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Raymond Choy
Environmental Manager - Woodlawn
Veolia Environmental Services (Australia) Pty Ltd
Woodlawn Eco-Precinct Facility
619 Collector Road
TARAGO, NSW 2580

16 February 2024

by email: raymond.choy@veolia.com

VEOLIA WOODLAWN ECO-PRECINCT FACILITY – OUTCOMES FROM THE RESAMPLING OF LTD & ED3N

Dear Raymond,

The following letter-style report documents the outcomes from the resampling of the following sources at the Veolia Environmental Services (Australia) Pty Ltd (**Veolia**) Woodlawn Eco-Precinct Facility, Tarago, New South Wales (the **Woodlawn Bioreactor Facility**), namely:

- Leachate Treatment Dam (**LTD**);
- Evaporation Dam 3 North (**ED3N**)-2; and
- ED3N-4

1. Relevant Background and Context

In February 2023, The Odour Unit (**TOU**) undertook the 11th Independent Odour Audit (**IOA**) at the Woodlawn Bioreactor Facility. Amongst other matters, the 11th IOA identified that the specific odour emission rate (**SOER**) values were higher than that reported in the Environmental Assessment Woodlawn Expansion Report dated August 2010 (**EA 2010**). As a result, a resampling visit was undertaken on 20 July 2023 with the objective of evaluating the conditions of the LTD, ED3N-2, and ED3N-4 from an odour emissions perspective. The July 2023 odour sampling and testing outcome indicated that ED3N-4 and the LTD had significantly reduced, but ED3N-2 had not yet improved. Veolia engaged TOU to undertake a follow-up resampling visit to evaluate the LTD, ED3N-2, and ED3N-4 since the July 2023 odour sampling and testing session to address this matter.

2. Odour Sampling Protocol

. Under all sessions, the LTD, ED3N-2, and ED3N-4 were sampled at identical locations, namely:

- LTD:
 - Aerobic zone, near the bridge; and
 - Anoxic zone, near the ramp.
- ED3N-2:
 - Eastern corner; and
 - Northern corner.
- ED3N-4:
 - South-eastern corner; and
 - North-western corner.

Furthermore, all samples were collected as per the sampling and laboratory testing protocols adopted in the 11th IOA. As such, the methodology is not reproduced in this letter report. The resampling visit was undertaken by TOU on 30 January 2024.

3. Odour Testing Results

The odour laboratory results report for the July 2023 and January 2024 sampling sessions are **appended** to this letter report. A summary of all results since the 11th IOA is provided in **Table 1**.

Table 1 – Comparison of odour testing results: LTD, ED2N-2 and ED3N-4									
Sample Location		SOER (ou.m ³ /m ² .s)						EA 2010 Value	
		11 th IOA		July 2023		January 2024		SOER Range	SOER Model Input
		Value	Odour Character	Value	Odour Character	Value	Odour Character		
LTD	Aerobic	52.9	rotten egg, sewage	0.855	earthy, muddy water, rotten, ammoniacal	0.562	dirty, ammoniacal, fishy	0.1 - 7.4*	3.6
	Anoxic	8.58	rotten egg	8.99		0.562			
ED3N-2	Eastern corner	7.66	rotten egg, dirty, muddy	21.2	rotten egg, muddy water	2.57	faecal, dirty, rotten egg	0.1 – 7.4	0.2*
	Northern corner	10.8	rotten egg, muddy water	95.7	rotten egg	3.33	faecal, dirty, rotten egg, vomit		
ED3N-4	South-eastern corner	7.12	rotten egg, muddy water	0.0549	muddy water	1.56	faecal, dirty, vomit	0.1 – 0.7	0.7**
	North-western corner	15.5	rotten egg, muddy water	0.122	muddy	27.2	faecal, dirty		
	Aeration zone			--			4.53	faecal, dirty	--

* partially / fully treated leachate

** includes groundwater and fully treated leachate

Based on the results documented in **Table 1**, the following remarks are made:

- The LTD has returned to normal operating performance from an odour emissions perspective (0.562 ou.m³/m².s). The derived SOER values are within the EA 2010 SOER range (0.1 – 7.4 ou.m³/m².s) and below the modelled input value (3.6 ou.m³/m².s);
- ED3N-2 has significantly improved from an odour emissions perspective since July 2023 (21.2/95.7 ou.m³/m².s compared with 2.57/3.33 ou.m³/m².s). The derived SOER values are within the EA 2010 SOER range (0.1 – 7.4 ou.m³/m².s) but higher than the modelled input value (0.2 ou.m³/m².s); and
- ED3N-4 appears to have increased since July 2023 (0.0549/0.122 ou.m³/m².s compared with 1.56/27.2 ou.m³/m².s). The derived SOER values are above the EA 2010 SOER range (0.1 – 0.7 ou.m³/m².s) and the modelled input value (0.7 ou.m³/m².s).

