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Odour Monitoring
Orange City Council
North Orange Pump Station No. 1

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Geolyse Pty Ltd
PO Box 1963
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Orange City Council

North Orange Pump Station No. 1

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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by Geolyse Pty Ltd on behalf of Orange City Council (Council) to undertake odour monitoring from Orange City Council's, Orange North No, 1 Pump Station, located off the corner of the Mitchell Highway and Northern Distributor, Orange, New South Wales.

The objective of the testing was to provide data for the site specific monitoring results for the atmospheric dispersion modelling being undertaken in relation to the potential for odour impacts on the proposed encroaching residential development to the north of the city.

The following scope of work was undertaken:

- Perform odour emissions sampling at the No 1 pump station to collect data on source dimensions and other details required for modelling.
- Collect samples in triplicate from the No 1 pump station from the vent stack. Sampling to be conducted over three periods to allow daily variations in odour concentrations to be measured, and subsequently modelled:
 - Off-Peak – 11pm – 1am
 - Peak period – 7am - 9am
 - Off-Peak – 11am to 1pm
- Take additional samples as required once on-site. SLR Consulting took four additional samples, with two analysed as per Council direction. The two additional samples that were analysed were taken from the wet well and door vent during the peak morning period.

Table 1 summarises the samples taken from each source.

Table 1 Odour Monitoring

Parameter	Location			NSW Approved Test Method Number	NSW Approved Sampling & Analysis Method
	Vent Stack	Wet Well	Door Vent		
Flow and temperature	✓	--	--	TM-2	USEPA M2C
Odour	3 x Concurrent samples	Single Sample	Single Sample	OM-7	AS4323.3

Key:

AS Australian Standard

OM Other Method

TM Test Method

USEPA United States Environment Protection Agency

The monitoring occurred on the 12 June 2012 and 13 June 2012.

This report provides a summary of the odour monitoring undertaken. It outlines the sampling methodologies used, summarises the odour monitoring results obtained, including calculation of odour emission rates for each source and analyses the variation in odour emissions from each source.

2 METHODOLOGY

2.1 Introduction

All sampling and analysis was carried out in accordance with the Office of Environment and Heritage (OEH) *Approved Methods for Sampling and Analysis of Air Pollutants in NSW* (December 2006).

2.2 Flow and Temperature Sampling and Analysis – Stack / Point Sources

Flow and temperature sampling and analysis was performed in accordance with USEPA M2C. The velocity profile was obtained across the stack utilising an S-Type pitot tube and manometer.

The vent temperature was measured using a digital thermometer connected to a thermocouple probe.

2.3 Odour Sampling – Stack / Point Sources

Sampling of the shaft was performed in accordance with AS/NZS 4323.3: 2001 *Stationary source emissions. Part 3: Determination of odour concentration by dynamic olfactometry*.

The sample is drawn through a Teflon tube, into a single use, odour-free Nalophan sample bag secured inside a drum kept under vacuum using a pump.

2.4 Odour Analysis

All samples were labelled and handled in accordance with our QA/QC procedures and delivered to a Sydney based odour laboratory for testing. The laboratory used for the sampling campaign was Odour Research Laboratories Australian (ORLA). ORLA's laboratory is NATA accredited for AS/NZS 4323.3:2001 *Stationary source emissions. Part 3: Determination of odour concentration by dynamic olfactometry*.

As required by the Australian Standard, all samples were analysed within 30 hours of sampling. The odour concentration measurements were performed using dynamic olfactometry according to AS/NZS 4323.3:2001.

2.5 Odour Emission Rate Calculations

Results of the odour analysis for each sample were provided by the laboratory, expressed as Odour Units (OU) contained within each odour sampling bag. From this information, odour emission rates ($\text{OU.m}^3/\text{s}$) are calculated using information on the volumetric flow of odour containing air from a source.

2.5.1 Odour Emission Rates

Odour emission rates have been calculated for emissions from the Vent stack however odour emission rates could not be calculated from the wet well sample and door vent sample as the flow recorded was considered negligible.

3 RESULTS

3.1 Introduction

SLR Consulting completed all the sampling as per the relevant standards and methods and analysis of flow and temperature. As mentioned in **Section 2.4** ORLA completed the odour analysis, ORLA's NATA accreditation number is 15043, the Report Nos associated with this project are ORLA 5101/ORLA/01 - Revision C and 5101/ORLA/02 – Revision C.

Detailed emission test results for flow and temperature are presented in Appendix A. Appendix B contains ORLA's laboratory certificates of analysis. Appendix C contains photographs of the sampling locations, with Appendix D containing information about the vent stack sampling plane's compliance with AS4323.1.

