



Air Noise Environment
Environmental Monitoring and Assessment

VOC & Aldehyde Emissions Monitoring: Talinga GPF

Origin Energy

**144 Montague Road
West End
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1 Introduction

Origin Energy commissioned Air Noise Environment Pty Ltd to conduct monitoring of VOC and Aldehyde emissions from their Talinga Facility.

Table 1.1 details the monitoring locations and the monitoring performed at each location. The monitoring was completed during the period 13th - 19th August 2015.

Table 1.1: Monitoring Locations and Parameters

Parameter	VOCs and Aldehydes
Reciprocating Compressor K4404-01.2	x
Reciprocating Compressor K4404-02.2	x
Reciprocating Compressor K4404-03.2	x
Screw Compressor K4404-01.1	x
Screw Compressor K4404-02.1	x
Screw Compressor K4404-03.1	x
Screw Compressor K4404-05.1	x
Screw Compressor K4404-06.1	x
Screw Compressor K4404-12.1	x

The monitoring of emissions at the Talinga Facility was completed during normal operating conditions. Any factors that may have affected the monitoring results were not observed by, or brought to the notice of Air Noise Environment (ANE) staff except where noted in this report.





2 Methodology

2.1 Emission Testing

Table 2.1 below lists the Methods used when undertaking emission monitoring at Talinga Facility.

All air quality monitoring undertaken has been undertaken in accordance with the methods identified in Table 2.1 below unless as specified in Section 2.3.

Table 2.1: Summary Of Emission Monitoring Methods

Measurement Parameter	Method Equivalency
Volatile Organic Compounds	USEPA TO-15 Determination of Volatile Organic Compounds in Air Collected in Specially-Prepared Canisters and Analysed by Gas Chromatography/Mass Spectrometry
Aldehydes (Formaldehyde, Acetaldehyde, and Acrolein)	NIOSH 2016: Formaldehyde. Sample collection on DNPH tubes and analysis of tubes and condensate. Stack gas was passed through an ice cooled condensate trap and then onto a sorbent tube.





2.2 Laboratory Analysis

Table 2.2 provides a list of the NATA accredited laboratories that performed the applicable analysis, NATA accreditation number, and report number. Duplicate sampling was completed for VOCs, and sent to two different laboratories for analysis as shown in Table 2.2.

Table 2.2: Table of NATA Accredited Laboratories with NATA Accreditation Number

Measurement Parameter	NATA Accreditation Number	Report Number
Volatile Organic Compounds (VOC)	National Measurement Institute - 198	VOC15_164
	ALS Laboratory Group - 825	EN1512764
Aldehydes (Formaldehyde, Acetaldehyde, and Acrolein)	SGS Leeder Consulting - 2562	M151865





3 Results

3.1 Process Conditions

Table 3.1 provides a summary of process conditions during the air emissions monitoring at Talinga Facility.

Table 3.1: Process Conditions During Emissions Monitoring for Compressors

Parameter	Average Engine Load (%)	Average Engine RPM
Reciprocating Compressor K4406-01.2	101	999
Reciprocating Compressor K4406-02.2	101	1000
Reciprocating Compressor K4406-03.2	104	1000
Screw Compressor K4404-01.1	103	1203
Screw Compressor K4404-02.1	102	1201
Screw Compressor K4404-03.1	91	1165
Screw Compressor K4404-05.1	86	1202
Screw Compressor K4404-06.1	94	1203
Screw Compressor K4404-07.1	101	1205
Screw Compressor K4404-08.1	102	1200
Screw Compressor K4404-12.1	100	1205

3.2 Monitoring Results

The results of the emissions monitoring for the Talinga Facility completed during the period of 13th - 19th August 2015 are provided in Table 3.2 to Table 3.9.

Table 3.2: Flow and Sample Characteristics for Reciprocating Compressors

Parameter	K4406-01.1	K4406-01.2	K4406-02.2	K4406-03.2
Date (dd/mm/yy)	17/08/15	17/08/15	17/08/15	14/08/15
Run Times:				
Aldehydes	-	15:25 – 16:25	12:40 – 13:40	14:41 – 15:41
VOC's	14:35 ^a	-	13:25 ^a	15:10 ^a
Dry Standard Stack Flow Rate (Nm ³ /s)	2.7	1.7	1.7	1.9

^a VOC canister sample periods ranged from 10-20 seconds



Table 3.3: Aldehydes Results for Reciprocating Compressors

Parameter		K4406-01.2	K4406-02.2	K4406-03.2
Formaldehyde	(mg/Nm ³)	14.5	19.0	17.7
	(g/s)	0.0272	0.0357	0.0382
Acetaldehyde	(mg/Nm ³)	<0.2	0.4	0.3
	(g/s)	<0.0003	<0.0003	<0.0004
Acrolein	(mg/Nm ³)	<0.2	<0.2	<0.2
	(g/s)	<0.0003	<0.0003	<0.0004

Table 3.4: Volatile Organic Compounds Emissions Concentrations for Reciprocating Compressors (ALS Results)

