Annual Air Emission Monitoring Report 2023

Mt Piper Power Station

PREPARED FOR

EnergyAustralia

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26 February 2024

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VERSION	REVISION	AUTHOR	REVIEWED BY	NAME	DATE	
Draft	D01	E. Edwards M. Paula Perez-Pena	J. Grieve	Paul Fridell	29.01.2024	Draft for client review
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Final	R01	E. Edwards M. Paula Perez-Pena	J. Grieve	Tamie Weaver	26.02.2024	Final

This report was prepared in accordance with the scope of services set out in the contract between Environmental Resources Management Australia Pty Ltd ABN 12 002 773 248 (ERM) and the Client.

To the best of our knowledge, the proposal presented herein accurately reflects the Client's intentions when the report was printed. However, the application of conditions of approval or impacts of unanticipated future events could modify the outcomes described in this document.

In preparing the report, ERM used data, surveys, analyses, designs, plans and other information provided by the individuals and organisations referenced herein. While checks were undertaken to ensure that such materials were the correct and current versions of the materials provided, except as otherwise state, ERM did not independently verify the accuracy or completeness of these information sources.

SIGNATURE PAGE

Annual Air Emission Monitoring Report 2023

Mt Piper Power Station

0716331_R01

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
AAEMR	Annual Air Emission Monitoring Report
AEMO	Australian Energy Market Operator
APC	Air Pollution Control
AQIA	Air quality impact assessment
AQMS	Air quality monitoring station
AWS	Automatic weather station
BCA	Brine Conditioned Ash
CEMS	Continuous emissions monitoring system
DPHI	Department of Planning, Housing and Infrastructure (DPHI)
EPA	Environment Protection Authority
EPL	Environment protection licence
ERM	Environmental Resources Management Australia Pty Ltd
GWh	gigawatt hour

Acronyms	Description
HDPE	High Density Polyethylene
K	degrees Kelvin
kPa	kilopascals
LBL	(NSW) Load-based Licencing Scheme
LNAR	Lamberts North Ash Repository
mg/Nm³	milligrams per normal cubic metre (i.e. at conditions of 273K and 101.3 kPa)
MPAR	Mt Piper Ash Repository
MPPS	Mount Piper Power Station
MW	megawatt
MWh	megawatt hour
NEPC	National Environment Protection Council
Nm³	Normal cubic metre (i.e. 1 cubic metre at conditions of 273 K and 101.3 kPa)
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
NPI	National Pollutant Inventory
NSW	New South Wales
LOR	Limit of reporting
O_2	Oxygen (molecular)
OEMP	Operational Environment Management Plan
PM_{10}	Particulate matter less than 10 microns in aerodynamic diameter
$PM_{2.5}$	Particulate matter less than 2.5 microns in aerodynamic diameter
ppb	parts per billion (by volume)
pphm	parts per hundred million (by volume)
QA/QC	Quality Assurance / Quality Control
RL	Reduced Level
SO_2	Sulfur dioxide
SO_3	Sulfur trioxide
SWTP	Springvale Water Treatment Plant
t	tonne
µg/m³	micrograms per cubic metre
WCA	Water Conditioned Ash

1. INTRODUCTION

EnergyAustralia operates the Mount Piper Power Station (MPPS), located at 350 Boulder Road, Portland, New South Wales. The MPPS is approved to operate 700 MW and 730 MW coal-fired steam turbine generators that have the capacity (> 4000 GWh) to meet the energy needs of approximately 1.18 million homes in New South Wales every year. MPPS is fuelled using black coal sourced from coal mines in the local area.

The MPPS operates under various licences and approvals including Environmental Protection Licence (EPL) 13007 issued by the NSW Environmental Protection Authority (EPA). This Annual Air Emissions Monitoring Report (AAEMR) has been prepared to satisfy Condition R1.9 of EPL13007. The AAEMR is required to analyse and summarise air emission and ambient air quality monitoring data collected within the reporting period.

ERM was engaged by EnergyAustralia to prepare the AAEMR for the 2023 calendar year ('the reporting period') and summarise the methodology and findings in a technical report (this report).

1.1 EPL UPDATES

A 5-year licence review was completed in 2023. The licence was revised five times. Three of these variations included conditions relevant to air emissions. These variations are as follows:

Licence Variation: 27 January, 2023

The 27 January 2023 variation to EPL 13007 includes the following updates:

- Condition L3.2 (note) - varied to reflect new Protection of the Environment (Clean Air) Regulation 2022;
- Condition M3.1 (note) - varied to reflect new Protection of the Environment (Clean Air) Regulation 2022;
- Condition O4 (note) - varied to reflect new Protection of the Environment (General) Regulation 2022;
- Remove all conditions related to the emergency discharge to Thompsons Creek Reservoir (TCR) emergency discharge being conditions A2.1, A2.5, P1.3, L3.8, L4.1, M2.6, M8.1 and E8;
- Condition A2.1 location table updated as follows;
    - Removal of Lot 15 DP 804929,
    - Removal of Lot 1 DP 813288,
    - Addition of Lot 3 DP 999329,
    - Addition of Lot 4 DP 1151441,
    - Addition of Lot 101 DP 1240974,
    - Addition of Lot 101 DP 1164619; and
- Condition A2.2 - varied to replace the location data for the Nu-Rock facility, Lot 2 DP 702619 formally Lot 103 DP 1164619.

Licence Variation: 18 October, 2023

The 18 October 2023 variation to EPL 13007 includes the following updates:

- Condition O5.2 - Varied. References to conditions have been varied to reference the correct conditions.
- Condition O5.6 – Varied. The condition that requires the testing of various substances within the coal fuel has been varied to specifically include mercury, as detailed in the Background section of this Notice. The wording has also been varied for consistency with other power station licences.
- Condition O5.7 (new) – Added. A new condition has been added to require the Licensee to provide the fuel testing data to the EPA upon request.
- Condition O5.7 Note – Added. A note has also been included to identify that the EPA intend on reviewing the testing regime after a set date.
- Condition O5.7 – O5.9 – Varied. The numbering of the conditions has been changed due to the addition of a new condition.
- Conditions L3.9 and L3.10 – Varied. References to conditions have been varied to reference the correct conditions.
- Condition M2.2 - Varied. The references to testing methods for cadmium and chlorine have been corrected to align with the 'Approved methods for the sampling and analysis of air pollutants in NSW'.
- Condition M2.4 – Varied. The Licensee now monitors for moisture, oxygen and temperature, as evidenced by monitoring data provided in the latest Annual Return, and as such the requirement for the installation of the equipment for these parameters has been removed.
- Condition M2.4 and Note – Varied. The Licensee condition has been varied to update the due date for continuous monitoring of flow rate, as agreed with the EPA. The Note has also been varied in respect of the above variation.
- Condition E1 (former) – Removed. The Dioxin and Furan Study has been provided to the EPA, as detailed in the Background section of this Notice, and as such the Licence condition has been removed.
- Condition E7 (former) – Removed. The Water Management Review Report has been provided to the EPA, as detailed in the Background section of this Notice, and as such the Licence condition has been removed.
- Conditions E1 to E9 – Varied. The former numbering of conditions has been varied due to the removal of conditions as detailed in the section of the Notice.
- Condition E1 – Varied. The Air Emissions Monitoring Plan has been provided and the condition has been changed to ‘must implement and maintain’, as detailed in the Background section of this Notice. Former condition E2.2 has been removed as the plan has been provided.
- Condition E2 – Varied. The QA/QC Procedure has been provided and the condition has been changed to must implement and maintain, as detailed in the Background section of this Notice. Former condition E3.2 has been removed as the plan has been provided.
- Condition E3 – Varied. The Air Pollution Control Procedure has been provided and the condition has been changed to must implement and maintain, as detailed in the

Background section of this Notice. Former conditions E4.2 and E4.3 have been removed as the plan has been provided.

- Condition E4 – Varied. The Particulate CEMS installation and commissioning has been successfully completed, as detailed in the Background section of this Notice, and as such the licence condition has been removed.
- Condition E4 Note – Added. A Note has been added to clarify that the EPA is currently evaluating an industry-wide consistent approach to the licensing requirements for PM-CEMS. The EPA intends on varying all coal-fired power station licences in due course to include consistent monitoring requirements that become in-force as each station's PM-CEMS are commissioned.
- Condition E6 – Added. A condition that requires appropriate dust management has been added to specifically include a dust management plan and a TARP, as detailed in the Background section of this Notice. The condition does not come into force until four months after the licence variation.

Licence Variation: 19 October, 2023

The 19 October 2023 variation to EPL 13007 includes the following updates:

- Condition M9.1 and Note – Added – A condition has been added to the licence to require the licensee to monitor and record details regarding generation, deposition, storage, transport and reuse of coal ash generated at the premises, for the reasons provided in the Background section of this Notice.
- Conditions R4.4, R4.5 and R4.6 – Added – A condition has been added to the licence to require the licensee to submit to the EPA and publicly publish an Annual Coal Ash Monitoring Report that details information required under condition M9.1 in respect of generation, deposition, storage, transport and reuse of coal ash generated at the premises for the previous reporting period, for the reasons provided in the Background section of this Notice.
- Condition E7.1, 7.2, and Note – Added - Conditions have been added to require quarterly reporting to the EPA of the coal testing results collected in accordance with condition O5.6, as detailed in the Background section of this Notice. The condition allows for a review of the regime after a set length of time.

1.2 EPL REQUIREMENTS

Condition R1.9 – Annual Air Emission Monitoring Report outlines a number of requirements that are to be addressed in preparation of the AAEMR. Table 1-1 lists these requirements with corresponding report sections that address each condition.

The monitoring requirements of *Condition M2.2 – Air Monitoring Requirements*, (as referenced in Condition R1.9) are shown in Table 1.2.

Condition – M9.1 Other Monitoring and Recording Conditions Coal Ash Monitoring outlines a number of reporting requirements relating to the production and storage of ash. These requirements are listed in Table 1-3. In addition to Condition – *R4.4 Other Monitoring Conditions Coal Ash Monitoring Reporting*, shown in Table 1-4, it is noted that this condition is not a specific requirement of the AAEMR, but has nominally been incorporated into the AAEMR to address conditions M9.1 and R4.4.

TABLE 1-1 NSW EPA EPL13007 CONDITION – R1.9 ANNUAL AIR EMISSION MONITORING REPORT

R1.9	Annual Air Emission Monitoring Report	Refer to
	The licensee must submit with the Annual Return an Annual Air Emission Monitoring Report. The Annual Emission Monitoring Report must analyse and summarise emission monitoring data from the reporting period including, but not limited to:	This report.
a)	*a comprehensive summary (tabulated and graphical) of all periodic and continuous monitoring data as required by condition M2.2 of this licence, including a comparison with the concentration limits specified in condition L3.2 and L3.3;*	Section 2 Table 2-1, Table 2-4, Table 2-6 Figure 2-1 to Figure 2.9
b)	*analysis of trends in emission performance for all pollutants monitored as required under condition M2.2. Trend analysis must include comparison of emission performance during the reporting period with emission performance from the previous 4 years;*	Section 3
c)	*details of any exceedances of air emission licence limits and details of plant operating conditions at the times the exceedances occurred;*	Section 2.4.1
d)	*details of plant operating conditions, including Boiler load (MW), during sampling for each Boiler;*	Table 2-1
e)	*demonstrated compliance with the CEMS Quality Assurance and Control Procedures prepared for the premises;*	Section 2.2.2 Table 2-5
f)	*summary of fuel usage, including:* *i. total coal and other permitted fuels consumed in each Boiler (including start-up);* *ii. a statement about the representativeness of fuel quality during periodic air emission sampling compared to non-sampling periods;* *iii. total fuel consumed by each Boiler during times when periodic air emission sampling was undertaken.*	Section 3.1 Table 3-1 Table 2-1
g)	*detailed calculations used to determine the aggregated pollutant emission rates for each boiler.*	Section 4

TABLE 1-2 NSW EPA EPL13007 CONDITION – M2.2 AIR MONITORING REQUIREMENTS

Pollutant	Units of Measure	Frequency	Sampling Method
Point 2,3			
Cadmium	milligrams per cubic metre	Every 6 months	TM-38
Chlorine	milligrams per cubic metre	Every 6 months	TM-38
Fluorine	milligrams per cubic metre	Every 6 months	TM-38
Hydrogen chloride	milligrams per cubic metre	Every 6 months	TM-38
Mercury	milligrams per cubic metre	Every 6 months	TM-38
Nitrogen oxides	milligrams per cubic metre	Continuous	TM-38
Solid particles	milligrams per cubic metre	Quarterly	TM-38

Pollutant	Units of Measure	Frequency	Sampling Method
Sulfur dioxide	milligrams per cubic metre	Continuous	TM-38
Sulfuric acid mist and sulfur trioxide (as SO_3)	milligrams per cubic metre	Every 6 months	TM-38
Type 1 and Type 2 substances in aggregate	milligrams per cubic metre	Every 6 months	TM-38
Volatile organic compounds as n-propane equivalent	milligrams per cubic metre	Every 6 months	TM-38
Point 4,5,6,7			
Cadmium	milligrams per cubic metre	Every 6 months	TM-12
Flow rate	cubic metres per second	Continuous	CEM-6 and US EPA Procedure 1
Mercury	milligrams per cubic metre	Every 6 months	TM-14
Moisture	Percent	Continuous	Special Method 1
Nitrogen oxides	milligrams per cubic metre	Continuous	CEM-2 and US EPA Procedure 1
Oxygen (O_2)	Percent	Continuous	CEM-3 and US EPA Procedure 1
Solid particles	milligrams per cubic metre	Quarterly	TM-15
Sulfur dioxide	milligrams per cubic metre	Continuous	CEM-2 and US EPA Procedure 1
Temperature	degrees Celsius	Continuous	TM-2 and US EPA Procedure 1
Type 1 and Type 2 substance in aggregate	milligrams per cubic metre	Every 6 months	TM-12, TM-13 & TM-14
Point 4,6			
Carbon dioxide	Percent	Every 6 months	TM-24
Chlorine	milligrams per cubic metre	Every 6 months	TM-7
Fluorine	milligrams per cubic metre	Every 6 months	TM-9
Hydrogen chloride	milligrams per cubic metre	Every 6 months	TM-8
Sulfuric acid mist and sulfur trioxide (as SO_3)	milligrams per cubic metre	Every 6 months	TM-3

Pollutant	Units of Measure	Frequency	Sampling Method
Volatile organic compounds as n-propane equivalent	milligrams per cubic metre	Every 6 months	TM-34
Point 8			
Fluoride	micrograms per cubic metre	Continuous	AM-8
Point 8,9			
Nitrogen dioxide	parts per hundred million	Continuous	AM-12
$PM_{2.5}$	micrograms per cubic metre	Continuous	Special Method 2
Sulfur dioxide	parts per hundred million	Continuous	AM-20
Point 10			
Nitrogen dioxide	parts per hundred million	Monthly	Special Method 3
Sulfur dioxide	parts per hundred million	Monthly	Special Method 3

TABLE 1-3 NSW EPA EPL13007 CONDITION – M9.1 OTHER MONITORING AND RECORDING CONDITIONS - COAL ASH MONITORING

M9.1	Other monitoring and recording conditions Coal Ash Monitoring (quantities to be reported in tonnes)	Refer to
	For each licence reporting period, the licensee must monitor and record the following details regarding generation, deposition, storage, transport and reuse of coal ash generated at the premises:	Section 5
a)	*Quantity of coal used for electricity generation at the premises;*	Table 5.1 (1)
b)	*Quantity of bottom ash; and quantity of fly ash, generated at the premises and the grade of fly ash produced (if the grade is known);*	Table 5.1 (2) (4)
c)	*Quantity of bottom ash; and quantity of fly ash, deposited, and/or stored at the premises with a description of how it is stored and the processes for managing the storage;*	Table 5.1 (1)
d)	*Quantity of bottom ash; and quantity of fly ash, transported from the premises together with identification of the destination; and*	Table 5.1 (1)
e)	*Management measures used for coal ash repositories on the premises to maintain the viability of ash reuse, including identification of any other materials being stored concurrently with newly deposited coal ash.*	Section 5
Note: The collection and reporting of information required by the above condition does not come into effect until three months after the issued date of this licence version to allow the licensee to put in place the relevant systems required to meet the condition.		

