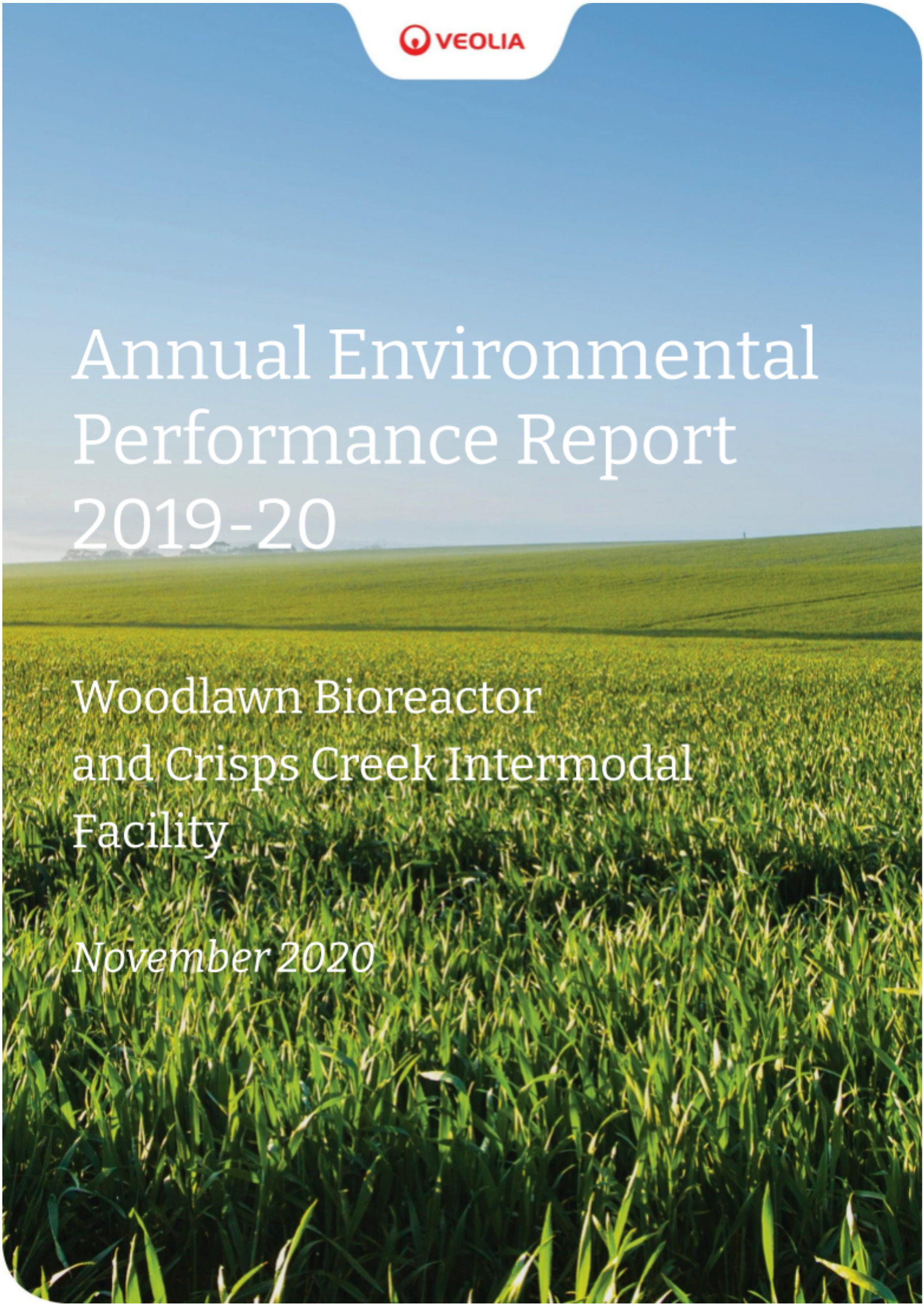

Annual Environmental Performance Report 2019-20

Woodlawn Bioreactor and Crisps Creek Intermodal Facility

November 2020

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0	Draft for internal review	• Woodlawn Bioreactor Site Management • NSW SHEQ Compliance Team	October 2020
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Contents

Introduction

This Annual Environmental Performance Report (Report) has been prepared in accordance with condition R1.8 of Environment Protection Licence (EPL) 11436 for the Woodlawn Bioreactor (Bioreactor), as well as documenting performance against EPL 11455 for the Crisps Creek Intermodal Facility (IMF), issued and regulated by the NSW Environment Protection Authority (EPA).

In accordance with relevant legislative requirements and industry best practice, the environmental performance of the Bioreactor and the IMF is managed to stringent conditions, the reporting of which forms the basis of this Report.

This Report covers the period of 6 September 2019 to 5 September 2020.

Background

The Bioreactor and IMF form part of the Woodlawn Eco-Precinct (the Eco-Precinct) which is owned and operated by Veolia Australia and New Zealand (Veolia) and located approximately 250 kilometres (km) south west of Sydney in the NSW Southern Tablelands. A site location plan is provided in **Appendix 1**. The Eco-Precinct, which covers an area of 6000 hectares, comprises of the 'Pylara' and 'Woodlawn' agricultural properties. The Bioreactor is where waste landfilling and landfill gas extraction occurs in the void of a remnant open cut mine, approximately 33 million cubic metres (m^3) in capacity.

The Bioreactor has been operating since September 2004, with the collection of landfill gas from landfill waste to extract methane for energy generation commencing in 2008. This occurs at the adjacent Woodlawn Bio Energy Power Station (the Power Station). Waste to the Bioreactor from Sydney is transported in shipping containers via rail and unloaded onto road trucks at the IMF which is located approximately 8 km away in the township of Tarago. Local waste from neighboring councils and businesses is transported to the Bioreactor via road.

In October 2018, Veolia commissioned the Leachate Treatment Plant (LTP) designed and constructed to facilitate improved environmental and operational performance by allowing Veolia to extract and treat greater volumes of leachate minimising and reducing the generation of odour, enabling more efficient gas extraction, and maximizing the waste to energy benefits of the Bioreactor. The first discharge of treated leachate from the LTP to ED1 Coffer Dam started on 26 April 2019, with the facility currently achieving an average throughput of 2.96L/s or 256m3/day.

Legislative Requirements

The main legislative instrument governing the environmental performance and activities undertaken at the Bioreactor and the IMF, pertaining to this Report, is the *Protection of the Environment Operations Act 1997* (POEO Act) regulated by the EPA, as well as its associated regulations.

The EPL for each site has been issued under s55 of the POEO Act. Conditions of the EPLs stipulate the environmental and operational parameters that need to be addressed by Veolia, in the management strategies adopted for both the sites, to maintain compliance.

This Report is split into a section for each EPL and contains these management strategies.

Part 1 EPL 11436 Woodlawn Bioreactor

1.1 Bioreactor Operations

In accordance with EPL 11436, the Bioreactor is permitted to accept material classified as General Solid Waste (Putrescible) as described in the *Waste Classification Guidelines Part 1: Classifying Waste* (EPA, 2014) for the scheduled activity 'Waste disposal by application to land'. The other ancillary activity permitted on the EPL is 'Electricity generating works' for the generation of energy from the extraction of landfill gas.

In addition to the waste management and energy generation activities, the site EPL mandates the administrative, operating and reporting conditions for the Bioreactor, as described in Table 2.1 below. A licence boundary plan is provided in **Appendix 2**.

1.2 Bioreactor Licence Conditions

EPL 11436 details the operating conditions and environmental monitoring requirements for the Bioreactor as noted in Table 2.1.

Table 1.2 **Bioreactor EPL 11436 Licence Conditions**

Condition	Compliance with Condition
1. Administrative conditions	Noted
2. Discharges to air and water and application to land	**P1. Location of monitoring/discharge points and areas** These monitoring points have been documented in a monitoring location plan (**Appendix 3**) and a program is in place for sampling as required.
3. Limit conditions	**L1. Pollution of Waters** The Bioreactor is deemed a zero discharge site, as all surface and stormwater that comes into contact with waste or leachate is captured, stored and treated onsite. Non contaminated water is managed through diversion drains and bunds. No water was discharged during this reporting period.
	L3. Waste All waste received at the Bioreactor during this reporting period was in accordance with the waste types permitted in the EPL. Waste generated onsite was deposited in the Bioreactor.
	L4. Noise Limits No noise complaints were received during this reporting period. The noise limit criteria for the Bioreactor is 35 dB(A) LAeq (15 minute) at the nearest residential receiver. Noise monitoring will be undertaken by Veolia on the receipt of any such complaints.

	L5. Hours of Operation All operational activities at the Bioreactor, including haulage of waste from the IMF were undertaken between 6:00 am and 10:00 pm, Monday to Saturday during this reporting period as permitted.
	L6. Potentially Offensive Odour 20 odour complaints were received at the premises during this reporting period which is lower than the last reporting period (32). 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. The IOA for the Bioreactor was undertaken by The Odour Unit in 2020. Veolia will continue to implement recommended actions from the odour audit in combination with improving current odour control measures identified onsite.
4. Operating conditions	**O1. Activities Carried out in a Competent Manner** All licensed activities undertaken at the Bioreactor in this reporting period were carried out in a competent manner and under a high standard of environmental management for which Veolia is certified under *ISO 14001:2015 Environmental Management Systems*.
	O2. Maintenance of Plant and Equipment The maintenance and operation of all plant and equipment on the premises associated with the licensed activities was undertaken in a proper and efficient condition as required by qualified technicians. Details of all major plant and equipment at the site are stored in a computerised maintenance management system in order to schedule and complete the required maintenance. Veolia operators hold the appropriate qualifications and licenses to operate plant and equipment used as part of Bioreactor operations.
	O3. Dust All operations and activities were carried out at the Bioreactor in a manner to minimise dust at the boundary of the premises. These included all access roads from the IMF to the Bioreactor 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.
	O4. Emergency Response The Emergency Response Plan (ERP) for the Eco-Precinct, incorporates the Pollution Incident Response Management Plan (PIRMP) in accordance with s153A of the POEO Act. The ERP/PIRMP is maintained electronically on Veolia's Business Management System, an online platform for storing Veolia policies, procedures, plans and working documents. Hard copies of the ERP/PIRMP are available at various locations on site for ease of use.