Compound	Units	K4406-01.1	K4406-02.2	K4406-03.2
Propene	µg/m ³	518	409	432
	g/s	0.00157	0.000769	0.000922
Propane	µg/m ³	<0.9	<0.9	<0.9
	g/s	<0.000003	<0.000002	<0.000002
2-Methylpropane	µg/m ³	<1.2	<1.2	<1.2
	g/s	<0.000004	<0.000002	<0.000003
1-Butene	µg/m ³	381	238	346
	g/s	0.001152	0.000447	0.000739
n-Butane	µg/m ³	<1.2	<1.2	<1.2
	g/s	<0.000004	<0.000002	<0.000003
trans-2-Butene	µg/m ³	29.4	24.1	25.4
	g/s	0.000089	0.000045	0.000054
cis-2-Butene	µg/m ³	19.7	15.8	17.2
	g/s	0.000060	0.000030	0.000037
2-Methylbutane	µg/m ³	<1.5	<1.5	<1.5
	g/s	<0.000005	<0.000003	<0.000003
1-Pentene	µg/m ³	114	92.6	103
	g/s	0.000345	0.000174	0.000220



Compound	Units	K4406-01.1	K4406-02.2	K4406-03.2
n-Pentane	µg/m ³	8.6	6.2	3.2
	g/s	0.000026	0.000012	0.000007
trans-2-Pentene	µg/m ³	18.6	11.8	12.0
	g/s	0.000056	0.000022	0.000026
cis-2-Pentene	µg/m ³	7.4	5.2	6.0
	g/s	0.000022	0.000010	0.000013
2-Methyl-1.3-butadiene	µg/m ³	12.5	<1.3	<1.3
	g/s	0.000038	<0.000002	<0.000003
2.2-Dimethylbutane	µg/m ³	<1.8	<1.8	<1.8
	g/s	<0.000005	<0.000003	<0.000004
2.3-Dimethylbutane	µg/m ³	<1.8	<1.8	<1.8
	g/s	<0.000005	<0.000003	<0.000004
2-Methylpentane	µg/m ³	<1.8	<1.8	<1.8
	g/s	<0.000005	<0.000003	<0.000004
Cyclopentane	µg/m ³	<1.4	<1.4	<1.4
	g/s	<0.000004	<0.000003	<0.000003
3-Methylpentane	µg/m ³	2.8	<1.8	<1.8
	g/s	0.000008	<0.000003	<0.000004
1-Hexene	µg/m ³	109	83.2	103
	g/s	0.000330	0.000156	0.000220
n-Hexane	µg/m ³	4.2	2.5	<1.8
	g/s	0.000013	0.000005	<0.000004
2.4-Dimethylpentane	µg/m ³	<2.0	<2.0	<2.0
	g/s	<0.000006	<0.000004	<0.000004
Methylcyclopentane	µg/m ³	<1.7	<1.7	<1.7
	g/s	<0.000005	<0.000003	<0.000004
2-Methylhexane	µg/m ³	<2.0	<2.0	<2.0
	g/s	<0.000006	<0.000004	<0.000004





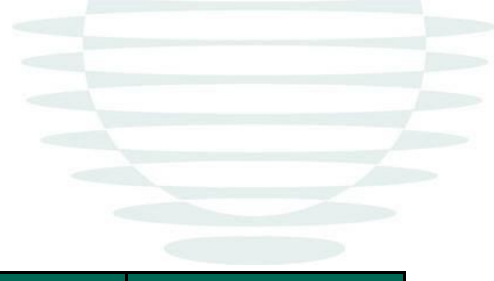
Compound	Units	K4406-01.1	K4406-02.2	K4406-03.2
2,3-Dimethylpentane	µg/m ³	<2.0	<2.0	<2.0
	g/s	<0.000006	<0.000004	<0.000004
Cyclohexane	µg/m ³	<1.7	<1.7	<1.7
	g/s	<0.000005	<0.000003	<0.000004
3-Methylhexane	µg/m ³	8.2	3.3	5.3
	g/s	0.000025	0.000006	0.000011
Isooctane	µg/m ³	<2.3	<2.3	<2.3
	g/s	<0.000007	<0.000004	<0.000005
Benzene	µg/m ³	65.1	54.6	63.2
	g/s	0.000197	0.000103	0.000135
n-Heptane	µg/m ³	2.4	<2.0	<2.0
	g/s	0.000007	<0.000004	<0.000004
Methylcyclohexane	µg/m ³	<2.0	<2.0	<2.0
	g/s	<0.000006	<0.000004	<0.000004
2,3,4-Trimethylpentane	µg/m ³	<2.3	<2.3	<2.3
	g/s	<0.000007	<0.000004	<0.000005
2-Methylheptane	µg/m ³	2.8	<2.3	<2.3
	g/s	0.000008	<0.000004	<0.000005
3-Methylheptane	µg/m ³	<2.3	<2.3	<2.3
	g/s	<0.000007	<0.000004	<0.000005
n-Octane	µg/m ³	<2.3	<2.3	<2.3
	g/s	<0.000007	<0.000004	<0.000005
Toluene	µg/m ³	57	42	30
	g/s	0.000171	0.000079	0.000063
n-Nonane	µg/m ³	<2.6	<2.6	<2.6
	g/s	<0.000008	<0.000005	<0.000006
Ethylbenzene	µg/m ³	7.8	5.6	3.9
	g/s	0.000024	0.000011	0.000008