Overall, the LTD and ED3N-2 appear to be trending towards optimal operating conditions from an odour emissions perspective. However, further attention is required on ED3N-4 (refer to **Section 4**).

4. Follow-up Actions/Recommendations

Based on the outcomes documented in **Section 3**, the follow-up actions/recommendations are made:

- LTD – continue under the current operating and monitoring protocols;
- ED3N-2 – continue under the current operating and monitoring protocols;
- ED3N-4 – implement one or more of the following odour risk minimisation measures:
 - **Follow-up Action 1** - Conduct a targeted campaign in the north-western corner using additional aeration. This can be achieved by utilising the compressed air infrastructure and a diffuser system.

Lead-time: approximately four (4) weeks from the date of the letter report.

- **Follow-up Action 2** – Enhance mechanical surface aeration on the west bank of the pond.

Lead-time approximately six (6) to eight (8) weeks from the date of the letter report.

TOU expects that the recommended follow-up actions will gradually improve the condition of ED3N-4 from an odour emissions perspective.

- As an initiative-taking measure, consider undertaking a bench-scale trial to investigate the efficacy of chemical dosing measures (such as hydrogen peroxide or equivalent) to temporarily enhance and manage dissolved oxygen levels in the pond system under emergency/upset scenarios. Given the complex chemistry of the ED3N pond system, the trial should follow a systematic process consisting of the following phases as a minimum:
 - **Phase 1** - Development of a trial plan that identifies and establishes the sampling and testing protocols and key performance metrics;
 - **Phase 2** – Review and implement the trial plan;
 - **Phase 3** – Analysis of the results and evaluate the effectiveness of the implemented trial plan from Phase 2.
 - **Phase 4** - If necessary, repeat Phase 2 and Phase 3. Otherwise, progress to Phase 5.
 - **Phase 5** – If all key performance metrics reflect a feasible outcome for a chemical dosing scenario, develop a trigger action response plan for its application in the future. Otherwise, if the trial identifies that a chemical dosing scenario is not effective or feasible, document the outcomes of the trial plan for future reference.

Yours sincerely,

The Odour Unit



Michael Assal MEngSc, B. Eng (Hon)/B.Sc, AMIChemE, MIEAust, CAQP
Operations Manager

Attachment: Odour laboratory results report - 21 July 2023 & 31 January 2024

Odour Concentration Measurement Report

Sampling and Laboratory Information

Organisation	Veolia Environmental Services	Telephone	02 4844 6262
Contact	M. Rakete	Email	marek.rakete@veolia.com
Sampling Site	Woodlawn, NSW	Sampling Personnel	TOU (JS, SM)
Sampling Method	AS/NZS 4323.3 & 4323.4	Laboratory Location	Mascot, NSW

Order and Project Information

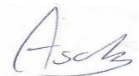
Order requested by	M. Rakete	Order accepted by	M. Assal
Date of order	14 July 2023	TOU Project #	N1806L.11
Order number	7500001994	Project Manager	M. Assal
Signed by	M. Rakete	Panel Operator	A. Schulz

Investigated Item	Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian/New Zealand Standard: Stationary source emissions – Part 3: <i>Determination of odour concentration by dynamic olfactometry</i> (AS/NZS 4323.3). The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Measuring Range	The measuring range of the olfactometer is $2^2 \leq \chi \leq 2^{18}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. The machine is not calibrated beyond dilution setting 2 ¹⁷ . This is specifically mentioned with the results.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained at 22 °C ±3 °C.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Used	The olfactometer used during this testing session was: TOU-OLF-004
Laboratory Precision	The precision of this laboratory (expressed as repeatability) for sensory quality must be $r \leq 0.477$ in accordance with the AS/NZS 4323.3. $r = 0.461$ Compliance – Yes
Laboratory Accuracy	The accuracy of this laboratory for sensory quality must be $A \leq 0.217$ in accordance with the AS/NZS 4323.3. $A = 0.216$ Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the olfactometer has been determined to be 16 ou, which is 4 times the lowest dilution setting.
Traceability	The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen. Note Disclaimers on last page of this document.

Accredited for compliance with ISO/IEC 17025 - Testing.
This report shall not be reproduced, except in full.

