



1 INTRODUCTION

Vipac Engineers & Scientists Ltd (Vipac) was commissioned by SA Power Networks (SAPN) to carry out an air quality assessment for the Temporary Generator Project. A report (630582-2 Temporary Generator Air Quality Assessment, 6/09/17) was issued by Vipac to SAPN outlining the results of air dispersion modelling of emissions of the primary air pollutants (PM2.5, PM10, CO, NO₂ and SO₂) emitted by the generators for three operating scenarios based on client supplied data.

SAPN has since engaged Enviroscan Industrial and Marine Surveys to undertake verification testing of NO_x, PM10 and PM2.5 emissions from the turbines.

This report provides a summary of the air dispersion modelling assessment of the impacts on nearby sensitive receptors based on the measured the emissions data. A discussion of the modelling methodology and adopted datasets is provided in the previously issued report.

2 EMISSIONS DATA

Enviroscan Industrial and Marine Surveys, a NATA accredited laboratory, undertook sampling of a turbine at the Lonsdale site on 1/12/2017. Emissions of NO_x, PM10 and PM2.5 were tested with the turbine while operating under 30MW load capacity with de-min water injection. Exhaust gas velocity and temperature were also specified. Testing complied with relevant Australian Standard and USEPA methodology. Further details of the testing can be found in the emissions testing report (Report 17-1210) provided by the laboratory.

Scenario 4 was modelled for the operation of the approximately 100MW power generation for one full year adopting the measured emissions data. Tables 1 and 2 outline the relevant emissions data adopted for the modelling as measured. Note, data for CO and SO₂ emission rates were adopted from the client supplied data previously modelled.

Table 1: Modelled Emissions Data for Edinburgh

Source ID	UTM Coordinates (m)		Height (m)	Diameter (m)	Velocity (m/s)	Temperature (K)	Emission Rate (g/s)				
	X	Y					PM10	PM2.5	CO	NO ₂	SO ₂
Turbine 1	285134	6152816	7.2	1.8	19	748	0.42	0.42	1.4	7.6	0.47
Turbine 2	285128	6152837	7.2	1.8	19	748	0.42	0.42	1.4	7.6	0.47
Turbine 3	285128	6152864	7.2	1.8	19	748	0.42	0.42	1.4	7.6	0.47
Turbine 4	285128	6152885	7.2	1.8	19	748	0.42	0.42	1.4	7.6	0.47
Turbine 5	285128	6152912	7.2	1.8	19	748	0.42	0.42	1.4	7.6	0.47

Table 2: Modelled Emissions Data for Lonsdale

Source ID	UTM Coordinates (m)		Height (m)	Diameter (m)	Velocity (m/s)	Temperature (K)	Emission Rate (g/s)				
	X	Y					PM10	PM2.5	CO	NO ₂	SO ₂
Turbine 1	270813	6112927	7.2	1.8	19	748	0.42	0.42	1.4	7.6	0.47
Turbine 2	270853	6112930	7.2	1.8	19	748	0.42	0.42	1.4	7.6	0.47
Turbine 3	270892	6112934	7.2	1.8	19	748	0.42	0.42	1.4	7.6	0.47
Turbine 4	270932	6112937	7.2	1.8	19	748	0.42	0.42	1.4	7.6	0.47

3 MODELLING RESULTS & DISCUSSION

The model predictions at the most affected sensitive receptors at Edinburgh and Lonsdale for near maximum operation (for approximately 100MW power generation) for one full year are shown in Tables 3 and 4. The results for all of the sensitive receptors modelled are provided in Appendix A.

It can be seen from the tables that the predicted concentrations of the gases (CO, NO₂ and SO₂) are below the criteria at all of the modelled sensitive receptors. The model predictions of 24 hour PM10 and 24 hour PM2.5 are also below criteria for all modelled sensitive receptors. The model predictions of annual PM2.5 at the residential receptor (SR15 at Edinburgh) are above criteria.