Compound	Units	K4406-01.1	K4406-02.2	K4406-03.2
meta- & para-Xylene	µg/m ³	31.7	20.0	8.2
	g/s	0.000096	0.000038	0.000018
ortho-Xylene	µg/m ³	10.4	8.2	3.5
	g/s	0.000031	0.000015	0.000007
Styrene	µg/m ³	5.5	<2.1	3.4
	g/s	0.000017	<0.000004	0.000007
Isopropylbenzene	µg/m ³	<2.4	<2.4	<2.4
	g/s	<0.000007	<0.000005	<0.000005
n-Propylbenzene	µg/m ³	2.4	2.4	<2.4
	g/s	0.000007	0.000005	<0.000005
2-Ethyltoluene	µg/m ³	6.4	6.4	<2.4
	g/s	0.000019	0.000012	<0.000005
n-Decane	µg/m ³	<2.9	<2.9	<2.9
	g/s	<0.000009	<0.000005	<0.000006
4-Ethyltoluene	µg/m ³	3.0	3.0	<2.5
	g/s	0.000009	0.000006	<0.000005
1.3.5-Trimethylbenzene	µg/m ³	2.9	2.9	<2.4
	g/s	0.000009	0.000005	<0.000005
3-Ethyltoluene	µg/m ³	<2.4	2.4	<2.4
	g/s	<0.000007	0.000005	<0.000005
1.2.4-Trimethylbenzene	µg/m ³	11.3	13.3	<2.4
	g/s	0.000034	0.000025	<0.000005
1.2.3-Trimethylbenzene	µg/m ³	2.4	3.4	<2.4
	g/s	0.000007	0.000006	<0.000005
1.4-Diethylbenzene	µg/m ³	<2.7	<2.7	<2.7
	g/s	<0.000008	<0.000005	<0.000006
1.3-Diethylbenzene	µg/m ³	4.4	4.9	<2.7
	g/s	0.000013	0.000009	<0.000006





Compound	Units	K4406-01.1	K4406-02.2	K4406-03.2
n-Undecane	µg/m ³	<3.2	<3.2	<3.2
	g/s	<0.000010	<0.000006	<0.000007
n-Dodecane	µg/m ³	8.4	<3.5	<3.5
	g/s	0.000025	<0.000007	<0.000007
Naphthalene	µg/m ³	7.3	11.5	6.8
	g/s	0.000022	0.000022	0.000015
Total Xylenes	µg/m ³	42.1	28.2	11.7
	g/s	0.000127	0.000053	0.000025
Total Trimethylbenzenes	µg/m ³	16.7	19.6	<7.2
	g/s	0.000050	0.000037	<0.000015

Table 3.5: Volatile Organic Compounds Emissions Concentrations for Reciprocating Compressors (NMI Results)

Compound	Units	K4406-01.1
Propene	µg/m ³	470
	g/s	0.00142
Dichlorodifluoromethane	µg/m ³	<1
	g/s	<0.000003
Chloromethane	µg/m ³	<1
	g/s	<0.000003
1,2-Dichlorotetrafluoroethane	µg/m ³	<1
	g/s	<0.000003
Vinyl chloride	µg/m ³	<0.5
	g/s	<0.000002
1,3-Butadiene	µg/m ³	12
	g/s	0.000036
Bromomethane	µg/m ³	<6
	g/s	<0.000018





Compound	Units	K4406-01.1
Chloroethane	µg/m ³	<0.5
	g/s	<0.000002
Acrolein	µg/m ³	1540
	g/s	0.00466
Acetone	µg/m ³	130
	g/s	0.00039
Ethanol	µg/m ³	48
	g/s	0.000145
2-Propanol	µg/m ³	<0.5
	g/s	<0.000002
Trichlorofluoromethane	µg/m ³	<1
	g/s	<0.000003
1,1-Dichloroethene	µg/m ³	<0.8
	g/s	<0.000002
Dichloromethane	µg/m ³	<2
	g/s	<0.000006
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/m ³	<2
	g/s	<0.000006
Carbon disulfide	µg/m ³	4.4
	g/s	0.000013
trans-1,2-Dichloroethene	µg/m ³	<0.8
	g/s	<0.000002
1,1-Dichloroethane	µg/m ³	<0.8
	g/s	<0.000002
Methyl-tert-butylether (MTBE)	µg/m ³	<0.8
	g/s	<0.000002
Vinyl acetate	µg/m ³	<0.7
	g/s	<0.000002





Compound	Units	K4406-01.1
2-Butanone (MEK)	µg/m ³	43
	g/s	0.00013
cis-1,2-Dichloroethene	µg/m ³	<0.8
	g/s	<0.000002
Hexane	µg/m ³	<0.7
	g/s	<0.000002
Chloroform	µg/m ³	<1
	g/s	<0.000003
Ethyl Acetate	µg/m ³	<0.8
	g/s	<0.000002
Tetrahydrofuran	µg/m ³	6.6
	g/s	0.000020
1,2-Dichloroethane	µg/m ³	<0.8
	g/s	<0.000002
1,1,1-Trichloroethane	µg/m ³	<1
	g/s	<0.000003
Benzene	µg/m ³	73
	g/s	0.00022
Carbon tetrachloride	µg/m ³	<1
	g/s	<0.000003
Cyclohexane	µg/m ³	<0.7
	g/s	<0.000002
1,2-Dichloropropane	µg/m ³	<1
	g/s	<0.000003
Bromodichloromethane	µg/m ³	<1
	g/s	<0.000003
Trichloroethene	µg/m ³	<1
	g/s	<0.000003





