system as approved by the EPA.

2.3.4.2 Water Balance

The Woodlawn Bioreactor water balance is a complete and tightly coupled system. It is important to focus on all elements of the water balance as a collective when considering any actions to be taken in order to achieve the overall purpose of the facility which is to maximise gas capture.

The elements of the Woodlawn Bioreactor water balance can impact each other and ultimately the effectiveness of gas generation and collection include:

- Leachate generation - Liquid inputs to waste (storm water, waste, groundwater ingress);
- Stormwater interception (rock walls and surface of waste);
- Leachate absorption (waste absorption capacity);
- Leachate removal (treatment);
- Leachate treatment (Leachate Treatment Dam (LTD) and Leachate Treatment Plant (LTP)); and
- Liquid storage (Stormwater, LTD treated leachate and LTP permeate)

In accordance with the requirements of the Pollution Reduction Program (PRP) of the EPL, a Leachate Assessment Report was prepared by Earth2Water Pty Ltd during the reporting period. A leachate Management Strategy has been developed and implemented in line with managing this complex system in a way that avoids any unintended consequences caused by not carefully considering all elements of the water balance in conjunction to allow for the best possible outcomes.

2.3.4 Waste Management

All waste received as part of the expanded operations was in accordance with the waste types permitted in the Bioreactor and MBT PA and EPL. Acceptance and screening of waste prior to final disposal was in accordance with the requirements of the Woodlawn Receipt of Non-Conforming Waste Work Instruction to ensure only conforming waste is received.

Visual assessments of incoming waste were conducted by operators, as tipping/unloading occurred on the landfill surface. No records of non-conforming waste were recorded during this reporting period.

An exceedance in Regional waste inputs was identified during the reporting period which is discussed in **Section 3.1.10**.

2.3.5 Meteorological Monitoring

Monitoring meteorological data during this reporting period provided an understanding of the ambient air (such as dust and odour) and rainfall conditions at the Eco-Precinct, which was utilised to manage environmental performance, as well as investigate potential impact to nearby sensitive receivers.

In accordance with Schedule 4, Condition 22 of the Consent, an onsite automated meteorological monitoring station was operated during the reporting period to monitor weather conditions representative of the site. Meteorological data recorded includes (but is not limited to):

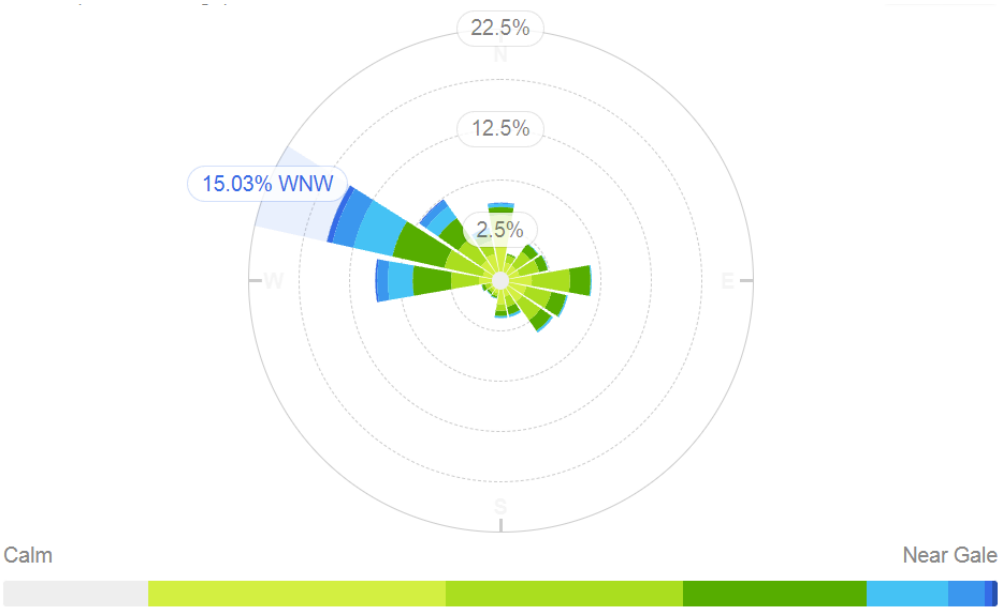
- Wind speed at 10m;

- Wind direction at 10m;
- Temperature at 2m;
- Temperature at 10m;
- Rainfall;
- Solar radiation; and
- Sigma theta at 10m

Meteorological data is logged in 60 minute and 24 hour intervals and can be made available for the 2020/2021 reporting period upon request. Servicing and calibration of the meteorological station is carried out quarterly by Hydrometric Consulting Services.

Figure 1.5.8 below indicates average wind speed and direction during the reporting periods.

Figure 1.5.8 Average Wind Speed (km/h) and Direction



Source: https://www.willyweather.com.au/

The wind rose above depicts the average wind speed and direction recorded at 10m above ground level from September 2020 to August 2021. Average wind speeds over the reporting period ranged from 0km/h to 45.7km/h with strong prevailing winds typically from the West North West (WNW) directly toward Tarago and surrounding areas.

The meteorological data for the reporting period is detailed in **Table 11.1** (refer **Appendix 4**).

Part 3 Woodlawn Bioreactor

3.1 Bioreactor Monitoring Results

3.1.1 Bioreactor Landfill Gas Monitoring Results

Gas monitoring is a critical component of the Bioreactor's landfill and subsurface gas monitoring regime. Portable gas monitors (PGM's) and analysers such as the GEM5000 and TDL Landfill Gas Analyser are used to take spot readings, showing landfill conditions moment-to-moment as well as fulfill quarterly surface and subsurface gas monitoring as required by the EPL.

The findings from Landfill gas monitoring required under the Bioreactor PA and EPL is summarised in **Table 3.1.1** below.

***Table 3.1.1* Bioreactor Landfill Gas Monitoring Results**

<table>
<tr><th>Parameter</th><th>Results/Discussion</th></tr>
<tr><td>Subsurface Gas</td><td>Monitoring of 3 subsurface gas monitoring bores (GMB) was undertaken on a quarterly basis as per EPL requirements and is summarised in Table 3.1.1.1 below:
Table 3.1.1.1: Subsurface Gas Monitoring Result
<table>
<tr><th rowspan="2">Gas Monitoring Bore ID</th><th colspan="4">Purged Methane Reading (%)</th></tr>
<tr><th>16/11/20</th><th>3/2/21</th><th>1/7/21</th><th>27/8/21</th></tr>
<tr><td>GMBH1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>GMBH2</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>GMBH4</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>
The results show that the gas collection network is effectively capturing and controlling landfill gas within the landfill void. Engineered impermeable barriers and the natural subsurface of the void wall also minimises the potential movement of landfill gas from the Bioreactor, allowing for maximum extraction through the gas collection system.
The monitoring data for each of the subsurface gas monitoring bores is provided in Tables 1.1 to 1.3 (refer Appendix 4).</td></tr>
<tr><td>Landfill Gas Extraction Booster</td><td>The data reported for the landfill gas extraction booster at the Power Station is consistent to the historical average as summarised in Table 3.1.1.2 below:
Table 3.1.1.2: Landfill Gas Extraction Booster Monitoring Results Summary
<table>
<tr><th>Parameter</th><th>Historical Average</th><th>2020/2021 Result</th></tr>
<tr><td>Temperature (°C)</td><td>2.7</td><td>3</td></tr>
<tr><td>Volumetric Flow (m³/s)</td><td>0.67</td><td>0.75</td></tr>
<tr><td>Carbon Dioxide (%)</td><td>38.8</td><td>36.3</td></tr>
</table>
The detailed data for each of the parameters required under the EPL for the gas extraction booster is provided in Table 2.1 and 2.2 (refer Appendix 4).</td></tr>
</table>

Surface Gas

Surface gas monitoring was completed on a quarterly basis as per EPL requirements, which are summarised in **Table 3.1.1.3** below. The detailed tabulated data is available in **Tables 3.1** to **3.9** (refer **Appendix 4**).

Table 3.1.1.3: Surface Gas Monitoring Results Summary

Parameter (ppm)	Minimum	Average	Maximum
Methane	2	71.97	2000
Hydrogen Sulfide	0.00	0.0083	1.20

Methane was detected in varying amounts over the waste surface with a slight decrease in overall average of 71.97ppm (0.007%) during this reporting period, compared to 0.008% last reporting period.

Identified through surface gas monitoring, areas where higher methane levels were recorded had additional cover material added to maintain the average methane emissions below the threshold concentration in surface gas emission testing of 500 parts per million (0.05%), as per the *Environmental Guidelines for Solid Waste Landfills* (EPA, 2016).

Application of cover material in areas of the void demonstrating settlement cracking, commissioning and rebalancing of gas extraction wells and installing additional gas collection infrastructure were methods used to reduce surface gas emissions.

Surface gas emission monitoring was increased from a quarterly to monthly frequency with the addition of hydrogen sulfide monitoring during the reporting period and implemented in Q4 of the reporting period.

During this reporting period mulch bio-cover was also implemented around wells, which has assisted in mitigating odour and reducing surface gas emissions as well as an approved Alternative Daily Cover (ADC).

Landfill Gas Flare

The 2 landfill gas flares located at the Power Station are manufactured to achieve a residence time of 0.3 seconds with a destruction efficiency of 98% for methane and non methanogenic organic compounds to meet the requirements of the EPL.

Monitoring was continuously performed during this reporting period, an average of which is summarised in **Table 3.1.1.4** below.

Table 3.1.1.4: Landfill Gas Flare Monitoring Results

Parameter	Units	Result
Temperature	°C	1000
Residence Time	Seconds	>0.3

Landfill Gas Engine Exhaust Point(s)

Monitoring of a landfill gas engine exhaust point was completed during the reporting period. The results are consistent with the previous monitoring period and presented in **Tables 4.1** and **4.2** (refer **Appendix 4**).

Concentration limits for each of the following pollutants are stipulated in the EPL, all of which were below the threshold for the exhaust point test within this reporting period and consistent with previously reported levels.

- Nitrogen Oxides;
- Hydrogen Sulphide;
- Volatile Organic Compounds
- Sulphuric Acid Mist; and
- Sulphur Trioxide

Table 3.1.1.5: Landfill Gas Engine Exhaust Point Monitoring

Concentration (mg/m^3)	Maximum	Result
Hydrogen Sulphide	5	<0.7
Sulfuric acid mist and sulfur trioxide (as SO3)	100	4.5
Nitrogen Oxides	450	440

Note: Only one engine exhaust is required to be monitored under the EPL as a representative sample of all the same engines.

3.1.2 Bioreactor Dust Monitoring Results

Air quality monitoring was carried out as required to determine whether activities conducted at the site impacted ambient air quality. All operations were carried out in a manner that would minimise emissions of dust from the premises.

Dust suppression control measures employed during the reporting period included but was not limited to:

- A water cart is used on access roads to suppress and/or clear dust, as required
- The wheel wash ensures that trucks travelling from the Bioreactor to the intermodal facility minimise the transport of particulate matter into the surrounds
- Truck speed and movements on-site are minimised as much as practicable, with speed limits no greater than 40km/h
- All trucks entering and leaving the premises carrying loads must be covered at all times, except during loading and unloading

Sampling and analysis of dust deposition was carried out in accordance with Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method as specified in the Woodlawn Bioreactor's Project Approval.

The criteria for deposited dust at the Woodlawn Bioreactor is assessed as insoluble solids and provided in **Table 3.1.2.1.**

***Table 3.1.2.1* Bioreactor Depositional Dust Long Term Criteria**

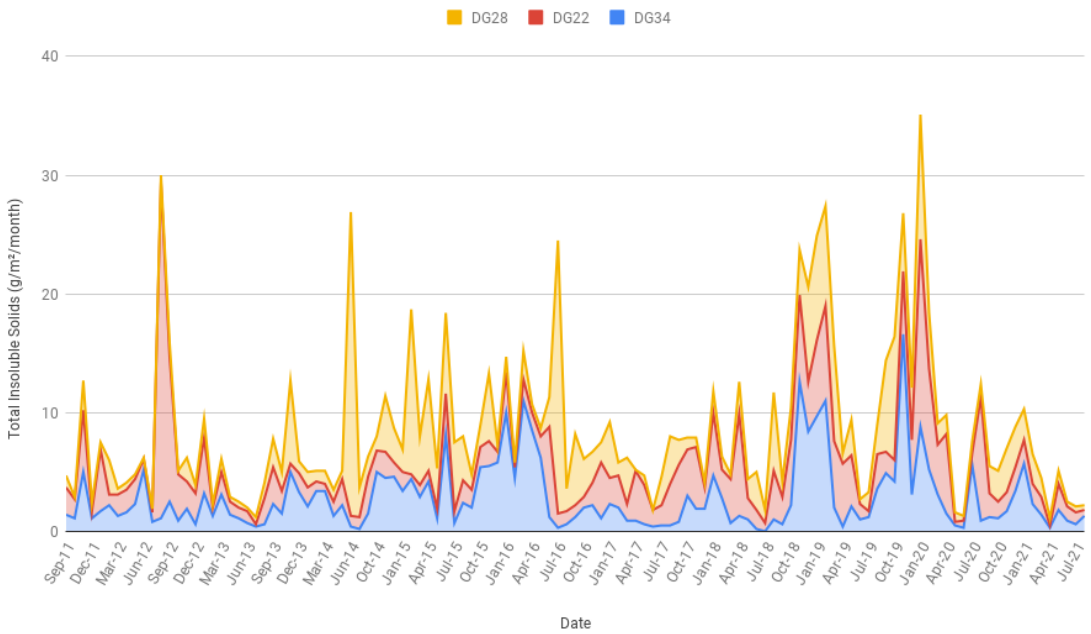
Pollutant	Averaging Period	Maximum Increase	Maximum Total Level
[c]Deposited Dust	Annual	[b]2 g/m^2/month	[a]4 g/m^2/month

There are currently three dust deposition gauges associated with the Woodlawn operation. DG22 on the eastern side of the void, DG34 behind the core shed, and DG28 located at Pylara. These are sampled each month as shown in **Table 3.1.2.2**.

***Table 3.1.2.2* Bioreactor Dust Monitoring Results**

Parameter	Results/Discussion
Particulates/ Dust Monitoring	The results of total insoluble solids found within the depositional dust samples are summarised for each of the monitoring locations in **Table 3.1.2.1** below, with the detailed results tabulated in **Tables 5.1** (refer **Appendix 4**). *Table 3.1.2.1: Dust Monitoring Results* **Dust Gauge** / **Summary Total Insoluble Solids (g/m²/month)** **Minimum** / **Average** / **Maximum** **DG22** 0.2 1.4 2.2 **DG34** 0.3 1.8 5.7 **DG28** 0.4 1.8 3.7 The maximum dust level recorded in this reporting period was 5.7 g/m2/month at DG34 (July 2021), which is located on the West side of the Bioreactor. Due to the location of DG34 and a predominantly westerly wind in the month of July the dust is indicative of a regional dust source. All monitoring points remained within the long term criteria for deposited dust during the reporting period.