	The ERP/PIRMP contains procedures for minimising the risk of and managing incidents such as fires, spills, explosions etc. at the Bioreactor, as well providing guidance on the notification protocols to relevant authorities in the event of a pollution incident. The PIRMP was activated on 2/06/2020 due to a gas extraction system failure at the Woodlawn Bio-Energy plant (EPA Reference Number C08556-2020) and was subsequently tested on 26/6/2020.
	O5. Processes and Management The processes implemented onsite to manage water quality in accordance with the EPL are documented in the *Landfill Environmental Management Plan* (LEMP), prepared by Veolia. The LEMP (MAN-13298 WL - Bioreactor Landfill Environmental Management Plan) provides 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. Clean surface and stormwater collected from within the void is pumped to Evaporation Dam 3 South (ED3S) for evaporation. An overview of the current Stormwater Management System is provided in **Section 3.3** of this Report. 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. In March 2020 Heron Resources suspended operations and entered a period of care and maintenance therefore are not utilising this water at present. 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. The wash bay, used for cleaning of containers and equipment associated with Bioreactor operations, collects sediment in a drainage sump. This sump is periodically drained and the resultant waste deposited in the Bioreactor.
	O6. Waste Management All activities associated with this condition were carried out in accordance with the EPL during this reporting period. A closure plan shall be submitted prior to the closure date of the Bioreactor. Monitoring of groundwater levels within the Bioreactor void and around the licenced boundary during this reporting period confirmed that groundwater flows maintained an inward gradient towards the void, indicating no outward movement of leachate could occur. Since April 2016, Veolia has comprehensively re-designed the landfill tipping profile and its gas collection infrastructure to maximise gas collection and minimise the impacts of higher leachate levels in the void. This included investing in new collection infrastructure across the void. Veolia continues to

	extract and treat leachate from the void at an average of 2.02 litres per second (L/s), totalling 62482 m^3 over the reporting using the current system. Gas collection remains steady at an average of 3709.19 cubic metres per hour (m^3/h) of landfill gas flow this reporting period. 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 the previous reporting period. Current average throughput was 2.96L/s or 256m3/day 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. Virgin Excavated Natural Material (VENM) was continuously sourced from onsite and offsite locations for use as cover material during the reporting period. All waste accepted within the Bioreactor in this reporting period was screened prior to final disposal to ensure only waste conforming to EPL 11436 was received. Veolia will undertake final capping of the Bioreactor when required and in accordance with the EPL. 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 EPL. The landfill gas extraction and utilisation infrastructure in the Bioreactor has been designed to meet the conditions of the landfill including settlement. Veolia has continued to construct temporary access roads to minimise waste delivery vehicles coming in contact with and tracking waste to external surfaces. Dedicated site vehicles that only operate within the void and other operational areas were utilised. Any vehicles exiting the facility are required to use the wheel wash facility to prevent the tracking of materials.

	In addition to tracking of materials, a monthly site inspection checklist is used to ensure practical measures are in place at the site to prevent materials leaving the premises. A variation of licence was issued in March 2020 permitting Veolia to undertake an alternative daily cover trial at the tip face over a 6 month period. A summary of the trial is detailed in **Section 3.2** of this report.
5. Monitoring and recording conditions	Noted, all compliance monitoring was carried out in this reporting period in accordance with EPL requirements. The results of which are detailed in **Section 3**. There were non-compliances with condition M2 during this reporting period. The site telephone complaints line was maintained and operated during this reporting period for receiving complaints from members of the public and is available to the public via signage placed at the entry of the site.
6. Reporting conditions	Noted and addressed in this Report and the annual return documents, where relevant. Notifications to the EPA were undertaken in a timely fashion.
7. General conditions	A copy of the EPL is displayed at the Woodlawn reception.
8. Pollution Studies and Reduction Programs	**U1. Long-term Leachate Treatment Solution** U1.1 and 1.2 The Leachate Treatment Plant was commissioned in the previous period (2018-19) and has implemented the following processes: - Throughput management to steadily increase leachate treatment to achieve EPA target of 346 m3/day (4litres/sec) ; - Permeate quality management of the final product going into the coffer dam; - Foam management via chemical and mechanical mechanisms; - Temperature control via monitoring through SCADA & in-line monitoring systems; and - Monitoring weather conditions U1.3 All monthly progress reports on the LTP commissioning and optimisation were submitted to the EPA in this reporting period.
9. Special Conditions	The financial assurance (FA) is adjusted each financial year in accordance with condition E1. The FA calculations were undertaken according to conditions E1.4 and E1.9 and submitted to the EPA for approval, prior to Veolia submitting the adjusted bank guarantee to the EPA by the EPL anniversary date.

1.3 Community Engagement

1.3.1 Community Liaison

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. These liaisons are facilitated through the Community Liaison Committee (CLC) to voice their concerns with the Bioreactor site.

Community concerns may also be raised at meetings attended by local community representatives, committee members/executives from the Tarago & District Progress Association Inc. (TADPAI) and local councillors from Goulburn Mulwaree and Queanbeyan-Palerang Regional Councils. Veolia continues to attend such meetings and implement activities to eliminate and minimise odour sources at the site based on annual odour audit recommendation.

1.3.2 Complaints

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

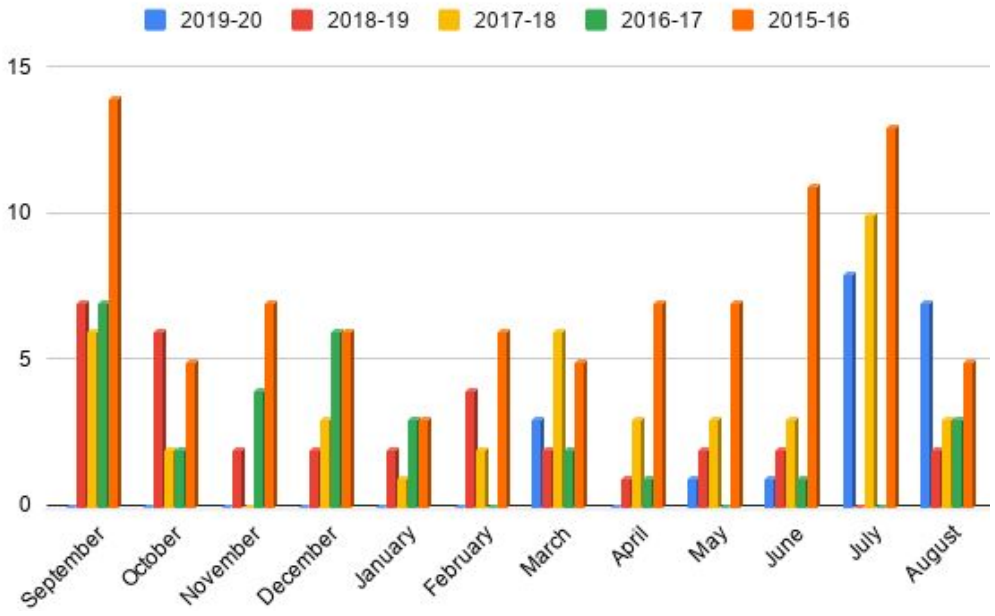
Upon receipt of an odour complaint, Veolia records the details of the complaint into the Eco-Precinct complaints register as follows:

- Date and time of complaint
- Method by which the complaint was made
- Personal details of the complainant if available
- Nature of the complaint
- Action taken by Veolia is relation to the complaint ie. investigation
- If no action was required, the reason why no action was undertaken

After investigating the odour complaint and implementing any remedial action, a report is submitted to the NSW EPA as per condition R4.2 of the EPL, and made publicly available on the Veolia website.

Figure 1.3.2 demonstrates the downward trend in odour complaints received during the 2019-20 reporting period compared to previous years with the exception of August 2020.

Figure 1.3.2 **Bioreactor Monthly Odour Complaints**



Veolia recorded a total of 20 complaints relating only to odour during this reporting period which is significantly lower than the previous reporting period (32). No odour complaints were received in Spring or Summer of 2019/2020, the majority occurring in the Winter and Autumn seasons of the reporting period.

Significant improvements in landfill gas extraction and leachate management through optimisation of surface water catchments, landfill gas infrastructure design, and increased leachate treatment capacity (via the LTP) have proven the benefits of the continuous improvements implemented at the Eco-Precinct with the recent odour complaint trends.

Possible contributing factors to odour may have included a combination of the 1 in 100 year ARI rain event, and the still climatic conditions during the cooler months of winter.

Complaints received in the 2019-20 reporting period are detailed in **Table 6.1** (refer **Appendix 6**).

1.4 Bioreactor Environmental Monitoring Requirements

Veolia is required to monitor environmental performance of the Bioreactor under EPL 11436. **Table 1.4** details the EPL ID, sampling location, frequency and the type of monitoring undertaken at each licensed point. A monitoring location plan is included in **Appendix 3**.

Table 1.4 **Bioreactor Licensed Monitoring Points**

EPA ID	Sampling Location	Frequency	Type of Monitoring
1	GMBH1	Quarterly	Subsurface Gas
2	GMBH2		
4	GMBH4		
6	Landfill Surface	Quarterly	Surface Gas
7	Landfill Gas Flare	Annual / Continuous	Air Discharge
8	Landfill Gas Engine Exhaust Point		
5	Gas Extraction Booster	Annual	Landfill Gas Input
9	Meteorological Station	Continuous	Meteorological
10	DG28 – Pylara	Monthly	Particulates – Deposited Matter
11	DG22		
12	DG34		
13	Site 115 – Allianoyonyige Creek	Quarterly	Surface Water
14	Spring 2		
15	Site 105 – Crisps Creek		
16	WM200		
17	WM201		
18	ED3SS		
19	WM203 – ED3N		

22	Pond 5		
54	WM202 - ED3S		
59	ED1		
23	Leachate Pond	Annual	Leachate
24	Leachate Recirculation System		
25	MB1	Quarterly / Annual	Groundwater
26	MB2		
27	MB3		
28	MB4		
30	MB6		
31	MB7		
33	MB10		
41	ED3B	Quarterly / Annual	Groundwater
42	WM1		
45	WM5		
46	WM6		
48	P38A & P38B	Quarterly	Standing Water Level
49	P200A		
50	P200B		
51	P58A & P58B		
52	P59A & P59B		
53	P100A & P100B		
55	MW8S	Quarterly/Annual	Groundwater
56	MW8D		
57	MW9S		
58	MW10S (Dry well) (GW10S)		
60	MB28		
66	MB33		
61	Effluent from LTP	Weekly	Discharge
62	ED1 Cofferdam (LTP)	Monthly	Surface Water
63	SP2-MW1	Quarterly	Groundwater
64	MW-FRC1		
65	MB10S		

1.5 Bioreactor Monitoring Results

All monitoring data collected at the monitoring points identified in **Table 1.4** during this reporting period has been tabulated and provided in **Section 1.5** or 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 **Section 1.5** or in **Appendix 5**.

1.5.1 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.

