TO: **MARY WONG & SARA MADDISON**

COMPANY: **VEOLIA (AUSTRALIA) PTY LTD**

FROM: **MICHAEL ASSAL**

DATE: **19 NOVEMBER 2019**

JOB NO: **N1906L.03**

SUBJECT: **BANKSMEADOW WASTE TRANSFER TERMINAL FACILITY – ON-GOING ODOUR AUDIT PROGRAM: OCTOBER 2019**

1. Introduction

The following technical memorandum documents the findings and recommendations from an on-going, six-monthly odour audit program (**the Audit**) being conducted by The Odour Unit Pty Ltd (**TOU**) at the Veolia (Australia) Pty Ltd (**Veolia**) Waste Transfer Terminal Facility, 34/36 McPherson St, Banksmeadow, New South Wales (**BTT Facility**). The Audit documented in this memorandum report covers the outcomes from a visit conducted by a TOU Senior Engineer and TOU Consultant at the BTT Facility on 2 October 2019. Specifically, the memoradum report documents the following:

1. The results and findings from odour sampling and testing of the roof discharge stack as found during the Audit visit;

2. Documentation of field observations made during the visit that are relevant to odour management as well as the outcomes from smoke testing.

3. A review of the relevant documentation including the service logs for the preventative maintenance works undertaken on the building ventilation air extraction system and logged odour complaints between April 2019 and October 2019; and

4. The results from the field ambient odour assessment (**FAOA**) survey undertaken within the BTT Facility at both downwind and upwind locations.

2. Relevant Background

The BTT Facility was completed in June 2016 and is designed, at full capacity, to receive up to 400,000 tonnes per annum of putrescible waste, consisting of mixed waste including food from the municipal and commercial sectors. All received waste is delivered to the BTT Facility in enclosed waste collection trucks, before being compacted and placed in sealed containers for rail transport to Veolia's site at Woodlawn for subsequent treatment, recycling, energy recovery, and disposal where required. The BTT Facility is also approved to receive up to 100,000 tonnes per annum of non-putrescible (dry) waste from the municipal, commercial and industrial sectors for transfer to a new material recycling facility currently being scoped in Camellia.

The following report should be read in conjunction with previously issued documents relating to the BTT Facility, including:

1. A TOU report titled *Banksmeadow Waste Transfer Terminal Facility – Odour Audit Final Report* dated 26 May 2017 (**May 2017 Report**);
2. An email-based summary report titled *Banksmeadow On-going Odour Investigation - 2 August 2017 Summary* dated 21 September 2017 documenting the works undertaken on 2 August 2017 at the BTT Facility (**August 2017 Report**);

3. A TOU Report titled *Banksmeadow Waste Transfer Terminal Facility – On-going odour audit and investigation progress update: January/February 2018* issued on 23 February 2018 (**the February 2018 Report**);

4. A TOU report titled *Banksmeadow Waste Transfer Terminal Facility – On-going odour audit and investigation progress update: March to May 2018 (Rev 3)* issued on 31 May 2018 (**the March/May 2018 Report**);

5. A TOU report titled *Banksmeadow Waste Transfer Terminal Facility – On-going odour audit and investigation progress update: June 2018* issued on 28 June 2018 (**he June 2018 Report**);

6. A TOU report titled *Banksmeadow Waste Transfer Terminal Facility – On-going odour audit and investigation progress update: October 2018* issued on 13 November 2018 (**the November 2018 Report**); and

7. A TOU report titled *Banksmeadow Waste Transfer Terminal Facility – On-going odour audit and investigation progress update: April 2019* issued on 10 May 2019 (**the May 2019 Report**)

3. Odour Audit Methodology

3.1 Odour Sampling and Testing

The odour sampling and laboratory analysis methodology are well documented in the May 2017 Report. As such, it is not reproduced in this memorandum report.

The point source sampling method was utilised to collect samples from a 10-millimetre (**mm**) tap point created in the common plenum chamber of the two fan modules servicing the building ventilation extraction system at the BTT Facility. An illustration of the location and sampling technique is presented in **Photo 1**.

3.2 Odour Audit Logsheet

An extract of the logsheet utilised as part of the Audit visit is provided in **Figure 1**, which was developed in previous audits conducted at the BTT Facility.