***Figure 3.1.2.3* Bioreactor Dust Monitoring Results**



3.1.3 Bioreactor Surface Water Monitoring Results

A surface water monitoring program is established to detect potential pollution of offsite surface water by leachate or sediment-laden stormwater from the landfill. Monitoring points are located upstream and downstream of the site to identify any impacts the Woodlawn operations may be having on surface waters and equally, eliminate impacts to surface waters that are not a result of the landfill operation.

The findings from water quality monitoring of surface water locations required under Bioreactor PA and EPL is summarised in **Table 3.1.3** below with detailed data provided in **Tables 6.1 - 6.11** (refer **Appendix 4**). Key quality indicators selected to identify likely impacts from the Bioreactor include:

- pH,
- Electrical conductivity (EC),
- Ammonia (NH_3),
- Total organic carbon (TOC),
- Potassium (K)
- Sulphate (SO_4), and
- Zinc (Zn).

These are depicted in the trend graphs **(Figures 1.5.3.1 – 1.5.3.11)** provided in **Appendix 5.**

Table 3.1.3 **Bioreactor Surface Water Monitoring Results**

Parameter	Results/Discussion
Site 115 – Allianoyonyiga Creek	Site 115 is situated downstream of the evaporation dams. All four quarterly monitoring samples were undertaken in this monitoring period. Based on the results provided in **Table 6.1** (refer **Appendix 4**), the pollutant concentration trends from previous monitoring periods are generally consistent. • Mean pH at 7.98 for this location indicates slightly alkaline water; • EC at 2155 µS/cm, indicating fresh to brackish water; • NH_3 at less than 0.1mg/L and TOC at mean of 17 mg/L concentrations recorded in this monitoring period remain consistent with historical monitoring results; • Mineral and heavy metal concentrations are of fairly low magnitude at 8.4 mg/L for K and 0.12 mg/L for Zn, indicating no contaminated runoff is impacting surface water at this monitoring location. While the indicator trends for this location indicate some variability over time, this is not uncommon when sampling intermittent streams.
Spring 2	Spring 2 is located upstream of the Bioreactor and adjacent to Crisps Creek. The site therefore provides background water quality information to site operations. The spring naturally overflows to Crisps Creek during rainfall events. 4 out of 4 quarterly monitoring events required under the EPL were undertaken in this monitoring period, and have been documented in the Annual Return. Water

	quality trend in Spring 2, based on the results provided in **Table 6.2** (refer **Appendix 4**), is consistent with water quality from historical monitoring records. • pH is consistent with previous years (average 6.4) and reflective of the overall range of 6.06 - 7.43 for this location; • EC (average 1039 µS/cm) for this reporting period is higher than previous;. • SO_4 (average 333 mg/L) shows an identical trend to conductivity, again indicating a direct effect on EC; • K (average 13.5 mg/L) and Zn (average 4.3 mg/L) concentrations continue to show slow decline from overall averages with some variability likely due to dilution following wet weather periods and concentration during drier periods; • NH_3 (average 0.5 mg/L) and TOC (average 24 mg/L) concentrations recorded in this monitoring period are consistent with historical monitoring results. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
Site 105 – Crisps Creek	Site 105 is located downstream of the Bioreactor and tailings dams. All quarterly monitoring requirements were undertaken in this monitoring period. Water quality trends in Site 105, based on the results provided in **Table 6.3** (refer **Appendix 4**) are consistent with previous monitoring results. • pH (7.4) is within the overall range of 7.06 - 7.96 for this location, indicating relatively neutral water; • EC (1188 µS/cm) is consistent with historical results, reflecting brackish water; • TOC (22 mg/L) and NH_3 (0.1 mg/L) were consistent with historical trends; • Zn and K remain consistent averaging 0.23 mg/L and 6.9 mg/L respectively, consistent with historical results. Site 105's water quality fluctuates in response to rainfall and can often contain higher salt content particularly during low flow or following extended dry conditions. During the reporting period Crisps Creek has consistently had water flow due to the above average rainfall experienced across the region.
WM200 - Raw Water Dam	The Raw Water Dam is located to the west of the dolerite stockpile and collects uncontaminated water. Quarterly monitoring events were undertaken in accordance with EPL conditions. Based on the results provided in **Table 6.4** (refer **Appendix 4**), the results for WM200 remain generally consistent with the previous reporting periods. • pH (average 7.4) indicates slightly alkaline water; • EC (average 962 µS/cm) is slightly lower but overall consistent with historical results; • SO_4 level (average 92.4 mg/L) is higher than previous reporting period; • Zn level was higher at an average of 1.1 mg/L than previous reporting period; • TOC was an average of 7 mg/L in this reporting period which is consistent with historical results. This could be reflective of the presence of organic matter from riparian zone vegetation surrounding the dam; • NH_3 at an average of 0.15 mg/L is consistent with historical results.

	No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
WM201 – Entrance Road Culvert	The Entrance Road Culvert collects surface water runoff from the Woodlawn Bioreactor administration office and workshop areas. 4 of 4 monitoring quarters were sampled during the 2020-21 reporting period. Water quality trends for WM2011, based on the results provided in **Table 6.5** (refer **Appendix 4**). • pH (6.6) is within the overall range of 5.53 – 8.56 for this location, indicating relatively neutral water; • EC (301 µS/cm) is consistent with historical results, reflecting brackish water; • TOC (8.5 mg/L) remains consistent with previous reporting periods; • NH_3 (0.2 mg/L) concentration are consistent with historical trends; • K (average 12.7 mg/L) is consistent with historical levels. Veolia will continue monitoring this location in the next reporting period for any runoff impacts.
ED3SS – Lagoon 5	Evaporation Dam 3 South-South (ED3SS) is a storage point to manage treated leachate by evaporation. Quarterly monitoring events were undertaken in accordance with the EPL. Based on the water quality results provided in **Table 6.6** (refer **Appendix 4**), for ED3SS, the following can be confirmed: • pH (average 8.5) appears to be fairly consistent with the existing treated leachate quality; • EC average (24100 µS/cm) indicates a slight increase from previous reporting periods; • SO_4 averages (1893 mg/L) appears to be fairly consistent with the existing treated leachate quality; • Zn levels (average 20.2 mg/L) higher than previous monitoring periods; • NH_3 concentrations (average 388 mg/L) remained stable over the course of the reporting period; • TOC (average 3945 mg/L) continues to trend upwards from previous reporting periods. The progressively increasing trend in EC and TDS evident in monitoring results is directly associated with the increase in concentration of salts as the water component on leachate evaporates from this dam.
WM203 – Evaporation Dam 3 North	Evaporation Dam 3 North (ED3N) is a storage point to manage treated leachate by evaporation. Quarterly monitoring events were undertaken in accordance with the EPL. Based on the water quality results provided in **Table 6.7** (refer **Appendix 4**), for WM203, the following can be confirmed: • pH (average 8.6) appears to be generally consistent with previous reporting periods; • EC average (36600 µS/cm) indicates a slight increase from previous reporting periods; • SO_4 averages (5360 mg/L) is consistent with previous reporting periods; • Zn levels (average 76.7 mg/L) is also consistent with historical levels;

	• NH_3 concentrations (average 85.8 mg/L) showing a steady decrease from previous reporting periods; • TOC average (3340 mg/L) has decreased from the previous reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
Pond 5	Pond 5 is situated on a bench within the landfill void and acts as a transfer point to capture stormwater from the walls of the landfill void to Evaporation Dam 3 South. All quarterly monitoring events required under the EPL were undertaken in this monitoring period, the results of which are tabulated in **Table 6.8** (refer **Appendix 4**). These water quality results are consistent with previous reporting periods. • pH average of 4.3 confirms acidic nature of water that comes in contact with the void walls and is lower than previous results; • EC (average 2002 µS/cm) is generally consistent lower than previous results; • SO_4 trends downwards (average 1227 mg/L) from the previous reporting period; • K average of 9.5 mg/L is slightly down on previous results; • Zn (average 145.9 mg/L) is generally consistent with previous results; • NH_3 (average 4.4 mg/L) and TOC (average 10 mg/L) both mirror a similar trend which appears quite variable over historical monitoring results. These results and trends are deemed representative of the stormwater quality captured from the walls of the void.
WM202 – ED3S	Evaporation Dam 3 South is a storage point to manage stormwater from the void by evaporation. Quarterly monitoring events were undertaken in accordance with EPL conditions. Water quality results indicated a similar trend to previously reported data as seen **in Table 6.9** (refer **Appendix 4**). • pH levels indicate an acidic, yet stable trending result with the average pH of 3.6 appearing to be generally consistent with previous reporting periods; • Zn at an average of 378 mg/L is consistent with previous reporting periods; • SO_4 (average 4380 mg/L) is lower than previous reporting periods; • EC (average 6115 µS/cm) is indicating a downward trend. Both SO_4 and EC concentrations reflect the signature for Acid Mine Drainage (AMD) contaminated waters from remnant mining operations stored in Evaporation Dam 3 South; • NH_3 concentrations (average 57.2 mg/L) is also lower than previous reporting periods. The majority of the analytes tested at this location during this monitoring period indicates a downward trend in concentrations in comparison to previous reporting periods.

ED1 – Evaporation Dam 1	Evaporation Dam 1 (ED1) is a storage point to manage runoff stormwater from its external catchment including dolerite stockpile area. Quarterly monitoring events were undertaken in accordance with the EPL. Based on the water quality results provided in **Table 6.10** (refer **Appendix 4**), for ED1, the following can be confirmed: • pH (average 2.7) which is consistent with previous reporting periods; • EC (average 20160 µS/cm) is slightly lower than previous reporting periods; • Zn levels (average 3041 mg/L) is consistent with the previous reporting period; • NH_3 concentrations (average 15.9 mg/L) showed lower than usual results over the reporting period; • TOC averages 14.75 mg/L remains consistent with previous reporting periods. Similar to ED3S, ED1 demonstrated a steady decline in concentrations in the majority of the analytes tested at this location during this monitoring period in comparison to previous reporting period, which is reflective of the increased surface water inputs resulting from the rainfall since Feb 2020.
ED1 Coffer Dam	Evaporation Dam 1 (ED1) coffer dam is a storage point to manage treated leachate from the Leachate Treatment Plant. Monthly monitoring events were undertaken in accordance with the EPL. Based on the water quality results provided in **Table 6.11** (refer **Appendix 4**), for ED1 coffer dam, the following can be confirmed: • pH (average 8.75) is lower than previous reporting period; • EC (average 26083 µS/cm), BOD (average 7.42 mg/L) and COD (2909 mg/L) results are lower than previous reporting period results; • NH_3 concentrations (average 10 mg/L) remained stable over the reporting period; • Chloride averages (4378 mg/L) remained stable however declining over the reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

3.1.4 Bioreactor Leachate Monitoring Results

Leachate quality monitoring is undertaken annually at 2 monitoring locations in the Bioreactor as required by the EPL. Effluent quality from the Leachate Treatment Plant is also monitored and sampled.

The findings from this reporting period are summarised in **Table 3.1.4** below with the detailed data provided in **Tables 7.1** and **7.2** (refer **Appendix 4**). The key quality indicators selected to characterize the leachate and identify any migration into groundwater or surface water monitoring locations include:

- pH,
- Electrical Conductivity (EC),
- Sulphate (SO_4),
- Lead (Pb),
- Zinc (Zn),
- Ammonia ($NH_{3)}$, and

- Total Organic Carbon (TOC).

These are also depicted in the subsequent trend graphs **Figures 1.5.4.1** and **1.5.4.2** (refer **Appendix 5).**

Table 3.1.4 Bioreactor Leachate Monitoring Results

Parameter	Results/Discussion
Leachate Dam	The leachate dam is located at the northwest rim of the landfill void where leachate collected and extracted from the void is treated by aeration to oxidise organic compounds. An annual monitoring round was completed during this reporting period as per the requirements of the EPL. Based on the results provided in **Table 7.1** (refer **Appendix 4**), the characteristics of the leachate are: • pH (8.71) and EC (27100µS/cm) is consistent with the previous reporting period; • SO_4 one of the dominant anions, (473 mg/L) is consistent with previous reporting readings; • Pb (0.798 mg/L) and Zn (2.96mg/L) is consistent with the previous reporting period; • NH_3 (2550 mg/L) is consistent with previous reporting; • TOC (5740 mg/L) is consistent with previous reporting. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
Leachate Recirculation System	An annual round was completed during this reporting period in accordance with the EPL, the results of which are detailed in **Table 7.2** (refer **Appendix 4**). Based on these results, the leachate collected directly from the recirculation system displays similar characteristics to the leachate pond, with some exceptions as summarised below: • pH (8.28) is generally consistent with previous reporting period; • EC (25700µS/cm) is consistent with the previous reporting period and is generally consistent with the overall annual average for this location; • SO_4 (382 mg/L) is higher than previous reporting period; • Both Pb and Zinc are consistent with the previous reporting period, 0.098 mg/L and 3.32 mg/L respectively; • TOC (4520 mg/L) is consistent with historical monitoring results. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
Effluent from LTP	The effluent from the Leachate Treatment Plant is located at the ultrafiltration membrane shed at the Leachate treatment Plant. Water quality is tested on the agreed 7 day assessment and provided to the NSW EPA on a monthly basis as part of the Commissioning process. Based on the results provided in **Table 8.1** (refer **Appendix 4**), the water quality at this location can be described as: • pH (average 8.03) consistent with throughout reporting period and meets proposed Targets; • EC (average 17076 µS/cm) remains stable, consistent with throughout the reporting period;

	• NH_3 (average 9.3 mg/L) is well below proposed Targets; • BOD (3 mg/L) is well below proposed targets; No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

3.1.5 Bioreactor Groundwater Monitoring Results

Groundwater quality monitoring at 22 locations was undertaken in this reporting period as required by the EPL, comprising 1 annual and 3 quarterly rounds of monitoring for 19 of the 22 locations. The results of which are summarised in **Table 3.1.5** below.

The groundwater monitoring well network allows for an assessment of potential impacts from the waste operations at the Bioreactor, evaporation dams and tailing dams.