Table 1.5.1 **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 1.5.1.1 below:

Table 1.5.1.1: Subsurface Gas Monitoring Result
<table><tr><th rowspan="2">Gas Monitoring Bore ID</th><th colspan="4">Purged Methane Reading (%)</th></tr><tr><th>16/01/20</th><th>25/02/20</th><th>20/05/20</th><th>26/08/20</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 1.5.1.2 below:

Table 1.5.1.2: Landfill Gas Extraction Booster Monitoring Results Summary
<table><tr><th>Parameter</th><th>Historical Average</th><th>2019/2020 Result</th></tr><tr><td>Temperature (°C)</td><td>2.7</td><td>2</td></tr><tr><td>Volumetric Flow (m³/s)</td><td>0.67</td><td>1</td></tr><tr><td>Carbon Dioxide (%)</td><td>38.8</td><td>38.4</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 (refer Appendix 4).</td></tr>
<tr><td>Surface Gas</td><td>Surface gas monitoring was completed on a quarterly basis as per EPL requirements, which are summarised in Table 1.5.1.3 below. The detailed tabulated data is available in Tables 3.1 to 3.4 (refer Appendix 4).</td></tr>
</table>

Table 1.5.1.3: Surface Gas Monitoring Results Summary

Parameter	Minimum	Average	Maximum
Methane (%)	0.0002	0.0089	0.0950

Methane was detected in varying amounts over the waste surface with a slightly increased overall average of 0.0089% during this reporting period, compared to 0.004% last reporting period. The slight increase in methane detected is likely due to the extended dry period that caused some cracking of the cover material in localised areas.

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).

Surface gas monitoring enables site operational personnel to investigate and apply corrective actions where any high concentrations of methane has been detected to maintain the effectiveness of the landfill cap and prevent migration of landfill gas through preferential pathways to the surface.

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. During this reporting period mulch bio-cover was also implemented around wells, which has assisted in mitigating odour and reducing surface gas emissions.

Landfill Gas Flare

The landfill gas flares are manufactured to 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 1.5.1.4** below.

Table 1.5.1.4: 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** to **4.7** (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, as demonstrated in **Figures 1.5.1.1** – **1.5.1.4**.

- Nitrogen Oxides;
- Hydrogen Sulphide;
- Volatile Organic Compounds

	• Sulphuric Acid Mist; and • Sulphur Trioxide Note: Only required to sample one engine exhaust due to sample type of engine. Generators 5 & 6 have not been tested to date.

Figure 1.5.1.1 **Landfill Gas Engine Exhaust Point - Nitrogen Oxide Flow**

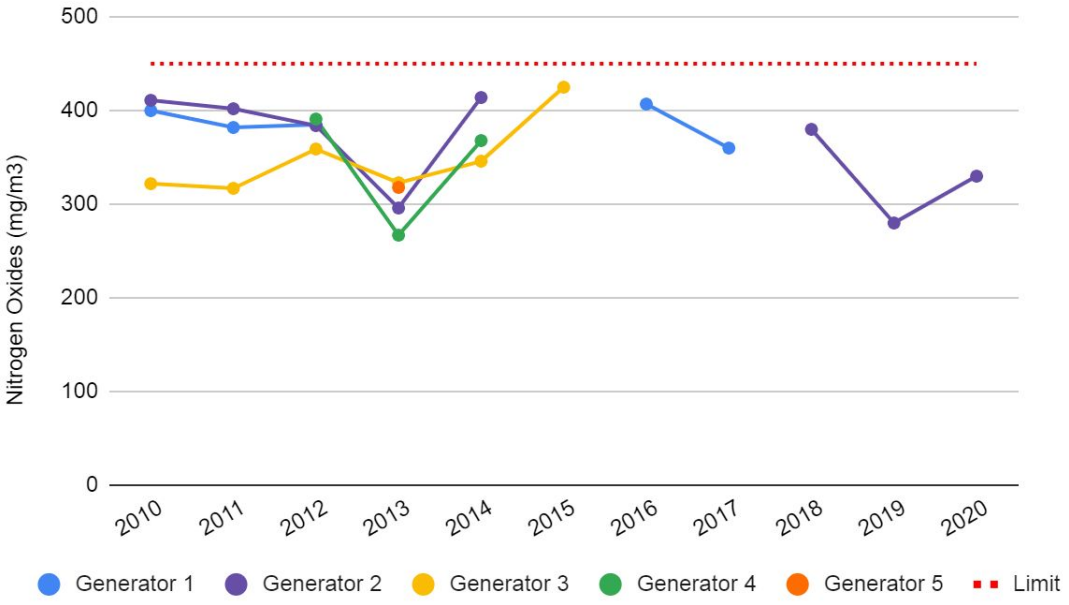


Figure 1.5.1.2 **Landfill Gas Engine Exhaust Point - Hydrogen Sulphide Flow**

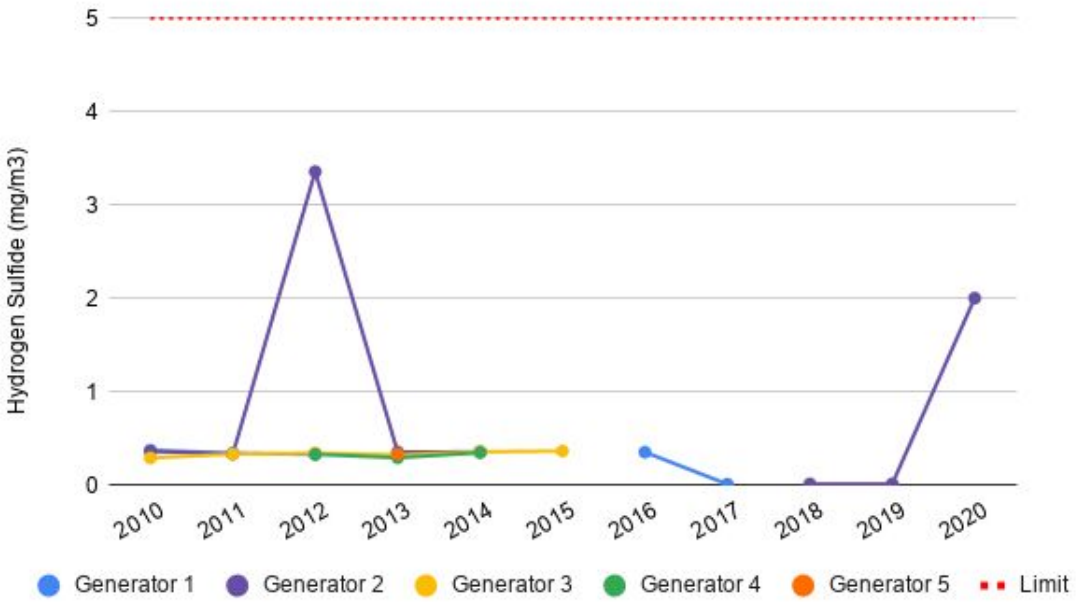


Figure 1.5.1.3 **Landfill Gas Engine Exhaust Point - Sulphuric Acid Mist & Sulphur Trioxide**

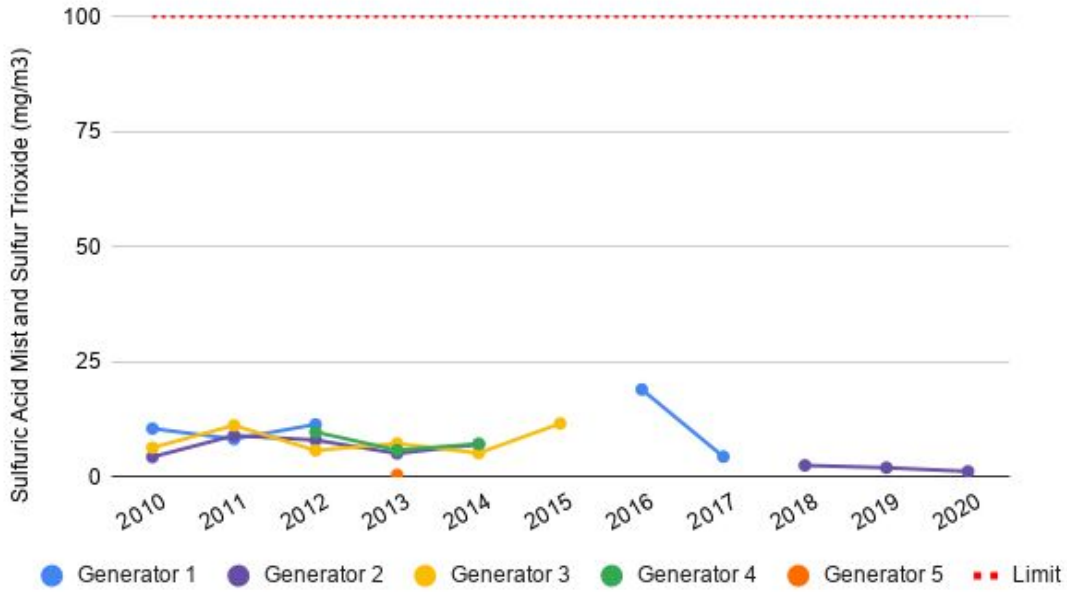
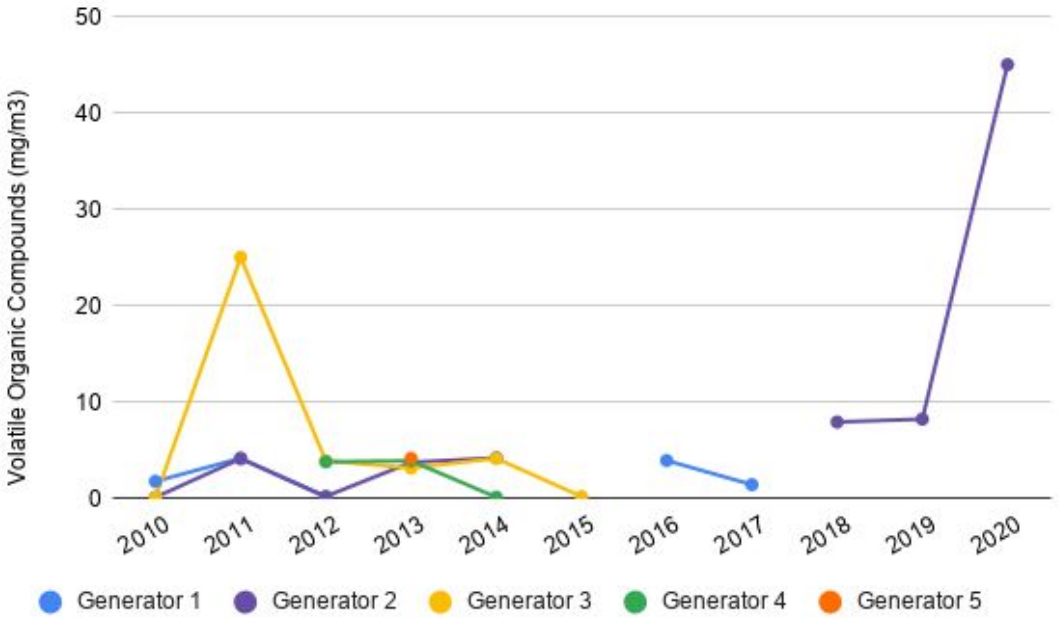


Figure 1.5.1.4 **Landfill Gas Engine Exhaust Point - Volatile Organic Compound**



1.5.2 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 1.5.2.1**.