The calibration details of the equipment used in the monitoring is presented in Section 4.

Results of the odour monitoring are presented in **Section 3.2** and **Section 3.3**.

3.2 Point Source Monitoring Results

Results of the odour monitoring from point sources are presented in **Table 2**.

Table 2 Summary of Monitoring Results

Location	SLR Sample ID No	Monitoring Date	Sampling Time	Velocity (m/s)	Volumetric Flow Rate (Nm ³ /s)	Odour Concentration (OU)
Vent Stack	1233	12/6/2012	2335-2350	0.96	0.05	1,688
Vent Stack	1234	12/6/2012	2350-0005	0.96	0.05	2,526
Vent Stack	1235	13/6/2012	0005-0020	0.96	0.05	1,237
Vent Stack	1239	13/6/2012	0758-0812	1.34	0.07	495
Vent Stack	1240	13/6/2012	0814-0828	1.34	0.07	1,148
Vent Stack	1241	13/6/2012	0835-0850	1.34	0.07	1,053
Wet Well	1242	13/6/2012	0800-0815	NA	NA	603
Door Vent	1243	13/6/2012	0825-0840	NA	NA	20
Vent Stack	1244	13/6/2012	1217-1230	1.36	0.07	1,148
Vent Stack	1245	13/6/2012	1230-1243	1.36	0.07	1,341
Vent Stack	1246	13/6/2012	1245-1258	1.36	0.07	896

Key:

ID No Identification Number

m/s metres per second

m³/s cubic metres per second

NA Not applicable – no flow could be measured from these locations

OU odour units

3.3 Site Odour Emission Rates

Based on the site specific monitoring data, total odour emissions per second from the stack vent have been calculated and are presented in

Table 3.

Table 3 Calculated Odour Emission by Source

Source	SLR Sample ID No	Sampling Time	SOER (OU.m ³ /s) (Dry)
Vent Stack	1233	2335-2350	86
Vent Stack	1234	2350-0005	129
Vent Stack	1235	0005-0020	63
Vent Stack	1239	0758-0812	33
Vent Stack	1240	0814-0828	77
Vent Stack	1241	0835-0850	71
Vent Stack	1244	1217-1230	78
Vent Stack	1245	1230-1243	91
Vent Stack	1246	1245-1258	61

Key:

OU.m³/s Odour units cubic metres per second

4 MONITORING INSTRUMENT CALIBRATION

Table 4 details the most recent calibration of each instrument used to take the measurements.

Table 4 Equipment Calibration Details

Asset Number	Name	Last Calibration /Check Date	Next Calibration / Due Date
1828	Time Piece	17/4/2012	17/7/2012
1805	Digital thermometer	17/4/2012	17/10/2012
1836	Thermocouple	23/5/2012	23/11/2012
1807	Manometer	31/3/2012	31/3/2013
1789	Barometer	5/3/2012	5/3/2013
1797	Gas meter	22/5/2012	22/5/2013

5 CLOSURE

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Table A - 5 Detailed Emission Test Results – 12 & 13 June 2012 – Off-Peak Evening Period

Odour	R1 Off-Peak Midnight Stack Vent	R2 Off-Peak Midnight. Stack Vent	R3 Off-Peak Midnight Stack Vent
Sampling Equipment	Stack Probe	Stack Probe	Stack Probe
Stack / Source Cross Sectional Area (m ²)	0.057	0.057	0.057
Sample Date	12-Jun-12	13-Jun-12	13-Jun-12
SLR Sample No.	1233	1234	1235
NATA Laboratory I.D No.	721481 / 3386	721482 / 3387	721483 / 3388
Sample Start Time	11:35	23:50	0:05
Sample Finish Time:	11:50	0:05	0:20
Average Stack / Surface Temperature (°C)	4.7	4.7	4.7
Average Stack / Surface Pressure (kPa)	95.00	95.00	95.00
Odour Concentration (Dry) (ou)	1,688	2,526	1,237
Average Stack / Surface Velocity (m/s)	0.96	0.96	0.96
Surface Odour Emission Rate (ou.m ³ /s/m ² wet)	NA	NA	NA
Mass Odour Emission Rate (Wet) (ou.m ³ /s dry)	86	129	63
Mass Odour Emission Rate (Dry) (ou.m ³ /s dry)	86	129	63
EPL MOER Limit (ou.m ³ /s dry)	NA	NA	NA
Odour Character	Organic waste composite, sewer, faeces, manure	Putrid, organic waste composite, faeces, sewerage, manure	Putrid, organic waste composite, sewerage, faeces, manure
Deviations from Test Method (Nil / Yes)	Nil	Nil	Nil
<i>If yes - specify deviations</i>	Nil	Nil	Nil
Sampling performed by (initials)	MB	MB	MB
Sample Analysed by (NATA Lab)	ORLA	ORLA	ORLA
Sample Storage Period	30-hrs	30-hrs	30-hrs
Calculations performed by (initial)	MB	MB	MB
Calculations checked by (initial)			