The key quality indicators selected to detect any pollutants in groundwater samples are the same as those deemed characteristic for leachate and are as follows:

- pH
- Electrical Conductivity (EC),
- Sulphate (SO_4),
- Lead (Pb),
- Zinc (Zn),
- Ammonia ($NH_{3)}$, and
- Total Organic Carbon (TOC).
- Copper (Cu)

These are depicted in the trend graphs **(Figures 1.5.5.1 to 1.5.5.21)** provided in **Appendix 5**.

Table 3.1.5 **Bioreactor Groundwater Monitoring Results**

Parameter	Results/Discussion
MB1	MB1 is located down gradient of the landfill void. Based on the results provided in **Table 9.1** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 775.6 m RL) was slightly higher than previous reporting periods due to recent rainfall events; • pH (average 7.6) neutral – to slightly alkaline consistent with previous reporting period; • EC (average 1550 µS/cm) is lower than but generally consistent with previous readings representing fresh water; • SO_4 (average 257 mg/L) is generally consistent with previous periods; • Pb and Zn (0.0008 mg/L and 0.192 mg/L respectively) are generally consistent with previous periods; • NH_3 (average 0.2) is consistent with previous reporting periods;

	• TOC (7 mg/L) is consistent with the previous reporting period and historical trends. The concentration is indicative of natural conditions. Veolia will continue to monitor this parameter in the future to ensure water quality at this location is preserved. All trends at this location indicate fairly stable concentration and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.
MB2	MB2 is located upstream of Evaporation Dam 2. Based on the results provided in **Table 9.2** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 779.4 m RL) was consistent with long term average since 2004; • pH (average 7.2) neutral, consistent with previous reporting period; • EC (average 6308 µS/cm) and SO_4 (average 4400 mg/L) are generally consistent with previous periods; • Pb (0.0002 mg/L) indicates a stable trend consistent with the previous reporting period; • Zn (0.052 mg/L) is generally consistent with previous reporting periods; • NH_3 (0.1 mg/L) is consistent with previous monitoring periods of non detection rates; • TOC (5 mg/L) shows a slight increase with previous reporting periods. All trends indicate fairly stable concentration and there is no indication of contamination from mining or Bioreactor activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.
MB3	MB3 is located upstream of the Bioreactor and mine site. Based on the results provided in **Table 9.3** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 790.7 m RL) was consistent with long term average since 2004; • pH (average 7.1) near neutral is consistent with previous reporting period; • EC (average 1795 µS/cm) is consistent with previous readings representing fresh water; • SO_4 (average 30.1 mg/L) is stable; • Pb (0.0004 mg/L) and Zn (0.015 mg/L) are stable and consistent with previous periods; • NH_3 (0.1 mg/L) is consistent with previous monitoring periods of non detection rates; • TOC (1 mg/L) result is consistent with historical results. The concentration is indicative of natural conditions. Veolia will continue monitoring this parameter in the future to ensure water quality at this location is preserved. All trends indicate fairly stable concentration and provide an indication of background groundwater concentrations.

MB4	MB4 is located to the east of the landfill void and downstream of the Bioreactor. Based on the results provided in **Table 9.4** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 773.94 m RL) was consistent with long term average since 2004; • pH (average 6.1) slightly acidic, consistent with previous reporting period; • EC (average 1707 µS/cm) represents fresh water salinity and is consistent with previous period. This trend is reflected in SO_4 (average 157 mg/L) results for this period; • Pb (0.0035 mg/L) remains stable while Zn (0.915 mg/L) is seen to fluctuate which appears consistent with historical cyclic trends; • NH_3 (0.1 mg/L) is consistent with previous monitoring periods of non detection rates; • TOC (1 mg/L) result is consistent with historical results. The concentration is indicative of natural conditions. Veolia will continue monitoring this parameter in the future to ensure water quality at this location is preserved. All trends indicate fairly stable concentrations and there is no indication of contamination from mining or Bioreactor activities.
MB6	MB6 is located to the west of the landfill void and downstream of Evaporation Dam 3 and upstream of the Bioreactor. Based on the results provided in **Table 9.5** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 773.6 m RL) was consistent with historical results; • pH (average 6.2) slightly acidic consistent with previous reporting period; • EC (average 1955 µS/cm) represents brackish water and the trend is mirrored by SO_4 (average 254 mg/L) consistent with previous periods; • Pb (0.004 mg/L) and Zn (4.4 mg/L) is consistent with previous periods; • TOC (2.0 mg/L) and NH_3 average of 0.1 mg/L is consistent with previous monitoring periods. This bore was not sampled in Quarter 1 and 4 of the reporting period due to being dry. Due to the tendency of MB6 to be dry, the long term reliability of this bore for monitoring is uncertain. It will continue to be monitored and samples obtained when possible.
MB7	MB7 is located upstream of Evaporation Dam 3. Based on the results provided in **Table 9.6** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 787.3 m RL) was consistent with long term average since 2004; • pH (average 7.5) neutral is consistent with the previous reporting period; • EC (average 8372 µS/cm) and SO_4 (average 147.3 mg/L) follow a similar stable trend to previous reporting periods ; • Pb (0.0003 mg/L) is consistent throughout the reporting period whilst Zn (0.227 mg/L) shows a fluctuating trend consistent with historical cycles; • NH_3 (0.1 mg/L) is consistent with previous monitoring periods of non detection rates;

	• TOC (13 mg/L) is fairly consistent with the previous reporting period. The concentration is indicative of natural conditions. Veolia will continue monitoring this parameter in the future to ensure water quality at this location is preserved. All trends indicate fairly stable concentration and there is no indication of contamination from mining or Bioreactor activities.
MB10	MB10 is located adjacent to Evaporation Dam 1. Based on the results provided in **Table 9.7** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 781.6m RL) was consistent with previous monitoring periods; • pH (average 7.3) neutral is consistent with previous reporting periods; • EC (average 7640 µS/cm) is of brackish quality generally consistent with previous readings; • SO_4 (average 3780 mg/L) mirrors EC and is generally consistent with previous periods; • Pb (0.0005 mg/L) is stable while Zn (0.028 mg/L) and is generally consistent with previous reporting periods; • NH_3 (0.1 mg/L) is consistent with previous monitoring periods of non detection rates; • TOC (3 mg/L) appears consistent with the previous reporting period. The concentration is indicative of natural conditions. Veolia will continue monitoring this parameter in the future to ensure water quality at this location is preserved. All trends indicate fairly stable concentrations and there is no indication of contamination from mining or Bioreactor activities.
ED3B	ED3B is located downstream of Evaporation Dam 3. Based on the results provided in **Table 9.8** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 784.1 mRL) was consistent with previous monitoring periods; • pH (average 7.4) is neutral – slightly alkaline and consistent with previous reporting period; • EC (average 7575 µS/cm) indicating brackish water and SO_4 (average 1082 mg/L) follow similar trends consistent with previous periods; • Pb (0.0024 mg/L) remains stable while Zn (0.356mg/L) is lower than previous monitoring periods; • NH_3 (0.1 mg/L) is at non detection rates; • TOC (27 mg/L) is higher than previous reporting periods. All trends indicate fairly stable concentrations at this location with no evidence of contamination from mining or Bioreactor activities.
WM1	WM1 is located northeast of the landfill void. Based on the results provided in **Table 9.9** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 748.1m RL) is consistent with previous monitoring periods; • pH (average 8) neutral – to slightly alkaline consistent with previous reporting period;

	• EC (average 2404 µS/cm) represents slightly brackish water, and slightly lower than previous historical records; • SO_4 (average 1513 mg/L) is similar in trend to EC and demonstrating a long term upward trend; • Both Pb (0.0022 mg/L) and Zn (0.281mg/L) remain consistent with previous reporting periods; • NH_3 (average 0.3 mg/L) is close to, or within, non-detection rates; • TOC (7 mg/L) is consistent with previous monitoring period reflective of natural conditions; All trends indicate fairly stable concentrations at this location with no evidence of contamination from mining or Bioreactor activities.
WM5	WM5 is located to the west of the void near Evaporation Dam 3 South. Based on the results provided in **Table 9.10** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 785.7mRL) is consistent with long term averages; • pH (average 7.48) neutral is consistent with the previous period; • EC (average 4146 µS/cm) is representative of saline water and consistent with the previous reporting period; • SO_4 (average 71.1 mg/L) is lower than previous monitoring periods; • Pb average 0.0002 mg/L) and Zn (0.006mg/L) can be seen to be fluctuating which appears consistent with historical cyclic trends; • NH_3 (average 0.1 mg/L) is close to non-detection rates; • TOC (12 mg/L) is consistent with previous monitoring periods reflecting natural conditions. No significant variations or anomalies were recorded for any analyte tested in this location during this monitoring period from the data available.
WM6	WM6 is located to the west of the void adjacent to Evaporation Dam 3 North. Based on the results provided in **Table 9.11** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 786.6m RL) is consistent with the previous reporting period; • pH (average 6.98) is slightly acidic, but stable and consistent with previous reporting period; • EC (average 12081 µS/cm) represents brackish to slightly saline water, consistent with previous reporting period; • SO_4 (average 284 mg/L) mirrors EC's stable trend; • Pb (0.0178 mg/L) and Zn (0.303 mg/L) are both similar to the previous reporting period and generally consistent with historical fluctuations; • NH_3 (average 0.1mg/L) is close to, or within, non-detection rates; • TOC (15 mg/L) is consistent with previous monitoring periods reflecting natural conditions. All trends are relatively consistent and there is no indication of contamination from mining or Bioreactor activities.

MW8S	MW8S is located on the northern side of ED3N. Only 3 of the 4 quarterly monitoring samples were obtained due to the bore being dry during Quarter 2 of the reporting period. Based on the results provided in **Table 9.12** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 783.98 m RL) is consistent with previous reporting periods; • pH (average 6.84) shows consistency with previous reporting periods; • EC (average 7045 µS/cm) shows a significant decrease from previous reporting period results; • SO_4 (average 2553 mg/L) continues to show a slight decrease but is generally consistent with previous periods; • NH_3 (average 0.1 mg/L) is close to, or within, non-detection rates; • Pb (0.0014mg/L) and Zn (12.1mg/L) are both similar to the previous reporting period and generally consistent with historical fluctuations. All trends indicate fairly stable concentrations with no evidence of contamination from mining or Bioreactor activities.
MW8D	MW8D is located adjacent to MW8S. Based on the results provided in **Table 9.13** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 783.88m RL) was consistent with long term average since 2004; • pH (average 7.36) slightly acidic to neutral consistent with previous reporting period; • EC (average 3488 µS/cm) represents brackish water showing a downward trend; • SO_4 (average 1502 mg/L) mirrors EC consistent with previous periods; • Pb (0.0004 mg/L) and Zn (7.28 mg/L) are both consistent with previous periods; • NH_3 (0.1 mg/L) is at non detection rates; • TOC (5 mg/L) is consistent with previous monitoring periods reflecting natural conditions. All trends indicate fairly stable concentrations with no evidence of contamination from mining or Bioreactor activities.
MW9S	MW9S is located on the northwest side of ED3N.Based on the results provided in **Table 9.14** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 786.61m RL) was consistent with previous reporting period; • pH (average 7.02) consistent with previous reporting period; • EC (average 9212 µS/cm) remains stable, consistent with previous reporting period for brackish water; • SO_4 (average 4217 mg/L) is consistent with previous periods; • Pb (0.0033 mg/L) and Zn (0.207 mg/L) were both generally consistent with historical results; • NH_3 (0.1mg/L) is at non detection rates; • TOC (4 mg/L) reflecting natural conditions is consistent with historical results. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

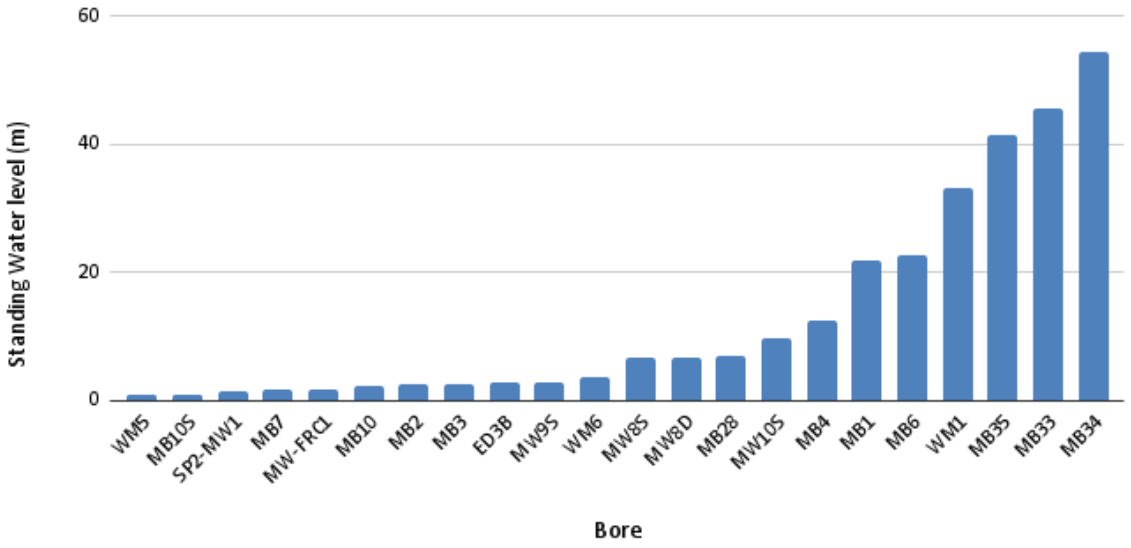
MW10S	MW10S is located on the northeast side of ED3. No sampling of MW10S could be undertaken during the reporting period as this well was continually dry. This has been a consistent observation since the well was commissioned in 2007. No data is available to produce tables or graphs for this monitoring point.
MB28	MB28 is located downstream of ED1. Based on the results provided in **Table 9.16** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 779.9m RL) was consistent throughout this reporting period; • pH (average 7.2) is neutral; • EC (average 8275 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 882.3 mg/L) is consistent; • Pb (0.0004 mg/L) and Zn (1.03mg/L) were both generally consistent in this reporting period; • NH_3 (0.1 mg/L) is at non detection rates; • TOC (7 mg/L) reflecting natural conditions is consistent throughout this reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
MB33	MB33 is a 75m deep groundwater monitoring bore to replace a waste covered well (WM4) in the Void. Based on the results provided in **Table 9.17** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 751.48m RL) was consistent throughout this reporting period; • pH (average 7.94) showing consistent alkalinity; • EC (average 1626 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 345 mg/L) is consistent with previous periods; • Pb (0.0002 mg/L) and Zn (0.04 mg/L) were both generally consistent in this reporting period; • NH_3 (0.93 mg/L) is close to, or within, non-detection rates; • TOC (6 mg/L) reflecting natural conditions is consistent throughout this reporting period. Veolia engaged Earth2Water Pty Ltd to carry out a flushing of this bore prior to the first quarterly sampling of the 2020-21 reporting period.
MB34	MB34 is a deep groundwater monitoring bore installed as part of a groundwater monitoring network review in the vicinity of the landfill void, and added to the EPL by way of variation in June 2021. Based on the results provided in **Table 9.21** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 761.12m RL) was consistent throughout this reporting period; • pH (average 8.19) showing consistent alkalinity; • EC (average 1455 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 233 mg/L) is consistent with previous periods; • Pb (0.0002 mg/L) and Zn (2.07 mg/L) was anaylsed for the first time during the reporting period, setting the benchmark for future annual testing trends; • NH_3 (0.23 mg/L) is close to, or within, non-detection rates;