***Table 1.5.2.1* Bioreactor Depositional Dust Long Term Criteria**

Pollutant	Averaging Period	Maximum Increase	Maximum Total Level
[c]Deposited Dust	Annual	[b]2 g/m²/month	[a]4 g/m²/month

Criteria Notes:
[a]Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to other sources);
[b] Incremental impact (i.e. incremental increase in concentrations due to the project on its own);
[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method; and
[d]Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed to by the Director-General in consultation with OEH.

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 1.5.2.2**.

***Table 1.5.2.2* Bioreactor Dust Monitoring Results**

<table>
<tr><th>Parameter</th><th>Results/Discussion</th></tr>
<tr><td>Particulates/ Dust Monitoring</td><td>The results of total insoluble solids found within the depositional dust samples are summarised for each of the monitoring locations in Table 1.5.2.1 below, with the detailed results tabulated in Tables 5.1 - 5.3 (refer Appendix 4).
Table 1.5.2.1: Dust Monitoring Results
<table>
<tr><th rowspan="2">Dust Gauge</th><th colspan="3">Summary Total Insoluble Solids (g/m²/month)</th></tr>
<tr><th>Minimum</th><th>Average</th><th>Maximum</th></tr>
<tr><td>DG22</td><td>0.3</td><td>5.1</td><td>15.8</td></tr>
<tr><td>DG34</td><td>0.3</td><td>4.6</td><td>16.6</td></tr>
</table></td></tr>
</table>

	DG28 0.4 4.1 10.5 The maximum dust level recorded in this reporting period was 16.6 g/m2/month at DG34 which is located on the West side of the Bioreactor in November 2019. All monitoring points reached averages exceeding the long term criteria for deposited dust during the reporting period. It should be noted that these are primarily due to a dust storm and prolonged bushfire events occurring between November 2019 and January 2020 and should be considered extraordinary events for monitoring purposes.

1.5.3 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.

There are 11 surface water monitoring sites in total as shown in **Table 1.4.** The sites consist of four creeks and seven dam locations.

The findings from water quality monitoring of surface water locations required under the EPL is summarised in **Table 1.5.3** 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 1.5.3 **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 8.1 for this location indicates slightly alkaline water. • EC at 3833 µS/cm, indicating fresh to brackish water. • NH_3 at less than 0.1 mg/L and TOC at mean of 14 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 2.5 mg/L for K and 0.44mg/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 5.9 – 7.4 for this location; • EC (average 579 µS/cm) for this reporting period is indicative of fresh water. • SO_4 (average 253 mg/L) shows an identical trend to conductivity, again indicating a direct effect on EC. • K (average 19.2mg/L) and Zn (average 1.79mg/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 0.3mg/L) and TOC (average 10mg/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 6.6 – 7.9 for this location, indicating relatively neutral water; • EC (2176 µS/cm) is consistent with historical results, reflecting brackish water. • TOC (21 mg/L) and NH_3 (0.3 mg/L) was consistent with historical trends. • Zn and K remain consistent averaging 0.68 mg/L and 2.4mg/L respectively, consistent with historical results. The higher than average EC recorded in May and July 2020 is most likely associated with accumulation of salts in the environment associated with the extraordinarily dry conditions experienced across the region during the 2 years prior. EC and TDS concentrations returned to normal levels in August 2020 during the final quarter of the reporting period after a significant rain event.

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 8.1) indicates slightly alkaline water; • EC (average 1463 µS/cm) is consistent with historical results; • SO_4 level (average 38 mg/L) is lower than previous reporting period; • Zn level was lower at an average of .22 mg/L than previous reporting period; • TOC was an average of 4 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 0.2 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. 2 of 4 monitoring quarters were sampled during the 2019-20 reporting period. Water quality trends for WM2011, based on the results provided in **Table 6.5** (refer **Appendix 4**). • pH (6.29) is within the overall range of 6.06 – 6.53 for this location, indicating relatively neutral water; • EC (393 µS/cm) is consistent with historical results, reflecting brackish water; • TOC (7.5mg/L) remains consistent with previous reporting periods; • NH_3 (0.2mg/L) concentration are consistent with historical trends; • K (average 1.85mg/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 8.7) appears to be fairly consistent with the existing treated leachate quality • EC average (26800 µS/cm) indicates a slight increase from previous reporting periods; • SO_4 averages (820 mg/L) appears to be fairly consistent with the existing treated leachate quality • Zn levels (average 6.4mg/L) are lower than previous monitoring periods • NH_3 concentrations (average 427 mg/L) remained stable over the course of the reporting period

	• TOC (average 3573 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 (45425 µS/cm) indicates a slight increase from previous reporting periods; • SO_4 averages (5690 mg/L) is consistent with previous reporting periods; • Zn levels (average 163 mg/L) is also consistent with historical levels; • NH_3 concentrations (average 181 mg/L); • TOC average (4675 mg/L) has increased from the previous reporting period. 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. While the indicator trends for this location indicate some variability this is not uncommon after extended periods of dry weather.
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 5.6 confirms acidic nature of water that comes in contact with the void walls and is generally consistent with previous results • EC (average 3333 µS/cm) is generally consistent with previous results; • SO_4 trends upwards (average 7000 mg/L) from the previous reporting period. • K average of 10.8 mg/L is generally consistent with previous results • Zn (average 179 mg/L) is generally consistent with previous results; • NH_3 (average 9.2 mg/L) and TOC (average 36 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 902 mg/L is consistent with previous reporting periods; ● SO_4 (average 8970 mg/L) is consistent with previous reporting periods ● EC (average 17783 µS/cm) remains within the overall average. 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 99.5 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.
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 2.8) which is consistent with previous reporting periods ● EC (average 29645 µS/cm) is slightly higher previous reporting periods ● Zn levels (average 6020 mg/L) shows a slight increase from the previous reporting period ● NH_3 concentrations (average 40.15 mg/L) showed higher than usual result over the reporting period; ● TOC averages 24 mg/L remains consistent with previous reporting periods Due to inconsistent Conductivity, TDS and Nitrogen concentrations reported in May 2020, we believe this may be a result of an analysis issue at the laboratory. Veolia notes that post this date, sample results have returned to averages consistent with historical data.

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 8.89) is slightly lower than previous reporting period; • EC (average 463167 µS/cm), BOD (average 37.2 mg/L) and COD (5662 mg/L) is consistent with monthly and previous reporting period results • NH_3 concentrations (average 6.9 mg/L) remained stable over the reporting period • Chloride averages (8698 mg/L) remained stable over the reporting period. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

1.5.4 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 1.5.4** 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 1.5.4 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 (8.55) is consistent with the previous reporting period EC (34400 µS/cm) is consistent with the previous reporting period; • SO_4 one of the dominant anions, (502 mg/L) is consistent with previous reporting readings;

	• Pb (0.151 mg/L) and Zn (3.35 mg/L)) is consistent with the previous reporting period • NH_3 (2900 mg/L) is consistent with previous reporting; • TOC (5850 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 (8.61) is generally consistent with previous reporting period; • EC (44500 µS/cm) is consistent with the previous reporting period and is generally consistent with the overall annual average for this location; • SO_4 (328 mg/L) is lower than previous reporting period; • Both Pb and Zinc are consistent with the previous reporting period, .0753 mg/L and 1.85 mg/L respectively. • TOC (9140 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 7.94) consistent with throughout reporting period and meets proposed Targets; • EC (average 23742 µS/cm) remains stable, consistent with throughout the reporting period; • NH_3 (average 2.19 mg/L) is well below proposed Targets; • BOD (4 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.

1.5.5 Bioreactor Groundwater Monitoring Results

Groundwater quality monitoring at 20 locations was undertaken in this reporting period as required by the EPL, comprising 1 annual and 3 quarterly rounds of monitoring for 17 of the 20 locations. The results of

which are summarised in **Table 1.5.5** below. Detailed data is provided in Tables **9.1** – **9.20** (refer **Appendix 4**).

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 1.5.5.19)** provided in **Appendix 5**.

***Table 1.5.5* 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 776.1 m RL) was slightly lower than previous reporting periods due to insufficient rainfall events; • pH (average 7.78) neutral – to slightly alkaline consistent with previous reporting period; • EC (average 1599 µS/cm) is lower than but generally consistent with previous readings representing fresh water; • SO_4 (average 247 mg/L) is generally consistent with previous periods; • Pb and Zn (average 0.0368 mg/L and 0.258 mg/L respectively) are generally consistent with previous periods. • NH_3 (average 0.1) is consistent with previous reporting periods. • TOC (2 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 776.6 m RL) was consistent with long term average since 2004; • pH (average 7.3) neutral, consistent with previous reporting period;

	• EC (average 7845 µS/cm) and SO_4 (average 3985 mg/L) is consistent with previous periods; • Pb (average 0.0005 mg/L) indicates a stable trend consistent with the previous reporting period. • Zn (average 0.01 mg/L) is generally consistent with previous reporting periods. • NH_3 (0.2 mg/L) is consistent with previous monitoring periods of non detection rates; • TOC (2 mg/L) shows a slight decline 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 789.9 m RL) was consistent with long term average since 2004; • pH (average 7.4) near neutral is consistent with previous reporting period; • EC (average 1902 µS/cm) is consistent with previous readings representing fresh water; • SO_4 (average 26.9 mg/L) is stable; • Pb (average 0.0002 mg/L) and Zn (average 0.016 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 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 772.56 m RL) was consistent with long term average since 2004; • pH (average 5.76) slightly acidic, consistent with previous reporting period; • EC (average 1597 µS/cm) represents fresh water salinity and is consistent with previous period. This trend is reflected in SO_4 (average 165 mg/L) results for this period; • Pb (average 0.0051 mg/L) remains stable while Zn (average 0.921 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 (2 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 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 774.6m RL) was consistent with historical results; • pH (average 6.21) slightly acidic consistent with previous reporting period; • EC (average 3563 µS/cm) represents brackish water and the trend is mirrored by SO_4 (average 461 mg/L) consistent with previous periods; • Pb (average 0.001 mg/L) and Zn (average 7.7 mg/L) is consistent with previous periods; • TOC (5.0 mg/L) and NH_3 average of 0.1 mg/L is consistent with previous monitoring periods. This bore was not sampled in Quarter 2 of the reporting period due to being dry.
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 783.5 m RL) was consistent with long term average since 2004; • pH (average 7.5) neutral is consistent with the previous reporting period; • EC (average 8785 µS/cm) and SO_4 (average 142.5 mg/L) follow a similar stable trend to previous reporting periods ; • Pb (average 0.0169 mg/L) is consistent throughout the reporting period whilst Zn (average 0.3 mg/L) shows a fluctuating trend consistent with historical cycles; • NH_3 (0.076 mg/L) is consistent with previous monitoring periods of non detection rates; • TOC (5 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 780.3m RL) was consistent with previous monitoring periods; • pH (average 7.4) neutral is consistent with previous reporting periods; • EC (average 9147 µS/cm) is of brackish quality consistent with previous readings; • SO_4 (average 3577 mg/L) mirrors EC and is generally consistent with previous periods; • Pb (average 0.0002 mg/L) is stable while Zn (average 0.007 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 (2 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 783.3 mRL) was consistent with previous monitoring periods; ● pH (average 7.4) is neutral – slightly alkaline and consistent with previous reporting period; ● EC (average 7669 µS/cm) indicating brackish water and SO_4 (average 973 mg/L) follow similar trends consistent with previous periods; ● Pb (0.0146 mg/L) remains stable while Zn (6.19 mg/L) is consistent with previous monitoring periods. ● NH_3 (0.1 mg/L) is at non detection rates; ● TOC (6 mg/L) is lower 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 742.3m RL) is consistent with previous monitoring periods; ● pH (average 7.6) neutral – to slightly alkaline consistent with previous reporting period; ● EC (average 3254 µS/cm) represents slightly brackish water, and is consistent with previous historical records; ● SO_4 (average 1802 mg/L) is similar in trend to EC and demonstrating a long term upward trend; ● Both Pb (average 0.351 mg/L) and Zn (average 5.3 mg/L) remain consistent with previous reporting periods. ● NH_3 (average 0.1 mg/L) is close to, or within, non-detection rates; ● TOC (2 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 783.2mRL) is consistent with long term averages; ● pH (average 7.67) neutral is consistent with the previous period. ● EC (average 12741 µS/cm) is representative of saline water and consistent with the previous reporting period; ● SO_4 (average 333 mg/L) is consistent with previous monitoring periods.