3.3 Field Ambient Odour Assessment Survey

The methodology followed for the FAOA survey is well documented in the February 2018 Report. As such, it is not reproduced in this memorandum report. For the Audit, TOU extended the FAOA survey measurement period to five-minute intervals, with discrete measurement readings collected every ten seconds (i.e. 30 'sniffs' per measurement location point). The product of this measurement methodology is an intensity frequency pie graph. The odour impact criterion (i.e. the threshold that would be considered as increasing the likelihood in odour annoyance at downwind receptors) is set to an odour intensity of greater than 2 (Weak) and at a frequency of 10% per measurement cycle per location. This criterion is considered suitable given the industrial context of the BTT Facility. This detail is outlined in the FAOA map plot in **Figure 4**.

3.4 Smoke Testing

The methodology for smoke testing is documented in the May 2018 Report. As such, it is not reproduced in this memorandum report.

3.5 Review of relevant documentation

As part of the Audit, the following documentation was reviewed:

- Fan maintenance reports; and
- Odour complaints register between April 2019 and October 2019.

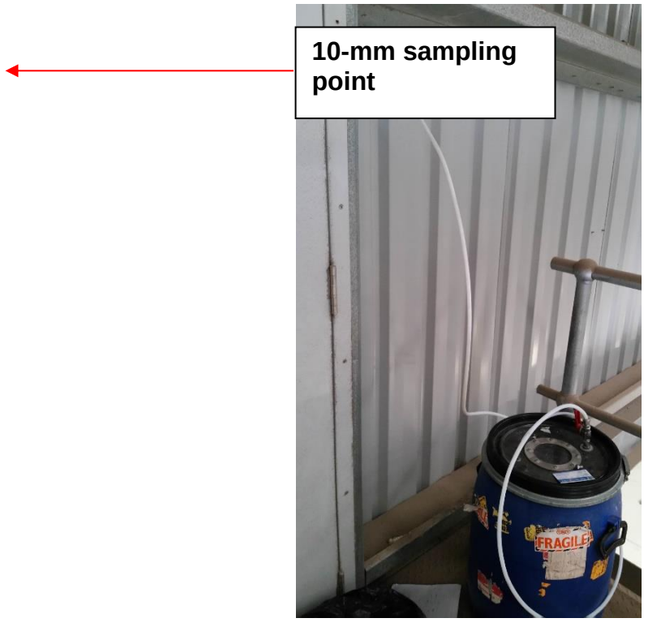


Photo 1 – An example of the roof discharge stack odour sampling point at the BTT Facility

Date		
Stack samples collected		
Waste tonnage on floor		
Observed local wind conditions		
Fan setting	**EF-01** **_____Hz** **_____Amps**	**EF-02** **_____Hz** **_____Amps**
Other comments		

Figure 1 – Odour audit logsheet showing the logging of key operational parameters and weather conditions

4. Results

The following section summaries the results from the sampling and testing conducted at the BTT Facility on 2 October 2019. The odour laboratory results report is enclosed as **Appendix A**.

4.1 Roof Discharge Stack Odour Emission Results

The roof discharge stack odour emission results are presented in **Table 1**. The historical trend between waste tonnage on the floor and the stack odour emission rate at the BTT Facility until 2 October 2019 is presented in **Figure 2**.

4.2 Smoke testing results

Several smoke release points were undertaken to evaluate airflow patterns and fugitive emission release within the BTT Facility building enclosure. The smoke release points included the northern, middle and southern areas of the BTT Facility building enclosure. A photo of a smoke testing point at the truck entry point of the BTT Facility building enclosure as occurred on 2 October 2019 is shown in **Photo 2**. The observations made during smoke testing are as follows:

- No smoke was found to be emanating from the sealed breezeways around the perimeter of the BTT Facility building;
- The released smoke was found to be well-contained with the BTT Facility building enclosure, suggesting that odour release at ground level is minimal; and
- The released smoke was found to gradually dissipate over time. This indicates that there is a very good level of air exchange turnover within the BTT Facility building enclosure.

4.3 Odour Audit Logsheet

The outcomes from the completion of the audit logsheet on 2 October 2019 is provided in **Figure 3**.

4.4 Field Ambient Odour Assessment Survey

The FAOA survey results as occurred on 2 October 2019 is provided in **Figure 4** and **Table 2**.