	• TOC (8 mg/L) reflecting natural conditions is consistent throughout this reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
MB35	MB35 is a deep groundwater monitoring bore installed as part of a groundwater monitoring network review in the vicinity of the landfill void, and added to the EPL by way of variation in June 2021. Based on the results provided in **Table 9.22** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 770.09m RL) was consistent throughout this reporting period; • pH (average 6.99) showing consistent alkalinity; • EC (average 9800 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 10700 mg/L) is consistent with previous periods; • Pb (0.0002 mg/L) and Zn (515 mg/L) was anaylsed for the first time during the reporting period, setting the benchmark for future annual testing trends; • NH_3 (4.03 mg/L) is close to non-detection rates; trend will continue to be monitored for increases in the next sampling round. • TOC (110 mg/L) reflecting natural conditions is consistent throughout this reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
SP2-MW1	SP2-MW1 is located adjacent to Spring 2. This shallow bore was installed as part of the ED1 and ED2 seepage management scheme. Based on the results provided in **Table 9.18** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 778.05m); • pH (average 7.25) being neutral, was consistent throughout the reporting period; • EC (average 2178 µS/cm) remains stable, consistent with for fresh to brackish water; • SO_4 (average 266 mg/L) is consistent with the previous reporting period; • Pb (average 0.0002 mg/L) and Zn (average 0.19 mg/L) were both generally consistent in this reporting period; • TOC (4 mg/L) reflecting natural conditions is consistent throughout this reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
MW-FRC1	MW-FRC1 is located adjacent to the farm road culvert. This shallow bore was installed as part of the ED1 and ED2 seepage management scheme. Based on the results provided in **Table 9.19** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 779.28m); • pH (average 6.88) consistent throughout this reporting period; • EC (average 5111 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 557 mg/L) is consistent with the previous reporting period;

	• Pb (average 0.0002 mg/L) and Zn (average 0.756mg/L) were both generally consistent and reflected low to non-detectable; • TOC (4 mg/L) reflecting natural conditions is consistent throughout this reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.
MB10S	MB10S is located adjacent to MB10 at the toe end of ED1. This shallow bore was installed as part of the ED1 and ED2 seepage management scheme. Based on the results provided in **Table 9.20** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 781.65m); • pH (average 6.84) consistent throughout this reporting period; • EC (average 1529 µS/cm) remains stable for fresh to brackish water; • SO_4 (average 606 mg/L) is consistent with the previous reporting period; • Pb (average 0.0002 mg/L) and Zn (average 3.04 mg/L) were both generally consistent and reflected low to non-detectable; • TOC (7 mg/L) reflecting natural conditions is consistent throughout this reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

Detailed monitoring data is provided in Tables **9.1** – **9.22** (refer **Appendix 4**). There was a consistent notable increase in standing water levels (SWL) averages during the reporting period due to the recent and prolonged rain period.

Figure 3.1.5 **Bioreactor Groundwater Bore Standing Water Levels**



3.1.6 Bioreactor Piezometers Level Monitoring Results

Measurements for groundwater standing water levels (SWL) in the vicinity of the Bioreactor were undertaken at 6 out of 6 piezometers around the landfill void in accordance with the EPL and have been documented in the Annual Return.

The primary purpose is to monitor the groundwater hydraulics in the Void. Each location consists of a shallow (reference A) and deep (reference B) piezometer.

The findings of the monitoring are summarised in **Table 3.1.6** below and detailed quarterly levels are provided in **Tables 10.1 – 10.5** (refer **Appendix 4**).

Table 3.1.6 **Bioreactor Piezometers Level Monitoring Results**

Parameter	Results/Discussion
P38A & P38B	P38 is located east of the void. Standing water levels are presented in **Table 10.1** (refer **Appendix 4**). • SWL in P38A (shallow aquifer) indicated a stable standing water level ranging from 775.62m RL to 776.85m RL during this reporting period. • SWL in P38B (deep) ranged from 771.40m RL to 772.38m RL in this reporting period, consistent with previous reporting periods.
P200A & P200B	P200 is located east of the void. Standing water levels are presented in **Table 10.2** (refer **Appendix 4**). • SWL in P200A (shallow) showed a range of 755.83m RL to 768.84m RL and is stable. • SWL in P200B (deep) showed a range of 760.72m RL to 769.3 m RL and is stable.
P58A & P58B	P58 is located west of the void. Standing water levels are presented in **Table 10.3** (refer **Appendix 4**). • SWL in P58A (shallow) showed a range of 764.15m RL to 764.19m RL and is stable. • SWL in P58B (deep) is similar to the previous reporting period, fluctuating between 744.15m RL and 748.64m RL.
P59A & P59B	P59 is located west of the void and to the south of P58. Standing water levels are presented in **Table 10.4** (refer **Appendix 4**). • SWL in P59A (shallow) ranged from 786.14m RL to 788.59m RL in this reporting period, consistent with previous reporting period. • SWL in P59B (deep) ranged between 773.8 m RL and 788.32m RL, consistent with previous reporting period.
P100A & P100B	P100 is located northeast of the void. Standing water levels are presented in **Table 10.5** (refer **Appendix 4**).

	• SWL in P100A (shallow) is consistent with the previous reporting period measuring 735.30m RL in quarter one. It was found to be Dry for the remainder of the monitoring period (Quarters 2 to 4). • P100B (deep) averaged between 701.66m RL and 722.69m RL which indicates water above the base level of 698.29 m RL which has been recorded in previous periods. As historical monitoring results indicated potential silting had occurred, P100B was developed by flushing by Earth2Water Pty Ltd during the reporting period.

3.1.7 Bioreactor Evaporation Dam Volume Monitoring Results

The Evaporation Dam 3 (ED3) system comprises extracted (and treated) leachate from the landfill void and captured stormwater. The water volume has to be maintained in all Evaporation Dam 3 (Lagoon systems) below the freeboard level at all times. Water levels are taken monthly as detailed in **Table 3.1.7**, which shows the dam levels and required freeboard requirements. At no point did the water level in each dam exceed the free board limit.

Table 3.1.7 **Bioreactor Evaporation Dam Volume Monitoring Results (RLs AHD)**

	ED3 SOUTH		ED3 NORTH				ED1
	ED3S	ED3S-S	ED3N-1	ED3N-2	ED3N-3	ED3N-4	Coffer Dam
Date	RL	RL	RL	RL	RL	RL	RL
29/09/2020	790.85	792.25	Empty	790.52	790.39	790.47	788.09
27/10/2020	790.89	792.16	Empty	790.75	790.57	790.36	788.18
27/11/2020	790.31	792.16	Empty	790.81	790.61	790.37	788.38
18/12/2020	790.27	792.11	Empty	790.88	790.45	790.24	788.35
28/01/2021	790.24	792.19	Empty	790.52	790.69	790.05	788.37
01/03/2021	790.35	792.42	Empty	789.62	790.86	790.14	788.45
31/03/2021	791.03	792.67	Empty	789.86	790.94	790.42	788.74
29/04/2021	790.94	792.82	Empty	789.44	790.94	790.51	788.75
31/05/2021	791.03	793.12	Empty	789.76	789.98	790.69	788.95
28/06/2021	791.19	793.18	Empty	789.80	790.09	790.85	789.11
29/07/2021	791.21	793.21	Empty	789.46	790.31	790.96	789.29
30/08/2021	791.24	793.19	Empty	789.82	790.46	790.96	789.47
Minimum	*790.24*	*792.11*	*0.00*	*789.44*	*789.98*	*790.05*	*788.09*
Mean	*790.80*	*792.62*	*0.00*	*790.10*	*790.52*	*790.50*	*788.68*
Maximum	*791.24*	*793.21*	*0.00*	*790.88*	*790.94*	*790.96*	*789.47*
Max Freeboard levels	**791.5**	**793.6**	**791.2**	**791.2**	**791.2**	**791.2**	**789.92**

Veolia has the capacity to move water if required in the event that water levels rise. Also outlined in the Project approval MP 10_0012 as modified, water can be moved from ED3S to ED2. Additional monitoring is conducted for other dams managed by Veolia.

3.1.8 Bioreactor Extraction of Water

Table 3.1.8 below provides the volume of the water extracted from the Willeroo Borefield of which an annual allocation of 600ML is available. Water Access Licence (Veolia Environmental Services (Australia) Pty Ltd) 28983 Lachlan Fold Belt Mdb Groundwater Source.

Table 3.1.8 **Willeroo Bore Field Extraction Volume**

Month	Usage Volume (kL)
September 2020	5060
October 2020	3345
November 2020	3529
December 2020	1192
January 2021	2641
February 2021	2680
March 2021	3808
April 2021	1363
May 2021	1452
June 2021	2255
July 2021	1917
August 2021	5764
TOTAL	**35,006 kL**

Heron Resources sources raw water from the Willeroo borefield as a primary source of water whilst in operations, utilising the allowance of a WAL owned by Veolia. Approximately 12ML of raw water was consumed by Heron Resources between the period of 1 July 2020 and 30 June 2021, a significant reduction since ceasing operations in March 2020.

3.1.9 Bioreactor Noise Monitoring

Operational activities at the Woodlawn Bioreactor are restricted to within the approved operating hours described in **Table 3.1.9** as per Conditions of Bioreactor PA.

Table 3.1.9 **Bioreactor & IMF Approved Hours of Operation**

Activity	Day	Hours
Operations	Monday - Saturday	6:00am - 10:00pm
	Sunday & Public Holiday	Nil

No noise complaints were received during this reporting period indicating that noise at the Bioreactor was likely maintained within the 35 dB(A) LAeq (15 minute) criteria at the nearest residential receiver. Noise monitoring will be undertaken by Veolia on the receipt of any such complaints.

3.1.10 Bioreactor Waste Volume Monitoring

The Bioreactor PA stipulates that the expanded operations must not exceed the maximum annual input rates in **Table 3.1.10.1**.

Table 3.1.10.1 **Maximum annual input rates for Woodlawn Bioreactor**

Putrescible waste received by rail from Sydney	Received as residual waste from Woodlawn AWT	Putrescible regional waste received by road
900,000 tpa	100,000 tpa	90,000 tpa +200,000m^3 Bushfire Waste

In March 2020, Condition 7A, Schedule 3 of SSD 10_0012 permitted the acceptance of up to 200,000m^3 of bushfire impacted waste material from regional areas of NSW between March 2020 and 30 September 2020, which was subsequently extended until 31 March 2021.

The regional waste received from bushfire impacted areas is excluded from the maximum annual input rates specified in Condition 7A, Schedule 3 of the PA, however is included in the regional inputs section of **Table 3.1.10.2**.

All waste received is recorded in the Systems, Applications and Products in Data Processing (SAP) software including details such as vehicle registration, the date and time of delivery, the gross and tare weight of the vehicle, as well as the nature and origin of the waste delivered by each contractor.

The data provided by SAP is used to track and monitor the amount of incoming waste in accordance with the limits of the Bioreactor PA. **Table 3.1.10.2** indicates that the Woodlawn Bioreactor has remained within the annual waste limit stipulated within the Bioreactor PA of 1.13Mtpa.

Table 3.1.10.2 **Incoming waste tonnage via rail and road at the Woodlawn Bioreactor via Crisps Creek (IMF) during 2020/2021 reporting period**

Waste received at the Woodlawn Bioreactor Via Crisps Creek IMF (tonnes)	Waste received at the Woodlawn Bioreactor as Residual from MBT (tonnes) (*Including MWOO)	Regional waste received at the Woodlawn Bioreactor by road (tonnes) (*Including Bushfire impacted waste)
567,306 tpa	95,291 tpa	139,837 tpa

Residual Waste to the Bioreactor was impacted due to the NSW EPA imposed revocation of Mixed Waste Organic Outputs Order (MWOO) and exemption, preventing the application of MBT's MWOO to the degraded Woodlawn Mine site. Thus a total of 23,795.896 tonnes of MWOO was landfilled during the reporting period, which would have otherwise been recovered. The NSW EPA approved the use of MWOO as an ADC by way of licence variation in June 2021.

Veolia received 1,957.920 tonnes of bushfire impacted waste material from regional areas of NSW during the reporting period. No Regional waste was received and processed at the MBT, as the NSW EPA MWOO revocation limited the opportunity to focus on mixed waste processing from non Sydney waste sources.

During the reporting period an impending exceedance of regional tonnage was identified. Veolia has carried out an investigation for the limit exceedances and is in the process of implementing the following corrective actions:

- Consult with the DPIE to clarify whether the maximum annual input rates in the Consent for regional waste received by road includes all regional waste received by road, or only putrescible regional waste received by road.
- Consult with the DPIE and the Goulburn Mulwaree Council (Council) to formally approve the maximum annual landfill input rates for putrescible regional waste received by road for the Project to 125,000 tonnes. For this purpose, Veolia requested the Australian Road Research Board (ARRB) to review and update the traffic assessment report completed by them on the basis of feedback provided from Council in October 2021.
- Updating processes for business reporting to include monitoring of waste received in ongoing reporting periods against the three separate streams outlined in Schedule 3, Condition 5 of the Consent (Refer **Table 3.1.10.1** above**)**.
- Conduct refresher training to site and administrative support personnel on waste data classification, tracking and reporting.
- Updating Veolia's template for the Woodlawn AEMR, which is required by the Consent, to report waste limits for the different waste streams outlined in Schedule 3, condition 5 of the Consent.

The forecasted tonnage (tpa) for the following reporting period is outlined in **Table 3.1.10.3**.