TABLE 1-4 NSW EPA EPL13007 CONDITION – R4.4 OTHER REPORTING CONDITIONS

R4.4	Coal Ash Monitoring Reporting	Refer to
	The licensee must prepare an Annual Coal Ash Monitoring Report that details information required under condition M9.1 in respect of generation, deposition, storage, transport and reuse of coal ash generated at the premises for each Annual Return reporting period.	Section 5

The stack concentration limits as referenced in Condition R1.9, *Condition L3.2 – Air Concentration Limits*, are shown in Table 1-5. Condition L3.3 states that in addition to the concentration limits specified in condition L3.2, the following 99th percentile concentration limits apply for points 2 and 3 utilising the same units of measure, reference conditions, oxygen correction and averaging period as above for each pollutant listed below:

a) nitrogen oxides: 1,100 mg/Nm^3; and

b) sulfur dioxide: 1,400 mg/Nm^3.

Condition L3.5 states that exceedances due to compliance with an Australian Energy Market Operator (AEMO) direction in accordance with Section 74 of the Protection of the Environment Operations (Clean Air) Regulation 2022 do not count towards the accumulated hours for the purpose of calculating compliance with condition L3.3.

It should be noted that the reference conditions (Dry, 273K, 101.3kPA), oxygen correction (7% O_2) and averaging period (1 hour) are constant for each pollutant and are left out of Table 1-5.

TABLE 1-5 NSW EPA EPL13007 CONDITION – L3.2 AIR CONCENTRATION LIMITS

Pollutant	100th percentile concentration limit
Mercury	0.05 mg/m^3
Chlorine	20 mg/m^3
Type 1 and Type 2 substance in aggregate	0.75 mg/m^3
Volatile organic compounds as n-propane equivalent	10 mg/m^3
Hydrogen chloride	50 mg/m^3
Solid Particles	50 mg/m^3
Sulfuric acid mist and sulfur trioxide (as SO_3)	100 mg/m^3
Nitrogen oxides	1,500 mg/m^3
Fluorine (total fluoride as HF equivalent)	30 mg/m^3
Cadmium	0.2 mg/m^3
Sulfur dioxide	1,700 mg/m^3

Note: During calibration and commissioning testing of the Particulate Continuous Emission Monitors undertaken in accordance with condition E5.2 (SIC), the limit for solid particles does not apply, however the concentration must not exceed the limits listed in the *Protection of the Environment (Clean Air) Regulation 2022*.

1.3 STUDY METHODOLOGY

The following steps were undertaken to complete this air emission monitoring report:

- Summarise data of the 2023 monitoring results required under EPL13007;
- Review historical monitoring data to analyse the trends in emission performance for all pollutants monitored under EPL13007;
- Consolidate and analyse monitoring data to understand if the data available is representative of normal operating conditions at MPPS; and
- Summarise compliance with Condition R1.9 under EPL13007.

2. AIR EMISSION MONITORING SUMMARY

The following sections summarise the air monitoring as relevant to the requirements of the *Condition R1.9 – Annual Air Emissions Monitoring Report*.

2.1 STACK TESTING

The stack test documents reviewed for 2023 monitoring include:

- Ektimo 2023a, Quarterly (Q1) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R014518, 5 April 2023;
- Ektimo 2023b, Quarterly (Q1) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R014323, 26 April 2023;
- Ektimo 2023c, Quarterly (Q3) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R015163, 14 August 2023; and
- Ektimo 2023d, Quarterly (Q4) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R015826, 30 November 2023.
- Ektimo 2024a, Quarterly (Q2) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R014882a, 15 January 2024;

The individual 2023 stack testing results are summarised in Table 2-1. All the concentrations provided are at normal conditions (0 °C, 101.325 kPa), dry basis, and at a reference oxygen content of 7% O_2 (dry basis).

The stack test frequencies met the stack, non-continuous sampling requirements as described in *Condition M2.2 – Air Monitoring Requirements* as outlined in Table 1-2. The results of the stack test indicate that there were no exceedances of the air concentration limits outlined in Table 1-5.

The corresponding stack test reports are included in Appendix A.

TABLE 2-1 SUMMARY OF STACK TESTING RESULTS AND POWER STATION OPERATING CONDITIONS

Sampling Date	Unit & Duct	Process condition	Temperature (°C)	Oxygen (%)	Daily Coal Burn (t)	Fuel Oil Consumed (L)	Daily Generation (MWh)	Mass Rate (g/min)	Measured Concentration (mg/Nm³)
Solid particles									
31/01/2023	1B	Load 350MW	122	10.5	4,367	6,225	7,558	17	2.2
1/02/2023	1A	Load 350MW	115	10.3	4,338	5,529	9,966	80	7.5
2/02/2023	2A	Load 350MW (mill running/adjustment with liquid fuel introduced)	117	9.1	9,870	14,385	10,487	58	3.9
3/02/2023	2B	Load 350MW	113	9.4	8,489	6,464	9,078	36	2.9
9/05/2023	2A	Boiler load stable at 280MW	106	10.6	9,805	4,549	10,505	<20	<2
9/05/2023	2B	Boiler load stable at 450 MW	120	8.1	9,805	4,549	10,505	17	1.2
10/05/2023	1B	Boiler load was stable at 280MW and increased to 350MW around 12:10pm	115	10.6	4,753	4,800	11,631	19	2
11/05/2023	1A	Boiler load stable at 280MW	118	10.2	4,743	6,007	9,869	31	3.3
4/07/2023	1A	Boiler load stable at 550 MW	121	8	5,699	7,981	12,713	<20	<1
5/07/2023	1B	Boiler load stable at 400 MW	122	7.8	5,034	8	11,675	26	1.6
6/07/2023	2A	Boiler load stable at 500-450 MW	113	9.4	10,832	4,192	11,493	<0.3	2.2
7/07/2023	2B	Boiler load stable at 350 MW	107	9.5	9,585	4,857	10,230	13	1.1
24/10/2023	1A	Boiler load stable at 220 MW	112	11	3,043	7,625	7,425	28	3.3
24/10/2023	1B	Boiler load stable at 220 MW	110	11.4	3,043	7,625	7,425	14	1.6
25/10/2023	2A	Boiler load stable at 220 MW	105	11.2	6,618	11,084	7,202	21	2.8
25/10/2023	2B	Boiler load stable at 220 MW	102	10.6	6,618	11,084	7,202	26	2.9
Sulfuric acid mist and sulfur trioxide (as SO_3)									
21/02/2023	1B	Boiler load stable at 220 MW	108	11.9	5,782	15,227	6,408	47	5
23/02/2023	2A	Boiler load stable at 220 MW	104	12.2	5,208	3,292	5,751	72	8.8
25/10/2023	2A	Boiler load stable at 220 MW	105	11.2	6,618	11,084	7,202	7	0.94
24/10/2023	1B	Boiler load stable at 220 MW	110	11.4	3,043	7,625	7,425	23	2.6
Volatile organic compounds (VOCs) as n-propane equivalent									
21/02/2023	1B	Boiler load stable at 220 MW	114	12.1	5,782	15,227	6,408	1.1	0.13
23/02/2023	2A	Boiler load stable at 220 MW	107	12.1	5,208	3,292	5,751	<0.7	<0.08
24/10/2023	1B	Boiler load stable at 220 MW	110	11.4	3,043	7,625	7,425	1.5	0.17
25/10/2023	2A	Boiler load stable at 220 MW	105	11.2	6,618	11,084	7,202	1.5	0.2
Chlorine									
21/02/2023	1B	Boiler load stable at 220 MW	114	12.1	5,782	15,227	6,408	1.3	0.16
23/02/2023	2A	Boiler load stable at 220 MW	107	12.1	5,208	3,292	5,751	0.42	0.051
5/07/2023	1B	Boiler load stable at 400 MW	125	8.5	5,034	8	11,675	<0.3	<0.02
6/07/2023	2A	Boiler load stable at 500-450 MW	113	8.7	10,832	4,192	11,493	<0.3	<0.02
Hydrogen chloride									
21/02/2023	1B	Boiler load stable at 220 MW	114	12.1	5,782	15,227	6,408	33	4.1
23/02/2023	2A	Boiler load stable at 220 MW	107	12.1	5,208	3,292	5,751	15	1.8
5/07/2023	1B	Boiler load stable at 400 MW	125	8.5	5,034	8	11,675	18	1.2
6/07/2023	2A	Boiler load stable at 500-450 MW	113	8.7	10,832	4192	11,493	25	1.7

Sampling Date	Unit & Duct	Process condition	Temperature (°C)	Oxygen (%)	Daily Coal Burn (t)	Fuel Oil Consumed (L)	Daily Generation (MWh)	Mass Rate (g/min)	Measured Concentration (mg/Nm³)
Fluorine									
21/02/2023	1B	Boiler load stable at 220 MW	114	12.1	5,782	15,227	6,408	100	13
23/02/2023	2A	Boiler load stable at 220 MW	107	12.1	5,208	3,292	5,751	57	6.8
5/07/2023	1B	Boiler load stable at 400 MW	125	8.5	5,034	8	11,675	170	12
6/07/2023	2A	Boiler load stable at 500-450 MW	113	8.7	10,832	4,192	11,493	240	16
Cadmium									
31/01/2023	1B	Load 350MW	122	10.5	4,338	5,529	9,966	0.0054	0.00069
1/02/2023	1A	Load 350MW	115	10.3	4,338	5,529	9,966	<0.004	<0.0004
2/02/2023	2A	Load 350MW (mill running/adjustment with liquid fuel introduced)	117	9.1	9,870	14,385	10,487	<0.004	<0.0003
3/02/2023	2B	Load 350MW	113	9.4	8,489	6,464	9,078	0.0044	0.00036
4/07/2023	1A	Boiler load stable at 550 MW	121	8.0	5,699	7,981	12,713	0.013	0.00088
5/07/2023	1B	Boiler load stable at 400 MW	122	7.8	5,034	8	11,675	<0.006	<0.0004
6/07/2023	2A	Boiler load stable at 500-450 MW	109	9.4	10,832	4,192	11,493	<0.003	<0.0002
7/07/2023	2B	Boiler load stable at 350 MW	107	9.5	9,585	4,857	10,230	0.0037	0.0003
Mercury									
1/02/2023	1A	Load 350MW	115	10.3	4,338	5,529	9,966	0.040	0.0037
1/02/2023	1B	Load 350MW	122	10.5	4,338	5,529	9,966	0.022	0.0028
2/02/2023	2A	Load 350MW (mill running/adjustment with liquid fuel introduced)	117	9.1	9,870	14,385	10,487	0.039	0.0027
3/02/2023	2B	Load 350MW	113	9.4	8,489	6,464	9,078	0.052	0.0042
6/07/2023	2A	Boiler load stable at 500-450 MW	109	9.4	10,832	4,192	11,493	0.0051	0.0004
7/07/2023	2B	Boiler load stable at 350 MW	107	9.5	9,585	4,857	10,230	0.0046	0.00038
5/07/2023	1B	Boiler load stable at 400 MW	122	7.8	5,034	8	11,675	0.011	0.00068
4/07/2023	1A	Boiler load stable at 550 MW	121	8.0	5,699	7,981	12,713	0.020	0.0014
Type 1 and Type 2 substances in aggregate									
1/02/2023	1A	Load 350MW	115	10.3	4,338	5,529	9,966	<0.38	<0.036
1/02/2023	1B	Load 350MW	122	10.5	4,338	5,529	9,966	<0.21	<0.027
2/02/2023	2A	Load 350MW (mill running/adjustment with liquid fuel introduced)	117	9.1	9,870	14,385	10,487	<0.42	<0.029
3/02/2023	2B	Load 350MW	113	9.4	8,489	6,464	9,078	<0.34	<0.028
4/07/2023	1A	Boiler load stable at 550 MW	121	8.0	5,699	7,981	12,713	<3.7	<0.25
5/07/2023	1B	Boiler load stable at 400 MW	122	7.8	5,034	8	11,675	<1.4	<0.085
6/07/2023	2A	Boiler load stable at 500-450 MW	109	9.4	10,832	4,192	11,493	<0.61	<0.048
7/07/2023	2B	Boiler load stable at 350 MW	107	9.5	9,585	4,857	10,230	0.53	<0.043

*Reported as dry, 0°C, 101.325 kPa and corrected to 7% O_2.
N/A – Not Applicable: Sampling performed as per required sampling frequencies outlined in Table 1-2.

2.2 CEMS

Condition M2.2 – *Air Monitoring Requirements* requires the continuous monitoring of specific stack parameters. Table 2-2 summarises the Continuous Emissions Monitoring System (CEMS) data as required in Condition M2.2.

The following sections summarise the CEMS data and quality assurance program.

TABLE 2-2 LIST OF REQUIRED CEMS PARAMETERS

Pollutant	Monitoring Points	Unit & Duct
Nitrogen Oxides	Point 2, 3, 4, 5, 6, 7	Unit 1, Unit 2, Unit 1A, Unit 1B, Unit 2A, Unit 2B
Sulfur dioxide		
Flow rate [a]	Point 4, 5, 6, 7	Unit 1A, Unit 1B, Unit 2A, Unit 2B
Moisture		
Oxygen (O_2)		
Temperature		

Moisture, temperature and oxygen are monitored as part of the existing CEMS at MPPS. EnergyAustralia requested an extension for the implementation of flow rate monitoring as provided by EPL13007. Consultation with the EPA is ongoing regarding the flow rate calculation methodology.

2.2.1 CEMS RESULTS SUMMARY

The 2023 CEMS monitoring results are summarised in Table 2-3 and presented in Figure 2-1 to Figure 2-7.

For NO_x and SO_2, compliance was achieved with the limits set for the 100^{th} and 99^{th} percentile concentration at the monitoring points. The NO_x concentrations are distributed broadly between 200 mg/Nm³ and 1,000 mg/Nm³, while the SO_2 concentrations are more concentrated between 1000 mg/Nm³ and 1,400 mg/Nm³ until October 2023, when lower concentrations of ~600 mg/Nm^3 were measured.

The moisture is generally between 4% and 9% for both boilers, with an average moisture of approximately 6.6%. The discharge oxygen percentage was, on average, 9.7%. The discharge temperatures are mostly between 100 °C and 130 °C, with some lower temperatures of ~80 °C. The trends identified are a result of lower load profile during the second half of the year at MPPS, shown in Figure 2-8.