	• Pb (average 0.0035 mg/L) and Zn (average 0.055mg/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 (4 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 785.82 m RL) is consistent with the previous reporting period; • pH (average 6.3) is slightly acidic, but stable and consistent with previous reporting period; • EC (average 14986 µS/cm) represents brackish to slightly saline water, consistent with previous reporting period; • SO_4 (average 303.7 mg/L) mirrors EC's stable trend; • Pb (average 0.0367 mg/L) and Zn (average 0.668 mg/L) are both similar to the previous reporting period and generally consistent with historical fluctuations. • NH_3 (average 0.086 mg/L) is close to, or within, non-detection rates; • TOC (4 mg/L) is consistent with previous monitoring period 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 1 of the 4 quarterly monitoring samples were obtained due to the bore being dry from Quarter 2 onwards 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 783.38 m RL) is shallower than previous reporting periods; • pH (average 4.25) shows slight acidification from previous reporting periods; • EC (average 17700 µS/cm) shows a slight increase from previous reporting period results; • SO_4 (average 5640 mg/L) continues to show a slight increase but is generally consistent with previous periods; • NH_3 (average 0.1 mg/L) is close to, or within, non-detection rates; • Pb, Zn and TOC were not analysed due to lack of water during the monitoring period. A spike in Potassium, consistent with an increase in EC and TDS might indicate that the sample extracted was muddy due to water level being very low to dry. The lower than usual pH remains unclear, but possibly related to dewatering of ED3N. The water quality in the bore will continue to be monitored quarterly to identify a trend and potential causes.
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 783.79m RL) was consistent with long term average since 2004; • pH (average 7) slightly acidic to neutral consistent with previous reporting period. • EC (average 5181 µS/cm) represents brackish water which is consistent with previous readings; • SO_4 (average 1189 mg/L) mirrors EC consistent with previous periods; • Pb (average 0.0245 mg/L) and Zn (average 4.4 mg/L) are both consistent with previous periods; • NH_3 (0.1 mg/L) is at non detection rates; • TOC (4 mg/L) is consistent with previous monitoring period 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 785.76m RL) was consistent with previous reporting period; • pH (average 7.13) consistent with previous reporting period; • EC (average 10972 µS/cm) remains stable, consistent with previous reporting period for brackish water; • SO_4 (average 4092 mg/L) is consistent with previous periods; • Pb (average 0.015 mg/L) and Zn (average 0.374 mg/L) were both generally consistent with historical results. • NH_3 (0.078mg/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 780m RL) was consistent throughout this reporting period; • pH (average 7.5) is neutral; • EC (average 12757 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 735.8 mg/L) is consistent; • Pb (average 0.072 mg/L) and Zn (average 13.5 mg/L) were both generally consistent in this reporting period. • NH_3 (0.1 mg/L) is at non detection rates; • 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.
MB33	In October 2019, Veolia collaborated with E2W to install MB33, a 75m deep groundwater monitoring bore to replace a waste covered well (WM4) in the Void. This bore was added to the EPL sampling regime in March 2020, and sampled from Quarter 2 of this reporting period. Based on the results provided in **Table 9.17** (refer **Appendix 4**), the groundwater quality at this location can be described as: • SWL (average 749.16m RL) was consistent throughout this reporting period; • pH (average 11.4) showing consistent alkalinity; • EC (average 1858 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 400 mg/L) is consistent; • Pb (average 0.21 mg/L) and Zn (average 2.1 mg/L) were both generally consistent in this reporting period. • NH_3 (0.4 mg/L) is close to, or within, non-detection rates; • TOC (6 mg/L) reflecting natural conditions is consistent throughout this reporting period. The alkalinity of this monitoring bore is likely due to the construction method involving gravel packing and cement grouting, cement of which is largely made up of calcium oxide. Veolia intends to engage a suitably qualified contractor to carry out a flushing of this bore prior to the first quarterly sampling of the 2020-21 reporting 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 777.58m); • pH (average 7.34) being neutral, was consistent throughout the reporting period; • EC (average 3330 µS/cm) remains stable, consistent with for fresh to brackish water; • SO_4 (average 392 mg/L) is consistent with the previous reporting period; • Pb (average 0.0002 mg/L) and Zn (average 0.381 mg/L) were both generally consistent in this reporting period. • Cu (0.003mg/L) reflected low to non-detectable; No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period. *Please note that the fluctuation in metals concentrations evident in Quarter 3 of the reporting period is due to being analysed in “total” as opposed to “dissolved”, due to an COC oversight. All concentrations returned to normal level in Quarter 4.
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 778.01m); • pH (average 8.0) consistent throughout this reporting period; • EC (average 5853 µS/cm) remains stable, throughout the reporting period; • SO_4 (average 254 mg/L) is consistent with the previous reporting period; • Pb (average 0.0002 mg/L) and Zn (average 0.152mg/L) were both generally consistent and reflected low to non-detectable. • Cu (0.005 mg/L) reflected low to non-detectable; No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period. *Please note that the fluctuation in metals concentrations evident in Quarter 3 of the reporting period is due to being analysed in "total" as opposed to "dissolved", due to an COC oversight. All concentrations returned to normal level in Quarter 4.
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 780.62m); • pH (average 6.98) consistent throughout this reporting period; • EC (average 1678 µS/cm) remains stable for fresh to brackish water; • SO_4 (average 636mg/L) is consistent with the previous reporting period; • Pb (average 0.0002 mg/L) and Zn (average 2.042 mg/L) were both generally consistent and reflected low to non-detectable. • Cu (0.013 mg/L) reflected low to non-detectable; No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period. *Please note that the fluctuation in metals concentrations evident in Quarter 3 of the current reporting period is due to being analysed in "total" as opposed to "dissolved", due to an COC oversight. All concentrations returned to normal level in Quarter 4.

1.5.6 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 1.5.6** below and detailed quarterly levels are provided in **Tables 10.1 – 10.5** (refer **Appendix 4**)

Table 1.5.6 **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 776.04 m RL to 776.18 m RL during this reporting period. • SWL in P38B (deep) ranged from 770.45 m RL to 770.78 m 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 752 m RL to 756.5m RL and is stable. • SWL in P200B (deep) showed a range of 751.6 m RL to 756.5 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 764.05 m RL to 764.15 m RL and is stable. • SWL in P58B (deep) is similar to previous reporting period fluctuating between 738.65 m RL and 741.91 m 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 782.53 m RL to 785.38 m RL in this reporting period, consistent with previous reporting period. • SWL in P59B (deep) ranged between 782.31 m RL and 784.98 m 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 735.68 m 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 700.16 m RL and 700.81 m RL which indicates water above the base level of 698.29 m RL which has been recorded in previous periods. Based on the recent review of the Groundwater well network in the void (undertaken by E2W), it is intended that P100B is developed by flushing, as monitoring results indicate potential silting has occurred.

1.5.7 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 1.5.7**, which shows that the dam levels and required freeboard requirements. At no point did the water level in each dam exceed the free board limit. Veolia have the capacity to move water if required in the event water levels rise. Also outlined in the Project approval, water can be moved from ED3S to ED2, as ED2 is now HDPE lined by Heron Resources Ltd.

Additional monitoring is conducted for other dams managed by Veolia.

Table 1.5.7 **Bioreactor Evaporation Dam Volume Monitoring Results (RLs AHD)**

	ED3 South		ED3 North				ED1	ED1N
Date	**ED3S**	**ED3S-S**	**ED3N -1**	**ED3N - 2**	**ED3N - 3**	**ED3N - 4**	**Coffer Dam**	**Legacy**
24/09/2019	790.78	792.13	790.03	790.93	790.07	791.10	786.96	785.80
23/10/2019	790.65	792.02	787.40	791.07	791.03	791.05	786.99	785.85
25/11/2019	790.42	791.82	Empty	790.72	790.89	790.86	786.91	785.85
17/12/2019	790.25	791.66	Empty	790.28	790.79	790.71	786.90	785.67
28/01/2020	790.11	791.41	Empty	790.08	789.91	790.53	786.77	785.40
27/02/2020	790.42	791.63	Empty	790.21	789.55	790.55	786.93	785.50
26/03/2020	790.65	791.64	Empty	790.19	789.47	790.52	787.02	785.41
28/04/2020	790.73	791.75	Empty	790.12	789.46	790.48	787.15	785.44
27/05/2020	790.8	791.77	Empty	789.86	789.57	790.50	787.31	785.49
22/06/2020	790.88	791.78	Empty	789.53	789.71	790.55	787.45	785.51
31/07/2020	790.17	791.57	Empty	789.51	789.81	790.54	787.64	785.54
25/08/2020	790.87	792.15	Empty	790.28	790.28	790.62	787.98	785.96
Minimum	790.11	791.41	787.40	789.51	789.46	790.48	786.77	785.40
Mean	790.56	791.78	788.72	790.23	790.05	790.67	787.17	785.62
Maximum	790.88	792.15	790.03	791.07	791.03	791.10	787.98	785.96
Max Freeboard	791.2	793.6	791.2	791.2	791.2	791.2	789.92	788.8

1.5.8 Bioreactor Meteorological Monitoring Results

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

Meteorological data is logged in 60 minute and 24 hour intervals and can be made available for the 2019/2020 reporting period upon request. Servicing and calibration of the meteorological station is carried out quarterly by Hydrometric Consulting Services.