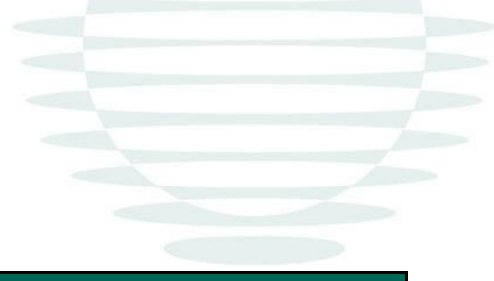
Compound	Units	K4406-01.1
1,4-Dioxane	µg/m ³	<0.8
	g/s	<0.000002
Heptane	µg/m ³	<0.9
	g/s	<0.000003
Methyl methacrylate	µg/m ³	<0.9
	g/s	<0.000003
cis-1,3-Dichloropropene	µg/m ³	<1
	g/s	<0.000003
4-Methyl-2-pentanone (MIBK)	µg/m ³	1.4
	g/s	0.000004
trans-1,3-Dichloropropene	µg/m ³	<1
	g/s	<0.000003
1,1,2-Trichloroethane	µg/m ³	<1
	g/s	<0.000003
Toluene	µg/m ³	39
	g/s	0.000118
2-Hexanone (MBK)	µg/m ³	9.5
	g/s	0.000029
Dibromochloromethane	µg/m ³	<2
	g/s	<0.000006
1,2-Dibromoethane	µg/m ³	<2
	g/s	<0.000006
Tetrachloroethylene	µg/m ³	<1
	g/s	<0.000003
Chlorobenzene	µg/m ³	<1
	g/s	<0.000003
Ethylbenzene	µg/m ³	4.9
	g/s	0.00001





Compound	Units	K4406-01.1
Bromof orm	$\mu\text{g}/\text{m}^3$	<2
	g/s	<0.000006
M & p-Xylenes	$\mu\text{g}/\text{m}^3$	11
	g/s	0.00003
Styrene	$\mu\text{g}/\text{m}^3$	<6
	g/s	<0.000018
1,1,2,2-Tetrachloroethane	$\mu\text{g}/\text{m}^3$	<1
	g/s	<0.000003
o-Xylene	$\mu\text{g}/\text{m}^3$	3.8
	g/s	0.000011
4-Ethyltoluene	$\mu\text{g}/\text{m}^3$	<1
	g/s	<0.000003
1,3,5-Trimethylbenzene	$\mu\text{g}/\text{m}^3$	<1
	g/s	<0.000003
1,2,4-Trimethylbenzene	$\mu\text{g}/\text{m}^3$	3.8
	g/s	0.00001
Benzyl Chloride	$\mu\text{g}/\text{m}^3$	<1
	g/s	<0.000003
1,3-Dichlorobenzene	$\mu\text{g}/\text{m}^3$	<1
	g/s	<0.000003
1,4-Dichlorobenzene	$\mu\text{g}/\text{m}^3$	<1
	g/s	<0.000003
1,2-Dichlorobenzene	$\mu\text{g}/\text{m}^3$	<1
	g/s	<0.000003
1,2,4-Trichlorobenzene	$\mu\text{g}/\text{m}^3$	<3
	g/s	<0.000009
Hexachlorobutadiene	$\mu\text{g}/\text{m}^3$	<2
	g/s	<0.000006





Compound	Units	K4406-01.1
Naphthalene	µg/m ³	<7
	g/s	<0.000021

Table 3.6: Flow and Sample Characteristics for Screw Compressors

Parameter	K4404-01	K4404-02	K4404-03	K4404-05	K4404-06	K4404-12
Date (dd/mm/yyyy)	18/08/15					19/08/15
Run Times:						
Aldehydes	08:53 – 09:53	10:35 – 11:35	12:06 – 13:06	13:43 – 14:43	15:24 – 16:24	09:01 – 10:01
VOC's	09:31 [#]	11:05 [#]	11:52 [#]	14:21 [#]	16:04 [#]	09:35 [#]
Dry Standard Stack Flow Rate (Nm ³ /s)	1.0	1.0	1.0	0.9	1.0	1.0

[#] VOC canister sample periods ranged from 10-20 seconds

Table 3.7: Aldehydes Results for Screw Compressors

Parameter		K4404-01	K4404-02	K4404-03	K4404-05	K4404-06	K4404-12
Formaldehyde	(mg/Nm ³)	6.9	4.8	0.9	0.6	0.3	5.1
	(g/s)	0.0060	0.0041	0.0007	0.0006	0.0003	0.0044
Acetaldehyde	(mg/Nm ³)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	(g/s)	<0.0002	<0.0002	<0.0001	<0.0002	<0.0002	<0.0001
Acrolein	(mg/Nm ³)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	(g/s)	<0.0002	<0.0002	<0.0001	<0.0002	<0.0002	<0.0001