Table 1 – Comparison of stack odour emission results and recorded waste tonnage on the floor between January 2018 and 2 October 2019

Sample No.	Sampling Date	Sampling Time (hrs)	Measured stack odour concentration (ou)	Tonnage on waste floor (tonnes)	Stack design discharge airflow (m^3/s)	Calculated stack odour emission rate ($ou.m^3/s$)	Calculated stack odour emission rate per tonne of waste on the floor ($ou.m^3/s$)	Relevant comments
1	Monday, 8 January 2018	0930	1,450	390	109	158,100	405	--
2		1040	1,450			158,100	405	--
3	Tuesday, 9 January 2018	0940	1,720	150	55	94,080	627	Single fan operating
4		1002	1,450			79,320	529	
5	Wednesday, 10 January 2018	0942	861	30	55	47,100	1,570	Single fan operating
6		1015	939			51,360	1,710	
7	Thursday, 11 January 2018	0930	1,580	120	109	172,200	1,440	--
8		1029	1,720			187,500	1,560	--
9	Friday, 12 January 2018	0950	790	120	109	86,110	718	--
10		1032	395			43,060	359	--
11	Monday, 15 January 2018	0950	1,330	300	109	145,000	483	--
12		1100	1,450			158,100	527	--
Post-fan optimisation and service works								
13	Wednesday, 16 May 2018	1030	152	300	109	16,600	55	--
14		1035	197			21,470	72	--
Odour sampling campaign: June 2018								
1	Monday, 18 June 2018	0945	181	360	109	19,800	55	Refer to the June 2018 Report
2		1025	362			39,500	110	
3	Tuesday, 19 June 2019	0930	332	320		36,200	113	
4		0955	332			36,200	113	
5	Wednesday, 20 June 2018	0910	362	250		39,500	158	
6		0940	256			27,900	112	
7	Thursday, 21 June 2018	0925	181	350		19,700	56	
8		0950	235			25,600	73	
9	Friday, 22 June 2018	0925	91	200		9,920	50	
10		0950	91			9,920	50	
Odour audit as conducted on 11 October 2018								
1	Thursday, 11 October 2018	1145	152	500	114	17,300	35	Refer to the November 2018 Report
2		1325	181			20,600	41	
Odour audit as conducted on 10 April 2019								
1	Wednesday, 10 April 2019	1051	91	150	115	10,500	70	Refer to the May 2019 Report
2		1207	91	150	115	10,500	70	
Odour audit as conducted on 2 October 2019								
1	Wednesday, 2 October 2019	1405	157	180	104	16,400	91	Refer to **Appendix A**
2		1500	91	100	104	9,460	95	