FIGURE 2-1 CEMS RESULTS – NO_X (POINT 2 AND 3)

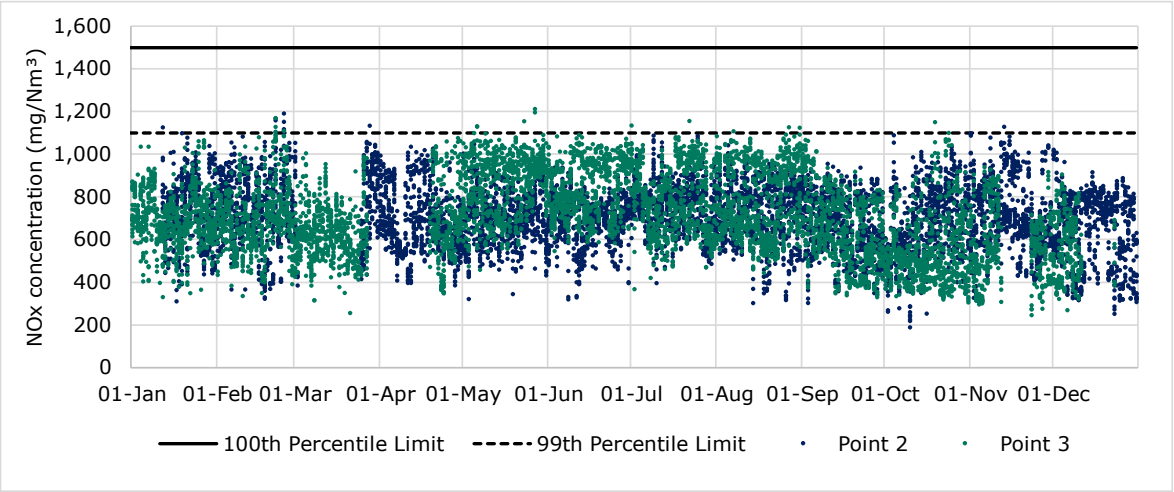


FIGURE 2-2 CEMS RESULTS – NO_X (POINT 4, 5, 6 AND 7)

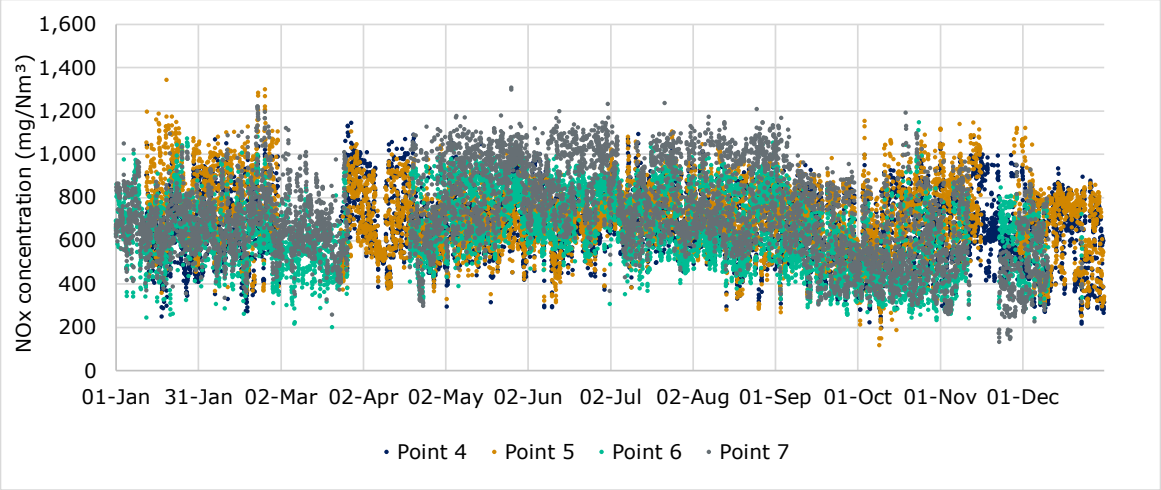


FIGURE 2-3 CEMS RESULTS – SO_2 (POINT 2 AND 3)

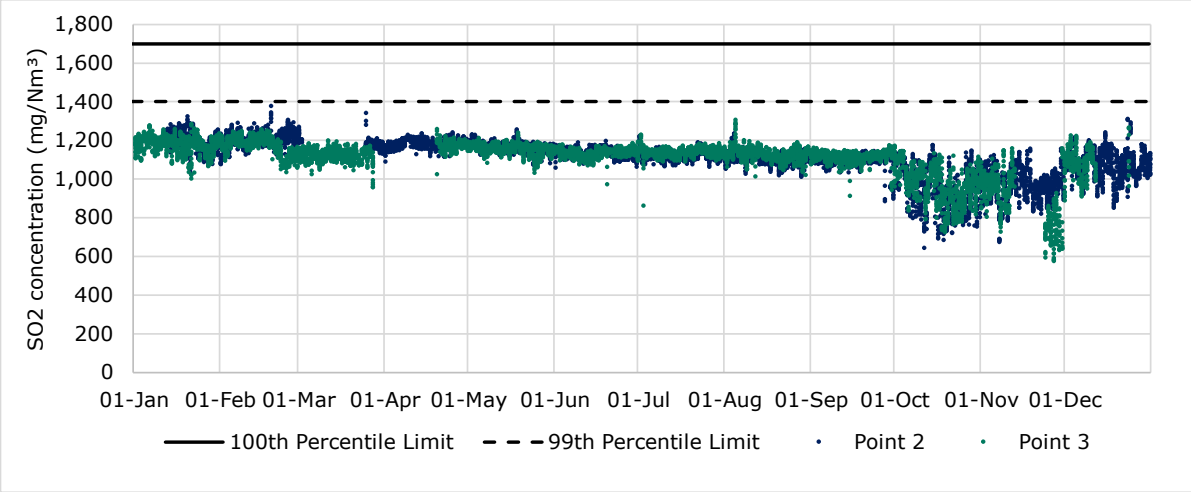


FIGURE 2-4 CEMS RESULTS – SO_2 (POINT 4, 5, 6 AND 7)

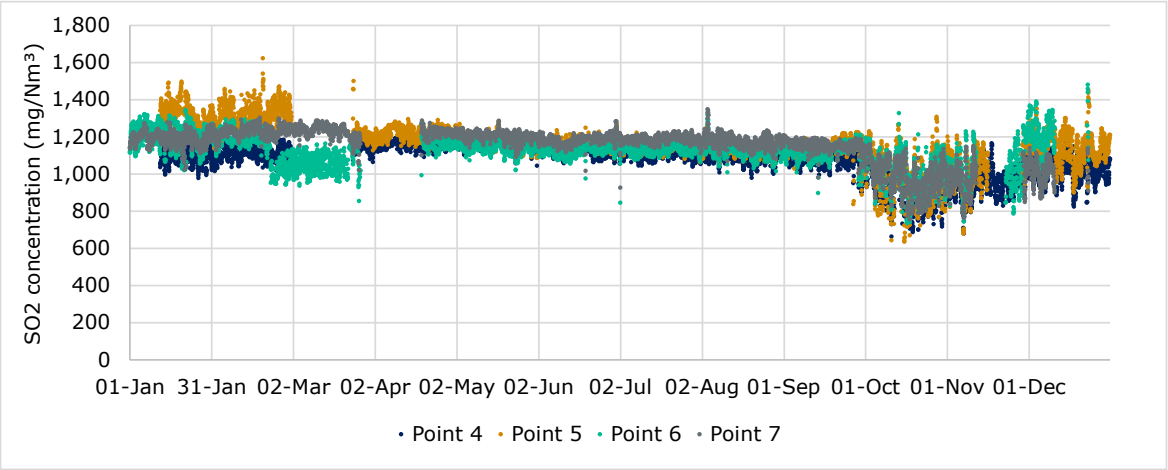


FIGURE 2-5 CEMS RESULTS – MOISTURE (POINT 4, 5, 6 AND 7)

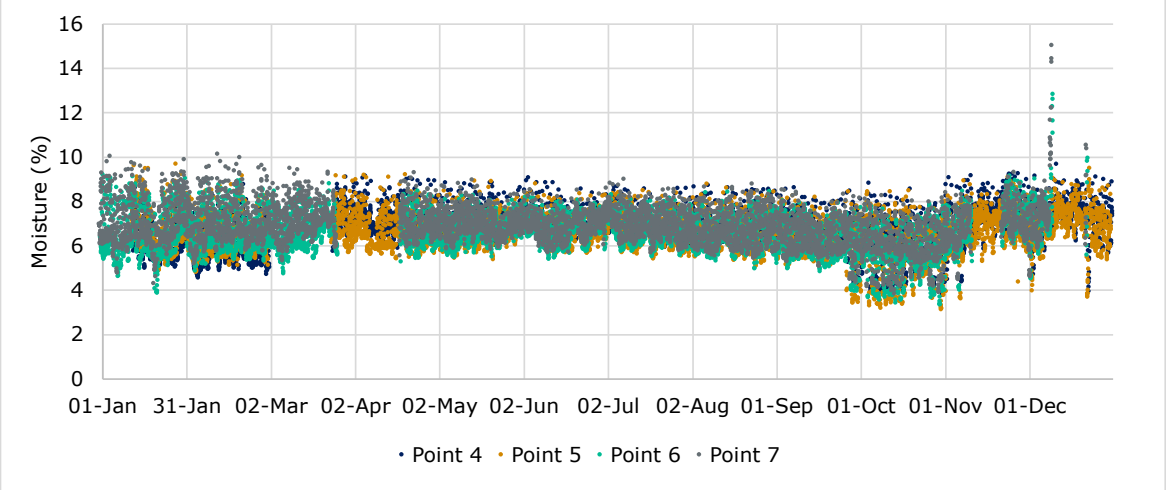


FIGURE 2-6 CEMS RESULTS – OXYGEN (POINT 4, 5, 6 AND 7)

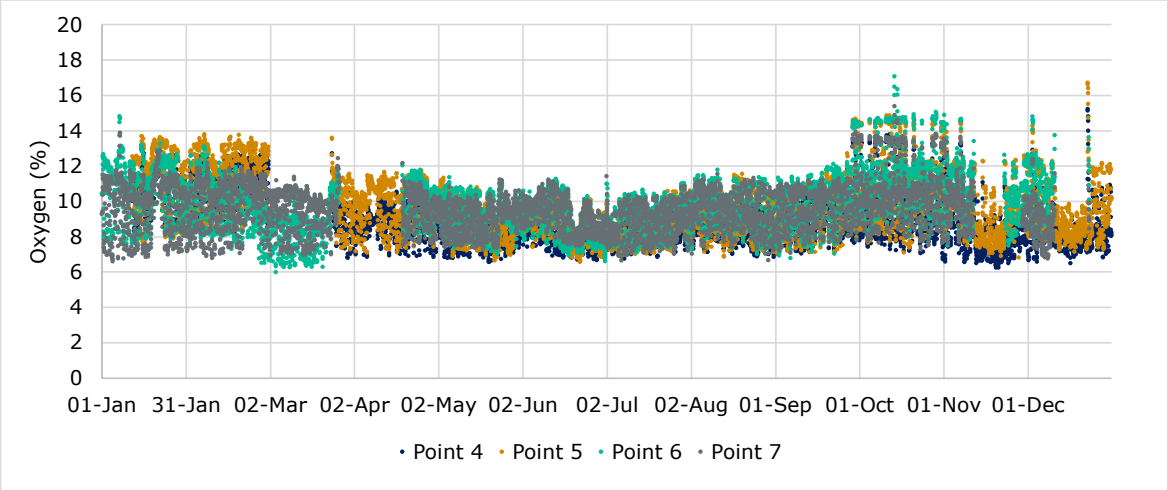


FIGURE 2-7 CEMS RESULTS – TEMPERATURE (POINT 4, 5, 6 AND 7)

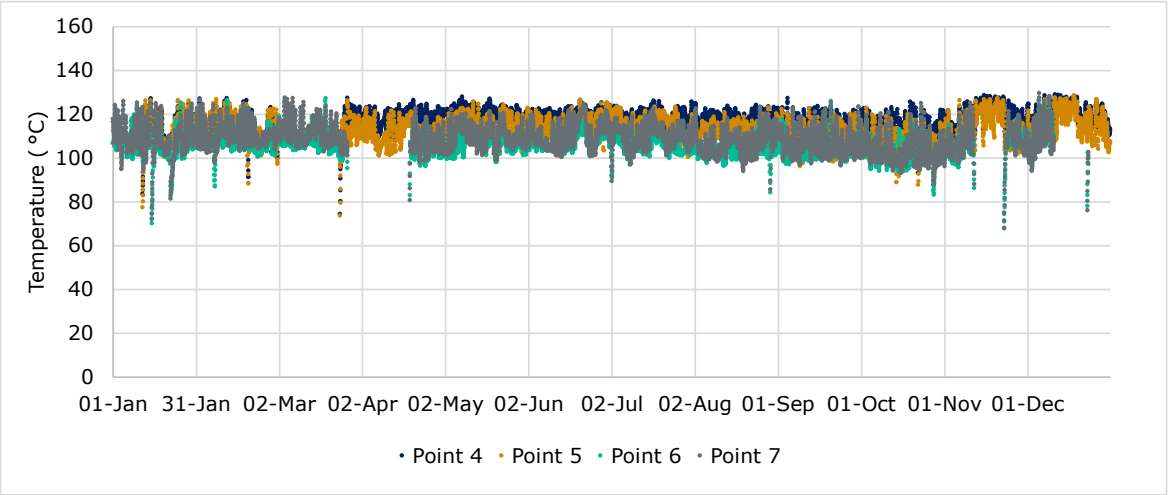


FIGURE 2-8 CEMS RESULTS – LOAD (MW, POINT 2 AND 3)

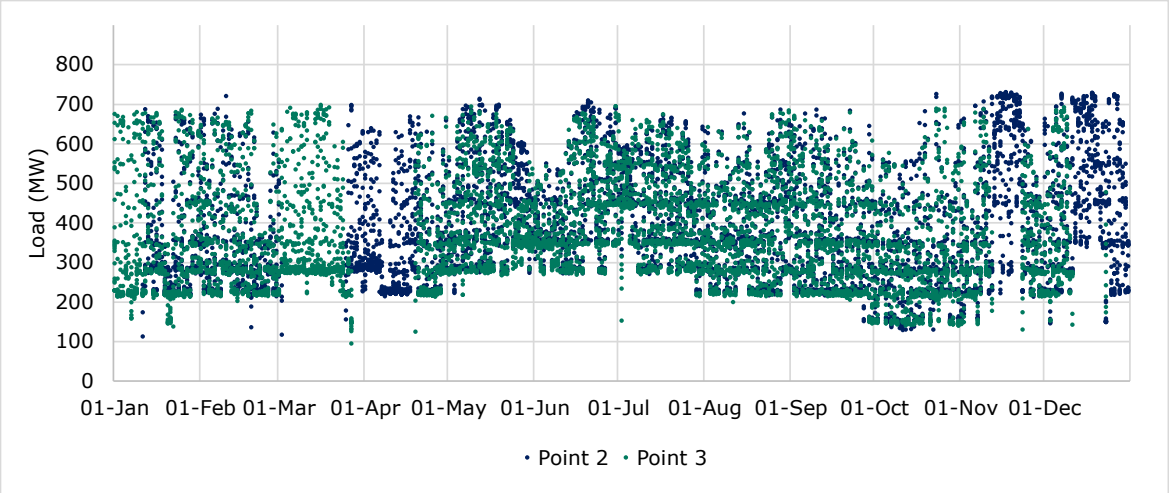


TABLE 2-3 SUMMARY OF 2023 CEMS RESULTS

Monitoring Point	Data Capture[a]	Minimum	Average	Maximum	50th Percentile	70th Percentile	99th Percentile	100th Percentile Concentration Limit compliance	99th percentile Concentration Limit Compliance
NO_x (mg/Nm³) – 1 hour average									
Point 2 (Unit 1)	99%	182	694	1,187	698	777	1,013	✓	✓
Point 3 (Unit 2)	99%	232	694	1,201	683	790	1,049	✓	✓
Point 5 (Unit 1A)	99%	204	671	1,146	672	756	999	N/A	
Point 4 (Unit 1B)	95%	129	719	1,349	725	797	1,085		
Point 6 (Unit 2A)	99%	215	650	1,165	645	747	986		
Point 7 (Unit 2B)	99%	157	737	1,328	723	845	1,137		
SO_2 (mg/Nm³) – 1 hour average									
Point 2 (Unit 1)	99%	644	1,110	1,378	1,129	1,161	1,266	✓	✓
Point 3 (Unit 2)	99%	730	1,118	1,311	1,137	1,159	1,240	✓	✓
Point 5 (Unit 1A)	99%	658	1,076	1,238	1,101	1,127	1,189	N/A	
Point 4 (Unit 1B)	95%	623	1,151	1,613	1,153	1,188	1,412		
Point 6 (Unit 2A)	99%	717	1,104	1,458	1,118	1,144	1,284		