Table 3.8: Volatile Organic Compounds Emissions Concentrations for Screw Compressors (ALS Results)

Compound	Units	K4404-01	K4404-02	K4404-03	K4404-05	K4404-06
Propene	µg/m ³	461	1280	182	155	106
	g/s	0.000529	0.001494	0.000214	0.000162	0.000121
Propane	µg/m ³	<0.9	<0.9	<0.9	<0.9	<0.9
	g/s	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001





Compound	Units	K4404-01	K4404-02	K4404-03	K4404-05	K4404-06
2-Methylpropane	µg/m ³	<1.2	<1.2	<1.2	<1.2	<1.2
	g/s	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001
1-Butene	µg/m ³	56.2	129.0	151.0	39.4	67.0
	g/s	0.000064	0.000151	0.000178	0.000041	0.000077
n-Butane	µg/m ³	<1.2	<1.2	<1.2	<1.2	<1.2
	g/s	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001
trans-2-Butene	µg/m ³	<1.1	12.6	9.6	5.5	4.8
	g/s	<0.000001	0.000015	0.000011	0.000006	0.000005
cis-2-Butene	µg/m ³	<1.1	6.9	6.4	2.8	2.8
	g/s	<0.000001	0.000008	0.000008	0.000003	0.000003
2-Methylbutane	µg/m ³	<1.5	<1.5	<1.5	<1.5	5.7
	g/s	<0.000002	<0.000002	<0.000002	<0.000002	0.000007
1-Pentene	µg/m ³	21.2	44.7	14.0	6.6	9.2
	g/s	0.000024	0.000052	0.000016	0.000007	0.000011
n-Pentane	µg/m ³	21.2	<1.5	12.1	4.4	2.9
	g/s	0.000024	<0.000002	0.000014	0.000005	0.000003
trans-2-Pentene	µg/m ³	<1.4	<1.4	5.4	2.9	2.9
	g/s	<0.000002	<0.000002	0.000006	0.000003	0.000003
cis-2-Pentene	µg/m ³	<1.4	<1.4	2.9	<1.4	<1.4
	g/s	<0.000002	<0.000002	0.000003	<0.000001	<0.000002
2-Methyl-1,3-butadiene	µg/m ³	<1.3	<1.3	<1.3	<1.3	<1.3
	g/s	<0.000001	<0.000002	<0.000002	<0.000001	<0.000001
2,2-Dimethylbutane	µg/m ³	<1.8	<1.8	<1.8	<1.8	<1.8
	g/s	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
2,3-Dimethylbutane	µg/m ³	<1.8	<1.8	<1.8	<1.8	<1.8
	g/s	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
2-Methylpentane	µg/m ³	19.4	<1.8	<1.8	<1.8	8.1
	g/s	0.000022	<0.000002	<0.000002	<0.000002	0.000009





Compound	Units	K4404-01	K4404-02	K4404-03	K4404-05	K4404-06
Cyclopentane	µg/m ³	<1.4	<1.4	<1.4	<1.4	<1.4
	g/s	<0.000002	<0.000002	<0.000002	<0.000001	<0.000002
3-Methylpentane	µg/m ³	9.2	<1.8	4.6	2.5	<1.8
	g/s	0.000011	<0.000002	0.000005	0.000003	<0.000002
1-Hexene	µg/m ³	12.8	33.8	16.6	7.2	9.7
	g/s	0.000015	0.000039	0.000020	0.000008	0.000011
n-Hexane	µg/m ³	16.6	<1.8	6.0	2.8	2.1
	g/s	0.000019	<0.000002	0.000007	0.000003	0.000002
2,4-Dimethylpentane	µg/m ³	<2.0	<2.0	<2.0	<2.0	<2.0
	g/s	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Methylcyclopentane	µg/m ³	7.6	<1.7	5.2	<1.7	2.1
	g/s	0.000009	<0.000002	0.000006	<0.000002	0.000002
2-Methylhexane	µg/m ³	13.1	<2.0	2.9	<2.0	<2.0
	g/s	0.000015	<0.000002	0.000003	<0.000002	<0.000002
2,3-Dimethylpentane	µg/m ³	3.3	<2.0	<2.0	<2.0	<2.0
	g/s	0.000004	<0.000002	<0.000002	<0.000002	<0.000002
Cyclohexane	µg/m ³	16.2	<1.7	3.8	<1.7	<1.7
	g/s	0.000019	<0.000002	0.000004	<0.000002	<0.000002
3-Methylhexane	µg/m ³	15.2	<2.0	4.1	<2.0	<2.0
	g/s	0.000017	<0.000002	0.000005	<0.000002	<0.000002
Isooctane	µg/m ³	<2.3	<2.3	<2.3	<2.3	<2.3
	g/s	<0.000003	<0.000003	<0.000003	<0.000002	<0.000003
Benzene	µg/m ³	782	1410	199	207	91.6
	g/s	0.000897	0.001646	0.000234	0.000217	0.000105
n-Heptane	µg/m ³	14.7	3.7	3.3	<2.0	<2.0
	g/s	0.000017	0.000004	0.000004	<0.000002	<0.000002
Methylcyclohexane	µg/m ³	9.2	<2.0	2.4	<2.0	<2.0
	g/s	0.000011	<0.000002	0.000003	<0.000002	<0.000002