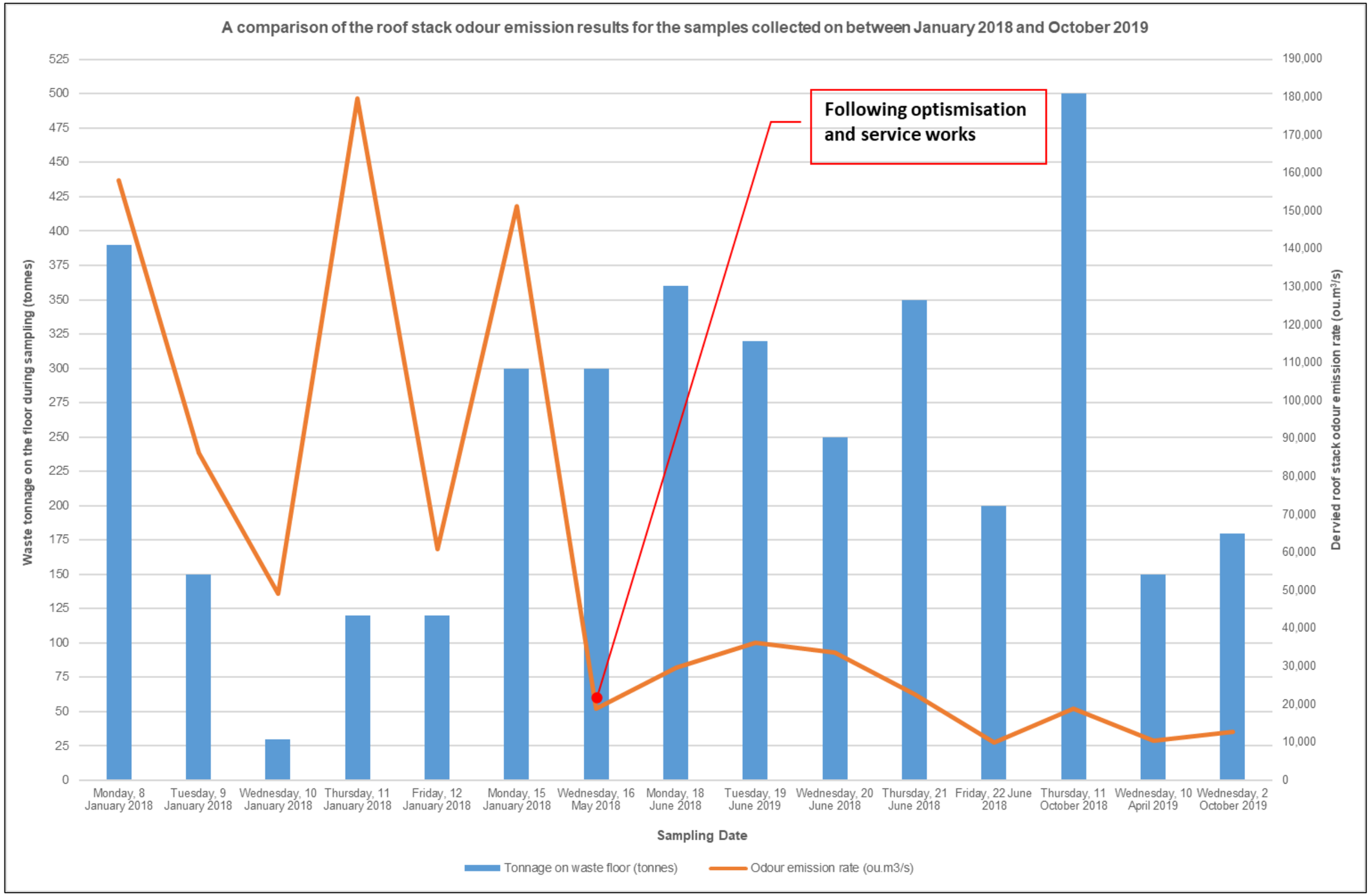


Figure 2 - Comparison of the roof stack odour emission rate between January 2018 and October 2019

Photo 2 – Smoke testing at the truck entry point of the BTT Facility building enclosure as occurred on 2 October 2019

Figure 3 – Completed audit logsheet as occurred on 2 October 2019		
Date	2 October 2019	
Stack samples collected	Stack Discharge 1 of 2 collected at 1405 hrs Stack Discharge 2 of 2 collected at 1500 hrs	
Waste tonnage on floor	Approximately 180 tonnes at 1405 hrs Approximately 100 tonnes at 1500 hrs	
Observed local wind conditions	Clear skies, light (0.5 – 2 m/s) to moderate (2 - 5 m/s) wind speeds oscillating between the westerly and easterly cardinal directions. The local ambient temperature was observed to be approximately 26ºC.	
Fan setting	**EF-01** ____54.6_____Hz ____68.3_____Amps	**EF-02** ____50.7_____Hz ____54.6_____Amps
Other comments	▪ EF-1 discharge stack reading = 19.0 m/s. ▪ EF-2 discharge stack reading = 19.0 m/s. ▪ Suction pressure reading at sampling point = -81 Pascals (**Pa**). ▪ Twenty-four (24) filled waste containers present on the concrete pad at approximately 1045 hrs. ▪ Breezeways permanently sealed around BTT Facility building. ▪ Good housekeeping observed across the BTT Facility (see **Photo 3, Photo 4, Photo 5** and **Photo 6**). ▪ Veolia advised that the air extraction plenum chamber was due to be completed in late-October 2019. At the time of writing, this should have been completed.	