Monitoring Point	Data Capture[a]	Minimum	Average	Maximum	50th Percentile	70th Percentile	99th Percentile	100th Percentile Concentration Limit compliance	99th percentile Concentration Limit Compliance
Point 7 (Unit 2B)	99%	730	1,135	1,328	1,164	1,186	1,248		
Moisture (%)									
Point 5 (Unit 1A)	99%	3.9	6.9	9.8	6.9	7.3	8.7	N/A	
Point 4 (Unit 1B)	99%	3.1	6.6	9.7	6.6	7.1	8.5		
Point 6 (Unit 2A)	99%	3.3	6.5	12.8	6.5	7.0	8.5		
Point 7 (Unit 2B)	99%	3.8	6.7	14.9	6.7	7.1	9.0		
O_2 (%)									
Point 5 (Unit 1A)	99%	6.4	9.1	15.4	8.8	9.5	13.3	N/A	
Point 4 (Unit 1B)	99%	6.8	10.0	17.0	9.7	10.7	14.6		
Point 6 (Unit 2A)	99%	6.2	10.1	17.4	10.0	10.9	14.9		
Point 7 (Unit 2B)	97%	6.9	9.9	15.7	9.9	10.6	13.8		
Temperature (°C)									
Point 5 (Unit 1A)	100%	75	118	130	118	121	128	N/A	
Point 4 (Unit 1B)	100%	75	114	131	114	118	128		

Monitoring Point	Data Capture[a]	Minimum	Average	Maximum	50th Percentile	70th Percentile	99th Percentile	100th Percentile Concentration Limit compliance	99th percentile Concentration Limit Compliance
Point 6 (Unit 2A)	100%	71	109	130	109	111	122		
Point 7 (Unit 2B)	100%	73	113	134	113	116	127		

[a.] Data capture calculation only considers periods when the units are in operation at loads of greater than 150 MW. Periods when the boilers are out of service are excluded.
N/A: Not Applicable

2.2.2 CEMS QUALITY ASSURANCE AND CONTROL PROCEDURES

Condition E2 requires an implemented CEMS Quality Assurance and Quality Control Procedure. The document *Mount Piper Power Station – Site Specific Air Emission Monitoring Plan and CEMS Quality Assurance and Quality Control Procedures* (HRL, 2021) was compared with the requirements of Condition E3.1 in Table 2-4 . The CEMS quality assurance and quality control reporting has been reviewed, and has demonstrated compliance with the procedure.

TABLE 2-4 NSW EPA EPL13007 CONDITION – E2 CONTINUOUS EMISSIONS MONITORING SYSTEMS QUALITY ASSURANCE AND CONTROL PROCEDURES

E2	Continuous Emissions Monitoring Systems Quality Assurance and Control Procedures	Review
E2.1	*The licensee must implement and maintain a CEMS quality assurance (QA) and quality control (QC) procedure which enables the evaluation of the quality of data produced by any CEMS monitoring required by conditions of this licence. As a minimum, the CEMS QA/QC procedure must describe in detail the following:*	EnergyAustralia has provided the Procedure for ERM to review.
	a) calibration and adjustment measures;	Detailed in section 8 of the Procedure.
	b) preventive maintenance measures (including spare parts inventory);	Detailed in section 9 of the Procedure.
	c) data handling, recording and calculation procedures;	Detailed in section 10.3 of the Procedure.
	d) processes for evaluating, verifying and reporting monitoring data;	Detailed in section 11.2 of the Procedure.
	e) accuracy audit measures including sampling and analysis methods;	Detailed in section 11.3 of the Procedure.
	f) fault identification and corrective action measures; and	Detailed in section 11.4 of the Procedure.
	g) process for ongoing review and evaluation of the effectiveness of the CEMS QA/QC procedures	Detailed in section 12 of the Procedure.

2.3 AMBIENT AIR MONITORING

As shown in Table 1-2, ambient air monitoring is required at three locations:

- Point 8 (Blackmans Flat);
- Point 9 (Wallerawang); and
- Point 10 (Newnes Plateau).

The ambient air monitoring results for 2023 are summarised in Table 2-6 and presented in Figure 2.9 to Figure 2.11.

FIGURE 2.9 AMBIENT MONITORING RESULTS – NO_2

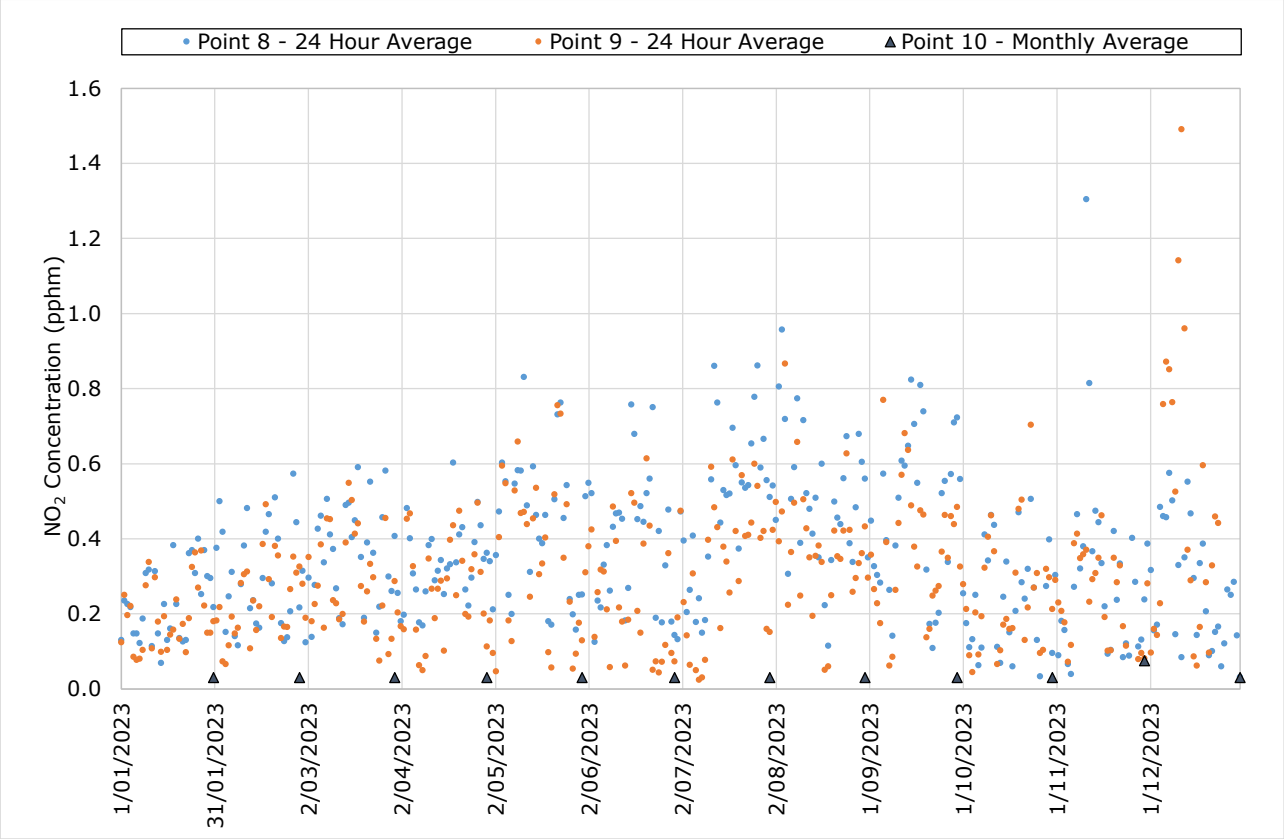


FIGURE 2.10 AMBIENT MONITORING RESULTS – SO_2

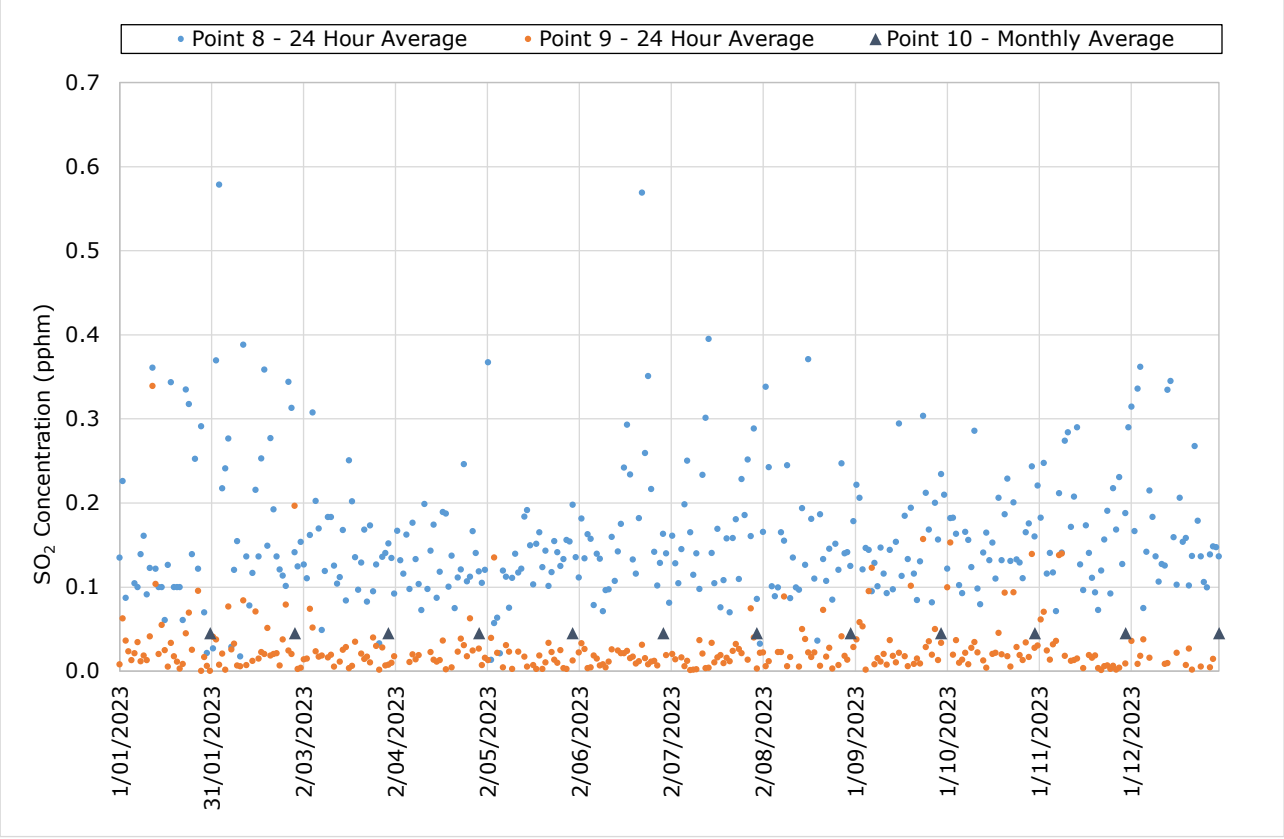


FIGURE 2.11 AMBIENT MONITORING RESULTS – $PM_{2.5}$ DAILY AVERAGE

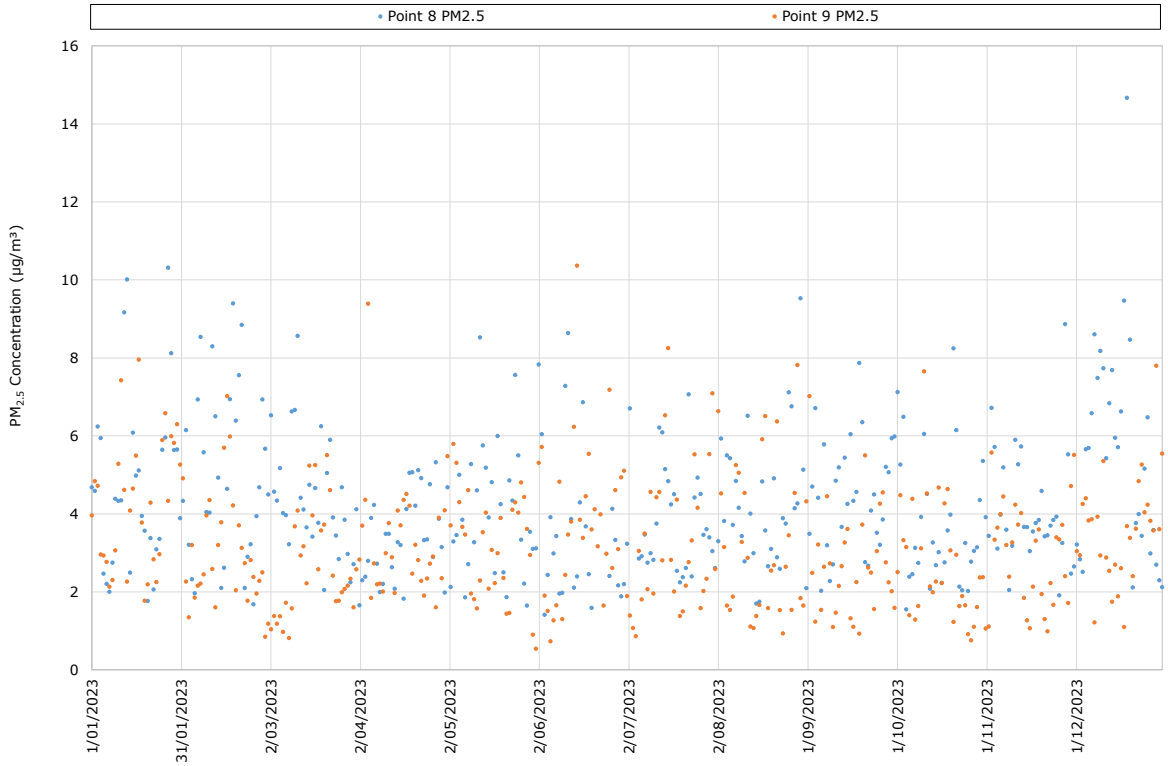


TABLE 2-5 SUMMARY OF 2023 AMBIENT MONITORING RESULTS

Pollutant	Average Period	Unit of Concentration	Data Capture	Concentration Statistic					
				Minimum	Average	Maximum	50th percentile	70th percentile	99th percentile
Point 8 (Blackmans Flat)									
Nitrogen dioxide	1 hour	pphm	95%	-0.045	0.359	2.452	0.245	0.420	1.482
	24 hours		100%	-0.005	0.359	1.304	0.338	0.457	0.841
Sulfur dioxide	1 hour		95%	-0.100	0.158	3.500	0.127	0.150	1.073
	24 hours		100%	-0.022	0.157	0.579	0.140	0.171	0.377
$PM_{2.5}$	24 hours	µg/m³	98%	1.413	4.279	14.666	3.889	4.972	9.491
Fluoride	7 days		96%	0.002	0.012	0.050	0.010	0.014	0.040
	30 days		100%	0.004	0.012	0.026	0.012	0.013	0.025
	90 days		100%	0.004	0.006	0.008	0.006	0.007	0.008
Point 9 (Wallerawang)									
Nitrogen dioxide	1 hour	pphm	92%	-0.136	0.297	2.662	0.161	0.339	1.441
	24 hours		97%	0.025	0.299	1.491	0.280	0.371	0.869
Sulfur dioxide	1 hour		92%	-0.059	0.021	2.047	0.013	0.020	0.301
	24 hours		100%	-0.054	0.021	0.339	0.015	0.022	0.144
$PM_{2.5}$	24 hours	µg/m³	100%	0.5	3.2	10.4	2.9	4.0	7.9
Point 10 (Newnes Plateau)									
Nitrogen dioxide	1 month	pphm	100%	<0.06	0.034*	0.075	0.030*	0.030*	0.070
Sulfur dioxide	1 month		100%	<0.09	0.045*	<0.09	0.045*	0.045*	0.045*

Note: "<" – Less than limit of reporting. * average and percentile values incorporate values less than the LOR at half of the LOR. Statistics prepared from hourly average data.