Compound	Units	K4404-01	K4404-02	K4404-03	K4404-05	K4404-06
2,3,4-Trimethylpentane	µg/m ³	92.0	6.1	<2.3	<2.3	<2.3
	g/s	0.000106	0.000007	<0.000003	<0.000002	<0.000003
2-Methylheptane	µg/m ³	41.1	<2.3	<2.3	<2.3	<2.3
	g/s	0.000047	<0.000003	<0.000003	<0.000002	<0.000003
3-Methylheptane	µg/m ³	21.5	<2.3	2.8	<2.3	9.3
	g/s	0.000025	<0.000003	0.000003	<0.000002	0.000011
n-Octane	µg/m ³	10.7	<2.3	3.7	<2.3	6.5
	g/s	0.000012	<0.000003	0.000004	<0.000002	0.000007
Toluene	µg/m ³	433	311	80	58	32
	g/s	0.000497	0.000363	0.000094	0.000061	0.000037
n-Nonane	µg/m ³	5.8	<2.6	<2.6	<2.6	<2.6
	g/s	0.000007	<0.000003	<0.000003	<0.000003	<0.000003
Ethylbenzene	µg/m ³	36	18.2	6.9	3.9	2.6
	g/s	0.000041	0.000021	0.000008	0.000004	0.000003
meta- & para-Xylene	µg/m ³	159	39.9	23.0	11.3	9.1
	g/s	0.000182	0.000047	0.000027	0.000012	0.000010
ortho-Xylene	µg/m ³	46.9	14.3	7.8	4.3	3.0
	g/s	0.000054	0.000017	0.000009	0.000005	0.000003
Styrene	µg/m ³	<2.1	<2.1	2.6	<2.1	<2.1
	g/s	<0.000002	<0.000002	0.000003	<0.000002	<0.000002
Isopropylbenzene	µg/m ³	<2.4	<2.4	11.8	<2.4	<2.4
	g/s	<0.000003	<0.000003	0.000014	<0.000003	<0.000003
n-Propylbenzene	µg/m ³	6.9	2.9	<2.4	<2.4	<2.4
	g/s	0.000008	0.000003	<0.000003	<0.000003	<0.000003
2-Ethyltoluene	µg/m ³	18.2	5.9	3.9	<2.4	<2.4
	g/s	0.000021	0.000007	0.000005	<0.000003	<0.000003
n-Decane	µg/m ³	5.2	<2.9	<2.9	<2.9	<2.9
	g/s	0.000006	<0.000003	<0.000003	<0.000003	<0.000003





Compound	Units	K4404-01	K4404-02	K4404-03	K4404-05	K4404-06
4-Ethyltoluene	µg/m ³	9.4	<2.5	<2.5	<2.5	<2.5
	g/s	0.000011	<0.000003	<0.000003	<0.000003	<0.000003
1.3.5-Trimethylbenzene	µg/m ³	<2.4	2.9	<2.4	<2.4	<2.4
	g/s	<0.000003	0.000003	<0.000003	<0.000003	<0.000003
3-Ethyltoluene	µg/m ³	5.4	<2.4	<2.4	<2.4	<2.4
	g/s	0.000006	<0.000003	<0.000003	<0.000003	<0.000003
1.2.4-Trimethylbenzene	µg/m ³	23.6	6.4	5.4	3.4	<2.4
	g/s	0.000027	0.000007	0.000006	0.000004	<0.000003
1.2.3-Trimethylbenzene	µg/m ³	4.4	<2.4	<2.4	<2.4	<2.4
	g/s	0.000005	<0.000003	<0.000003	<0.000003	<0.000003
1.4-Diethylbenzene	µg/m ³	<2.7	<2.7	<2.7	<2.7	<2.7
	g/s	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
1.3-Diethylbenzene	µg/m ³	6.0	<2.7	<2.7	<2.7	<2.7
	g/s	0.000007	<0.000003	<0.000003	<0.000003	<0.000003
n-Undecane	µg/m ³	4.5	<3.2	<3.2	<3.2	<3.2
	g/s	0.000005	<0.000004	<0.000004	<0.000003	<0.000004
n-Dodecane	µg/m ³	4.2	<3.5	<3.5	<3.5	<3.5
	g/s	0.000005	<0.000004	<0.000004	<0.000004	<0.000004
Naphthalene	µg/m ³	69.7	40.3	26.7	27.2	11.5
	g/s	0.000080	0.000047	0.000031	0.000028	0.000013
Total Xylenes	µg/m ³	206	54.2	30.8	15.6	12.1
	g/s	0.000236	0.000063	0.000036	0.000016	0.000014
Total Trimethylbenzenes	µg/m ³	28	9.3	<7.2	<7.2	<7.2
	g/s	0.000032	0.000011	<0.000008	<0.000008	<0.000008





Table 3.9: Volatile Organic Compounds Emissions Concentrations for Screw Compressors (NMI Results)