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

The meteorological data for the reporting period is detailed in **Table 11.1** (refer **Appendix 4**) A summary of rainfall data is presented in **Table 1.5.8.**

Table 1.5.8 **Rainfall Statistics by Month (mm)**

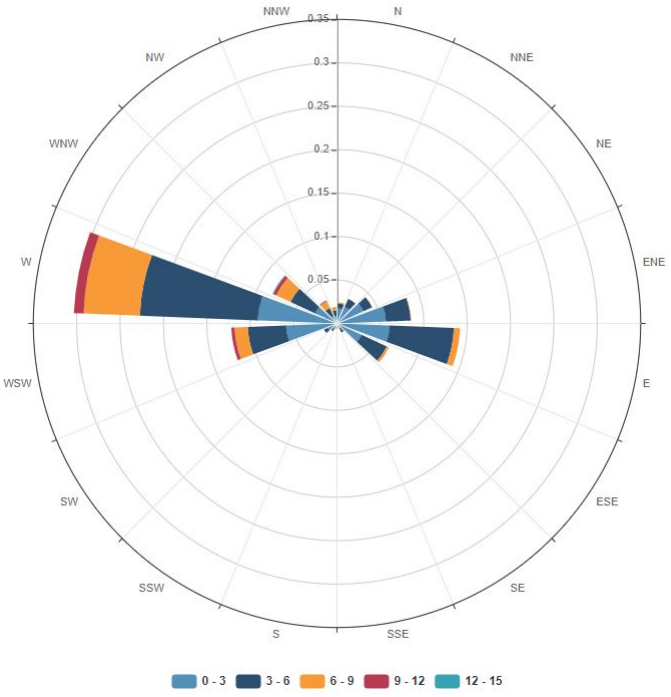
Month	Days of Rainfall	Total Rainfall (mm)	Daily Average (mm)	Daily Maximum (mm)
September 2019	5	36.5	1.21	19
October 2019	7	24	0.77	11.5
November 2019	5	11.5	0.38	9
December 2019	1	2.5	0.08	2.5
January 2020	7	15	0.48	8
February 2020	11	140	4.82	55
March 2020	9	88.5	2.85	25
April 2020	7	76.5	2.55	18
May 2020	8	33	1.06	17
June 2020	8	33.5	1.11	17
July 2020	10	35	1.12	19
August 2020	14	208	6.71	80
Total	**92**	**704**	**23.14**	**281**

According to the Woodlawn Weather Station, total rainfall over the reporting period was 704mm, well above the annual average from 2010-Present of 458.5mm. The highest monthly rainfall occurred in August 2020 with 208mm, the wettest day of which was 9th August 2020 with 80mm of rainfall (the most rainfall recorded in a 24 hour period since 2010). The lowest monthly rainfall was recorded in December 2019, at just 2.5mm.

Wind speed, direction and sigma theta (which are used to calibrate turbulence) are logged at 60-minute intervals, the data from which is used to respond to odour and noise complaints, on receipt.

Figure 1.5.8 indicates average wind speed and direction in Tarago, based on the Woodlawn Weather Station.

Figure 1.5.8 Average Wind Speed (m/s) and Direction



The wind rose above depicts the average wind speed and direction recorded at 10m above ground level from September 2019 - August 2020.

The maximum wind speed ranged from 94.3km/h to 100.1km/h, with an average wind speed and direction ranging from WNW 15.6km/h to NW 15.0km/h over the 2019-20 reporting period.

Over the 5 year period, the winds prevailed predominantly from the West North West in the general direction of the Tarago Village.

Part 2 EPL 11455 Crisps Creek Intermodal Facility

2.1 Crisps Creek IMF Operations

Veolia operates the Crisps Creek Intermodal Facility (IMF), which is comprised of a rail siding, container storage hardstand and mobile infrastructure located adjacent to the regional Bombala railway line network (approximately 1 km south of Tarago train station and 8 km from the Bioreactor), to enable transfer of containerised waste received by rail from Sydney onto road trucks and subsequently to the Bioreactor for disposal.

2.2 Crisps Creek IMF Licence Conditions

The IMF is operated under EPL 11455 which details the operating conditions and environmental monitoring requirements as noted in **Table 2.2**.

***Table 2.2* IMF Licence Conditions**

Condition	Compliance with Condition
1. Administrative conditions	Noted
2. Discharges to air and water and application to land	**P1. Location of monitoring/discharge points and areas** These monitoring points have been documented in a monitoring location plan (**Appendix 3**) and a program is in place for sampling as required.
3. Limit conditions	**L1. Pollution of Waters** All clean surface and storm water collected at the IMF was diverted to the onsite retention system for storage, as part of the first flush stormwater management system, in this reporting period. Following rainfall events, surface water monitoring was undertaken to assess the water quality prior to discharge.
	L5. Waste All waste received at the IMF during this reporting period was in accordance with the waste types permitted in the EPL, received via rail from the Clyde and Banksmeadow Transfer Terminals in Sydney. All waste was maintained in sealed containers and transported to the Bioreactor and MBT facility on the same day.
	L6. Noise Limits No noise complaints were received during this reporting period indicating that noise from operational activities at the IMF was likely maintained within the 35 dB(A) LAeq (15 minute) criteria at the nearest residential receiver. Similarly, it can be inferred that noise from freight trains did not exceed 45 dB(A) LAeq (15 minute and 50 dB(A) LAeq (15 minute before and after 7:00 am respectively.

	Noise monitoring will be undertaken by Veolia on the receipt of any such complaints.
	L7. Hours of Operation All operational activities at the IMF including haulage of waste to the Bioreactor and MBT facility were undertaken between 6:00 am and 10:00 pm, Monday to Saturday during this reporting period as permitted under the DA.
	L8. Potentially Offensive Odour No odour complaints were received for the IMF during this reporting period.
4. Operating conditions	**O1. Activities Carried out in a Competent Manner** All licenced activities undertaken at the IMF in this reporting period were carried out in a competent manner and under a high standard of environmental management for which Veolia is certified under ISO 14001.
	O2. Maintenance of Plant and Equipment The maintenance and operation of all plant and equipment on the premises associated with the licenced activities was undertaken in a proper and efficient condition as required by qualified technicians. All major plant and equipment at the site is stored in a computerised maintenance management system in order to schedule and complete the required maintenance. All Veolia operators hold the appropriate qualifications and licenses to operate plant and equipment used as part of IMF operations.
	O3. Dust Control All operations and activities were carried out at the IMF in a manner to minimise dust at the boundary of the premises. These included operating on a hardstand site with fully paved access roads to the site. All haulage of waste to the Bioreactor and MBT facility occurred within enclosed containers. Monitoring for the presence and quantity of depositional dust is undertaken monthly to verify the performance.
	O4. Stormwater and Wastewater Management – Operating Phase The first flush stormwater management system was operated effectively in this reporting period in accordance with the EPL requirements to capture all the clean storm and surface water from the paved and sealed areas of the IMF. No sewage was removed from the IMF in this reporting period. Uncontaminated stormwater is permitted under the EPL to be utilised in vegetated areas of the IMF, as required.
	O5.Tracking of Mud and Waste As all waste container unloading and movements occurred within enclosed containers on a hardstand site, tracking of waste from the IMF did not occur during this reporting period. No opening of containers was required to be undertaken at the IMF during this reporting period.
	O6. Waste Transportation All containers utilised in the transportation of waste in this reporting period were maintained in accordance with the EPL requirements to minimise potential odour emissions. All containers had rubber seals to prevent the leakage of leachate during transport and handling activities.
	O7. Fire Extinguishment There were no fires at the IMF during this reporting period.

	O8. Fire Fighting Capability All Veolia operators are trained in handling emergency situations, which include fire fighting in accordance with the Woodlawn Eco-Precinct ERP (MAN-6297 WL - Eco-Precinct Emergency Response Plan). Fire extinguishers and a 20,000 litre water tank were maintained onsite during this reporting period to enable effective fire fighting capabilities. In addition, Crisps Creek and Mulwaree River are located adjacent to the IMF, which are approved and readily available water sources for fire fighting. The Tarago Fire Brigade is also located approximately 10 km from the IMF,which enables fast mobilisation to the site.
5. Monitoring and recording conditions	Noted, all compliance monitoring was carried out in this reporting period in accordance with EPL requirements, the results of which are detailed in Section 5.
6. Reporting conditions	Noted and addressed in this Report and the annual return documents, where relevant. Notifications to the EPA were undertaken in a timely fashion.
7. General conditions	Noted.
8. Pollution studies and reduction programs	N/A
9. Special Conditions	N/A

2.3 Crisps Creek IMF Environmental Monitoring Requirements

Veolia is required to monitor environmental performance of the IMF under the site EPL. **Table 2.3** details the EPA ID, Veolia monitoring point identification, frequency and the type of monitoring undertaken at each licensed point. A monitoring location plan is included in **Appendix 3**.

***Table 2.3* IMF Licensed Monitoring Points**

EPA ID	Veolia ID	Frequency	Type of Monitoring
1	Site 110 - Upstream	Quarterly	Surface Water
2	Site 150 - Downstream		
3	IMF First Flush		
4	DG18 IMF	Monthly	Dust / Particulates

Veolia also undertakes additional surface water quality monitoring at Site 130 (located upstream of Crisps Creek Intermodal in Mulwaree River) to provide additional background quality information.

2.4 Crisps Creek IMF Monitoring Results

2.4.1 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 2.4.1**. 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 2.4.1 **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. Three out of four quarterly monitoring requirements were fulfilled this reporting period due to lack of flow. Results provided in **Table 12.1** (refer **Appendix 4**) indicate the following trends: • pH is close to neutral (average 7.54, consistent with previous reporting periods; • EC (average 1115 µS/cm) is consistent with the historical data and representative of fresh water salinity; • SO_4 (average 101.4 mg/L) is consistent with previous reporting periods; • Fe (average 0.6 mg/L) is consistent with previous reporting periods, whilst Zinc indicates a fluctuating trend (average 0.3mg/L), consistent with historical cyclic results; • NH_3 (average 0.2 mg/L) is consistent with previous reporting periods and continues to be at non-detection levels. • TOC (average 13 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. Three out of four quarterly monitoring requirements were fulfilled this reporting period due to lack of flow. Results provided in **Table 12.2** (refer **Appendix 4**) indicate the following trends: ● pH (average 7.91) is slightly alkaline, consistent with the previous reporting period; ● EC (average 804 µS/cm) shows a fluctuating trend and is generally consistent with previous periods and fresh water salinity; ● SO_4 (average 40 mg/L) reflecting EC trend, is generally consistent with previous reporting periods; ● Fe and Zn, average 0.44 mg/L and 0.063 mg/L respectively indicate consistency with fluctuating cycles in previous reporting periods. ● NH_3 (0.2mg/L) continued to be not detected during this reporting period. ● TOC (average 9 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 7.39) is close to neutral, consistent with the previous reporting period; ● EC (average 136 µS/cm) shows a slight downward trend but is generally consistent with the previous period and representative of fresh water salinity; ● SO_4 (average 14 mg/L) is also slightly lower but generally consistent with previous reporting period; ● Fe and Zn, average 0.60 mg/L and 0.08 mg/L are generally consistent with the previous period but reflective of fluctuating cycles. ● NH_3 an average of (0.20 mg/L) is also is consistent with previous reporting period; ● TOC (average 8 mg/L) which is consistent with previous reporting period reporting periods. No significant variations or anomalies were recorded for any analyte tested at this location during this monitoring period.