2.4 COMPLIANCE REVIEW

Compliance against monitoring requirements (EPL Condition M2.2) and air concentration limits (EPL Condition L3.2 and L3.3) has been reviewed and is summarised in Table 2-6.

TABLE 2-6 SUMMARY OF MONITORING REQUIREMENTS AND LIMIT COMPLIANCE REVIEW

Pollutant	Compliance			Comments
	Monitoring Frequency	Monitoring Method	Concentration Limit	
Point 2,3				
Cadmium	✓	✓	✓	-
Chlorine	✓	✓	✓	
Fluorine	✓	✓	✓	
Hydrogen chloride	✓	✓	✓	
Mercury	✓	✓	✓	
Nitrogen oxides	✓	✓	✓	
Solid particles	✓	✓	✓	
Sulfur dioxide	✓	✓	✓	
Sulfuric acid mist and sulfur trioxide (as SO_3)	✓	✓	✓	
Type 1 and Type 2 substances in aggregate	✓	✓	✓	
Volatile organic compounds as n-propane equivalent	✓	✓	✓	
Point 4,5,6,7				
Cadmium	✓	✓	N/A	
Flow rate	N/A	N/A	N/A	
Mercury	✓	✓	N/A	
Moisture	✓	✓	N/A	
Nitrogen oxides	✓	✓	N/A	
Oxygen (O_2)	✓	✓	N/A	
Solid particles	✓	✓	N/A	
Sulfur dioxide	✓	✓	N/A	
Temperature	✓	✓	N/A	
Type 1 and Type 2 substance in aggregate	✓	✓	N/A	

Pollutant	Compliance			Comments
	Monitoring Frequency	Monitoring Method	Concentration Limit	
Point 4,6				
Carbon dioxide	✓	✓	N/A	
Chlorine	✓	✓	N/A	
Fluorine	✓	✓	N/A	
Hydrogen chloride	✓	✓	N/A	
Sulfuric acid mist and sulfur trioxide (as SO_3)	✓	✓	N/A	
Volatile organic compounds as n-propane equivalent	✓	✓	N/A	
Point 8				
Fluoride	✓	✓	N/A	-
Point 8,9				
Nitrogen dioxide	✓	✓	N/A	-
$PM_{2.5}$	✓	✓	N/A	
Sulfur dioxide	✓	✓	N/A	
Point 10				
Nitrogen dioxide	✓	✓	N/A	-
Sulfur dioxide	✓	✓	N/A	

2.4.1 EXCEEDANCES OF AIR EMISSION LIMITS AND PLANT OPERATING CONDITIONS AT THE TIME

No exceedances of air emission limits were reported during the reporting period.

3. HISTORICAL AIR EMISSION MONITORING REVIEW

Condition R1.9(b) requires an analysis of the boilers' emissions performance for the past five years. The historical analysis was completed for the pollutants listed in Condition M2.2. The data used for the historical analysis were sourced from annual returns, stack testing, CEMS data and ambient air monitoring and have been reported at dry, 0°C, 101.325 kPa conditions, corrected to 7% O_2.

3.1 HISTORICAL FUEL USAGE

MPPS has combusted black coal as the primary fuel with supplementary firing using fuel oil during start-up operations for at least the past ten years.

Monthly amounts of coal burnt and average coal analysis for the reporting year 2023 are shown in Table 3-1. The stack tests for the reporting period of 2023 were performed in January, February, May, July and October, as shown bold font in Table 3-1. While there is variability in the coal quality, the quality of coal burnt during the stack testing did not favour any specific conditions and is considered to be representative of typical coal properties for coal used at MPPS.

The long-term trends of the coal consumption and coal quality are presented in Figure 3.1 to Figure 3.3. The data show the monthly coal consumption variations over the past five years. Coal consumption typically peaks in the winter months (June, July and August). The coal quality has been generally stable over the past five years, especially for carbon, ash, sulfur, nitrogen and hydrogen percentages. The moisture and oxygen contents show more variation. Low moisture content in 2019 and increased oxygen percentage in 2023 are the only noted variation from typical values.

Based on the review of the coal composition during 2023 and the long-term trends of coal quality, the coal quality during stack testing is considered to be representative of typical conditions.

TABLE 3-1 MONTHLY COAL CONSUMED AND COAL ANALYSIS – 2023

Month	Coal Burnt	Average Coal Analysis							
		Moisture	Ash	S	F	C	H	N	O
		%	%	%	ppm	%	%	%	%
Jan	189,284	7.82	26.1	0.73	170	83.6	5.23	2.02	8.40
Feb	199,346	7.24	26.7	0.76	160	84.5	5.30	1.91	7.50
Mar	131,176	6.78	27.6	0.74	170	83.8	5.21	1.97	8.30
Apr	151,513	8.79	27.5	0.77	170	84.1	5.26	1.90	8.00
May	282,953	8.52	27.9	0.76	180	84.0	5.51	1.96	7.80
Jun	262,309	8.95	26.6	0.73	150	83.0	5.69	1.87	8.70
Jul	277,793	8.94	26.2	0.77	140	84.4	5.15	1.94	7.70
Aug	247,203	8.27	28.3	0.75	175	82.4	5.45	1.94	9.50
Sep	221,108	8.16	28.6	0.71	140	82.4	5.26	1.88	9.70

Month	Coal Burnt	Average Coal Analysis							
		Moisture	Ash	S	F	C	H	N	O
		%	%	%	ppm	%	%	%	%
Oct	186,155	7.74	25.4	0.71	140	82.4	5.26	1.88	9.70
Nov	202,042	8.44	27.1	0.67	170	82.0	5.20	1.78	10.4
Dec	185,673	7.18	25.2	0.67	155	82.2	5.38	1.84	9.90
Average	-	8.07	26.9	0.73	160	83.2	5.33	1.91	8.80
Total	*2,536,555*	-							

FIGURE 3.1 HISTORICAL MONTHLY COAL BURNT (TONNES)

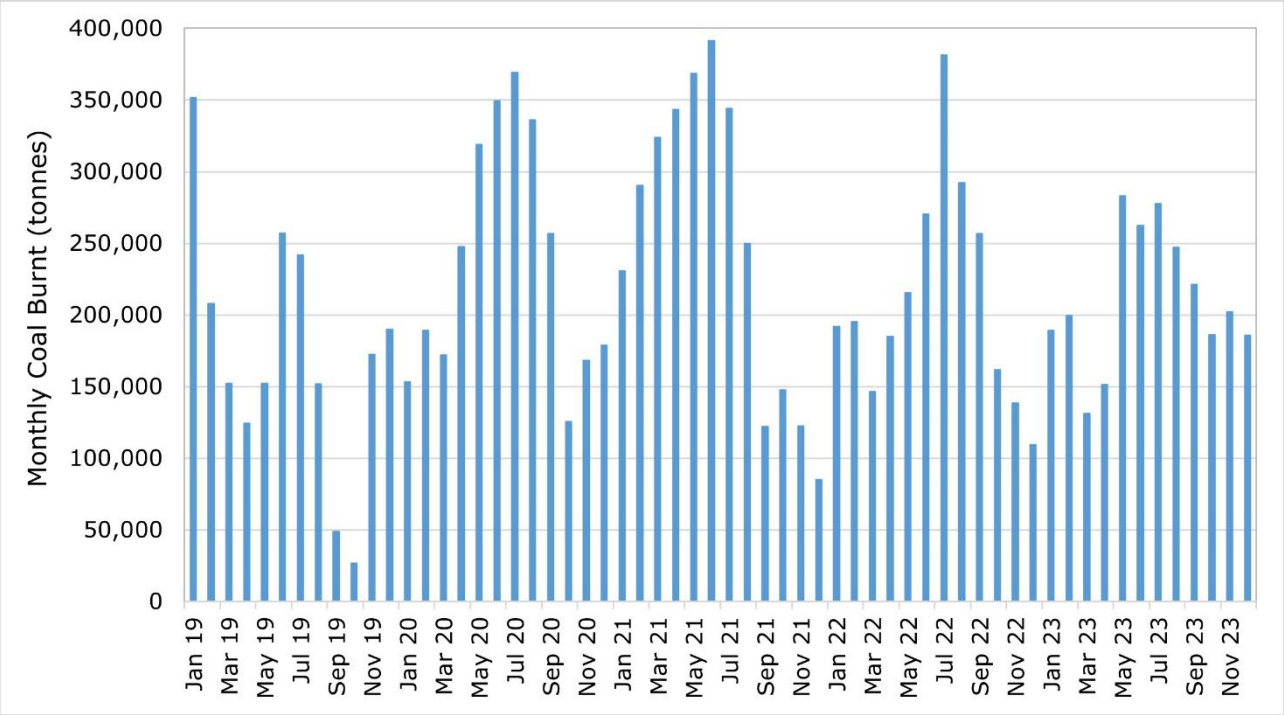


FIGURE 3.2 HISTORICAL COAL ANALYSIS – CARBON AND ASH (%)

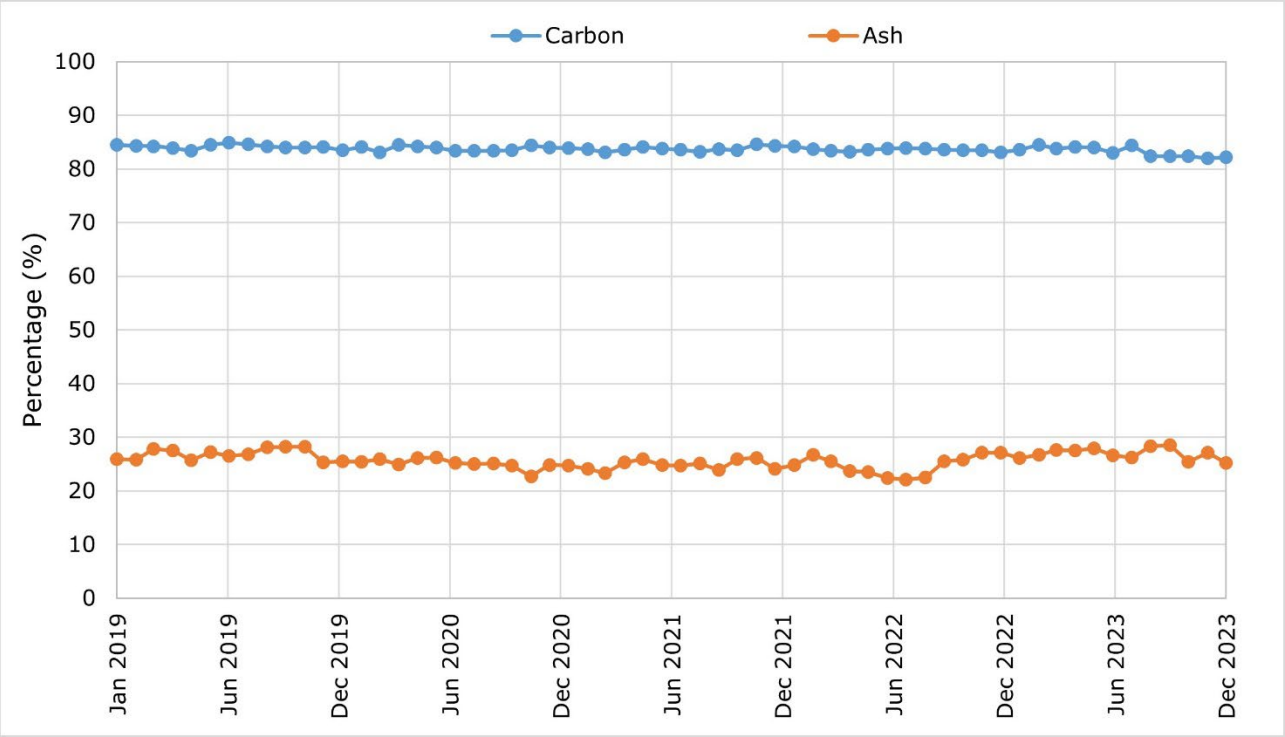
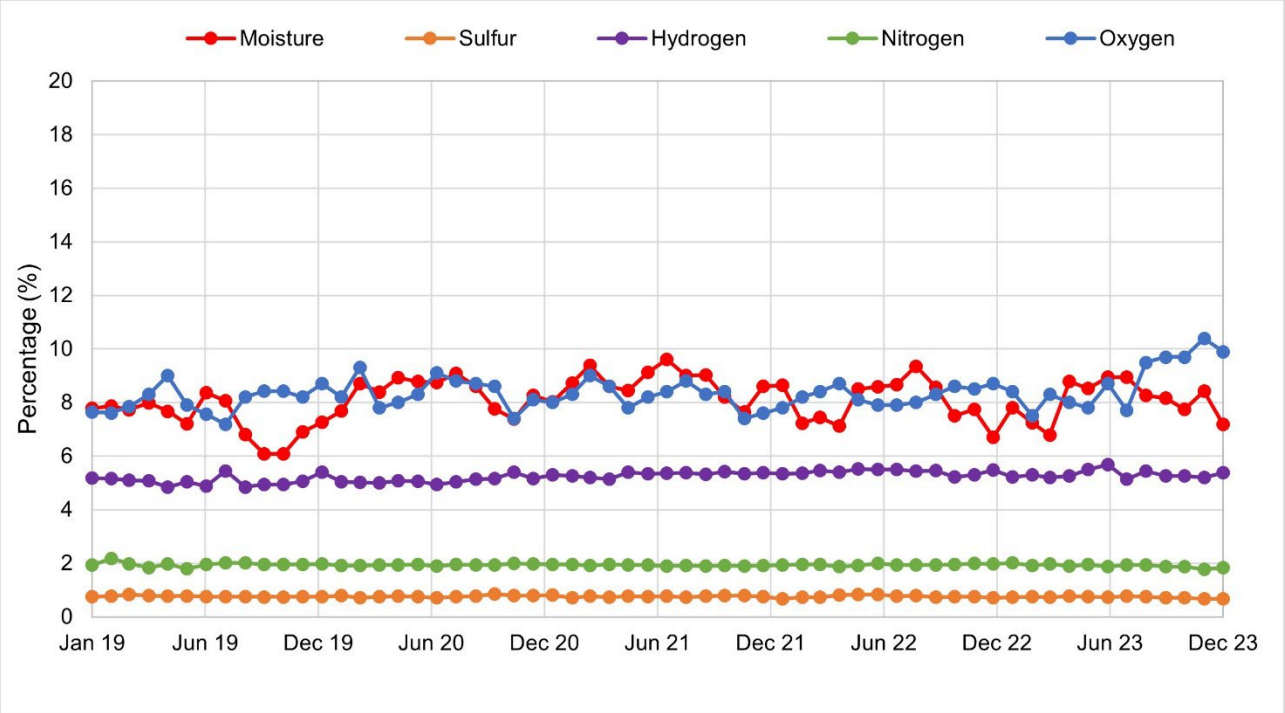


FIGURE 3.3 HISTORICAL COAL ANALYSIS – MOISTURE, SULFUR, HYDROGEN, NITROGEN AND OXYGEN (%)



3.2 COMPARISON WITH HISTORICAL STACK EMISSION MONITORING

The analysis of the historical stack emissions includes review of the fuel usages, stack concentrations (at dry, 0 °C, 101.325 kPa conditions, corrected to 7% O_2), calculated emission factors (kg/tonne coal and kg/PJ), as well as the analysis of correlations with default emission factors and potential coal quality influences. Samples below the limit of reporting (LOR) have been shown at half of the LOR.

As CEMS monitoring has relatively recently been implemented at MPPS, the historical emission analysis has depended on the stack test reports. Historically, EnergyAustralia undertakes annual stack testing on both boilers. The stack testing was typically performed between March and June of the annual period. During the stack testing, notes are provided on boiler operations, which are included in the final reports.