Date: Tuesday, 25 July 2023

Panel Roster Number: SYD20230721_054



A. Schulz
Authorised Signatory

Odour Sample Measurement Results
Panel Roster Number: SYD20230720_054

Sample ID / Location	Laboratory ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Final Odour Concentration (ou)
1806-11-080 ED3N4 (Sample 21)	SC23402	20/07/2023 0822 hrs	21/07/2023 1157 hrs	4	8	84
1806-11-081 ED3N4 (Sample 22)	SC23403	20/07/2023 0835 hrs	21/07/2023 1225 hrs	4	8	197
1806-11-085 LTD Aeration Zone (Sample 31)	SC23404	20/07/2023 1058 hrs	21/07/2023 1335 hrs	4	8	1,330
1806-11-083 ED3N2 (Sample 17)	SC23405	20/07/2023 0927 hrs	21/07/2023 1359 hrs	4	8	35,700
1806-11-084 LTD Anoxic Zone (Sample 30)	SC23406	20/03/2023 1033 hrs	21/07/2023 1510 hrs	4	8	13,800
1806-11-082 ED3N2 (Sample 16)	SC23407	20/07/2023 0932 hrs	21/07/2023 1531 hrs	4	8	156,000

Samples Received in Laboratory – From: J. Schulz Date: 20/07/2023 Time: 1405 hrs

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit:

1. The collection of samples by a method that is not prescribed by AS/NZS 4323.3.
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit have performed the dilution of samples.

Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppb)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS 4323.3 (Yes / No)
n-butanol	SYD20230721_054	44,800	$20 \leq \chi \leq 80$	1,261	36	Yes

Comments Odour characters (non-NATA accredited) as determined by odour laboratory panel:

Sample ID / Location	Laboratory ID	Odour Character	Sample ID / Location	Laboratory ID	Odour Character
1806-11-080 ED3N4	SC23402	muddy water	1806-11-083 ED3N2	SC23405	rotten egg, muddy water
1806-11-081 ED3N4	SC23403	muddy	1806-11-084 LTD Anoxic Zone	SC23406	earthy, muddy water, rotten, ammoniacal
1806-11-085 LTD Aerobic Zone	SC23404	earthy, muddy water, rotten, ammoniacal	1806-11-082 ED3N2	SC23407	rotten egg

Departures Clause 9.5.3 (d) – Cross-sectional distribution of airflow and concentration from port-openings are not checked due to impracticality of the requirement.

Disclaimers

- Parties, other than The Odour Unit, responsible for collecting odour samples have advised that they have voluntarily furnished these odour samples, appropriately collected and labelled, to The Odour Unit for the purpose of odour testing.
- The collection of odour samples by parties other than The Odour Unit relinquishes The Odour Unit from all responsibility for the sample collection and any effects or actions that the results from the test(s) may have.
- Any comments included in, or attachments to, this Report are not covered by the NATA Accreditation issued to The Odour Unit.
- This report shall not be reproduced, except in full, without written approval of The Odour Unit.

Report Status

Status	Version	Prepared by	Date	Checked by	Date	Change	Reason
Draft	0.1	A. Schulz	25/07/2023	M. Assal	25/07/2023	--	--
Final	1.0	A. Schulz	25/07/2023	M. Assal	25/07/2023	--	--
Revised	1.1	--	--	--	--	--	--

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 ABN: 87 102 255 765

Odour Concentration Measurement Report

Sampling and Laboratory Information

Organisation	Veolia (Australia & New Zealand)	Telephone	+61 472 571 387
Contact	R. Choy	Email	raymond.choy@veolia.com
Sampling Site	Woodlawn, New South Wales	Sampling Personnel	TOU (MA & SM)
Sampling Method	AS/NZS 4323.4, IFH	Laboratory Location	Mascot, NSW

Order and Project Information


Order requested by	R. Choy	Order accepted by	M. Assal
Date of order	15 January 2024	TOU Project #	N1806-012
Order number	Refer to correspondence	Project Manager	M. Assal
Signed by	Refer to correspondence	Panel Operator	A. Schulz