Table A - 6 Detailed Emission Test Results – 13 June 2012 – Peak Morning Period

Odour	R1 Peak Morning Stack Vent	R2 Peak Morning Stack Vent	R3 Peak Morning Stack Vent
Sampling Equipment	Stack Probe	Stack Probe	Stack Probe
Stack / Source Cross Sectional Area (m ²)	0.057	0.057	0.057
Sample Date	13-Jun-12	13-Jun-12	13-Jun-12
SLR Sample No.	1239	1240	1241
NATA Laboratory I.D No.	721488 / 3390	721489 / 3391	721490 / 3392
Sample Start Time	7:58	8:14	8:35
Sample Finish Time	8:12	8:28	8:50
Average Stack / Surface Temperature (°C)	12.5	12.5	12.5
Average Stack / Surface Pressure (kPa)	92.70	92.70	92.70
Odour Concentration (Dry) (ou)	495	1,148	1,053
Average Stack / Surface Velocity (m/s)	1.34	1.34	1.34
Surface Odour Emission Rate (ou.m ³ /s/m ² wet)	NA	NA	NA
Mass Odour Emission Rate (Wet) (ou.m ³ /s dry)	33	77	71
Mass Odour Emission Rate (Dry) (ou.m ³ /s dry)	33	77	71
EPL MOER Limit (ou.m ³ /s dry)	NA	NA	NA
Odour Character	Garbage tip, soiled nappy, burning vegetables	Rotting garbage, sour milk, sewerage, rotting banana skins, faecal	Garbage, wet, sewerage, rotting vegetable matter, soiled nappy, faecal
Deviations from Test Method (Nil / Yes)	Nil	Nil	Nil
<i>If yes - specify deviations</i>	Nil	Nil	Nil
Sampling performed by (initials)	MB	MB	MB
Sample Analysed by (NATA Lab)	ORLA	ORLA	ORLA
Sample Storage Period	30-hrs	30-hrs	30-hrs
Calculations performed by (initial)	MB	MB	MB
Calculations checked by (initial)			

Table A - 7 Detailed Emission Test Results – 13 June 2012 – Off-Peak Late Morning Period

Odour	R1 Off-Peak Midday Stack Vent	R2 Off-Peak Midday Stack Vent	R3 Off-Peak Midday Stack Vent
Sampling Equipment	Stack Probe	Stack Probe	Stack Probe
Stack / Source Cross Sectional Area (m ²)	0.057	0.057	0.057
Sample Date	13-Jun-12	13-Jun-12	13-Jun-12
SLR Sample No.	1244	1245	1246
NATA Laboratory I.D No.	721493 / 3395	721494 / 3396	721495 / 3397
Sample Start Time	12:17	12:30	12:45
Sample Finish Time	12:30	12:43	12:58
Average Stack / Surface Temperature (°C)	12.6	12.6	12.6
Average Stack / Surface Pressure (kPa)	92.70	92.70	92.70
Odour Concentration (Dry) (ou)	1,148	1,341	896
Average Stack / Surface Velocity (m/s)	1.36	1.36	1.36
Surface Odour Emission Rate (ou.m ³ /s/m ² wet)	NA	NA	NA
Mass Odour Emission Rate (Wet) (ou.m ³ /s dry)	78	91	61
Mass Odour Emission Rate (Dry) (ou.m ³ /s dry)	78	91	61
EPL MOER Limit (ou.m ³ /s dry)	NA	NA	NA
Odour Character	Bad sewerage, faeces, rotting meat, sour, dead fish, rancid	Sewerage, garbage, rotting odour, vomit	Sewerage, garbage, rotting odour, septic sewer, manure
Deviations from Test Method (Nil / Yes)	Nil	Nil	Nil
<i>If yes - specify deviations</i>	Nil	Nil	Nil
Sampling performed by (initials)	MB	MB	MB
Sample Analysed by (NATA Lab)	ORLA	ORLA	ORLA
Sample Storage Period	30-hrs	30-hrs	30-hrs
Calculations performed by (initial)	MB	MB	MB
Calculations checked by (initial)			