The historical stack test documents reviewed include:

- Ektimo 2019, Annual Emission Testing Report – Energy Australia – Mt Piper Power Station, report no. R007170, 13 November 2019;
- Ektimo 2019, Annual Emission Testing Report – Energy Australia – Mt Piper Power Station, report no. R007171, 13 November 2019;
- Ektimo 2020, Annual Emission Testing Report – Energy Australia – Mt Piper Power Station, report no. R009203, 2 September 2020;
- Ektimo 2020, Annual Emission Testing Report – Energy Australia – Mt Piper Power Station, report no. R009204, 2 September 2020;
- Ektimo 2020, Emission Testing Report – Energy Australia – Mt Piper Power Station, report no. R009599, 13 October 2020;
- Ektimo 2021, Emission Testing Report – Energy Australia – Mt Piper Power Station, report no. R009826, 11 January 2021;
- Ektimo 2021, Quarterly (Q1) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R010363, 12 May 2021;
- Ektimo 2021, Quarterly (Q2) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R010887, 25 June 2021;
- Ektimo 2021, Quarterly (Q3) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R011365, 13 October 2021; and
- Ektimo 2021, Quarterly (Q4) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R011676, 5 January 2022.
- Ektimo 2022, Quarterly (Q1) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R012309, 30 March 2022;
- Ektimo 2022, Quarterly (Q2) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R012769ar, 12 July 2022;
- Ektimo 2022, Quarterly (Q3) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R013250, 29 July 2022;
- Ektimo 2022, Quarterly (Q4) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R013593, 25 October 2022.
- Ektimo 2022, Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R013819, 9 November 2022;

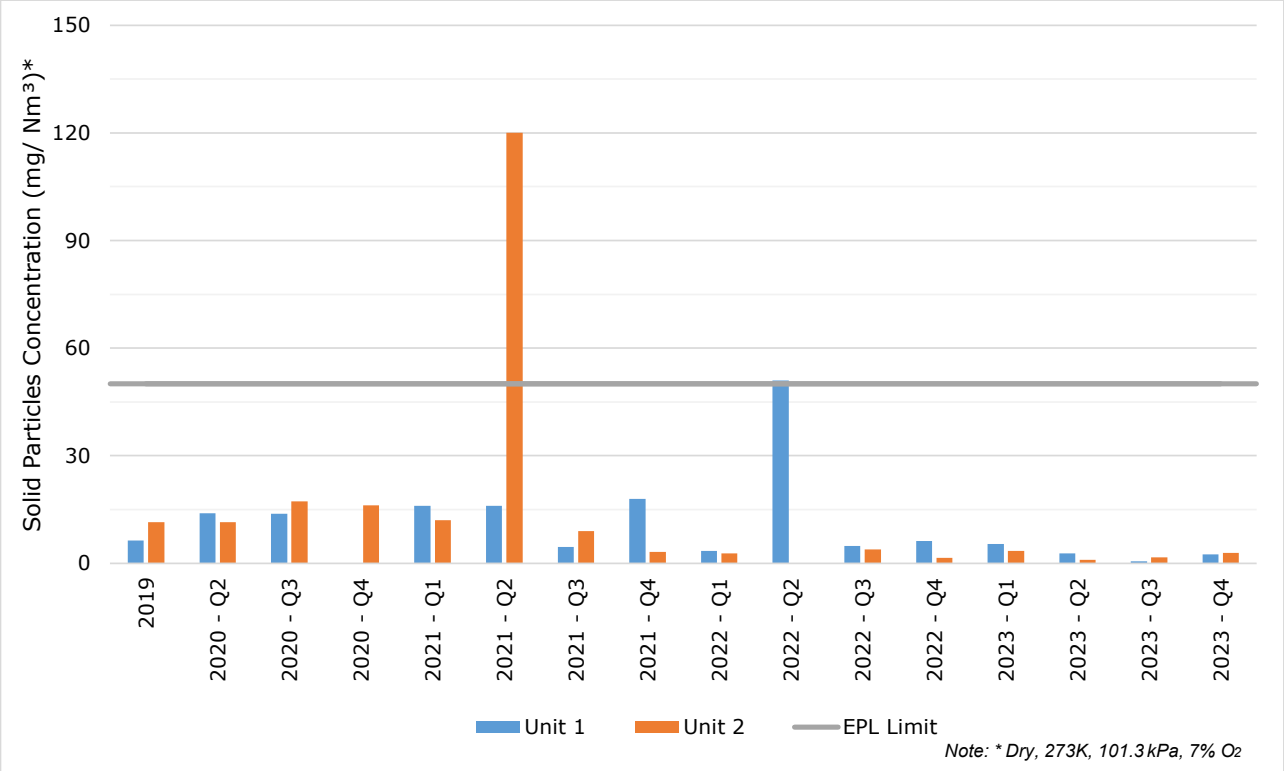
- Ektimo 2022, Quarterly (Q4) Emission Testing Report – Energy Australia NSW Pty Ltd – Mt Piper Power Station. Report number R013949, 16 December 2022.

The 2023 stack test reports are included in Appendix A and all other reports can be made available upon request.

3.2.1 SOLID PARTICLES

Figure 3.4 shows the solid particles concentrations measured between 2019 and 2023. The solid particles limit is 50 mg/Nm³ in both the current and previous EPL, with the monitoring frequency changed from annual to quarterly in 2020. All reported concentrations were below the EPL limit as shown in Figure 3.4 with the exception of Unit 2 in Quarter 2 of 2021 and Unit 1 in Quarter 2 of 2022.

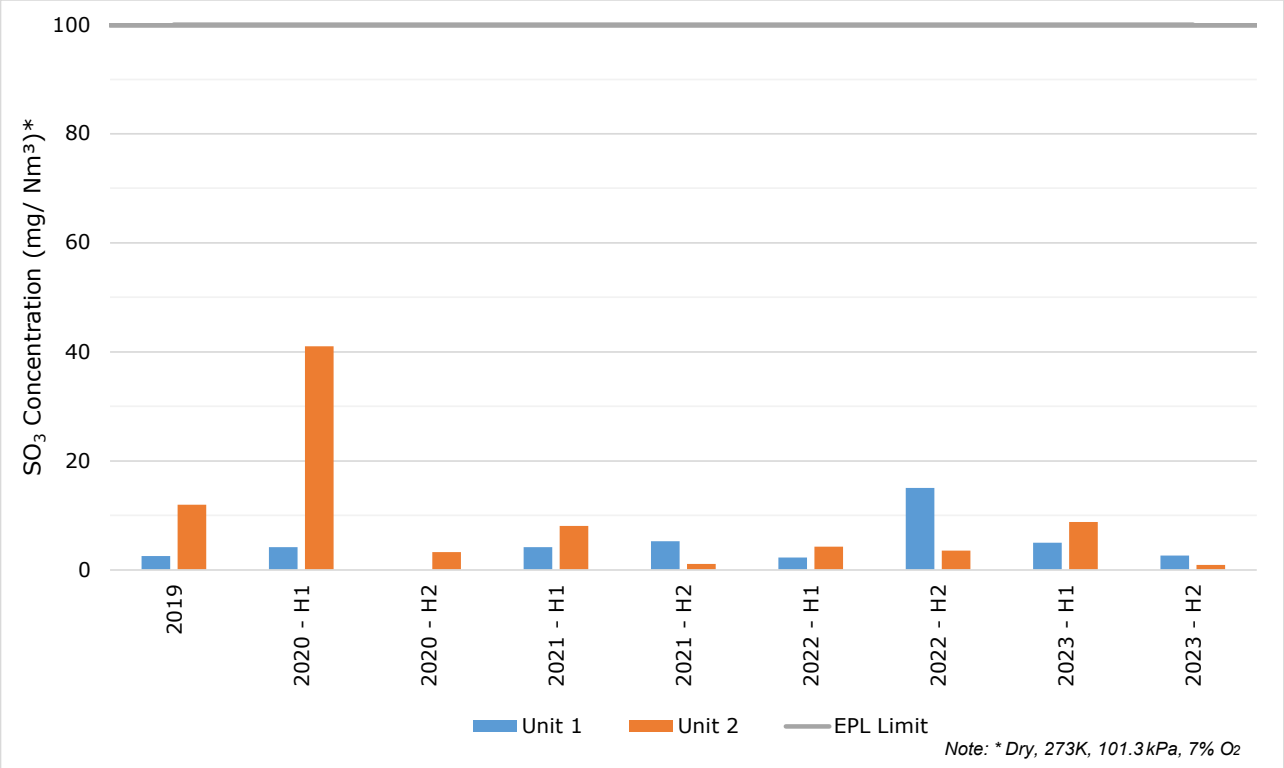
FIGURE 3.4 2019 – 2023 STACK TESTING RESULTS – SOLID PARTICLES



3.2.2 SULFUR TRIOXIDE/SULFURIC ACID (AS SO_3)

Figure 3.5 shows the sulfur trioxide/sulfuric acid (as SO_3) concentrations measured between 2019 and 2023. The sulfur trioxide/sulfuric acid (as SO_3) limit is 100 mg/Nm³ in both the current and previous EPL, with the monitoring frequency changed from annual to six-monthly in 2020. All reported concentrations were below the EPL limit as shown in Figure 3.5.

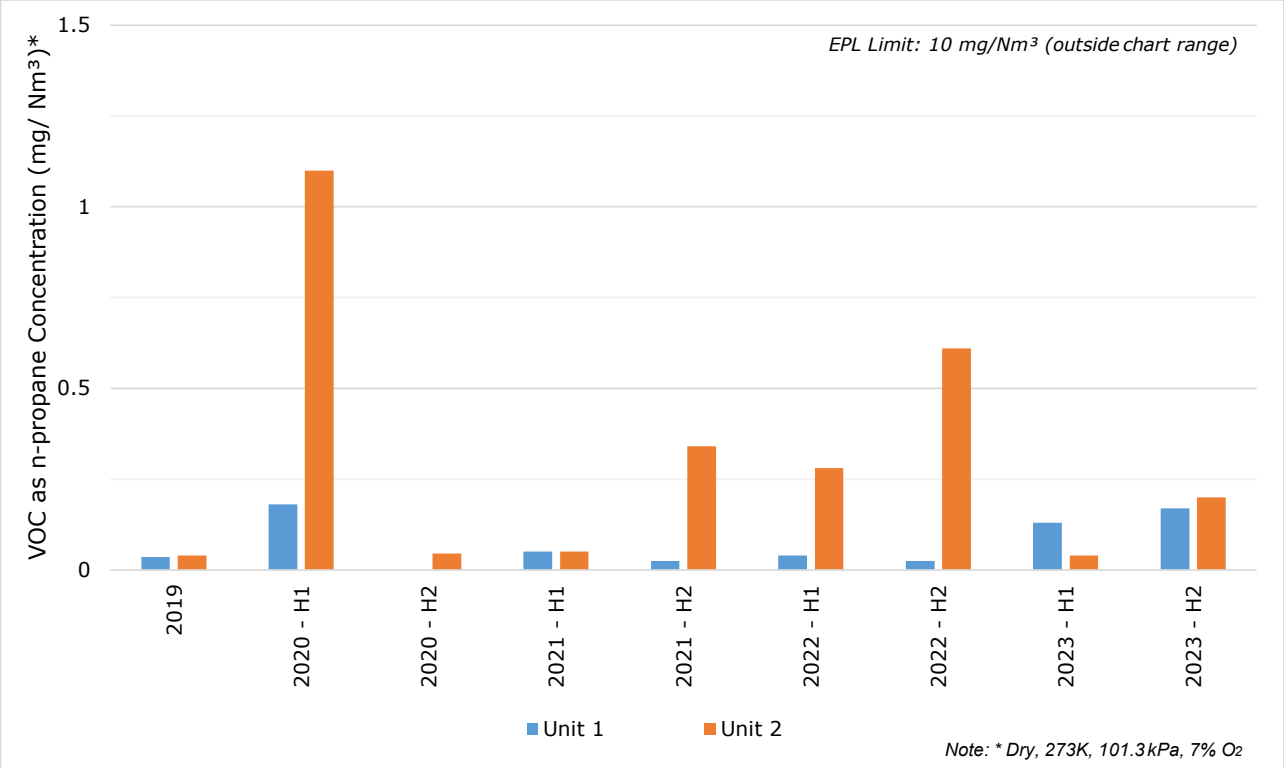
FIGURE 3.5 2019 – 2023 STACK TESTING RESULTS – SULFUR TRIOXIDE AND/OR SULFURIC ACID (AS SO_3)



3.2.3 VOC (AS N-PROPANE)

Figure 3.6 shows VOC concentrations measured between 2019 and 2023. The VOC limit is 10 mg/Nm³ in both the current and previous EPL, with the monitoring frequency changed from annual to six-monthly in 2020. All reported concentrations were below the EPL limit as shown in Figure 3.6. Reported concentrations are commonly below the LOR, which varies based on sampling and analysis conditions, and was commonly in the range of 0.05 – 0.10 mg/Nm³.

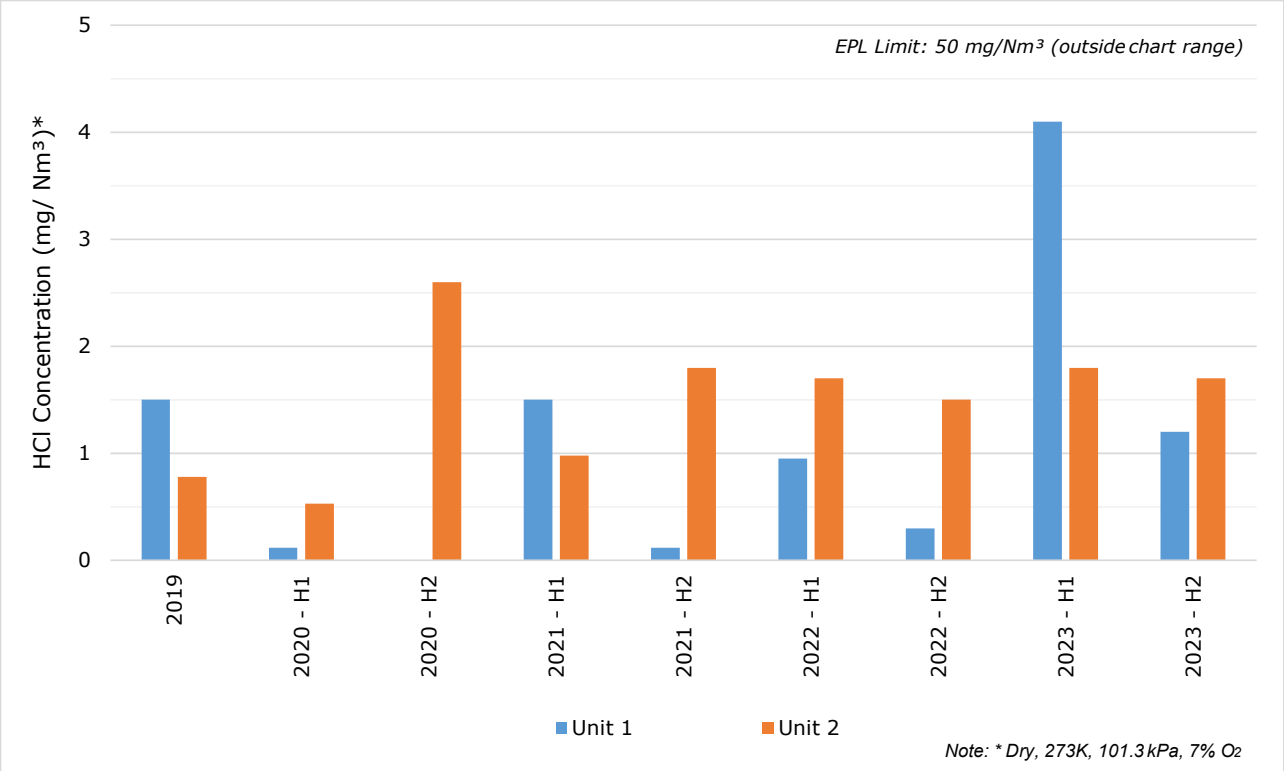
FIGURE 3.6 2019 – 2023 STACK TESTING RESULTS – VOC (AS N-PROPANE)



3.2.4 HYDROGEN CHLORIDE

Figure 3.7 shows hydrogen chloride concentrations measured between 2019 and 2023. The hydrogen chloride limit is 50 mg/Nm³ in both the current and previous EPL, with the monitoring frequency changed from annual to six-monthly in 2020. All reported concentrations were below the EPL limit as shown in Figure 3.7.