Investigated Item	Odour concentration in odour units 'ou', determined by sensory odour concentration measurements, of an odour sample supplied in a sampling bag.
Identification	The odour sample bags were labelled individually. Each label recorded the testing laboratory, sample number, sampling location (or Identification), sampling date and time, dilution ratio (if dilution was used) and whether further chemical analysis was required.
Method	The odour concentration measurements were performed using dynamic olfactometry according to the Australian/New Zealand Standard: Stationary source emissions – Part 3: 'Determination of odour concentration by dynamic olfactometry' (AS/NZS 4323.3). The odour perception characteristics of the panel within the presentation series for the samples were analogous to that for butanol calibration. Any deviation from the Australian standard is recorded in the 'Comments' section of this report.
Measuring Range	The measuring range of the olfactometer is $2^2 \leq \chi \leq 2^{18}$ ou. If the measuring range was insufficient the odour samples will have been pre-diluted. The machine is not calibrated beyond dilution setting 2^{17} . This is specifically mentioned with the results.
Environment	The measurements were performed in an air- and odour-conditioned room. The room temperature is maintained at $22 \text{ }^\circ\text{C} \pm 3 \text{ }^\circ\text{C}$.
Measuring Dates	The date of each measurement is specified with the results.
Instrument Used	The olfactometer used during this testing session was: TOU-OLF-004
Laboratory Precision	The precision of this laboratory (expressed as repeatability) for sensory quality must be $r \leq 0.477$ in accordance with the AS/NZS 4323.3. $r = 0.461$ Compliance – Yes
Laboratory Accuracy	The accuracy of this laboratory for sensory quality must be $A \leq 0.217$ in accordance with the AS/NZS 4323.3. $A = 0.216$ Compliance – Yes
Lower Detection Limit (LDL)	The LDL for the olfactometer has been determined to be 16 ou, which is 4 times the lowest dilution setting.
Traceability	The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. The assessors are individually selected to comply with fixed criteria and are monitored in time to keep within the limits of the standard. The results from the assessors are traceable to primary standards of n-butanol in nitrogen. Note Disclaimers on last page of this document.

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Date: Friday, 9 February 2024

Panel Roster Number: SYD20240131_005


A. Schulz
 Authorised Signatory

Odour Sample Measurement Results
Panel Roster Number: SYD20240131_005

Sample ID / Location	Laboratory ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Final Odour Concentration (ou)
1806-012-100 – ED3N-4 (NW)	SC24027	30.01.2024 0836 hrs	31.01.2024 1100 hrs	4	8	46,300
1806-012-101 – ED3N-4 (SE)	SC24028	30.01.2024 0843 hrs	31.01.2024 1154 hrs	4	8	2,660
1806-012-102 – ED3N-4 (Aerator Zone)	SC24029	30.01.2024 0915 hrs	31.01.2024 1220 hrs	4	8	8,190
1806-012-103 – ED3N-2 (E)	SC24030	30.01.2024 0937 hrs	31.01.2024 1324 hrs	4	8	4,470
1806-012-104 - ED3N-2 (N)	SC24031	30.01.2024 1010 hrs	31.01.2024 1356 hrs	4	8	5,790
1806-012-105 – LTD (Aerobic Zone)	SC24032	30.01.2024 1116 hrs	31.01.2024 1430 hrs	4	8	861
1806-012-106 – LTD (Anoxic Zone)	SC24033	30.01.2024 1101 hrs	31.01.2024 1514 hrs	4	8	861

Samples Received in Laboratory – From: TOU (J. Schulz)

Date: 30.01.2024

Time: 1520 hrs

Note: The following are not covered by the NATA Accreditation issued to The Odour Unit:

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Odour Panel Calibration Results

Reference Odorant	Reference Odorant Panel Roster Number	Concentration of Reference gas (ppb)	Panel Target Range for n-butanol (ppb)	Measured Concentration (ou)	Measured Panel Threshold (ppb)	Does this panel calibration measurement comply with AS/NZS 4323.3 (Yes / No)
n-butanol	SYD20240131_005	44,200	$20 \leq \chi \leq 80$	724	61	Yes

Comments Odour characters (non-NATA accredited) as determined by odour laboratory panel:

Laboratory ID	Odour Character	Laboratory ID	Odour Character
SC24027	faecal, dirty	SC24031	faecal, dirty, rotten egg, vomit
SC24028	faecal, dirty, vomit	SC24032	dirty, ammoniacal, fishy
SC24029	faecal, dirty,	SC24033	dirty, ammoniacal, fishy
SC24030	faecal, dirty, rotten egg		

Departures Clause 9.5.3 (d) – Cross-sectional distribution of airflow and concentration from port openings are not checked due to the impracticality of the requirement.

Disclaimers

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Draft	0.1	A. Schulz	09.02.2024	--	--	--	--
Final	1.0	--	--	M. Assal	09.02.2024	--	--
Revised	1.1	--	--	--	--	--	--

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