Appendix B

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Figure C - 1 Photograph of Vent Stack and Sampling Equipment

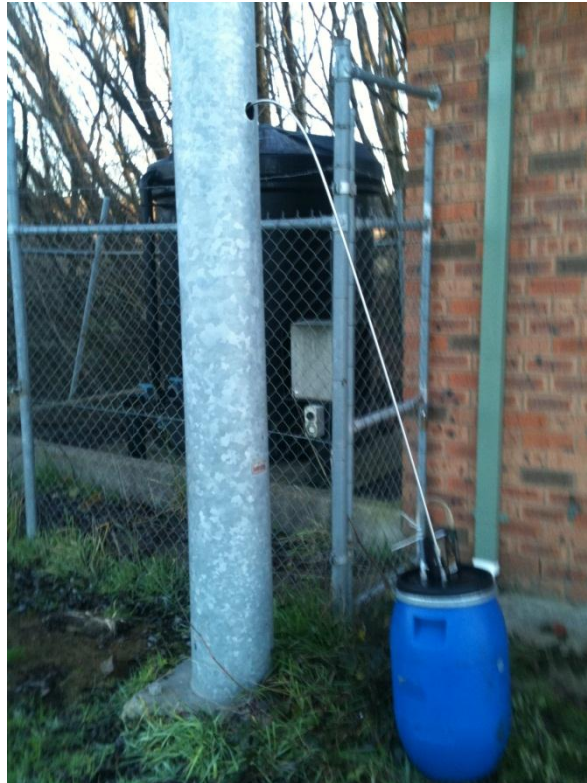


Figure C - 2 Photograph of Wet Well and Sampling Equipment



Figure C - 3 Photograph of Door Vent and Sampling Equipment



Sample Plane

Ideal sampling positions; In the absence of cyclonic flow activity ideal sampling plane conditions will be found to exist at 7-8 diameters downstream and 2-3 diameters upstream from a flow disturbance. However, in most cases, a suitable sampling plane will be a position fitting the minimum criteria specified in Table 1 of AS4323.1.

Non Ideal sampling position; If measurements near a bend is unavoidable, the sampling position shall be greater than one duct diameter upstream of the bend or greater than two duct diameters downstream of the bend. When the criteria in Table 1 of AS4323.1 cannot be met, a greater number of sampling points shall be used in order to retain as much accuracy as is practicable.

Orange Sewage Pump Station No 1			
Monitoring Location: Vent Stack			
Co-ordinates:	693525.5x UTM	6318443.5y UTM	Elevation: 824m AHD
Duct Diameter (m)	0.27m		

Parameter	Upstream	Downstream
Type of Disturbance	Exit / Exhaust	Bend (Inlet)
Distance to Disturbance (m)	5m	1.94m
No. of Duct Diameters	18.5D	7.2D
Ideal Minimum Distance Criteria	2D	6D
Diameters less than Ideal Criteria	< 0D	< 0D
Sampling Factor	1.00	1.00

Number of sampling points for manual isokinetic sampling	Criteria	Comments
Minimum No. of Sampling Traverses	2	Only 1 traverse available
Minimum No. of Access Holes	2	Only 1 two inch port available.
Minimum Total No. of Sampling Points	4	--
Combined Sampling Factor	1.00	--
Total No. of Sampling Points	4	SLR adopted a total of 6 points as the minimum number of access points and sampling traverses was not in compliance

The sample position complies with ideal sampling position criteria however does not meet the minimum number of access holes available. Additional sampling points were adopted in accordance with AS4323.1 to improve the accuracy of the measurements.

The temperature survey complies with AS4323.1 Section 4.1 (clause a to f), however the velocity profile does not comply with AS4323.1 Section 4.1 (clause a to f); the gas velocity at all sampling points is greater than 3m/s.

Temperature Profile (Minimum = 277.3°K, Average = 277.7°K, Maximum = 278.0°K)

Velocity Profile Midnight (Minimum = 0m/s & 277.3°K, Average = 0.94m/s & 277.7°K, Maximum = 1.40m/s & 278.0°K)

Velocity Profile Morning (Minimum = 0m/s & 285.5°K, Average = 1.34m/s & 285.5°K, Maximum = 1.93m/s & 285.5°K)

Velocity Profile Midday (Minimum = 0m/s & 285.6°K, Average = 1.36m/s & 285.6°K, Maximum = 1.93m/s & 285.6°K)