Table 3.1.10.3 **Forecast waste tonnages for the 2021/2022 reporting period**

Forecast waste received at the Woodlawn Bioreactor Via Crisps Creek IMF (tonnes)	Forecast waste received residual as waste from MBT (tonnes) at the Bioreactor	Forecast regional waste received by road (tonnes) at the Bioreactor
700,000 tpa	100,000 tpa	90,000 tpa

Part 4 Crisps Creek Intermodal Facility

4.1 Crisps Creek IMF Monitoring Results

4.1.1 IMF Surface Water Monitoring Results

Upstream and downstream monitoring is undertaken at nearby surface water bodies to identify any degradation of water quality caused by landfilling operations.

Surface water quality monitoring at 3 monitoring locations was undertaken as required by the EPL, the findings of which are summarised in **Table 4.1.1**. Detailed quality results are provided in **Tables 12.1** to **12.3** (refer **Appendix 4**). The key quality indicators selected to identify any contamination in the receiving surface waters from site operations include:

- pH,
- Electrical Conductivity (EC),
- Sulphate (SO_4),
- Zinc (Zn),
- Ammonia ($NH_{3)}$, and
- Total Organic Carbon (TOC).

These are depicted in trend graphs **(Figures 2.4.1.1 to 2.4.1.3)** provided in **Appendix 5**.

Table 4.1.1 **IMF Surface Water Monitoring Results**

Parameter	Results/Discussion
Site 110 Upstream	Site 110 is located upstream of the IMF in Crisps Creek. It is approximately 8 km downstream of the Bioreactor. Four out of four quarterly monitoring requirements were fulfilled this reporting period. Results provided in **Table 12.1** (refer **Appendix 4**) indicate the following trends: • pH is close to neutral (average 7.72, consistent with previous reporting periods; • EC (average 954 µS/cm) is consistent with the historical data and representative of fresh water salinity; • SO_4 (average 70.18mg/L) is consistent with previous reporting periods; • Fe (average 0.32 mg/L) is consistent with previous reporting periods, whilst Zinc indicates a fluctuating trend (average 0.13mg/L), consistent with historical cyclic results; • NH_3 (average 0.1 mg/L) is consistent with previous reporting periods and continues to be at non-detection levels.

	• TOC (average 15 mg/L) shows a slight increase than the previous reporting period and is generally reflective of natural organic matter in streams. While the indicator trends for this location indicate some variability over time, this is not uncommon when sampling intermittent streams. Veolia will continue to endeavour to obtain samples when flow occurs during a rainfall event for low flow surface water points.
Site 150 – Mulwaree River	Site 150 is located 2 km downstream of the IMF on the Mulwaree River, which is also downstream of a railway bridge and Braidwood Road. Four out of four quarterly monitoring requirements were fulfilled this reporting period. Results provided in **Table 12.2** (refer **Appendix 4**) indicate the following trends: • pH (average 7.61) is consistent with the previous reporting period; • EC (average 675 µS/cm) shows a fluctuating trend and is generally consistent with previous periods and fresh water salinity; • SO_4 (average 35 mg/L) reflecting EC trend, is generally consistent with previous reporting periods; • Fe and Zn, average 0.52 mg/L and 0..31mg/L respectively indicate consistency with fluctuating cycles in previous reporting periods. • NH_3 (0.1mg/L) continued to be not detected during this reporting period. • TOC (average 15 mg/L), is generally consistent with previous reporting periods; These results are consistent with the trends for Site 110. Veolia will continue to endeavour to obtain samples when flow occurs during a rainfall event for low flow surface water points.
First Flush Stormwater Outlet	The IMF First Flush is located at the surface water outlet point of the site, prior to runoff into Crisps Creek. Results provided in **Table 12.3** (refer **Appendix 4**) indicate the following trends: • pH (average 7.22) is close to neutral, consistent with the previous reporting period; • EC (average 160 µS/cm) shows a slight downward trend but is generally consistent with the previous period and representative of fresh water salinity; • SO_4 (average 8 mg/L) is also slightly lower but generally consistent with previous reporting period; • Fe and Zn, average 0.84 mg/L and 0.103 mg/L are generally consistent with the previous period but reflective of fluctuating cycles. • NH_3 an average of (0.1 mg/L) is also is consistent with previous reporting period; • TOC (average 7 mg/L) which is consistent with previous reporting periods. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

4.1.2 IMF Dust Monitoring Results

The handling of waste and associated operational activities at the IMF are undertaken in a manner to ensure minimal emissions of dust. This includes no opening of containerised waste on unloading, and operating on a hardstand which aids in the mitigation of dust emissions due to the sealed surface.

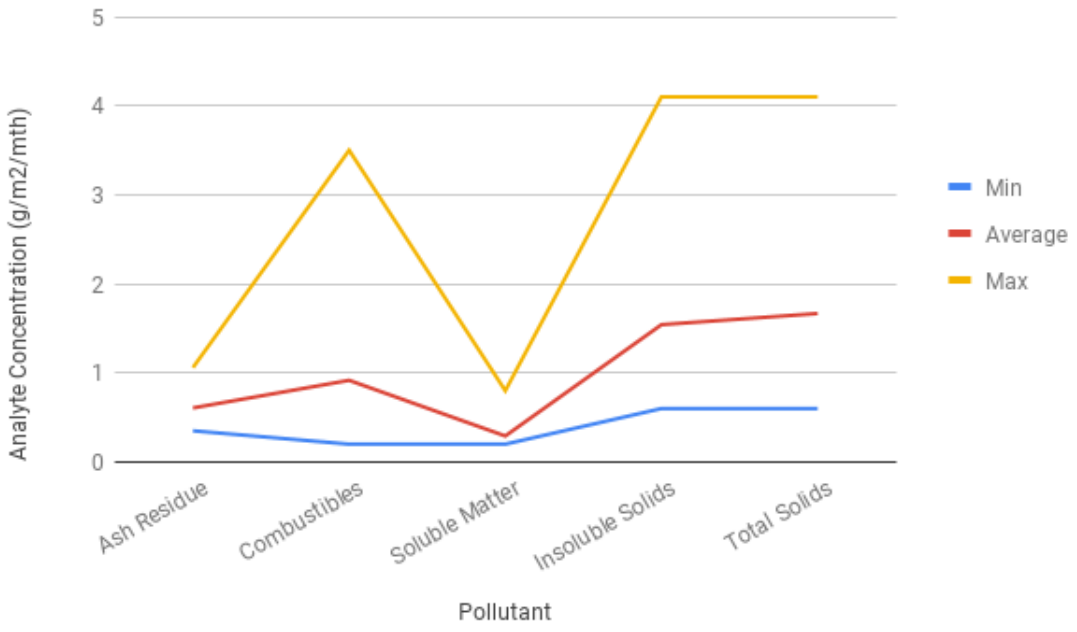
Dust monitoring is undertaken monthly at 1 location at the IMF in accordance with the EPL. A summary of this reporting period is provided in **Table 4.1.2** and detailed in **Table 13.1** (refer **Appendix 4**).

Table 4.1.2 **Dust Monitoring Results**

Dust Gauge	Summary Total Insoluble Solids (g/m²/month)		
	Minimum	Average	Maximum
DG18	0.6	1.54	4.1

The results at DG18 indicate an average level of total insoluble solid matter is 1.5 g/m²/month, which is lower compared to overall historical trends as seen in the subsequent graph in **Figure 4.1.2.**

Figure 4.1.2 **Crisps Creek IMF Depositional Dust Levels**



4.1.3 IMF Waste Volume Monitoring

Schedule 3, Condition 8 stipulates that the facility must not exceed the annual throughout rate outlined to **Table 4.1.3** below.

Table 4.1.3 **Maximum annual input rates for Crisps Creek IMF**

Received by Rail from Sydney	Received by rail from Sydney for processing at the Woodlawn MBT
900,000 tpa	280,000 tpa

Veolia uses data provided by PWS to track and monitor the amount of incoming waste transported by rail from Sydney to Crisps Creek Intermodal Facility for processing at the Woodlawn Bioreactor and MBT Facilities. The Crisps Creek IMF has remained within the annual waste limit stipulated within the Bioreactor PA during the 2020-21 reporting year.

Table 4.1.3A indicates that inputs received by rail from Sydney have remained within the annual waste limit stipulated within the Bioreactor PA.

Table 4.1.3A **Incoming waste tonnage received by rail at the Crisps Creek (IMF) during 2020/2021 reporting period**

Received by Rail from Sydney for processing at the Woodlawn Bioreactor	Received by rail from Sydney for processing at the Woodlawn MBT
567,306 tpa	140,146 tpa

Part 5 Woodlawn MBT Facility

5.1 MBT Monitoring Results

5.1.1 MBT Surface Water Monitoring Results

Quarterly surface water monitoring is carried out to monitor any potential surface water impacts of the project on the surrounding area. Baseline data for surface water has been obtained from historical water quality monitoring undertaken for monitoring location Site 115 - Allianoyonyiga Creek.

For results of the surface water monitoring point Site 115, refer to **Section 3.1.3** and **Table 6.1** (refer **Appendix 4**).

5.1.1.1 Discharge Monitoring Results

Surface water discharge monitoring is conducted at the MBT facility to determine whether surface water flowing off site could be contaminated as a result of operational activities. The results of discharge monitoring are assessed against discharge limits stipulated within the MBT PA and EPL 20476, which are described in **Table 5.1.1**.

***Table 5.1.1* Discharge Parameters and Performance Measures**

Parameter	Performance Measure	Standards	Statutory Requirements
pH	6.5-8.5	Approved Methods for the Sampling and Analysis of Water Pollutants in NSW	EPL Condition L2.4
Total Suspended Solids (TSS)	50 mg/L		

Condition 19 of the MBT PA states the stormwater retention pond must capture and store all stormwater runoff generated at the premises during a 24-hour duration 1-in-100-year Average Recurrence Interval (ARI) rainfall event. Following the commencement of operations the facility must ensure it maintains a closed water management system, which ensures no discharge to the downstream environment.

The discharge point was sampled on seven occasions in accordance with the EPL during the reporting period. **Table 5.1.1A** below.

***Table 5.1.1A* MBT Discharge Point Monitoring Results**

Parameter	Results/Discussion
Site 140	Site 140 is located near the north western boundary of the facility collecting surface water runoff from the western and northern side of the MBT maturation pad . The

	pollutant concentration trends are generally consistent with previous sampling opportunities. • pH (7.76) is slightly lower than the overall average (7.62), indicating slightly acidic water; • TSS (52 mg/L) is fairly consistent with previous results, a concentration reflecting slightly turbid water. Veolia will continue monitoring this location in the next reporting period for any runoff impacts.

5.1.2 MBT Groundwater Water Monitoring Results

Four quarterly groundwater quality monitoring at WMBT Point 11 was undertaken in this reporting period as required by the EPL. Results are summarised in **Table 5.1.2** below and depicted in **Figure 5.1.2.1** (refer **Appendix 5**).

The key quality indicators selected are the same as listed in **Section 3.1.5** to detect any pollutants in groundwater samples are the same as those deemed characteristic for leachate.

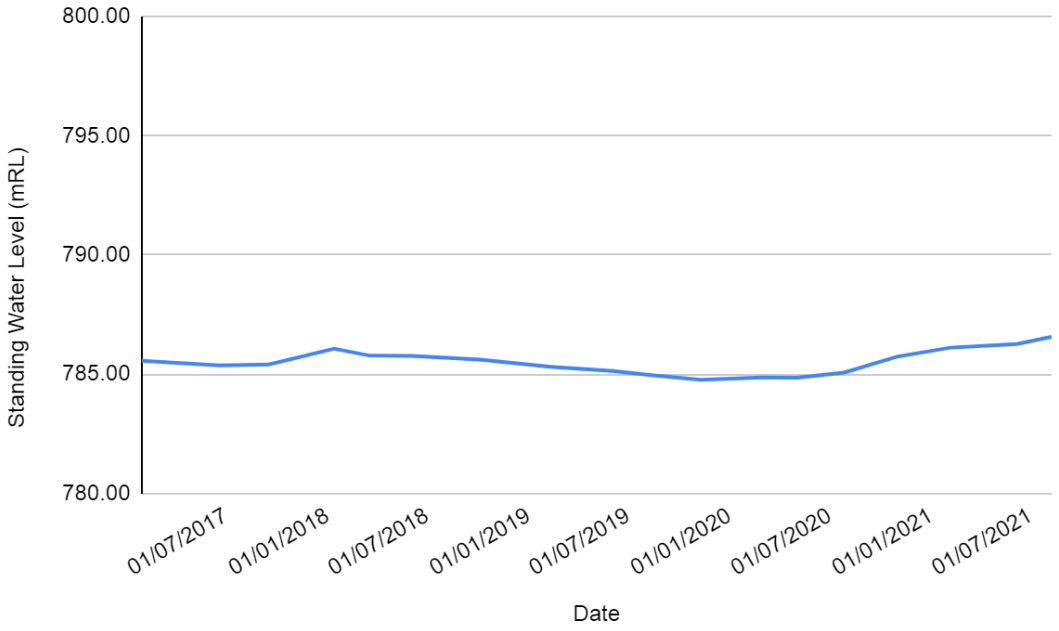
In addition to water quality monitoring, standing water levels (SWL) of the wells are also measured in metres relative to sea level (m RL) and are depicted in the subsequent graph **Figure 5.1.2.**

***Table 5.1.2* MBT Groundwater Monitoring Results**

Parameter	Results/Discussion
WMBT Point 11	WMBT Point 11 is located down gradient of the MBT leachate aeration dam. Based on the results provided in **Table 15.1** (refer to **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 787.07m RL) shows an increase from the previous reporting period of 784.88 m RL most likely due to extensive rainfall during the reporting period; • pH (average 7.39) and is slightly alkaline, showing a slight decrease from the previous reporting period; • EC (average 13600 µS/cm) is lower than previous reporting period readings (average 14300 µS/cm); • SO_4 (average 563 mg/L) is consistent throughout this reporting period and average of the previous period (546 mg/L); • Pb and Zn (average 0.0001 mg/L and 0.084 mg/L respectively) are generally consistent with the previous period; • NH_3 (average <0.1 mg/L) is lower than the previous reporting period; • TOC (11 mg/L) is consistent with previous reporting periods (10.3 mg/L) with a slight increase in concentration.

	All trends at this location indicate consistent concentration and there is no indication of contamination from leachate or MBT activities. No significant variations or anomalies were recorded for any analyte tested during this monitoring period.

Figure 5.1.2 **MBT Groundwater Levels - WMBT Point 11**



5.1.3 MBT Leachate Monitoring Results

Leachate quality monitoring is undertaken half-yearly at the MBT leachate aeration dam as detailed in the OEMP. The findings from this reporting period are summarised in **Table 5.1.3** below with the detailed data provided in **Table 15** (refer to **Appendix 4**). The trends are also depicted in **Figure 5.1.3.1** (refer **Appendix 5**).