2.4.2 IMF Dust Monitoring Results

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 2.4.2** and detailed in **Table 13.1** (refer **Appendix 4**).

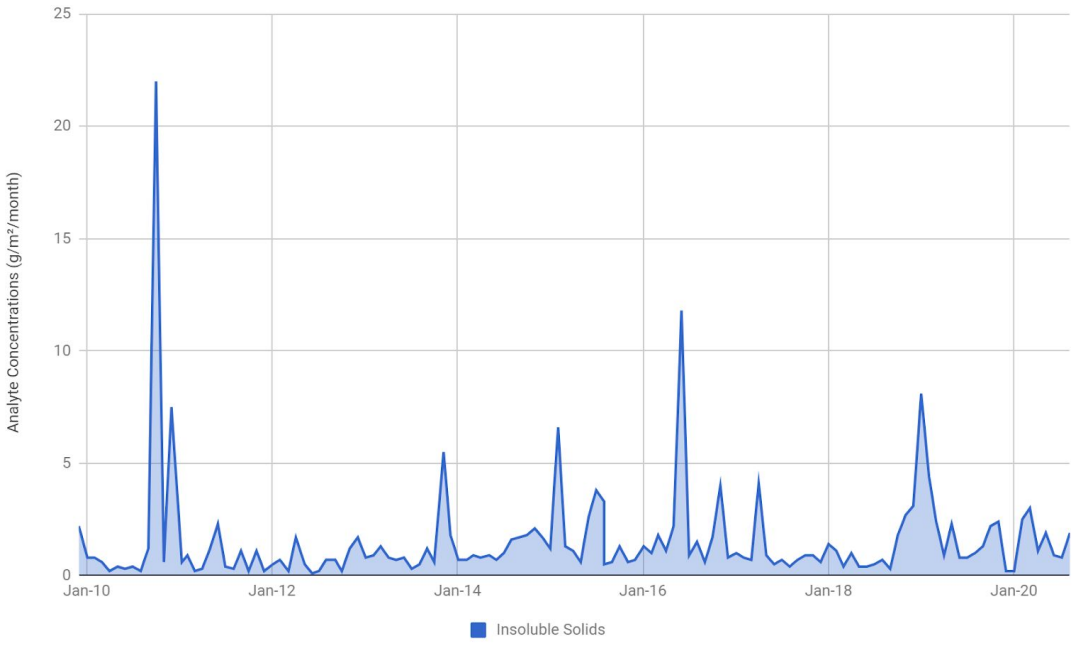
***Table 2.4.2* Dust Monitoring Results**

Dust Gauge	Summary Total Insoluble Solids (g/m²/month)		
	Minimum	Average	Maximum
DG18	0.2	1.5	3

The results at DG18 indicate an average level of total insoluble solid matter is 1.5 g/m^2/month, which is lower compared to overall historical trends as seen in the subsequent graph in **Figure 2.4.2.1.**

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..

***Figure 2.4.2.1* Crisps Creek IMF Depositional Dust Levels**



Part 3 Environmental Performance

3.1 Evaporation Dam Seepage Management Strategy

In accordance with Bioreactor EPL Condition U2.1 *(Condition Removed March 2020)*, Veolia was required to submit a management plan detailing the control and remediation measures proposed to be implemented to prevent the occurrence of seepage from ED1 and ED2 and rectify any water pollution that has occurred, by 30 September 2018. This management plan was submitted to the EPA on 28th September 2018.

Following an Ecological Risk Assessment undertaken by Niche Environment and Heritage, Earth2Water Pty Ltd was engaged to provide the management plan and strategy detailing potential solutions and strategies for the two dams.

It should be noted that the management and monitoring schedule for ED2 is part of Heron Resources responsibility, whilst the management, investigation & remediation of ED1 is Veolia's responsibility.

A summary of the groundwater Management Strategies for ED1 derived from the ED1 & ED2 Management is presented in **Table 3.1.1**.

Table 3.1.1 ED1 Management Actions

Dams	Action	Progress
ED1	Installation of Evaporators	Complete
	Empty ED1 through evaporators and site wide water balance by 2023	Ongoing
	Installation of 300mm Clay, and HDPE liner at ED1 Coffer Dam	Complete
	Phase 1: Groundwater and Surface Water Assessment Monitoring of Natural Attenuation (MNA) Install two shallow bores ; one next to Spring 2 and one next to MB10	Complete
	Phase 2: Develop Trigger Values & Control Measures (as required) Dependent on monitoring data and trends to determine remedial works	Ongoing

3.1.1 Groundwater Monitoring

Three new shallow monitoring bores were installed as recommended in the E2W Management Strategy Report. One located next to MB10 (deep well) and two located close to other existing water sampling locations, FRC (not a licenced monitoring point) and Spring 2. These are known as SP2-MW1, MW-FRC and MB10S

Trigger values and water quality trends such as significant increases in heavy metal concentrations (eg. Zn, Cu, Pb) and EC are monitored to determine if additional control measures and/or remedial works are required.

Groundwater monitoring results show that heavy metal concentrations remain fairly low with no significant changes in historically reported results. These are summarised in **Table 3.1.2.**

Table 3.1.2 Groundwater Heavy Metal Concentrations 2019-20

Average Heavy Metal Concentrations (mg/L)			
Pollutant	**SP2-MW1**	**MW-FRC**	**MB10S**
Copper	0.003	0.005	0.013
Lead	<0.0002	<0.0002	<0.0002
Zinc	0.381	0.152	2.402

With only *2* years of data for the new monitoring bores installed towards the end 2018, and early 2019, the intention is to continue sampling for the following 2 to 3 years to determine the effectiveness of the evaporation plan of the legacy water in ED1. This will outline trigger points requiring further assessment.

As part of a detailed investigation by AECOM in 2016, 10 additional monitoring bores not included in the EPL were installed. These sampling points will be used to augment licenced monitoring points and will be assessed on a 6 monthly basis to compare against baseline data established in 2016. Veolia will continue to engage with Earth2Water or other suitable hydrologists to provide commentary on the data for future reports and guidance on any changes required as part of the management of the dam.

To support the investigation, groundwater monitoring results for the EPL bores can be found in **Section 1.5.5** and depicted in the trend graphs **(Figures 1.5.5.17 – 1.5.5.19)** provided in **Appendix 5**.

3.1.2 Surface Water Monitoring

Surface water monitoring results show that heavy metal concentrations, with zinc being of particular interest, remain fairly low with no significant changes in historically reported results. These are summarised in **Table 3.1.2**

Table 3.1.2 Surface water Heavy Metal Concentrations 2019-20

Average Heavy Metal Concentrations (mg/L)			
Pollutant	**Site 105**	**Site 115**	**Spring 2**
Copper	0.002	0.005	0.010
Lead	0.008	0.001	0.099
Zinc	0.680	0.046	1.790

Overall, the concentration of heavy metals remains consistently low indicating that ED1 is not causing measurable impacts on the groundwater or surface water system.

3.2 Trial of Alternative Daily Cover

In December 2019, Veolia submitted an application to the EPA soughting to vary the conditions of the Bioreactor EPL to permit a trial of the use of Mixed Waste Organic Outputs (MWOO) as an alternative daily cover (ADC).

The EPA approved a trial of MWOO as ADC. The approval permitted Veolia to undertake a trial within the Bioreactor void tipping areas over a 6 month period commencing from 25 May 2020.

A progress report was submitted to the EPA in August 2020 indicating positive preliminary results in relation to the reduction in odour and covering capabilities. A comprehensive report will be prepared by an independent consultant as required under condition O6.30 of the EPL will be submitted to the EPA on completion of the trial.

Based on the trial results to date, Veolia anticipate that the MWOO will prove a suitable alternative cover material for future use at the Woodlawn Bioreactor.

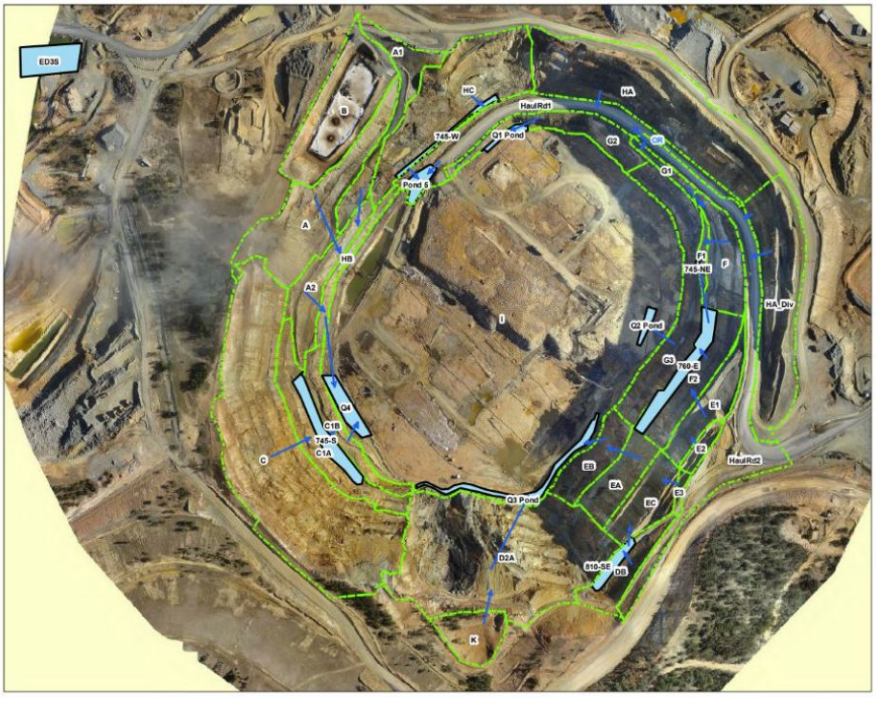
3.3 Stormwater Management

Stormwater management is one of the most critical aspects of the Bioreactor's operation. Effective capture and efficient removal of stormwater from the void makes up an integral part of the leachate minimisation strategy.

Veolia is committed to continuous process improvement. As a result, a complete upgrade of the existing stormwater management system was designed and installed to deal with 1/100 year rain events. With a total rainfall of 704mm over the reporting period, the new stormwater management system was commissioned and performed well. During commissioning the stormwater system was tested by a 150mm rainfall event over a single weekend.

The landfill void has been divided into multiple sub-catchment areas as shown in **Figure 3.3.1** below.