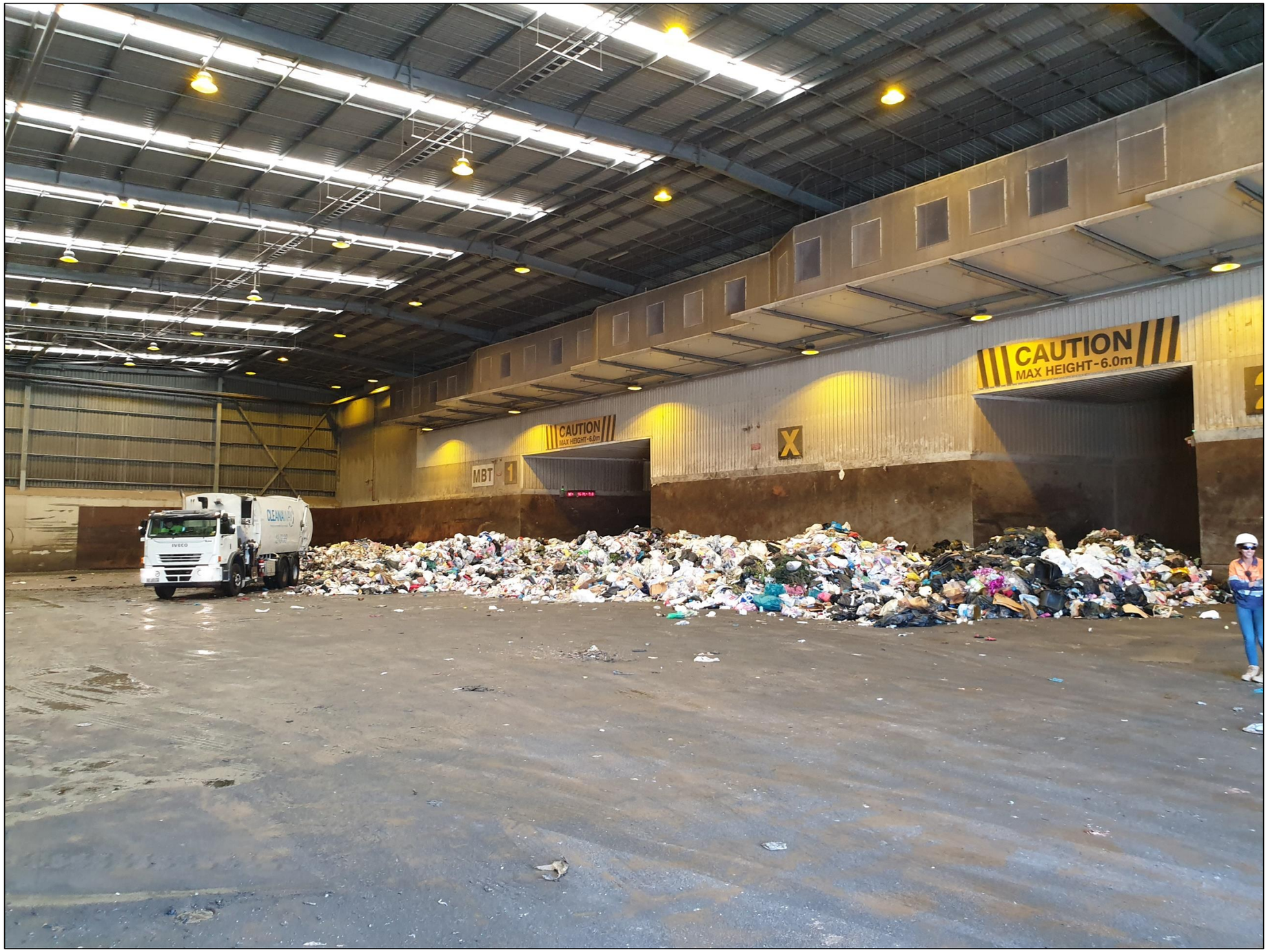