Compound	Units	K4404-02	K4404-06	K4404-12
Propene	µg/m ³	1600	110	1530
	g/s	0.00187	0.00013	0.00180
Dichlorodifluoromethane	µg/m ³	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024
Chloromethane	µg/m ³	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024
1,2-Dichlorotetrafluoroethane	µg/m ³	<30	<1	<30
	g/s	<0.000035	<0.000001	<0.000035
Vinyl chloride	µg/m ³	<10	<0.5	<10
	g/s	<0.000012	<0.000001	<0.000012
1,3-Butadiene	µg/m ³	<8	<0.4	<8
	g/s	<0.000009	<0.0000005	<0.000009
Bromomethane	µg/m ³	<100	<10	<70
	g/s	<0.000117	<0.000011	<0.000082
Chloroethane	µg/m ³	<10	<0.5	<10
	g/s	<0.000012	<0.000001	<0.000012
Acrolein	µg/m ³	450	110	170
	g/s	0.00053	0.00013	0.00020
Acetone	µg/m ³	120	41	100
	g/s	0.00014	0.00005	0.00012
Ethanol	µg/m ³	<20	85	68
	g/s	<0.000023	0.00010	0.00008
2-Propanol	µg/m ³	<9	<0.5	<9
	g/s	<0.000011	<0.000001	<0.000011
Trichlorofluoromethane	µg/m ³	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024
1,1-Dichloroethene	µg/m ³	<20	<0.8	<20
	g/s	<0.000023	<0.000001	<0.000024





Compound	Units	K4404-02	K4404-06	K4404-12
Dichloromethane	µg/m ³	56	<2	<30
	g/s	0.00007	<0.000002	<0.000035
1,1,2-Trichloro-1,2,2 trifluoroethane	µg/m ³	<30	<2	<30
	g/s	<0.000035	<0.000002	<0.000035
Carbon disulfide	µg/m ³	41	18	45
	g/s	0.000048	0.000021	0.000053
trans-1,2-Dichloroethene	µg/m ³	<20	<0.8	<20
	g/s	<0.000023	<0.000001	<0.000024
1,1-Dichloroethane	µg/m ³	<20	<0.8	<20
	g/s	<0.000023	<0.000001	<0.000024
Methyl-tert-butylether (MTBE)	µg/m ³	<10	<0.7	<10
	g/s	<0.000012	<0.000001	<0.000012
Vinyl acetate	µg/m ³	<10	<0.7	<10
	g/s	<0.000012	<0.000001	<0.000012
2-Butanone (MEK)	µg/m ³	27	12	22
	g/s	0.000032	0.000014	0.000026
cis-1,2-Dichloroethene	µg/m ³	<20	<0.8	<20
	g/s	<0.000023	<0.000001	<0.000024
Hexane	µg/m ³	<10	<0.7	<10
	g/s	<0.000012	<0.000001	<0.000012
Chloroform	µg/m ³	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024
Ethyl Acetate	µg/m ³	<10	<0.7	<10
	g/s	<0.000012	<0.000001	<0.000012
Tetrahydrofuran	µg/m ³	<10	1.6	<10
	g/s	<0.000012	0.0000018	<0.000012
1,2-Dichloroethane	µg/m ³	<20	<0.8	<20
	g/s	<0.000023	<0.000001	<0.000024
1,1,1-Trichloroethane	µg/m ³	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024





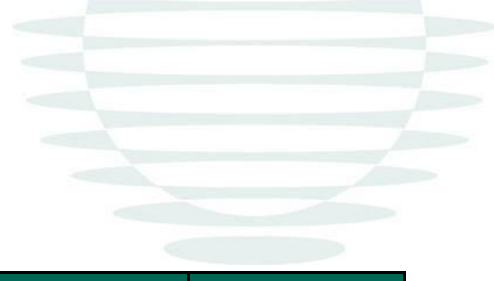
Compound	Units	K4404-02	K4404-06	K4404-12
Benzene	µg/m ³	1360	86	1090
	g/s	0.00159	0.00010	0.00128
Carbon tetrachloride tetrachloride	µg/m ³	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024
Cyclohexane	µg/m ³	<10	<0.7	<10
	g/s	<0.000012	<0.000001	<0.000012
1,2-Dichloropropane	µg/m ³	<20	<0.9	<20
	g/s	<0.000023	<0.000001	<0.000024
Bromodichloromethane	µg/m ³	<30	<1	<30
	g/s	<0.000035	<0.000001	<0.000035
Trichloroethene	µg/m ³	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024
1,4-Dioxane	µg/m ³	<10	<0.7	<10
	g/s	<0.000012	<0.000001	<0.000012
Heptane	µg/m ³	<20	<0.8	<20
	g/s	<0.000023	<0.000001	<0.000024
Methyl methacrylate	µg/m ³	<20	<0.8	<20
	g/s	<0.000023	<0.000001	<0.000024
cis-1,3-Dichloropropene	µg/m ³	<20	<0.9	<20
	g/s	<0.000023	<0.000001	<0.000024
4-Methyl-2-pentanone (MIBK)	µg/m ³	<20	<0.8	<20
	g/s	<0.000023	<0.000001	<0.000024
trans-1,3-Dichloropropene	µg/m ³	<20	<0.9	<20
	g/s	<0.000023	<0.000001	<0.000024
1,1,2-Trichloroethane	µg/m ³	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024
Toluene	µg/m ³	360	26	330
	g/s	0.000420	0.000030	0.000389
2-Hexanone (MBK)	µg/m ³	<20	<0.8	<20
	g/s	<0.000023	<0.000001	<0.000024