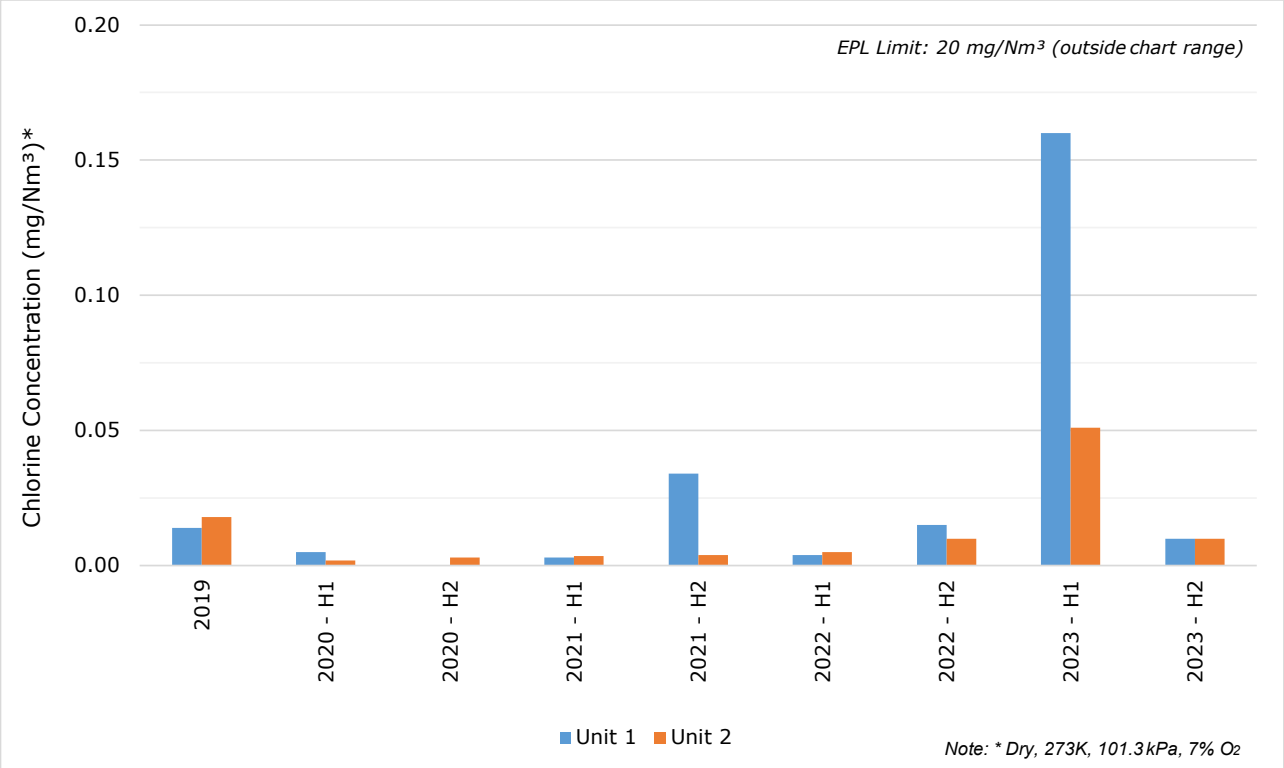
FIGURE 3.7 2019 – 2023 STACK TESTING RESULTS – HYDROGEN CHLORIDE



3.2.5 CHLORINE

Figure 3.8 shows chlorine concentrations measured between 2019 and 2023. The chlorine limit is 20 mg/Nm³ in both the current and previous EPL, with the monitoring frequency changed from annual to six-monthly in 2020. All reported concentrations were well below the EPL limit as shown in Figure 3.8. Reported concentrations were commonly below the LOR, which varied based on sampling and analysis conditions, and was commonly less than 0.01 mg/Nm³.

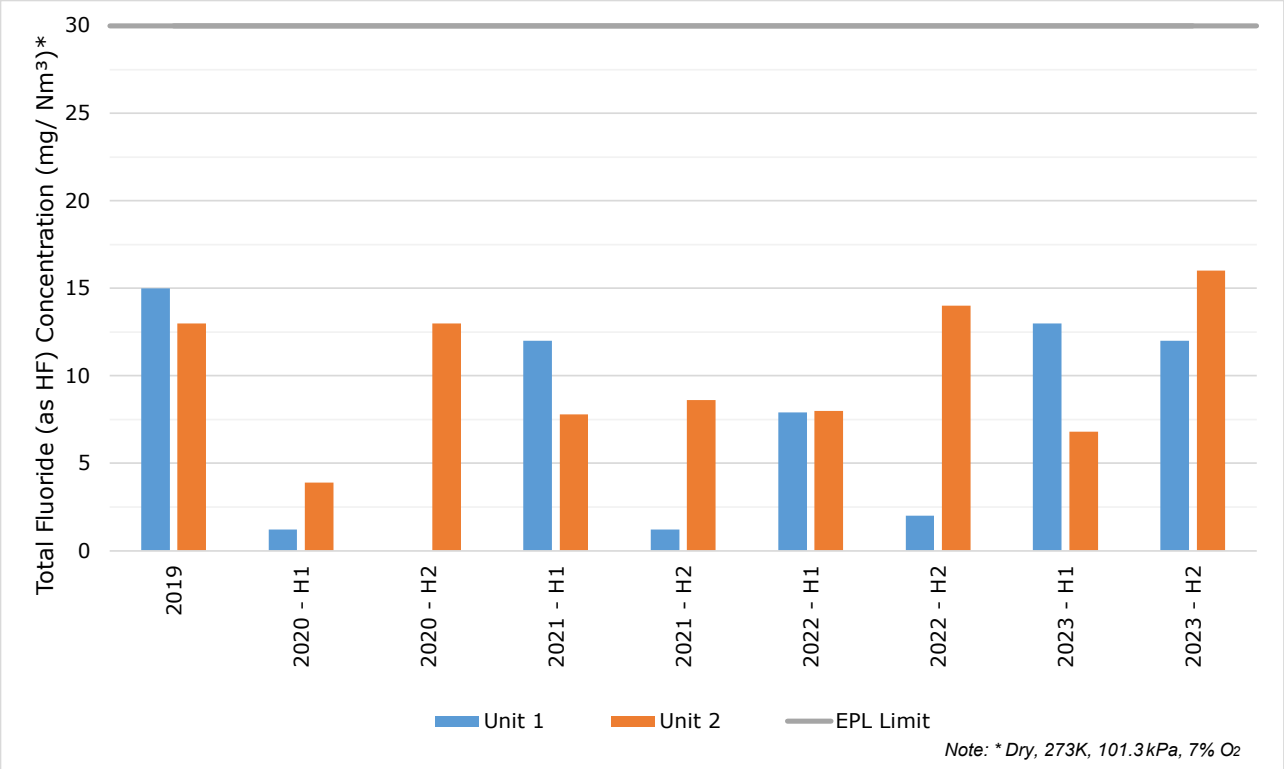
FIGURE 3.8 2019 – 2023 STACK TESTING RESULTS – CHLORINE



3.2.6 TOTAL FLUORIDE

Figure 3.9 shows total fluoride concentrations measured between 2019 and 2023. The total fluoride limit is 30 mg/Nm³ in both the current and previous EPL, with the monitoring frequency changed from annual to six-monthly in 2020. All reported concentrations were below the EPL limit as shown in Figure 3.9.

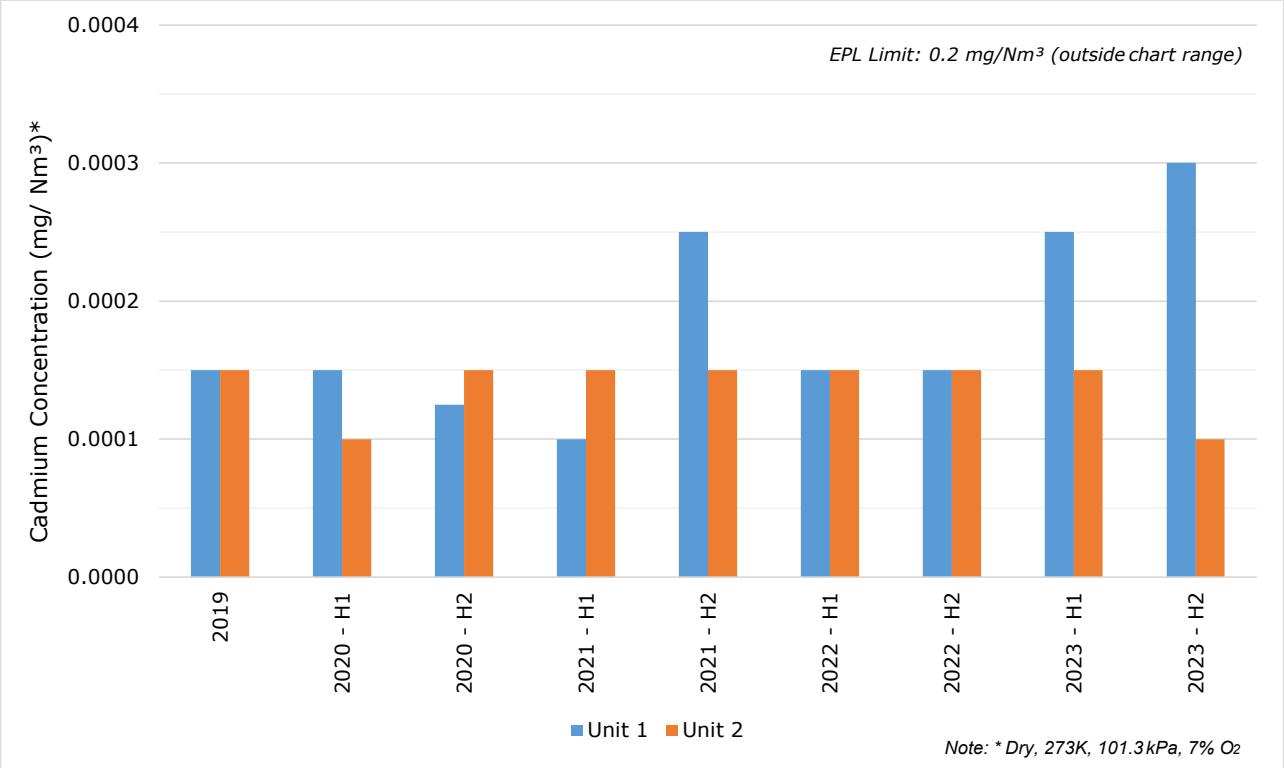
FIGURE 3.9 2019 – 2023 STACK TESTING RESULTS – TOTAL FLUORIDE



3.2.7 CADMIUM

Figure 3.10 shows cadmium concentrations measured between 2019 and 2023. The cadmium limit is 0.2 mg/Nm³ in both the current and previous EPL, with the monitoring frequency changed from annual to six-monthly in 2020. All reported concentrations were below the EPL limit as shown in Figure 3.10. Reported concentrations were commonly below the LOR, which varied based on sampling and analysis conditions, and is commonly less than 0.0005 mg/Nm³.

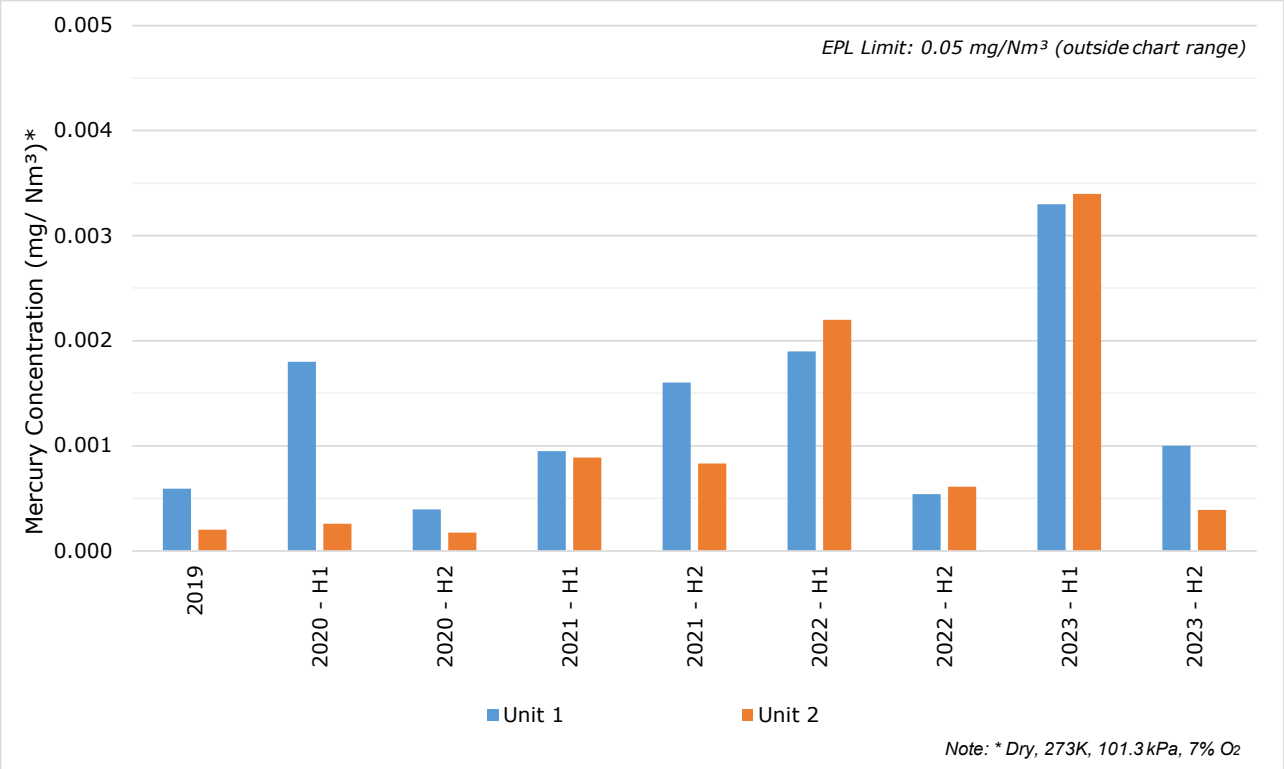
FIGURE 3.10 2019 – 2023 STACK TESTING RESULTS – CADMIUM



3.2.8 MERCURY

Figure 3.11 shows mercury concentrations measured between 2019 and 2023. The mercury limit is 0.05 mg/Nm³ in both the current and previous EPL, with the monitoring frequency changed from annual to six-monthly in 2020. All reported concentrations were below the EPL limit as shown in Figure 3.11.