It is noted that operation of the turbines under this scenario is highly unlikely. In reality, the generators are more likely to be switched on for approximately 2-6 hours per event, most likely during peak demand (usually between 4pm and 8pm), with events expected to be infrequent (approximately 1-5 times per year). An annual average criteria (such as the PM2.5 criteria) is therefore not applicable for these short term operational scenarios. However, it is compared with model predictions here as an extremely conservative approach.

Furthermore, the modelling is performed inclusive of an annual average background that is, already above criteria (i.e. 9.0 µg/m³ from the Netley station). The contribution to predicted concentrations by emissions from the operation of the turbines is minimal (on average 0.3 µg/m³ or 3% of background at Edinburgh) compared to the background data.

Table 3: Model Predictions (Including Background) at the Most Affected Receptors for Edinburgh

Pollutant	Averaging period	Receptor ID	Type	Model prediction (µg/m ³)	Criteria (µg/m ³)	Compliant
PM10	24 hour ^a	SR15	Residential	22.1	50	✓
PM2.5	24 hour ^a	SR15	Residential	13.8	25	✓
	Annual ^a	SR15	Residential	9.3	9	✗
CO	1 hour	SR7	Residential	65.4	31,000	✓
		SR33	Commercial	195.6	31,000	✓
	8 hour	SR15	Residential	45.2	11,250	✓
		SR33	Commercial	87.6	11,250	✓
NO ₂	1 hour	SR15	Residential	173.4	250	✓
		SR33	Commercial	243.7	250	✓
	Annual ^a	SR15	Residential	19.3	60	✓
SO ₂	1 hour	SR7	Residential	14.9	570	✓
		SR33	Commercial	58.7	570	✓
	24 hour	SR15	Residential	5.5	230	✓
	Annual ^a	SR15	Residential	0.5	60	✓

^a not applicable to commercial receptors



Table 4: Model Predictions (Including Background) at the Most Affected Receptors for Lonsdale

Pollutant	Averaging period	Receptor ID	Type	Model prediction ($\mu\text{g}/\text{m}^3$)	Criteria ($\mu\text{g}/\text{m}^3$)	Compliant
PM10	24 hour	SR6	Residential	22.5	50	✓
PM2.5	24 hour	SR6	Residential	9.0	25	✓
	Annual ^a	SR6	Residential	7.7	8	✓
CO	1 hour	SR5	Residential	50.1	31,000	✓
		SR18	Commercial	169.3	31,000	✓
	8 hour	SR5	Residential	36.5	11,250	✓
		SR18	Commercial	125.8	11,250	✓
NO ₂	1 hour	SR5	Residential	128.4	250	✓
		SR18	Commercial	218.1	250	✓
	Annual ^a	SR5	Residential	9.3	60	✓
SO ₂	1 hour	SR5	Residential	7.6	570	✓
		SR18	Commercial	47.6	570	✓
	24 hour	SR5	Residential	1.7	230	✓
	Annual ^a	SR5	Residential	0.3	60	✓

^a not applicable to commercial receptors



APPENDIX A MODEL PREDICTIONS AT THE SENSITIVE RECEPTORS (INC BACKGROUND)