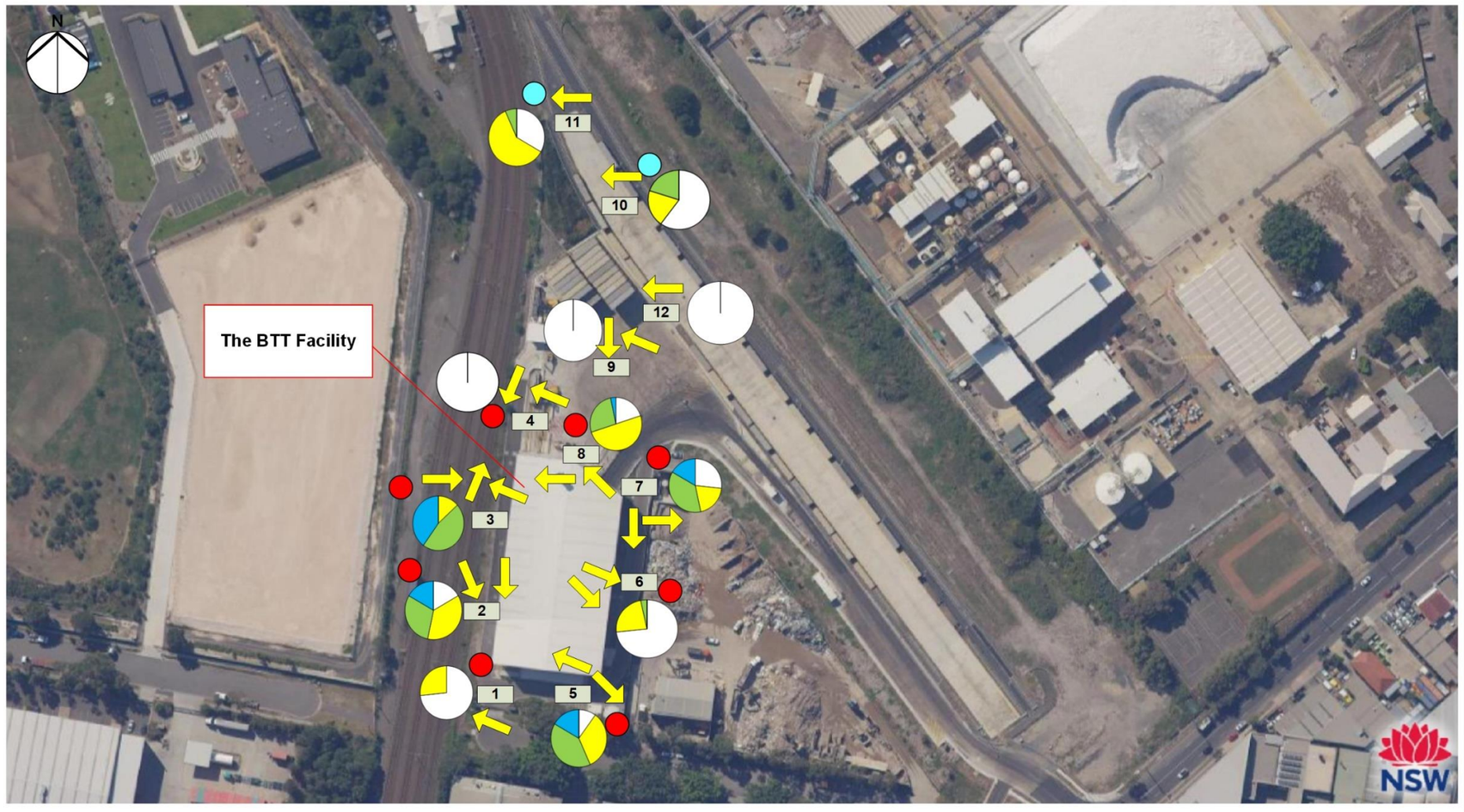