Figure 3.3.1 **Woodlawn Void Stormwater Sub-catchment Areas**



The upgraded stormwater management system no longer relies on the extraction of stormwater from a single collection point within the void. Innovative design using multiple catchments above the waste level and robust configuration using multiple pumps with backup contingency at critical locations that pump independently has improved the Bioreactor's ability to handle significant rainfall events.

Each sub-catchment has either natural or engineered drainage and flow control infrastructure, such as concrete dish drains, clay berms, pumps and pipes, to manage surface water. These systems are designed to minimise the amount of surface water flow from the void walls onto the waste, reducing the potential generation of leachate from surface water flows.

The current stormwater management system is composed of 3 on-duty pumps, 7 buffer ponds, as well as the related water drain, diversion and delivery pipework system. Detailed information on the movement of stormwater within the system is outlined in **Table 3.3.1**.

***Table 3.3.1* Stormwater Management Transfer Register**

Pond	Catchment Area	Destination	Transfer Method
5	The entire Void wall area	ED3S	On-duty: ● Pioneer pump via DN500mm PN10 pipe for about 100m then split to 3 of DN280mm PN8 pipe to ED3S. ● Weir pump via DN200mm PN10 pipe for about 100m then to DN280mm PN8 pipe to ED3S; Backup: ● Sykes HH220i via the same pipe of the on-duty pump.
745W	A, A1, A2, HB, HC	Pond 5	Gravity drain via DN250mm pipe to Pond 5.
745SW	A, A2	Pond 5	On duty: Sykes HH160i through DN500mm pipe to ED3S. Gravity drain via DN250mm pipe for overflow to Pond 5.
745S	C, C1A, A2, A, A1, B	Pond 745SW	On duty: Sykes HH160i through DN500mm pipe to ED3S. Gravity drain via DN250mm pipe for overflow to Pond 745W.
Q3	DB, D2A, E3, EA, EB, EC, K	Pond 5	Sykes HH220i pump (100-120 L/s) via DN280mm and DN500mm pipe to ED3S.
745NE	F, F1, F2	Pond 5	Gravity drain and overflow via 2 of DN250mm PN8 pipe
760E	E1, E2	Pond 745NE	2 of HH160i pumps via DN400mm pipe to ED3S.

When stormwater accumulates on the covered landfill surface, testing for ammonia is undertaken to determine water quality and suitability for discharge into ED3S. Surface water collected on the covered landfill surface is drained to temporary storage ponds and is transferred to Pond 5.

Where surface water comes in contact with waste or leachate, it is managed as leachate through the site leachate management system. A quality control indicator of <15mg/l of ammonia is used to determine the water quality.

3.4 Independent Audit Findings

The annual Independent Leachate and Water Management System (LWMS) Audit and annual Independent Leachate and Water Management System (LWMS) Audit were undertaken at the Woodlawn Bioreactor during this reporting period.

A number of mandatory and non-mandatory recommendations were developed as a result and discussed in **Table 3.4.1** and **Table 3.4.2**.

***Table 3.4.1* 2020 Independent LWMS Audit Findings and Corrective Actions**

Item	Recommendation	Implemented/Proposed Action
1.	Develop a long-term water usage plan with Heron following development of their site Water Balance. Seek to integrate the Veolia and Heron Water Balances as best as possible in future iterations.	Awaiting the restart of operations at Heron to actively pursue this strategy. Until this occurs, Veolia is focussed on the effective evaporation of all site waters.
2.	Continue to seek opportunities to optimise the dam evaporation systems to maximise the removal of leachate from the system (e.g. positioning of mechanical evaporators, evaporator maintenance etc).	Veolia continues to optimise dam evaporation systems through new installations as well as the maintenance and improvement of existing systems.
3.	Continue to improve and optimise the LTP operation with the assistance of suitably qualified experts (as required).	Improvement projects are currently underway in order to reach the target throughput of 4L/s.
4.	Continue upgrades to the foam management system at the LTP and monitor the aeration tanks to ensure that a foaming incident does not occur again.	Deluge system is being constructed and will be commissioned in November 2020. Antifoam injection through the deluge system will provide additional control.
5.	Continue to monitor the impact of the Bioreactor on the surrounding community through an analysis of complaints registered with the site, to be included in the next Annual Review.	Veolia continues to engage with the community and individual complainants. Veolia is committed to minimising impacts on the local community. An analysis has been included in **Section 1.3.2** of this report.
6.	Continue to seek opportunities for leachate minimisation as the operation progresses and changes in the future.	Leachate minimisation strategies are continually reviewed as leachate generation

		affects gas generation and results in additional cost to treat and evaporate.

***Table 3.4.2* 2020 Independent Odour Audit Findings and Corrective Actions**

Item	Recommendation	Implemented/Proposed Action
1.	Continue to improve landfill gas capture from the Bioreactor.	Veolia will continue to optimize landfill gas (LFG) extraction and leachate management according to the strategies stated in the WIP 2020 to minimize the fugitive gas/odour emission.
2.	Continue to adequately maintain and manage the upgraded LMS to ensure it is operating in an optimum state and meeting leachate quality monitoring targets.	Veolia continues to upgrade the LMS in order to meet the desired leachate extraction rate from the Void, as well as meeting leachate quality monitoring targets.
3.	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 will be continuously conducted according to WIP 2020.
4.	Refine investigation of odour issues in the community and continue active engagement with the community through its existing odour complaints and response management strategy.	Veolia will continue to manage the odour complaints in-line with the complaints procedures.
5.	Continue to review aspects relating to the use of the IMF and waste transport activities to further improve its odour performance.	Veolia will continue to maintain and monitor the operation of the container and truck wheel washing practices on site.
6.	Develop a heightened awareness of the operability and maintenance of the biofilter-based odour control system at the MBT Facility,	Veolia will continue to make continuous improvements to the MBT Biofilter System in accordance with the Biofilter Operation and Maintenance manual for optimised performance.

Part 4 Conclusion

Based on the results of environmental monitoring undertaken at both the Bioreactor and IMF sites over the 2019-20 reporting period, the overall performance of the Woodlawn Eco-Precinct can be considered to be well managed. As part of Veolia's commitment to continuous development, the following improvements have been implemented.

4.1 Proposed Improvements

During this reporting period, Veolia implemented the recommendations for environmental and operational improvements identified in the 2018-19 Annual Performance Report as discussed in **Table 4.1.1**.

***Table 4.1.1* 2019/2020 Improvement Recommendation**

Item.	Recommendation	Implemented/Proposed Action
1.	Veolia should continue the current community liaison program (including the Woodlawn Community Liaison Committee (CLC) and the Tarago and District Progress Association Inc. (TADPAI) to notify affected/nearby residents of works and address concerns.	Veolia continues to liaise with the local community through both the CLC and TADPAI.
2.	Veolia should continue to improve landfill gas capture, management of fugitive emission and waste placement of the Bioreactor, including the continuous monitoring of performance. Re-develop the Woodlawn infrastructure Plan (WIP) for 2020.	Veolia continues to update the WIP with each waste lift.
3.	Continue to develop and optimise the operation of the Woodlawn Leachate Treatment plant, achieving a consistent treatment target of 4 l/sec.	Multiple concurrent projects were undertaken with the aim of achieving a consistent treatment target of 4 l/sec at the Woodlawn Leachate Treatment plant. Where this cannot be met, the original leachate dam treatment system is used to meet the required extraction rates is necessary.
4.	Veolia to engage a suitably qualified person to revise the site water balance to provide a more accurate assessment of how the leachate / water management system is tracking against its key objectives given that many of the assumptions from the 2017 water balance have changed. Water Balance to encompass Heron Resources water management objectives and ensure that the updated water balance is more accurate and continues to monitor all leachate / water	SLR completed an external audit of the Leachate and Water Management System in 2020.

	flows around the site. (ED1 evaporation, ED3N Lagoon system evaporation plan)	
5.	Review evaporation systems of ED1 mine legacy water and assess capabilities of the existing system and modify as required to meet the development consent requirements.	Several improvements have been made to the evaporation system at ED1 to ensure the legacy mine waters can be dealt with according to the development consent requirements.

Additional improvements proposed for the 2020-21 reporting period at the Bioreactor and the IMF are as follows in **Table 4.1.2**.

***Table 4.1.2* 2020/2021 Improvement Recommendations**

Item	Recommendation	Implemented/Proposed Action
1.	Engage suitably qualified persons to conduct a review of the Groundwater Monitoring Network in the vicinity of the Void	Veolia engaged Earth 2 Water (E2W) in March 2020 to assess the existing well network within the Void. A comprehensive review and report outlining recommendations was received in April 2020.
2.	Act on the recommendations of the Groundwater Monitoring Network review by installing two deep wells to replace previously decommissioned wells within the void (WM-3 & WM-7).	The installation of two new wells is scheduled for December 2020 in conjunction with E2W and Terratest.
3.	Increase the landfill gas extraction infrastructure including the installation of an additional blower and flares.	Progressively add new extraction wells as the surface area increases with the bioreactor. 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.	A new evaporative system will be fully implemented with the ED1 and ED1 coffer dam system. Expected completion is the end of November 2020.
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.	Continue to monitor ground and surface water quality and develop effective methods of identifying trends in heavy metal concentrations and natural attenuation. Develop a 6-monthly monitoring regime for monitoring bores not included in the EPL condition.
6.	Implement a Dams Safety Management System including the development of a Dams Safety Emergency Plan (DSEP) in order to meet new regulatory requirements.	Carry out review of existing dams management strategy and consult with Heron Resources in developing a collaborated DSEP for the Woodlawn Eco-Precinct.

Reference and Related Documents

Document Name
Earth2Water (2020) Woodlawn Bioreactor - Review of Groundwater Network in the Void, 30 April 2020
Earth2Water (2018) Woodlawn Bioreactor - EMP for ED1 & ED2, 27 September 2018
Niche (2018) Woodlawn Evaporation dams ED1 and ED2, June 2018
The Odour Unit (2020) Woodlawn Bioreactor Expansion Project Independent Odour Audit #8, September 2020
SLR Consulting (2020) Independent Audit Leachate and Water Management System, August 2020
EPA (2014) Waste Classification Guidelines: Part 1 Classifying Waste, November 2014
EPA (2016) Environmental Guidelines: Solid Waste Landfills Second Edition, 2016, April 2016
Veolia (2019) Annual Environmental Performance Report – Woodlawn Bioreactor and Crisps Creek Intermodal Facility, November 2019
Veolia (2018) MAN-13298 WL - Bioreactor Landfill Environmental Management Plan (LEMP), 30 August 2018
Veolia (2020) MAN-6297 WL - Eco-Precinct Emergency Response Plan (ERP), 26 June 2020

Appendices

Appendix 1 Site Location Map

Appendix 2 EPL Boundary Map

Appendix 3 Monitoring Locations Map

Appendix 4 Tabulated Monitoring Results

Appendix 5 Monitoring Trend Graphs

Appendix 6 Complaints Register