.1 SCENARIO 4

.1.1 EDINBURGH

ID	UTM Coordinates		Maximum Predicted Concentration including background ($\mu\text{g}/\text{m}^3$)									
			PM10	PM2.5		CO		NO ₂		SO ₂		
	East (m)	South (m)	24 Hour	24 Hour	Annual	1 Hour	8 Hour	1 Hour	Annual	1 Hour	24 Hour	Annual
SR1	283.709	6152.367	18.6	10.3	9.1	52.5	30.9	166.4	16.0	10.6	1.6	0.3
SR2	283.244	6152.958	18.6	10.3	9.1	57.6	32.3	169.2	16.1	12.3	1.6	0.3
SR3	282.927	6153.394	18.7	10.4	9.1	50.9	34.1	165.5	16.1	10.1	1.7	0.3
SR4	285.278	6153.717	18.7	10.4	9.1	37.3	31.0	101.8	15.8	5.5	1.7	0.3
SR5	285.423	6153.643	18.8	10.5	9.1	40.6	32.3	120.1	16.2	6.6	1.9	0.3
SR6	285.536	6153.59	18.8	10.5	9.1	57.3	32.1	169.0	16.8	12.2	1.9	0.3
SR7	285.65	6153.571	18.7	10.4	9.2	65.4	32.3	173.4	17.1	14.9	1.8	0.4
SR8	286.17	6153.104	19.4	11.1	9.1	38.6	33.1	109.4	16.8	6.0	2.6	0.3
SR9	286.109	6152.977	19.2	10.9	9.1	43.2	35.8	134.0	16.8	7.5	2.4	0.3
SR10	286.034	6152.829	20.1	11.8	9.1	43.1	33.7	133.6	16.8	7.5	3.4	0.4
SR11	286.628	6152.529	19.3	11.0	9.1	37.8	31.9	104.6	15.9	5.7	2.5	0.3
SR12	285.969	6152.363	19.2	10.9	9.1	45.9	35.0	148.5	15.9	8.4	2.4	0.3
SR13	285.919	6152.233	19.1	10.8	9.1	48.1	33.2	160.4	15.6	9.1	2.2	0.3
SR14	285.792	6152.015	18.2	9.9	9.1	43.9	28.2	137.6	15.3	7.7	1.2	0.3
SR15	285.58	6152.874	22.1	13.8	9.3	62.2	45.2	171.6	19.3	13.9	5.5	0.5
SR16	285.406	6151.809	18.6	10.3	9.1	40.6	30.8	119.0	15.5	6.6	1.7	0.3
SR17	285.256	6151.779	18.8	10.5	9.1	40.6	31.1	118.3	15.6	6.6	1.9	0.3
SR18	285.111	6151.745	18.8	10.5	9.1	44.2	31.1	137.8	15.8	7.9	1.9	0.3
SR19	284.844	6151.697	18.4	10.1	9.1	47.0	29.8	152.7	16.1	8.8	1.5	0.3
SR20	284.33	6152.586	19.1	10.8	9.1	71.4	33.3	176.6	16.6	17.0	2.2	0.3
SR21	284.693	6152.982	21.0	12.7	9.2	56.3	40.6	168.3	18.8	11.9	4.4	0.5



SR22	284.814	6153.254	19.8	11.5	9.2	62.0	40.6	171.6	18.0	13.8	3.0	0.4
SR23	285.21	6153.434	19.6	11.3	9.1	45.6	36.7	147.0	16.7	8.3	2.8	0.3
SR24	285.397	6153.327	19.7	11.4	9.2	51.6	39.3	165.9	18.4	10.3	2.9	0.4
SR25	285.604	6153.229	19.3	11.0	9.2	51.0	36.4	165.5	18.4	10.1	2.5	0.4
SR26	285.573	6153.083	19.4	11.1	9.3	51.7	40.2	165.9	19.4	10.4	2.5	0.5
SR27	285.583	6152.91	21.2	12.9	9.3	60.5	46.1	170.6	19.4	13.3	4.6	0.5
SR28	285.583	6152.855	22.3	14.0	9.3	62.4	44.6	171.7	19.2	14.0	5.8	0.5
SR29	285.633	6152.589	20.3	12.0	9.1	57.8	38.0	169.2	16.8	12.4	3.6	0.4
SR30	285.597	6152.422	19.2	10.9	9.1	56.8	33.2	168.6	16.0	12.1	2.3	0.3
SR31	285.603	6152.234	18.2	9.9	9.1	50.9	29.2	165.4	15.6	10.1	1.2	0.3
SR32	284.805	6152.027	18.9	10.6	9.1	49.8	33.1	164.7	16.6	9.7	1.9	0.3
SR33	285.247	6152.799	27.2	18.9	9.8	195.6	87.6	243.7	28.1	58.7	11.3	1.0
SR34	285.384	6152.833	26.1	17.8	9.5	117.6	66.4	201.5	23.3	32.5	10.1	0.8
SR35	285.374	6153.017	21.9	13.6	9.5	92.2	54.8	187.7	24.2	24.0	5.4	0.8
SR36	285.276	6152.5	20.2	11.9	9.2	82.5	47.2	182.5	17.4	20.7	3.4	0.4
SR37	285.159	6152.496	21.3	13.0	9.2	84.3	44.4	183.5	18.3	21.3	4.7	0.4
SR38	284.925	6152.48	21.5	13.2	9.3	70.8	45.1	176.1	19.4	16.8	4.9	0.5
SR39	284.945	6152.617	23.9	15.6	9.4	88.8	56.0	185.9	22.3	22.8	7.6	0.7
Criteria	N/A	N/A	50	25	8	31,000	11,250	250	60	570	230	60