Photo 3 – A picture of the BTT Facility waste floor area as found on 2 October 2019 at 1424 hrs

Photo 4 – A picture of the BTT Facility concrete pad facing north-east on 2 October 2019 at 1507 hrs

Photo 5 – A picture of the BTT Facility concrete pad facing north-east on 2 October 2019 at 1507 hrs

Photo 6 – A picture of the BTT Facility truck entry point as found on 2 October 2019. Note: The truck entrance plastics strips were found to be in good condition



VDI 3882.1 Intensity	
0	Not detectable
1	Very weak
2	Weak
3	Distinct
4	Strong
5	Very Strong
6	Extremely Strong

Odour Character

- A – bin juice, sour
- B – other non-waste odours
- C – chlorine, musty

Legend

- 10 — Measurement location
- Intensity Frequency Pie Graph
- Local Wind Direction

Prevailing Local Wind Conditions

Clear skies, light (0.5 – 2 m/s) to moderate (2 – 5 m/s) winds oscillating between westerly and easterly wind direction. The ambient local temperature was approximately 26°C.

THE ODOUR UNIT

Veolia – Banksmeadow, NSW
Field Ambient Odour Assessment – Survey 1
Odour Impact Map

Field Ambient Odour Assessment Survey
Session Date: 02.10.2019 Session Time: 1345 hrs – 1505 hrs
Area: 1 Odour Impact Criterion: Intensity ≥ 2, Frequency ≥ 10%
Drawn By: M. Assal Revision: A Date: 01.11.2019

Figure 4 - FAOA survey odour impact map as conducted on 2 October 2019 between 1345 hrs and 1505 hrs (see **Table 2** for details)

Table 2 - FAOA survey logsheet: 2 October 2019 between 1345 hrs and 1505 hrs

Grid Reference Position	Time (hrs)	Wind Direction	Wind speed (m/s)	Odour Present (Y / N)	Odour character	VDI 3940 Intensity Scale 0-6 Range Detected	Is odour intensity ≥ 2 (Weak) and frequency of detection ≥ 10%	Comments
1	1345 – 1350	ESE	0.5	Y	bin juice, sour	0-1	No	▪ Localised odour from the activities at the BTT Facility, likely source indeterminate.
2	1352 – 1357	NNW – N	1-3	Y	bin juice, sour	0-3	Yes	▪ Localised odour from the activities at the BTT Facility, likely source indeterminate.
3	1359 – 1404	SSW-SE-W	1-3	Y	bin juice, sour	1-3	Yes	▪ Localised odour from the activities at the BTT Facility, likely source indeterminate.
4	1406 - 1411	NNE-ENE	1-5	N	no detection	0	No	▪ None
5	1415 - 1420	NW-ENE	1-5	Y	bin juice, sour	0-3	Yes	▪ Localised odour from the activities at the BTT Facility, likely source indeterminate.
6	1421 - 1426	WNW-NW	3-5	Y	bin juice, sour	0-2	No	▪ Localised odour from the activities at the BTT Facility, likely source indeterminate.
7	1427 - 1432	N-W	3-5	Y	bin juice, sour	0-3	Yes	▪ Localised odour from the activities at the BTT Facility, likely source indeterminate
8	1433 – 1438	E-SE	2-3	Y	bin juice, sour	0-2	Yes	▪ Localised odour from the activities at the BTT Facility, likely source indeterminate
9	1440 – 1445	N-ENE	3-5	N	no detection	0	No	▪ Localised odour from the activities at the BTT Facility, likely source indeterminate
10	1446 – 1451	E	3-5	Y	chlorine, musty	0-2	Yes	▪ Likely source was the nearby IXOM facility
11	1452 – 1457	E	3-5	Y	chlorine, musty	0-2	No	▪ Likely source was the nearby IXOM facility
12	1500 – 1505	E	3-5	N	no detection	0	No	▪ None

5. Odour Audit Findings

Based on the results and observations documented in **Section 4** of this memorandum report, the following findings are made:

- The roof discharge stack was found to be operating at a favourable odour performance level. Specifically, the odour performance of the roof discharge stack continues to be consistent with original design performance documented in the Wilkinson & Murray Air Quality Impact Assessment dated April 2014;

- At the current roof discharge stack performance, downwind odour impacts are very unlikely. The status quo is expected to be maintained under the current (and recently updated) operating and maintenance practices at the BTT Facility;

- A localised very weak to distinct odour was detectable within the boundary of the BTT Facility at several measurement location points (see **Figure 4**) during the FAOA survey. The odour character was 'bin juice, sour' and the likely source indeterminate;

- A 'chlorine, musty' odour was intermittently detectable during the FAOA survey at measurement location points 10 and 11 (see **Figure 4**). The likely source was the nearby IXOM facility based on the prevailing wind conditions at the time of the FAOA survey;

- It is understood that the BTT Facility continues to implement an active service and maintenance program for the waste containers (refer to the *NSW Resource Recovery – Container Maintenance*). It is also understood that the road sweeper is utilised twice daily. As such, given the current odour mitigation and management practices and stack testing results as found in the Audit, the localised odour within the BTT Facility detected during the FAOA survey is not expected to be problematical at nearby, off-site downwind locations. This is consistent with the near absence of odour complaints since the previous May 2019 Report (see point below);

- There were two odour complaints recorded over the period of April 2019 and October 2019. One of the two odour complaints (10 September 2019) was related to an upset condition at the BTT Facility where there was a machinery breakdown that affected the standard workflow on that day. The circumstance pertaining to the 29 April 2019 complaint is unclear. No further odour complaints were logged between April 2019 and October 2019;

- The smoke testing conducted within the BTT Facility building enclosure indicated positive results and suggests that the building ventilation air extraction system at the BTT Facility is operating in an optimum condition; and

- The service logs indicate that all required maintenance works on the building ventilation air extraction system at the BTT Facility since the previous May 2019 Report have been adequately undertaken, and the system is operating in a satisfactory condition.