Compound	Units	K4404-02	K4404-06	K4404-12
Dibromochloromethane	µg/m ³	<30	<2	<30
	g/s	<0.000035	<0.000002	<0.000035
1,2-Dibromoethane	µg/m ³	<30	<2	<30
	g/s	<0.000035	<0.000002	<0.000035
Tetrachloroethylene	µg/m ³	<30	<1	<30
	g/s	<0.000035	<0.000001	<0.000035
Chlorobenzene	µg/m ³	<20	<0.9	<20
	g/s	<0.000023	<0.000001	<0.000024
Ethylbenzene	µg/m ³	22	2.3	32
	g/s	0.000026	0.0000026	0.000038
Bromof orm	µg/m ³	<40	<2	<40
	g/s	<0.000047	<0.000002	<0.000047
m & p-Xylenes	µg/m ³	50	5.1	95
	g/s	0.000058	0.0000058	0.00011
Styrene	µg/m ³	<20	<2	<20
	g/s	<0.000023	<0.000002	<0.000024
1,1,2,2-Tetrachloroethane	µg/m ³	<30	<1	<30
	g/s	<0.000035	<0.000001	<0.000035
o-Xylene	µg/m ³	<20	1.7	36
	g/s	<0.000023	0.000002	0.000042
4-Ethyltoluene	µg/m ³	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024
1,3,5-Trimethylbenzene	µg/m ³	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024
1,2,4-Trimethylbenzene	µg/m ³	<20	<2	62
	g/s	<0.000023	<0.000002	0.00007
Benzyl Chloride	µg/m ³	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024
1,3-Dichlorobenzene	µg/m ³	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024





Compound	Units	K4404-02	K4404-06	K4404-12
1,4-Dichlorobenzene	$\mu\text{g}/\text{m}^3$	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024
1,2-Dichlorobenzene	$\mu\text{g}/\text{m}^3$	<20	<1	<20
	g/s	<0.000023	<0.000001	<0.000024
1,2,4-Trichlorobenzene	$\mu\text{g}/\text{m}^3$	<30	<2	<30
	g/s	<0.000035	<0.000002	<0.000035
Hexachlorobutadiene	$\mu\text{g}/\text{m}^3$	<40	<2	<40
	g/s	<0.000047	<0.000002	<0.000047
Naphthalene	$\mu\text{g}/\text{m}^3$	<70	<8	<70
	g/s	<0.000082	<0.000009	<0.000082





Appendix A – Glossary of Terms

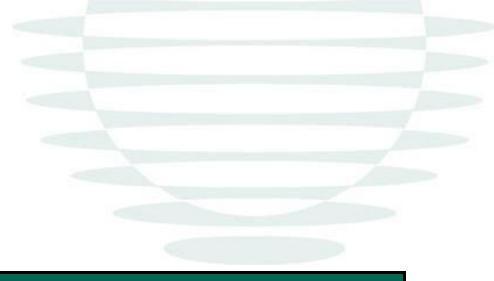




APPENDIX A: GLOSSARY OF TERMS

<	The analytes tested for was not detected, the value stated is the reportable limit of detection
µg	Micrograms (10 ⁻⁶ grams)
AS	Australian Standard
dscm	dry standard cubic meters (at 0°C and 1 atmosphere)
g	grams
kg	kilograms
m	metres
m ³	Cubic Metres, actual gas volume in cubic metres as measured.
mg	Milligrams
min	Minute
mg/m ³	Milligrams (10 ⁻³) per cubic metre.
mmH ₂ O	Millimetres of water
Mole	SI Unit defined as an amount of a substance that contains as many elementary entities (e.g. atoms, molecules, ions, electrons) as there are atoms in 12 grams of pure Carbon-12 (¹² C)
N/A	Not Applicable
ng	Nanograms (10 ⁻⁹ grams)
Nm ³	Normalised Cubic Metres - Gas volume in dry cubic metres at standard temperature and pressure (0°C and 101.3 kPa).
ou	Odour Units
°C	Degrees Celsius
µg/m ³	Micrograms (10 ⁻⁶) per cubic metre.
ppb / ppm	Parts per billion / million.
PM	Particulate Matter.





APPENDIX A: GLOSSARY OF TERMS

PM ₁₀ , PM _{2.5} , PM ₁	Fine particulate matter with an equivalent aerodynamic diameter of less than 10, 2.5 or 1 micrometres respectively. Fine particulates are predominantly sourced from combustion processes. Vehicle emissions are a key source in urban environments.
sec	Second
Sm ³	Standardised Cubic Metres - Gas volume in dry cubic metres at standard temperature and pressure (0°C and 101.3 kPa) and corrected to a standardised value (e.g. 7% O ₂).
STP	Standard Temperature and Pressure (0°C and 101.3 kPa).
TVOC	Total Volatile Organic Compounds. These compounds can be both toxic and odorous.
USEPA	United States Environmental Protection Agency





Appendix B – Laboratory Results