.1.2 LONSDALE

ID	Maximum Predicted Concentration including background ($\mu\text{g}/\text{m}^3$)											
	UTM Coordinates		PM10	PM2.5		CO		NO ₂		SO ₂		
	East (m)	South (m)	24 Hour	24 Hour	Annual	1 Hour	8 Hour	1 Hour	Annual	1 Hour	24 Hour	Annual
SR1	271.018	6114.003	21.8	8.3	7.7	44.1	33.4	95.8	8.5	5.6	1.0	0.3
SR2	271.15	6113.976	21.9	8.4	7.7	41.2	34.4	79.6	8.7	4.6	1.1	0.3
SR3	271.233	6113.92	21.9	8.4	7.7	46.4	34.7	108.1	8.9	6.4	1.1	0.3
SR4	271.282	6113.866	22.0	8.5	7.7	48.9	35.6	121.9	9.0	7.2	1.3	0.3
SR5	271.346	6113.795	22.2	8.7	7.7	50.1	36.5	128.4	9.3	7.6	1.4	0.3
SR6	272.967	6112.744	22.5	9.0	7.7	47.2	36.1	112.5	8.8	6.7	1.7	0.3
SR7	273.063	6111.876	22.0	8.5	7.6	39.3	33.6	69.5	8.4	4.0	1.2	0.2
SR8	272.248	6110.603	21.5	8.0	7.6	40.2	31.0	74.5	7.9	4.3	0.7	0.2
SR9	270.638	6111.285	21.9	8.4	7.7	36.9	33.4	56.5	8.6	3.2	1.1	0.3
SR10	270.154	6111.255	22.3	8.8	7.7	38.4	34.4	64.6	8.8	3.7	1.6	0.3
SR11	269.781	6111.217	22.1	8.6	7.7	36.8	32.9	56.0	8.6	3.2	1.3	0.3
SR12	270.648	6113.224	24.4	10.9	7.8	55.8	53.5	156.5	11.6	9.5	3.9	0.4
SR13	271.055	6113.533	22.4	8.9	7.7	45.8	40.7	104.7	9.3	6.2	1.7	0.3
SR14	271.064	6113.427	22.6	9.1	7.7	50.1	42.3	127.9	9.9	7.6	1.9	0.3
SR15	271.062	6113.345	23.4	9.9	7.8	60.0	47.1	158.8	11.1	10.9	2.7	0.4
SR16	271.066	6113.262	24.1	10.6	7.9	68.2	54.6	163.2	12.5	13.7	3.5	0.5
SR17	271.073	6113.188	29.8	16.3	8.0	84.9	72.7	172.3	15.1	19.3	9.9	0.7
SR18	271.156	6112.894	42.0	28.5	8.2	169.3	125.8	218.1	18.9	47.6	23.6	0.9
SR19	271.099	6112.795	38.5	25.0	8.1	132.8	125.2	198.3	17.5	35.4	19.7	0.8
SR20	271.187	6112.793	35.9	22.4	8.1	126.5	110.9	194.9	16.4	33.3	16.7	0.7
SR21	271.156	6112.526	27.9	14.4	7.7	75.7	69.7	167.3	9.9	16.2	7.8	0.3
SR22	271.101	6112.076	22.2	8.7	7.7	46.2	38.0	106.9	8.9	6.3	1.4	0.3
Criteria	N/A	N/A	50	25	8	31,000	11,250	250	60	570	230	60