In addition to chemical testing, the level of the water in the leachate aeration dam is also monitored on a weekly basis and after every rainfall event to ensure the freeboard is not exceeded as per Condition O5.3 of the EPL.

Table 5.1.3 **MBT Leachate Monitoring Results**

Parameter	Results/Discussion
MBT Leachate Aeration Dam	The leachate aeration dam is located at the northern side of the MBT facility where leachate collected from the facility is treated by aeration to oxidise organic compounds in leachate. Based on the results provided in **Table 16.1** (refer to **Appendix 4**), the characteristics of the leachate are:

	• pH average (7.54) is showing an decrease in alkaline state from the previous reporting period result. • EC average (21,050 µS/cm) slightly lower than the previous reporting period (22,700 µS/cm). • SO_4 average (396 mg/L) is significantly lower than the previous reading (711 mg/L). • Pb average decreased from 0.338 mg/L to 0.286 mg/L, Zn also decreased from 10.91 mg/L to 9.9 mg/L from the previous reporting period. • NH_3 average (754 mg/L) is lower compared to previous reporting reading (987 mg/L). • TOC average (8555mg/L) is lower compared to previous reporting reading (10305 mg/L). The leachate concentration levels in the aeration dam show no significant changes compared to the previous reporting period. Affected by weather conditions during this reporting period, a decrease in overall concentrations was observed during the reporting period due to the significant rainfall experienced at the start of the period. A new aeration system was installed during the reporting period, which has decreased biological parameters such as Total Organic Carbon significantly.

5.1.4 MBT Air Quality Monitoring Results

5.1.4.1 MBT Dust Monitoring

Dust monitoring is undertaken monthly at the MBT facility in accordance with the MBT PA and EPL. A summary of this reporting period is provided in **Table 5.1.4.1** below and detailed in **Table 5** and **Table 15** (refer to **Appendix 4**).

***Table 5.1.4.1* MBT Air Quality Monitoring Results**

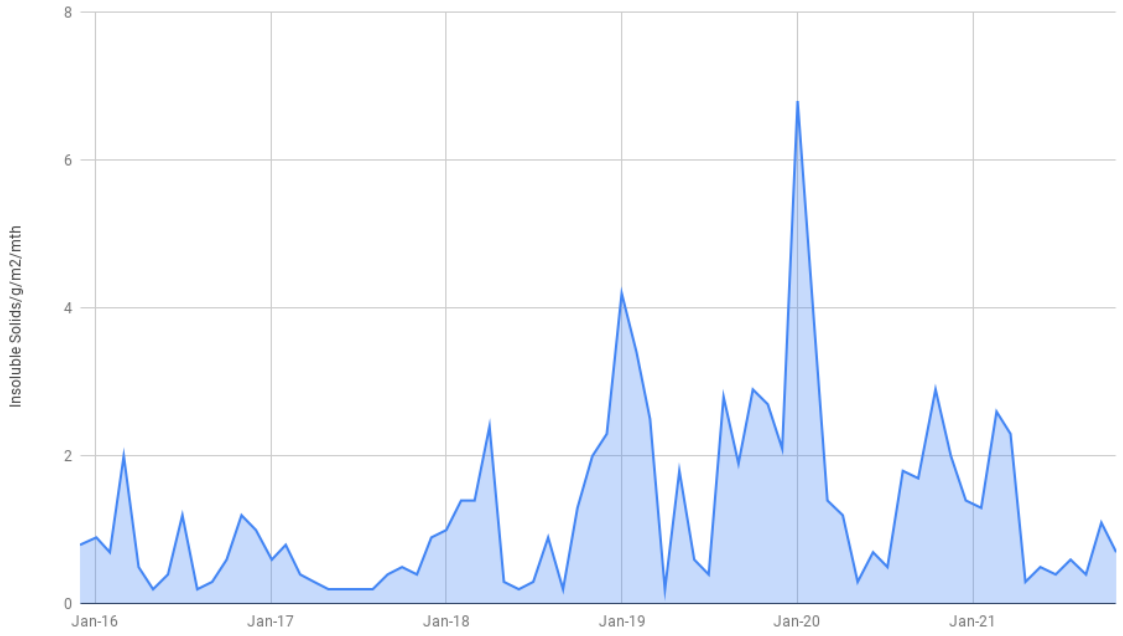
Parameter	Results/Discussion
Particulates/ Dust Monitoring	Monitoring of 3 depositional dust gauges (DG) was completed on a monthly basis as required under the MBT PA and EPL, the results of which are generally consistent with previously reporting periods. MBT shares 2 depositional dust gauges with the Bioreactor, which include Pylara (DG28) and West Void (DG 34), which are summarised in **Section 3.1.2**. In addition, there is a dust gauge (DG 33) close to the MBT facility. A summary of this reporting period at the dust gauge is provided in **Table 5.1.4.1** and detailed in **Table 5** and **Table 17.1**(refer to **Appendix 4**).

Table 5.1.4.1: Dust Monitoring Results

Dust Gauge	Summary Total Insoluble Solids (g/m²/month)		
	Minimum	Maximum	Average
DG 33 (Point 7)	0.3	2.9	1.3

	The average level of total insoluble solid matter is generally consistent with long term historical trends. The maximum dust level recorded during the reporting period was 2.9 g/m^2/month in October 2020, with a significant decrease from the maximum concentration of 6.8 g/m^2/month reported in the previous reporting period resulting from the bushfire and dust storm events occurring between November 2019 and January 2020.

Figure 5.1.4 **MBT Depositional Dust Levels – DG33**



5.1.4.2 MBT Odour Monitoring

The air quality impact assessment (AIA) prepared by SLR, predicted that MBT Facility operations would comply with relevant air quality goals and are not expected to generate offensive or nuisance odours at nearby sensitive receivers.

The adopted odour criterion of 6 OU was predicted to be achieved at all receptors with the exception of the TriAusMin (now Heron) administration building, which was predicted to experience a 99th percentile odour concentration of 8.5 OU.

Table 5.1.4.2 **Odour Emission Performance Criteria**

Parameter	Measure	Standards	Statutory Requirement
Odour Emissions	6 OU	German Standard VDI 3940 'Determination of Odorants in Ambient Air by Field Inspections'	OEMP

This concentration was predicted to be dominated by the existing source of the Bioreactor, rather than the operation of the Facility, which was predicted to result in a 99th percentile concentration of 1.7 OU when modelled alone.

The management of odour emissions from each of the proposed processing stages is maintained by the use of biofilter pollution control mechanisms which use living material to biologically degrade and filter pollutants which may cause odours. These pollutants are absorbed into the biofilter material whereby it is broken down by microorganisms. No odour complaints were received in this reporting period.

5.1.5 MBT Noise Monitoring Results

The performance of the facility in managing potential noise emissions was assessed on the receipt of any noise complaints. No noise complaints were received in this reporting period.

Operational activities at the MBT are restricted within the approved operating hours described in **Table 5.1.5** as per Schedule 3, Condition 27 of the MBT PA, as well as all processing confined to enclosed areas.

***Table 5.1.5* Agreed Hours of Construction & Operation**

Activity	Day	Hours
Operation Hours	Monday - Saturday	6:00am – 10:00pm
Emergency Hours	Monday - Sunday	Anytime

Note: Operation of BRS Drums and associated infrastructure is permitted over 24 hours.

Noise limits are stipulated in the MBT PA to ensure the site does not generate nuisance noise emissions as a result of operational activities.

5.1.5.1 Operational Noise

Ambient noise measurements were conducted at the two locations as identified as the nearest residences on privately owned land, as specified in Condition 25 of the MBT PA.

The results of the operator-attended measurements confirm the noise impact assessment criteria (Refer to **Table 5.1.5.1**) is complied with at the nearest residences on privately-owned land, with LAeq (15minute) noise levels recorded below 35 dBA at both locations. The operator-attended measurements also recorded levels higher than LAeq (15minute) 35 dBA, and in these instances the ambient noise environment was due to natural sounds such as birds, insects and frogs.

***Table 5.1.5.1* Noise Impact Assessment Criteria dB(A)**

Parameter	Performance Measure	Standards	Statutory Requirement

Residences on privately owned land (during construction)	Laeq (15min) = 40dB	NSW Industrial Noise Policy (EPA)	Schedule 3, Condition 25
Residences on privately owned land (during operations)	Laeq (15min) = 35 dB		
Traffic Noise on privately owned land	Laeq (1 hour) = 60dB	Environmental Criteria for Road Traffic Noise (DECC)	Schedule 3, Condition 26

5.1.5.2 Traffic Noise

Traffic noise levels were calculated at the nearest residence to the road between the Crisps Creek Intermodal Terminal and Woodlawn MBT, for comparison with the Traffic Noise Impact Assessment Criteria specified in the approval. The results of the operator-attended measurements and calculation confirm the Project Approval (06_0239) noise criteria is complied with at the nearest residence on privately-owned land.

5.1.6 MBT Waste Volume Monitoring

5.1.6.1 Waste Acceptance and Screening

Waste is screened at the Clyde Transfer Terminal and Banksmeadow Transfer Terminal sites before the loading of waste into containers for the transportation to the MBT Facility. If any waste is detected that is not acceptable through the screening process, it is rejected and cannot be loaded into the containers.

Once received at the facility, the operator of the grapple crane inspects the waste as it is discharged from the vehicle to check for non-conforming waste. In the event that any easily extractable, bulk recyclable waste is detected, it is separated from the general waste stream and set aside for removal from the facility to another facility licensed to receive this type of waste for processing or recycling. This includes waste types identified as less desirable to processing operations. No records of non-conforming waste were recorded during this reporting period.

5.1.6.2 Waste Volume Monitoring

Schedule 3, Condition 2 of the MBT PA stipulates that the facility must not receive or process more than 240,000 TPA of mixed waste and 40,000 TPA of garden waste. Under the facility operations (Stage 1), the site currently accepts and treat 184,000 TPA, which includes 144,000 TPA of mixed waste and 40,000 TPA of garden waste in accordance with the EPA licence. The WRVCP details the Waste Monitoring Program used to monitor and record incoming waste at the facility.

The MBT PA stipulates that the waste received on site from the Crisps Creek IMF must not exceed the maximum annual input rates in **Table 5.1.6.2**.

***Table 5.1.6.2* Maximum annual input rates for Woodlawn MBT Facility**

Mixed Waste received by rail from Sydney	Garden Waste received by rail from Sydney
240,000 tpa	40,000 tpa

Veolia utilises the data provided by the onsite Paperless Weighbridge System (PWS) to track and monitor the amount of incoming waste transported by rail to Crisps Creek Intermodal Facility and transferred to the MBT Facility. **Table 5.1.6.2A** indicates that the MBT Facility has remained within the annual waste limit stipulated within the MBT PA. Veolia shall continue to monitor incoming waste tonnages at the facility for the following operational year.

Total tonnage received at the MBT during the reporting period is outlined in **Table 5.1.6.2A and Table 5.1.6.2B** below.

***Table 5.1.6.2A* Total incoming waste tonnages during the 2020/2021 reporting period at MBT**

Mixed Waste received by rail from Sydney	Garden Waste received by rail from Sydney
140,146 tpa	0 tpa

***Table 5.1.6.2B* Mixed waste tonnages during the 2020/2021 reporting period at MBT**

Source	Waste Type	Total TPA
Banksmeadow Transfer Terminal	Mixed Waste	86,189.060
Clyde Transfer Terminal	Mixed Waste	53,957.805
TOTAL		**140,146.865**

Due to the NSW EPA imposed revocation of Mixed Waste Organic Outputs Order (MWOO) and exemption, preventing the application of MBT's MWOO to the degraded Woodlawn Mine site, all MWOO produced from the MBT was landfilled in the Bioreactor. A total of 33,743.170 tonnes of MWOO was landfilled during the reporting period as reflected in **Table 3.1.10.2** of **Section 3.1.10**.

The forecasted tonnage (tpa) for the following reporting period is outlined in **Table 3.1.6.2C** below.

***Table 5.1.6.2C* MBT Forecast mixed waste tonnages for the 2021/2022 reporting period**

Source	Waste Type	Total TPA
Banksmeadow Transfer Terminal	Mixed Waste	85,947.57
Clyde Transfer Terminal	Mixed Waste	57,052.43
TOTAL		**143,000.00**

Part 6 Environmental Performance

6.1 Independent Audit Findings

In consultation with both the EPA and DPIE the Independent Audits below were conducted during the reporting period. All identified non-conformances and proposed corrective actions were reported to the DPIE during the reporting period.

6.1.1 Leachate and Water Management System (LWMS) Audit

In accordance with Condition 18R, Schedule 2 of Project Approval MP 10_0012, as modified, Veolia is required to carry out an Independent Audit of the Leachate and Water Management System for the Woodlawn Bioreactor. This LWMS Audit covered the period from the day after the last audit ended (12 March 2020), until 11 March 2021 (last day of SLR Consulting Australia's onsite Auditing).

A number of mandatory and non-mandatory recommendations were developed as a result and discussed in **Table 6.1.1** and **6.1.2** below.