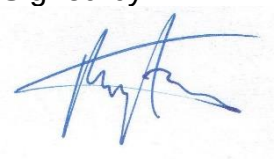
6. Concluding Remark

Given the results and findings as documented in this memorandum report, TOU is of the view that the BTT Facility is operating in a manner that is very unlikely to adversely impact the local amenity from an odour viewpoint under the measured and current operating circumstances as found in the Audit.

The next odour audit is due in **April 2020**.

The Odour Unit Pty Ltd

Signed by:



Michael Assal MEngSc, B. Eng (Hon)/B.Sc, AMIChemE, MIEAust, CAQP
Senior Engineer & Consultant

Attachments:

- **Appendix A –** Odour Laboratory Results Reports: 3 October 2019

THE ODOUR UNIT

APPENDIX A -

ODOUR LABORATORY RESULTS REPORT: 3 OCTOBER 2019

THE ODOUR UNIT PTY LTD

THE ODOUR UNIT

Level 3, Suite 12
56 Church Avenue
MASCOT NSW 2020

Phone: +61 2 9209 4420
Email: info@odourunit.com.au
Internet: www.odourunit.com.au
ABN: 53 091 163 061

NATA
Accreditation Number: 14974

Odour Concentration Measurement Report

The measurement was commissioned by:

Organisation	Veolia Environmental Services	Telephone	+61 2 9841 2924
Contact	S. Maddison	Facsimile	--
Sampling Site	Banksmeadow Transfer Facility	Email	sara.maddison@veolia.com
Sampling Method	Drum & pump, AS4323.3	Sampling Team	TOU

Order details:

Order requested by	S. Maddison	Order accepted by	M. Assal
Date of order	13.09.2019	TOU Project #	N1906L
Order number	7100180366	Project Manager	M. Assal
Signed by	S. Maddison	Testing operator	J. 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/NZS4323.3:2001**). 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: ODORMAT V04.
Instrumental Precision	The precision of this instrument (expressed as repeatability) for a sensory calibration must be $r \leq 0.477$ in accordance with the AS/NZS4323.3:2001. ODORMAT V04: $r = 0.154$ (February 2019) Compliance – Yes
Instrumental Accuracy	The accuracy of this instrument for a sensory calibration must be $A \leq 0.217$ in accordance with the AS/NZS4323.3:2001. ODORMAT V04: $A = 0.189$ (February 2019) 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 measurements have been performed using standards for which the traceability to the national standard has been demonstrated. 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.

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

Date: 4 October 2019

Panel Roster Number: SYD20191003_079

A. Schulz
NSW Laboratory Coordinator

J. Schulz
Authorised Signatory

Odour Sample Measurement Results
Panel Roster Number: SYD20191003_079

Sample Location	TOU Sample ID	Sampling Date & Time	Analysis Date & Time	Panel Size	Valid ITEs	Nominal Sample Dilution	Actual Sample Dilution (Adjusted for Temperature)	Sample Odour Concentration (as received, in the bag) (ou)	Sample Odour Concentration (Final, allowing for dilution) (ou)	*Specific Odour Emission Rate ($ou.m^3/m^2/s$) (See Note:1)*
Stack Outlet (1 of 2)	SC19533	2.10.2019 1405 hrs	3.10.2019 1030 hrs	5	10	--	--	157	157	--
Stack Outlet (2 of 2)	SC19534	2.10.2019 1500 hrs	3.10.2019 1105 hrs	5	10	--	--	91	91	--

Samples Received in Laboratory – From TOU Date: 02.10.2019 Time: 1600 hrs

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

1. The collection of Isolation Flux Hood (**IFH**) samples and the calculation of the Specific Odour Emission Rate (**SOER**).
2. Final results that have been modified by the dilution factors where parties other than The Odour Unit Pty Ltd have performed the dilution of samples.

THE ODOUR UNIT PTY LTD

Accreditation Number: 14974

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/NZS4323.3:2001 (Yes / No)
n-butanol	SYD20191003_079	51,400	$20 \leq \chi \leq 80$	724	71	Yes

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

SC19533 sweet, musty
SC19534 sweet, musty

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

END OF DOCUMENT