***Table 6.1.1* 2021 Independent LWMS Audit Mandatory Recommendations**

Condition	Observation/Recommendation	Implemented/Proposed Action	Status
b) i)	Actual inflows were higher in many of the dams (including ED3N2, ED3N3, ED3N4, ED3SS and ED1) due to the additional transfer of water / leachate around the site as a result of significant rainfall during the audit period.	Taking into consideration the high rainfall and low evaporation, Veolia is developing a contingency plan in consultation with the EPA, Water NSW and the Department.	Complete
b) iv)	The assessment of water / leachate stored in the dams indicates that Veolia could have potential issues emptying the dams in accordance with their objectives. Clarification of whether the dams will be emptied in accordance with the objectives will be provided upon finalisation of the updated site water balance (in progress at the time of the audit).	Veolia is developing a contingency plan in consultation with the EPA, Water NSW and the Department. Veolia is continuing to work on improving the evaporation system for all the dams for volume reduction.	Ongoing
c) i)	Information contained within the monthly LTP reports indicate that the majority of the effluent water quality parameter targets (detailed in the site	The ED1 coffer dam, where the LTP discharges treated effluent, is assessed as part of the annual odour audit. The 2020 IOA reported the effluent from	Ongoing

	Leachate Management Plan) have been achieved. Ammonia and BOD are the key odour parameters and these are generally undetectable. However, there have been regular exceedances of COD with some isolated exceedances of Total Phosphorus, Nitrates and pH. This primarily occurred due to the ongoing optimisation of the LTP system including the fluctuation in feed leachate quality.	the LTP to be of a quality that contributes negligible levels of odour. The only exceedance in measured analytes since February 2021 has been TSS (suspected to be a lab error). Veolia intends to engage a third party to assess the odour potential of the effluent with higher (than the current target) COD concentration, re-assess and set more realistic effluent quality targets in consultation with the EPA, Water NSW and the Planning Secretary should the Void leachate become concentrated for an extended period causing higher than target COD.	
c) ii)	The LTP started discharging treated effluent into the ED1 CofferDam on 26th April 2019. Information contained within the monthly LTP reports indicates that during the annual audit period the average throughput has been 3.3 L/s. This throughput rate is less than the 4 L/s predicted in the Water Balance.	Veolia is investing in an additional ultrafiltration train to increase the throughput of the LTP and continues to utilise suitably qualified experts to improve and optimise its operation. Veolia has provided a schedule to the NSW EPA regarding the process improvements and timeframes. This is now formalised within the Sites Environmental Protection Licence.	Ongoing

Table 6.1.2 **2021 Independent LWMS Audit Improvement Opportunities**

Condition	Observation/Recommendation	Implemented/Proposed Action	Status
b) ii)	The actual mechanical evaporation from each dam is not easily measurable. Veolia currently undertakes monthly monitoring of dams, which can be used to provide an approximate indication of dam evaporation. The operation of the floating evaporators and dam inflow spray locations are selected based on real time weather data including the wind direction, wind speed, temperature, humidity and the time of the day.	Additional evaporation systems have been installed in all dams since the 2019/20 audit. Veolia is continuing to work on the improvement of the evaporation system for all the dams for volume reduction including evaporation system runtime logging.	Complete
d)	The assessment of mine drainage stored in ED1 indicates that Veolia	Over the past year, rainfall has exceeded our annual average by 245mm. Veolia is	Compete

	could have potential issues emptying ED1 in accordance with Condition 18S of the Project Approval (MP 10_0012).	developing a contingency and re-assessing the target for volume to consider ED1 as empty based on the water balance study and in consultation with the EPA, Water NSW and the Department.	
	The assessment of leachate stored in the ED3N dams indicates that Veolia could have potential issues emptying the dams in accordance with Condition 18T of the Project Approval (MP 10_0012).	Over the past year, rainfall has exceeded our annual average by 245mm. Veolia is developing a contingency plan in consultation with the EPA, Water NSW and the Department.	Complete
	Based on observations during the site inspection, information pertaining to the diversion of runoff and the prevention of seepage through the dam walls SLR believes that leachate and clean water are effectively separated at the facility as best is practically possible.	Veolia is seeking approval from the EPA to discharge contaminated stormwater directly to ED3N or ED3SS, to maintain the feed quality to LTP for a stable operation of LTP, and continue to work on the optimization of stormwater management to minimise leachate production. A third party consultant was engaged to assist in the development of a longterm leachate management solution which has been completed.	Complete

6.1.2 Independent Odour Audit

In accordance with the requirements of Condition 7 of Schedule 4 of MP 10_0012, Veolia is required to carry out an annual independent odour audit. This was the ninth Independent Odour Audit (IOA) commissioned by Veolia since the Woodlawn Waste Expansion project approval was granted and encompasses the Woodlawn Bioreactor, Crisps Creek Intermodal Facility and Woodlawn MBT facility.

A number of mandatory and non-mandatory recommendations were developed as a result and discussed in **Tables 6.1.3** and **6.1.4** below.

***Table 6.1.3* 2021 Independent Odour Audit Mandatory Recommendations**

Item	Observation/Recommendation	Implemented/Proposed Action	Status
1.	Veolia should continue to manage fugitive landfill gas pathways from the surface using the existing toolkit such as biocover material and should enhance and accelerate its improvement to landfill gas capture from the Bioreactor	Continuous improvement on odour management includes: • Installation of biocover material to identified areas of fugitive gas emissions to minimise odour.	Complete

	as reasonably practicable. This continuation is apparent in the WIP 2020, which outlines a comprehensive plan that is being implemented to increase gas capture.	• Develop the Odour Management Plan in line with licence conditions by the end of 2021. • Monthly surface gas monitoring for methane and hydrogen sulphide.	
2.	Continue to adequately maintain and manage the upgraded LMS to ensure it is operating in an optimum state and meeting the leachate quality monitoring targets as outlined in the Leachate Treatment Operation Manual and recommended by Veolia Water and continue the implementations planned in the WIP 2020.	Continuous improvement on leachate management includes: • Optimizing leachate extraction and transfer infrastructure to provide more options and contingency for leachate management. • Request contingency storage for contaminated stormwaters. • Install additional UF train at the LTP to optimise the throughput of the plant with expected completion by July 2022. • Review strategies and storage capacity for leachate. • Continuous improvement of evaporation systems. • Continued regular monitoring of the water quality in LTD, ED3S-S, and ED3N from an odour perspective.	Complete
3.	Veolia should continue to develop strategies for the minimising of the exposed active tipping face surface area. It should also proceed and continue with the details in the WIP 2020.	GPS assisted tipping activity will be continuously conducted according to WIP 2020.	Complete
4.	Given the significant increase in odour complaints documented in the Audit, the Audit recommends that Veolia enhance its community engagement and liaison process.	Continuous improvement on odour complaint management includes: • Continue to engage with complainants to better understand potential odour sources through invitations to site and odour identification. • Veolia is continuing to periodically visit complainants directly to discuss the events and type of odour. Invitation to the complainants for a Woodlawn site visit is included in this consultation. • Continued community engagement through various groups (i.e. TADPAI,	Ongoing

		Tarago Times publications & Community Liaison Committee, Open days) • Refine the Odour Management Plan to incorporate defined criteria following an odour complaint. • Veolia is continuing to manage the odour complaints in-line with the complaints procedures.	

Table 6.1.4 **2021 Independent Odour Audit Improvement Opportunities**

Item	Observation/Recommendation	Implemented/Proposed Action	Status
1.	Based on The Odour Unit observations, the Audit suggests that Veolia continue to review the following aspects relating to the use of the IMF and waste transport activities to further improve its odour performance as a minor and transient source of odour: • The washing practice associated with the sealed containers; and • The maintenance of the sealed containers.	Veolia continues to monitor the operation of the container and truck wheel washing practices on site. Veolia is continuing to monitor and maintain the integrity of the containers on a regular schedule, utilising an automated system to schedule regular maintenance and checks of containers in the fleet.	Complete
2.	It is recommended that the MBT Facility improve its overall management of biofilter bed moisture to ensure optimum odour removal performance. This can be achieved by an intensification of the surface drip irrigation system and/or optimisation of the current spray humidification system. Furthermore, it is understood that the MBT Facility has assigned dedicated personnel to manage and maintain the biofilter system – this will facilitate the effective execution of continuous improvement and optimisation works.	Veolia is continuing to inspect the MBT Biofilter System on a regular basis in accordance with the Biofilter Operation and Maintenance manual to maintain suitable moisture, air flow rate and pressure of the air from the buildings for maximum air quality and odour control. Veolia has developed and implemented an improved automated asset maintenance system to improve management of the biofilter bed moisture levels and create a benchmark process in consultation with The Odour Unit prior to the next IOA.	Ongoing

6.1.3 Independent Environmental Audit

In accordance with the requirements of Condition 6 of Schedule 7 of MP 10_0012, every three (3) years after the first Independent Odour Audit required of this approval, Veolia is required to carry out an independent environmental audit. The 3-yearly Independent Environmental Audit was undertaken for the Woodlawn Bioreactor and Crisps Creek Intermodal Facility during this reporting period.

A number of mandatory and non-mandatory recommendations were developed as a result and discussed in **Table 6.1.5** and **6.1.6** below.

***Table 6.1.5* 2021 Independent Environmental Audit Mandatory Recommendations**

Condition	Observation/Recommendation	Implemented/Proposed Action	Status
MP 10_0012			
3.5	The limit for maximum waste input rates at the Landfill for waste received as residual waste from the MBT was exceeded in the 2019 and 2020 AEMR reporting periods.	Veolia is seeking acceptance from GMC for ARRB's Traffic Impact Assessment that indicates that a climbing lane is not necessary. Discussions are ongoing.	Ongoing
3.9	The Leachate Treatment Plant (LTP) was occupied prior to the issue of an occupation certificate (07/04/2021).	No action was required as the Occupation Certificate for the LTP has been issued.	N/A
4.18D	Veolia transferred 50 ML stormwater from ED3S to ED2 during the Audit Period. There is no evidence available to the Auditors that the seepage or leakage points identified in ED2 have been repaired to the satisfaction of the Planning Secretary and EPA.	In consultation with Heron Resources, Veolia has endeavored to obtain verification of repairs undertaken and submit to the Department & NSW EPA for approval.	Complete
4.18E	The LTP was commissioned on 04/10/2018, which was four days after the stipulated completion date of 30/09/18.	No recommendation as the LTP is operational.	N/A
4.18M	There is no evidence that quarterly updates have been submitted to Water NSW or the Department in accordance with this Condition.	Veolia has ensured that relevant stakeholders are included in monthly report distribution. Quarterly updates as per 70A have been reinstated.	Complete
5.20	This non-compliance continued from the previous IEA through to November 2020 when the Tarago Loop Extension works were completed and the train was no longer required to be split in two.	No action was required as the non-compliance has been addressed.	N/A

6.4	The Transport Code of Conduct was last issued in 2011 and was not updated in consultation with RMS, Goulburn Mulwaree Council, Palerang Council and the Community Liaison Committee to the satisfaction of the Department prior to the receipt of more than 50,000 tpa of regional waste.	A revision has been submitted to all relevant stakeholders for consultation and will be forwarded to the Department for approval in due course.	Ongoing
7.7	Four complaints between 19/04/2018 and 26/05/2018 were not published on the website within seven days of a complaint being made.	No action was required as the non-compliance has been addressed.	N/A
7.8	Waste volume limits were exceeded during the Audit Period, which represent an 'incident', as defined in PA 10_0012, Schedule 2, Definitions. The waste volume limit exceedances were not notified and reported to the Department within the required timeframes.	Veolia has developed a process to identify exceedances using cumulative data and prompt timely notification to the Department as required.	Complete
7.9	The SWMP was not reviewed and updated following the LWMS Audit and revision of the water balance in 2020, and changes to the stormwater system.	A review of the Woodlawn LEMP and sub-plans is already underway and will be submitted to the Department by the end of 2021.	Ongoing
DC 31-02-99			
18	A Compliance Report has not been issued for more than two years.	Veolia has ascertained that Compliance Reports are required to be submitted to the Department unless otherwise agreed by the Secretary.	Complete
70A	Quarterly updates to the EPA and DPIE of the leachate volume in ED3SS and remaining volume were not available.	Veolia has located and retained the evidence of lining previously submitted to EPA and DPIE and resumed quarterly updates as per 4.18M and has proposed that this condition be removed as the use of ED3SS was no longer required, and storage volume and capacity is reported every year in the AEMR.	Complete

***Table 6.1.6* 2021 Independent Environmental Audit Improvement Opportunities**

Condition	Observation/Recommendation	Implemented/Proposed Action	Status
MP 10_0012			
3.5	There is an inconsistency to references to regional waste and putrescible regional waste in PA 10-0012 which requires clarification as this impacts on assessment of compliance with limits.	Veolia has instigated discussions to clarify various waste volume allowance limits with the Department and EPA.	Ongoing
4.2	A VENM certificate from Denrith Pty Ltd did not provide the address of the source site, Reynolds Pit, and the certificate does not provide photographs or other evidence demonstrating that the material is in fact VENM.	Veolia has obtained and will retain a more comprehensive VENM certificate from Denrith Pty Ltd.	Complete
4.7	The IOA did not include a detailed odour complaint analysis as recommended in the previous IEA and in accordance with the Department's consultation requirement.	Veolia will ensure that an odour complaint analysis is added to the scope of the next IOA.	Complete
4.9	Records showing the submission of the 2019 IOA and Veolia's response were not available.	Submission of 2019 IOA correspondence was provided to the Auditors during the audit period. This appears to have been overlooked.	Complete
4.11	The available tabulated data for dust monitoring do not record "extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed to by the [Department] in consultation with [EPA]" for the purpose of excluding elevated data linked to extraordinary events.	Such field observations will be recorded in field sheets and master data records.	Complete
4.18R	It is considered that the water balance model in its current form is not sufficient to assess the overall performance of the LWMS.	Veolia in collaboration with Heron Resources Ltd, will consult with the EPA on LWMS Audit prior to the next Audit.	Ongoing
4.25B	Two to three Intermediate Bulk Containers (IBCs) that from a distance appeared empty and labelled as corrosives were stored at Crisp Creek IMF outside a bunded area.	The IBC's, previously used for pumping out storm water/drain sediment, were empty and have been removed.	Complete
5.14	Whilst there was evidence of slope stability erosion controls used in a swale drain at the IMF, the sides of	Veolia made the appropriate repairs to eroded sides of the swale drain.	Complete

	the drain had eroded in some places and required maintenance.		
7.5	Whilst non-compliances are discussed in the AEMRs (e.g. waste volume limit exceedances), they are not always clearly identified as a "non-compliance".	A separate section on EPL related non-compliances has been incorporated into the AEMR/AEPR's.	Complete
7.8	Veolia's ERP / PIRMP does not refer to the requirement to notify the Department in accordance with this Condition.	Notification of the Department has been added to the ERP/PIRMP.	Complete
7.10	The majority of the required documents are provided on the Veolia's Woodlawn Bioreactor, NSW webpage, with the exception of Veolia's responses to the IOAs.	Veolia has continued to comply with the existing consent requirements for public availability of information.	Complete
DC 31-02-99			
19	Correspondence could not be provided showing that the 2018 IEA report was submitted to DPIE, EPA, Dol L&W, Council and the Community Liaison Committee. However, the Auditors recall that Veolia advised the report had been submitted to DPIE.	Veolia has verified the stakeholder distribution requirements in the consent.	Complete
32 & 151	The ERP does not provide a response procedure for a truck rollover and spill of waste on a public road that may be within an agricultural area (Condition 151).	An emergency response procedure for truck rollover whilst carrying waste has been added to the Woodlawn ERP.	Complete
65	Changes to the stormwater collection and transfer system in the void have occurred during the Audit Period, including the transfer and EPL monitoring point, which are not reflected in the 2018 SWMP and potentially the EPL 11436. The monitoring location is also unclear to the EPA.	Veolia is currently in consultation with the EPA in relation to stormwater management system improvements and increased efficiency during significant storm events. The SWMP will be updated to reflect these improvements.	Ongoing
70	The LEMP, SWMP and LMP address management of ED3. It is considered that the management plans for ED3 dams do not adequately address: leak detection monitoring of all pipelines used to transfer leachate and treated leachate; leachate quality targets; and performance indicators, which are not clearly stated.	Veolia is currently undertaking a review of LEMP and this information will be incorporated accordingly.	Ongoing
125 & 127	Dust is not identified as a potential environmental impact in the IMF EMP and therefore, dust control measures are not included.	Wind-blown dust and preventative controls will be incorporated into the IMF EMP.	Ongoing

131	The SWMP does not detail how the groundwater height should be reported against water table contours around the site and should be monitored and reported to assess any variation over time, and importantly, ensure that the groundwater continues to flow towards the void.	Veolia is currently in the process of reviewing the LEMP and all supplementary plans. This information will be incorporated. Clarification of this recommendation is required.	Ongoing
132	The SWMP does not address all of the requirements of this Condition, particularly, monitoring of volumes that are transferred from one location to another (e.g. void to ED3, ED3 to void, ED3S to ED2).	Veolia manages dam volumes and quantities of water transferred by the continuous monitoring of freeboard. Veolia is currently in the process of reviewing the LEMP and all supplementary plans. This information will be incorporated.	Ongoing
134	The requirement to notify the EPA as soon as practicable after becoming aware that the height of the saturation level in the waste is above the height of the groundwater table that surrounds the mine void is not addressed within the LEMP, the LMP or the SWMP.	Veolia is currently in the process of reviewing the LEMP and all supplementary plans. This information will be incorporated.	Ongoing
153	The Landscaping and Vegetation Management Plan (LVMP) does not refer to Buttercup Doubletail.	Veolia will collaborate with Heron Resources Ltd during the review of the LVMP as it encompasses an area of operation, and will be proposing the removal of this reference to the Buttercup Doubletail as it has not listed as a species that was identified in the field surveys undertaken for Veolia's or Heron Resources Ltd's EA.	Complete
160	The LEMP and IMF EMP do not refer to a complaint verification procedure that aims to correlate potential sources of odours with an operation or activity by assessing relevant meteorological data.	Veolia is currently in the process of reviewing the LEMP and all supplementary plans. This information will be incorporated.	Ongoing

6.2 Community Engagement

6.2.1 Complaints

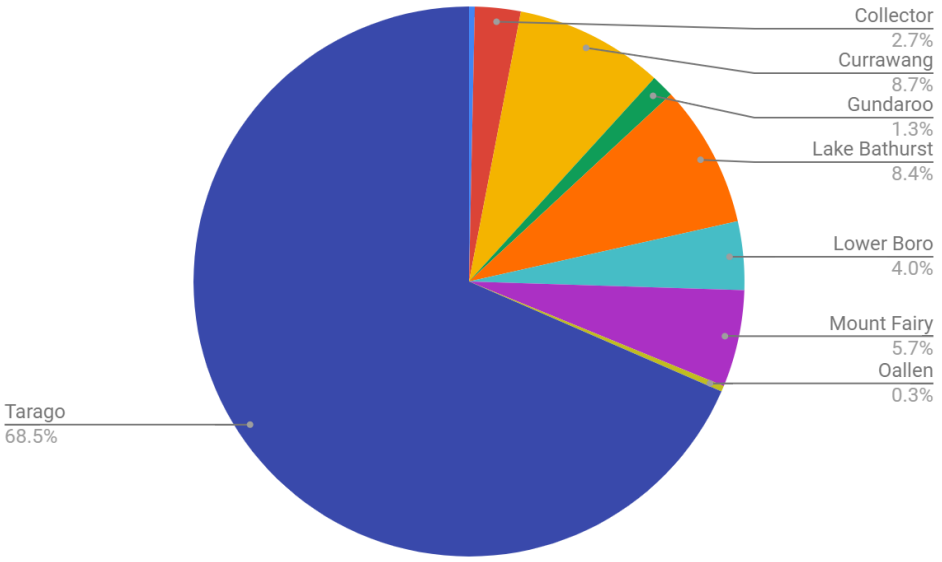
Veolia operates a 24-hr telephone complaints line that enables the receipt of complaints from members of the public, as required under the Bioreactor and MBT PAs and EPLs. Other complaints that were received off site during this reporting period were logged by the EPA.

In order to proactively engage in effective odour management, Veolia participates in regular community liaisons to encourage and gather feedback from the local residents regarding the odour performance at the Bioreactor.
In accordance with Condition 1 and 2 of Schedule 7 (PA 10_0012), a Community Liaison Committee (CLC) operates for the Woodlawn Project consisting of an Independent Chair, representatives from Goulburn Mulwaree and Queanbeyan Palerang Regional Council, a TADPAI representative, and five community members. The CLC aims to meet up to four times per year.

There was a notable increase in odour complaints over the reporting period, with Veolia recording a total of 302 complaints relating to odour which is significantly higher than the previous reporting year (20). Complaints received in the 2020-21 reporting period are detailed in **Table 6.1** (refer **Appendix 6**).

The majority of odour complaints were reported from the Tarago area as demonstrated in the **Figure 6.2.2)** below**.**

Figure 6.2.2 **Woodlawn Eco-Precinct Odour Complaint Locations**



6.3 Rehabilitation

6.3.1 Woodlawn Mine

Rehabilitation of the mine void through landfilling is a continuous process. Final rehabilitation works shall be completed in accordance with the Rehabilitation and Closure Plan.

The areas to be rehabilitated include but is not limited to:

- The Bioreactor
- Former Mineral Processing Area - Plant Area

- Evaporation Dam 3
- Evaporation Dam 1
- Power Station
- Office and car park areas
- Crisps Creek IMF and Mulwaree River
- MBT Facility

Other areas of the site are subject to a current development approval by Heron Resources Limited Pty Ltd (Heron). Under the approved development, Heron is proposing to undertake further underground mining and reprocessing over various areas of the mine site. Rehabilitation of other areas will be the responsibility as identified in Heron Mining Operations Plan (MOP) (refer to **Section 6.3.1)**.

Veolia has undertaken vegetation monitoring and tree planting programs at the Eco-Precinct site and continues to seek out ways to continuously improve and rehabilitate the overall natural amenity of the site.

6.3.2 Woodlawn Tailings Dams

Heron Resources (Heron) operate the Woodlawn Zinc-Copper Project within Special (Crown and Private Lands) Lease 120, issued pursuant to the NSW Mining Act 1992. Several conditions exist under their Lease to prevent, minimise and/or offset adverse environmental impacts, and to ensure that areas disturbed by mineral production and exploration activities are appropriately rehabilitated.

Developed under the approval conditions Heron's Mining Operations Plan (MOP) includes a Rehabilitation Strategy which describes the proposed rehabilitation strategy for the four tailings dams on site.

In May 2020, the Environment Protection Authority (EPA) through a NSW Resource Recovery Exemption, permitted the application of the Woodlawn organic outputs (WOO) (MBT organic output derived from mixed waste) to land for trials for the rehabilitation of acid mine tailings in the tailings dams of the Woodlawn Zinc-Copper Project Mine site. The trial began in February 2021 and is ongoing.

Veolia will consult with EPA on the final rehabilitation plans and plant species to be adopted within the rehabilitation areas, once a suitable rehabilitation design is selected and additional detail is developed.

Part 7 Conclusion

Based on the results of monitoring undertaken at the Bioreactor, IMF and MBT sites, in accordance with the respective PA conditions and EPLs, the overall environmental performance of the Woodlawn Eco-Precinct in this reporting period can be demonstrated to be well managed.

7.1 Improvement Actions

A number of improvements to the environmental management of the Woodlawn Eco-Precinct have been implemented during this reporting period. These improvements were identified as a result of the recommendations and findings identified by independent environmental audits, regulatory inspections as well as Veolia's internal assurance program.

7.1.1 Improvement Actions Implemented

Table 7.1.1 outlines the improvements identified in the 2019/2020 AEMR and implemented in the 2020/2021 reporting year for the Woodlawn Bioreactor, Crisp Creek IMF and Woodlawn MBT facility.

***Table 7.1.1* 2020/2021 Improvements Implemented**

Item.	Recommendation	Implemented Action
1.	Engage suitably qualified persons to conduct a review of the Groundwater Monitoring Network in the vicinity of the Void	A comprehensive review and report carried out by Earth 2 Water (E2W) was received in April 2020 and based on the recommendations, 2 new deep groundwater monitoring bores were installed post COVID restrictions.
2.	Act on the recommendations of the Groundwater Monitoring Network review by installing two deep wells to replace previously decommissioned wells within the void	The installation of two new wells was completed in November 2020 in conjunction with E2W and Terratest. These have since been added to EPL 11436 by way of licence variation.
3.	Increase the landfill gas extraction infrastructure including the installation of an additional blower and flares.	Blower 5, Flare 3 and 2nd Gas Main have been installed and commissioned. Progressive addition of new extraction wells as the surface area within the Bioreactor increases. This is in line with the WIP 2020 and beyond, Showing additional wells on the approximate 20m x 20m grid pattern.
4.	Install and optimise additional infrastructure for dam evaporation.	Further improvements to evaporative systems on ED3N and ED1 Coffer Dam have been installed.

5.	Develop and implement trigger values & control measures for monitoring points located within the vicinity of ED1 as identified in the Groundwater Management Strategies for ED-1.	A 6-monthly monitoring regime for the groundwater monitoring bores has been implemented with relevant triggers based on laboratory analysis results.
6.	Implement a Dams Safety Management System including the development of a Dams Safety Emergency Plan (DSEP) in order to meet new regulatory requirements.	In consultation with Heron Resources a "Woodlawn" DSEP has been developed and implemented as part of the site's overall Dams Safety Management System.
7.	Manage Regional Waste Tonnage inside the approved limits received at the Bioreactor and the MBT.	Bioreactor has put in place a system to tally Regional Waste inputs to the Bioreactor each month. Whilst clarification is still being sought from NSW EPA and DPIE around waste classification, this system is currently in place. Woodlawn Eco Precinct is currently working to develop a dashboard that allows for immediate and up to date review of all waste inputs to the facility. This work is in the development phase.
8.	Implement stormwater diversion to reduce the leachate generation due to mixing with storm water at Woodlawn MBT site.	Initial Concept Design work has been completed. Detail design and implementation to be carried out in first quarter of 2022
9.	Developed a leachate evaporation system at Woodlawn MBT to evaporate leachate mainly generated from the stormwater.	Design work has been completed and the equipment is on order. Project to be completed in Dec 2021.
10.	Improvement of the leachate aeration system for the Leachate Aeration Pond.	New Aerator system has been purchased, installed and commissioned.

7.1.2 Improvement Actions Proposed

Veolia is committed to continuous improvement. As a result of the previous 2 years of well above average rainfall, the improvements are largely focused on stormwater and leachate management which also impact gas capture.

Table 7.1.2 outlines the improvements proposed for the 2021/2022 reporting year for the Woodlawn Bioreactor, Crisp Creek IMF and Woodlawn MBT facility.

***Table 7.1.2* 2021/2022 Improvement Recommendations**

Item	Recommendation	Proposed Action
1.	Install and optimise additional infrastructure for dam evaporation.	Install an evaporation system on ED3S. The evaporation system will take water from the dam and evaporate it on various sections of the void walls.

2.	Improve stormwater management efficiencies for periods of high rainfall.	Investigate evaporative technologies to reduce our reliance on natural and mechanically assisted evaporation during periods of high rainfall.
3.	Develop and implement throughput contingency for the Leachate Treatment Plant.	Install an additional Ultrafiltration (UF) train at the Leachate Treatment Plant to optimise the throughput of the plant by July 2022.
4.	In accordance with EPL Condition O6.31 develop and implement an Odour Management Plan that includes the use of MWOO as alternate daily cover (ADC).	Incorporate an Odour Management Plan into the Woodlawn Air Quality and Greenhouse Gases Management Plan in consultation with the EPA for submission to the Department for approval.
5.	Increase the landfill gas extraction infrastructure.	Install additional manifold to the waste surface in the south west corner to improve gas extraction within the void.
6.	Develop strategy for removal of mildly contaminated stormwater from within the void.	Develop transfer of contaminated stormwater work instruction for the transfer of contaminated stormwater from the Woodlawn Landfill Void to treated leachate storage dams in consultation with the EPA.
7.	Implement a robust container maintenance programme ensuring prevention of emission of offensive odour and leakage from containers during transport and handling activities.	Implement an improved container inspection and monitoring program using an automated plant maintenance management system to ensure containers are managed and maintained efficiently.
8.	Install and optimise additional infrastructure for Woodlawn MBT evaporation dam.	New Evaporation system to be installed and commissioned to increase leachate evaporation.
9.	Develop processes for business reporting to include monitoring of waste received in ongoing reporting periods against the three separate streams outlined in Schedule 3, Condition 5.	Design and implement a waste stream monitoring dashboard collating relevant data to provide real time visual feedback.

Reference and Related Documents

Document Name
URS Australia Pty Ltd, Veolia Environmental Services Environment Assessment: Woodlawn Expansion Project Volume 1 – Main Report, August 2010
URS Australia Pty Ltd, Veolia Environmental Services Environment Assessment: Woodlawn Expansion Project Volume 2 – Appendices, August 2010
EPA, Waste Classification Guidelines Part 1: Classifying Waste, November 2014;
EPA, Environmental Guidelines: Solid Waste Landfills Second Edition, 2016, April 2016
Veolia, WL - Bioreactor Landfill Environmental Management Plan (LEMP), 30 August 2018
Veolia, WL - Bioreactor infrastructure Plan (WIP) 2020, 13 October 2020
Veolia, WL - MBT Operational Environmental Management Plan (OEMP), 19 January 2017
Veolia, WL - Crisps Creek IMF Environmental Management Plan (EMP), 2 September 2016
Veolia, WL - Bioreactor Receipt of Non-Conforming Waste Work Instruction, 28 August 2019
Ramboll Australia Pty Ltd, Independent Environmental Audit, May 2021
The Odour Unit Pty Ltd, Woodlawn Bioreactor Expansion Project Independent Odour Audit #9, August 2021
SLR Consulting Ltd, Independent Audit Leachate and Water Management System, May 2021
Earth2Water Pty Ltd, Leachate Assessment Report, August 2021

Appendices

Appendix 1 Site Location Map

Appendix 2 EPL Boundary Map

Appendix 3 Monitoring Location Maps

Appendix 4 Tabulated Monitoring Results

Appendix 5 Monitoring Trend Graphs

Appendix 6 Complaints Register