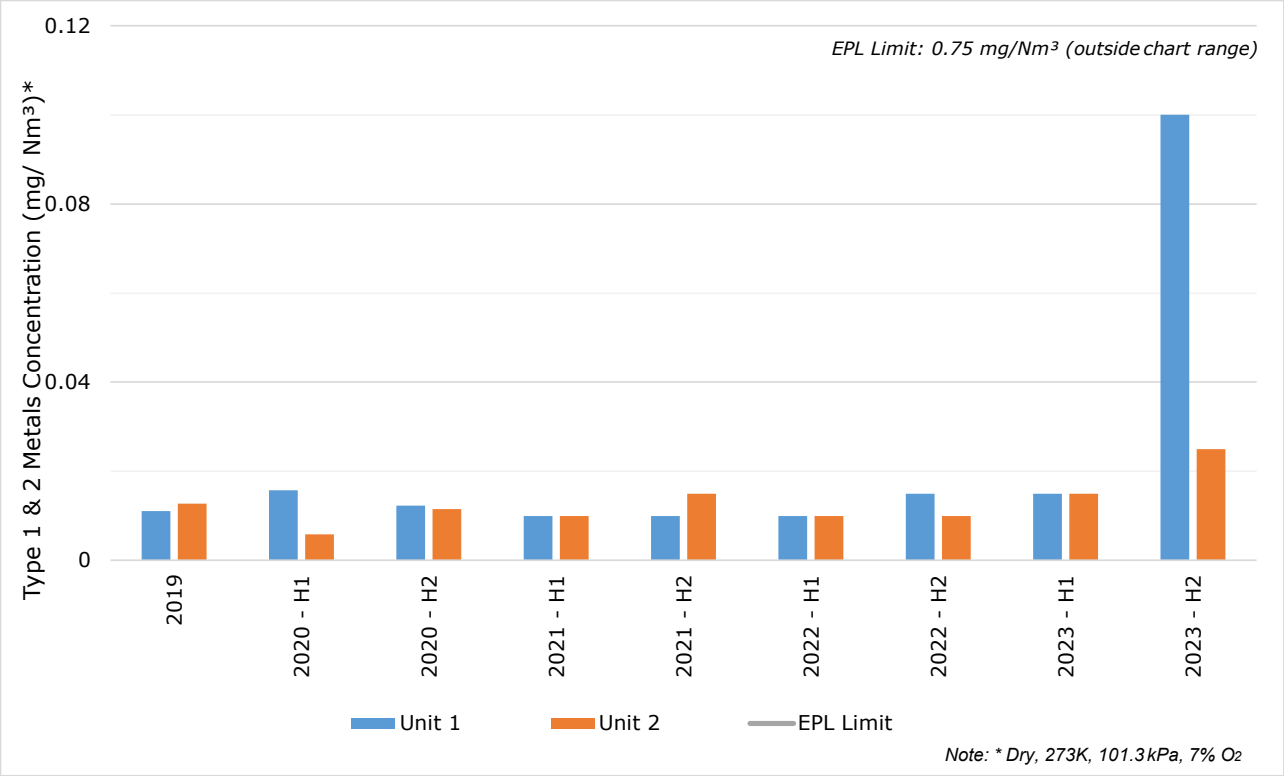
FIGURE 3.11 2019 – 2023 STACK TESTING RESULTS – MERCURY



3.2.9 TYPE 1 & 2 METALS

Figure 3.12 shows type 1 & 2 metals concentrations measured between 2019 and 2023. The type 1 & 2 metals limit is 0.75 mg/Nm³ in both the current and previous EPL, with the monitoring frequency changed from annual to six-monthly in 2020. All reported concentrations were below the EPL limit as shown in Figure 3.12.

FIGURE 3.12 2019 – 2023 STACK TESTING RESULTS – TYPE 1 & 2 METALS



3.2.9.1 NON-REPRESENTATIVE DATA

Stack emission testing of metals (Type 1 and 2 substances as well as copper and zinc) was conducted between the 4 and 7 July 2023. Elevated concentrations of lead, copper, nickel and zinc were reported for the test on 4 July 2023. These concentrations are uncharacteristically high when compared against historic measurements. MPPS has sought independent expert advice from consultants ERM and HRL to assess the representativeness of these results. A copy of the HRL assessment is included in full in Appendix B.

It was generally concluded that the test results for Unit 1 were anomalous and should not be considered representative of MPPS emissions. Consultants HRL and ERM both concluded that the anomalous test results should not be included in the dataset when reporting emissions from MPPS. The anomalous results for the four elevated metals from the July 2023 test have not been included in the data set for the purpose of LBL reporting.

3.2.10 NO_X AND SO_2 MONITORING REVIEW

NO_x and SO_2 (including SO_2 and sulfuric acid/sulfuric trioxide) are the assessable pollutants emitted in greatest quantity by the MPPS facility via the two boiler stacks. The licence has required SO_2 and NO_x to be monitored using CEMS since 2019.

Table 3-2 summarises the statistics of the CEMS monitoring results for the period of 2019 – 2023 (inclusive). Figure 3.13 and Figure 3.14 provide hourly monitoring data plots for this period for NO_x and SO_2, respectively. In addition to Figure 3.15 and Figure 3.16, which present the quarterly average CEMS NO_x and SO_2 concentration to visually assess long term trends.

TABLE 3-2 STATISTICS OF 2019 TO 2023 CEMS MONITORING RESULTS

Unit	Year	Data Capture	Concentration (mg/Nm³)*		
			Minimum	Average	Maximum
NO_x (as NO_2)					
Unit 1 (Point 2)	2019	100%	2.7*	577	1,239*
	2020	100%	185	728	1,121
	2021	98%	230	627	1,072
	2022	99%	202	694	1,193
	2023	95%	182	695	1,187
Unit 2 (Point 3)	2019	100%	10.2*	394	1,172*
	2020	100%	131	686	1,265
	2021	100%	178	619	1,133
	2022	99%	224	624	1,260
	2023	99%	247	697	1,201
SO_2					
Unit 1 (Point 2)	2019	100%	160*	871	2,266*
	2020	100%	506	1,177	1,436
	2021	98%	1,006	1,185	1,381
	2022	99%	885	1,238	1,402
	2023	95%	644	1,115	1,378
Unit 2 (Point 3)	2019	100%	27*	783	2,719*
	2020	100%	678	1,189	1,597
	2021	100%	906	1,203	1,417
	2022	99%	1,002	1,229	1,399
	2023	97%	730	1,121	1,311

Note: * 2019 maximum and minimum include start up and shut down periods where the unit is operating below 150 MW.

FIGURE 3.13 2019 TO 2023 CEMS RESULTS – NO_X

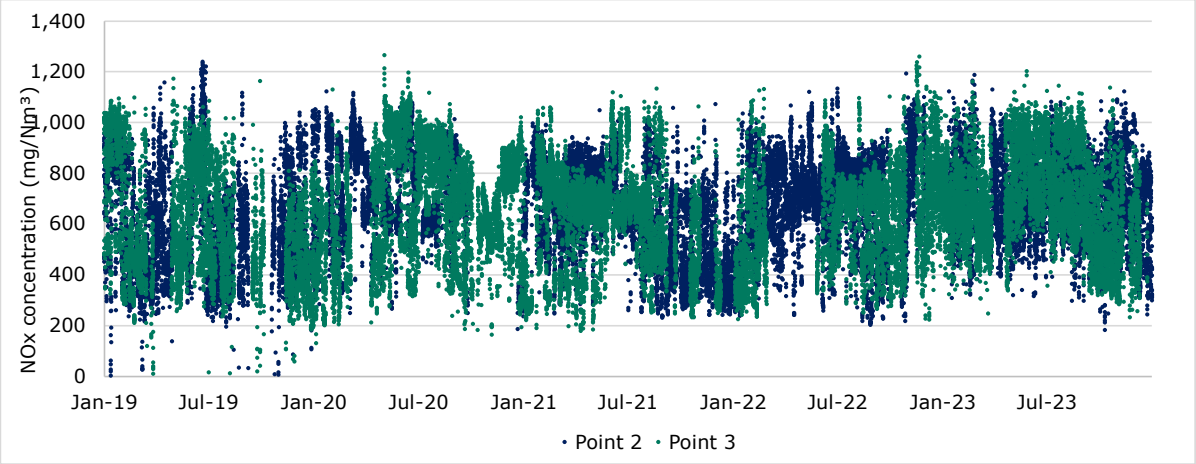


FIGURE 3.14 2019 TO 2023 CEMS RESULTS – SO_2

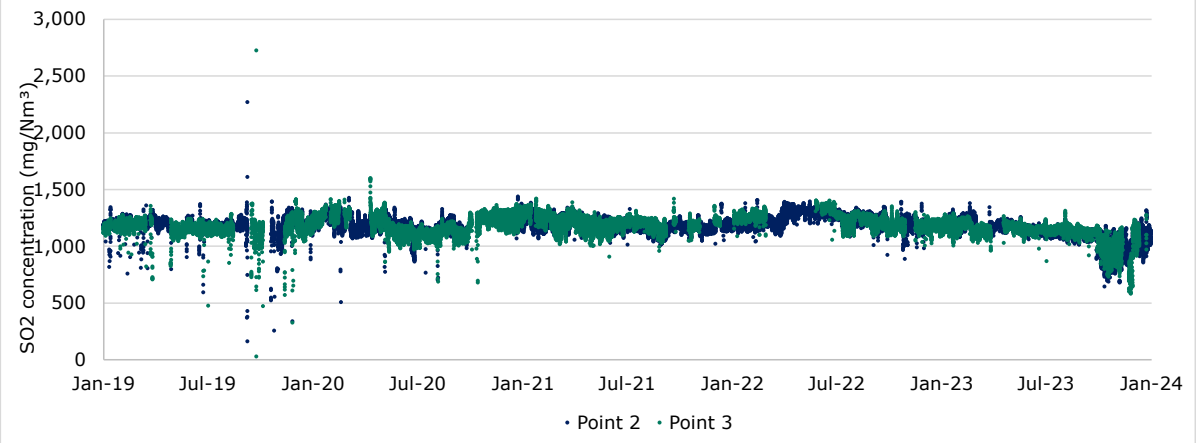


FIGURE 3.15 QUARTERLY AVERAGE CEMS MONITORING RESULTS – NO_X

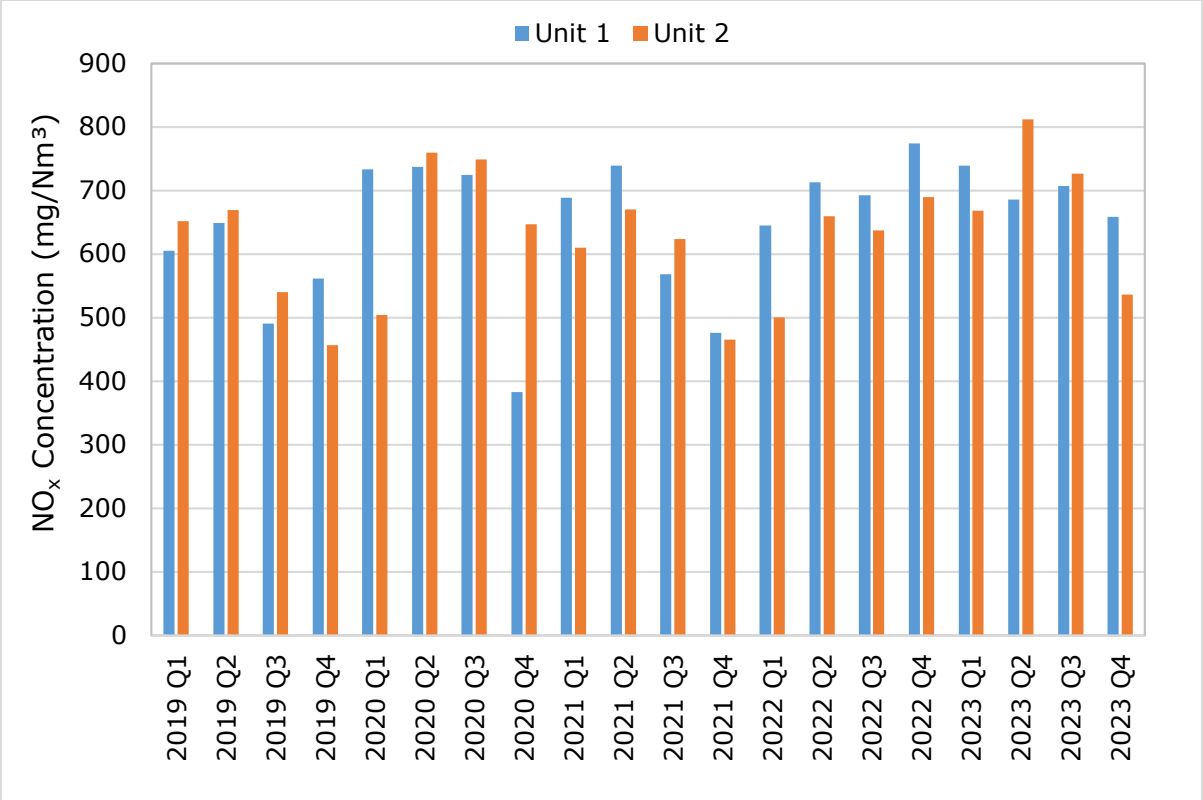
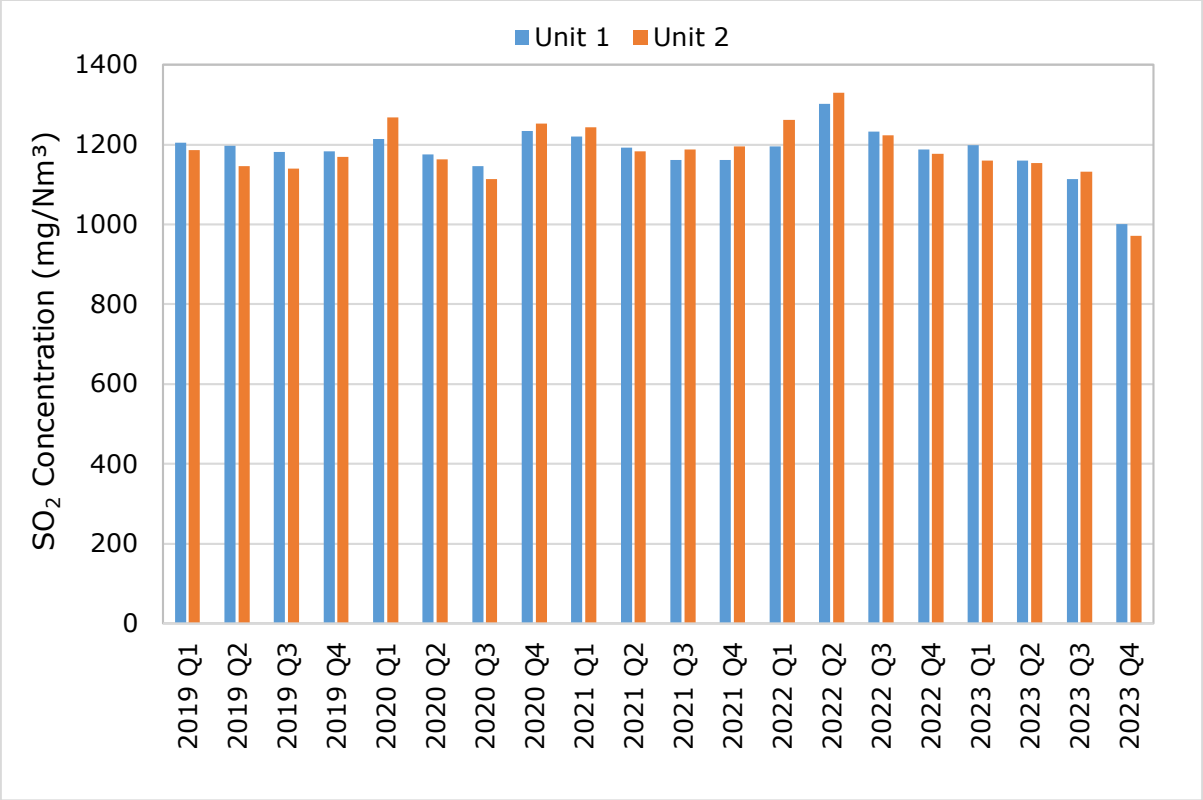


FIGURE 3.16 QUARTERLY AVERAGE CEMS MONITORING RESULTS – SO_2



3.3 AMBIENT AIR MONITORING REVIEW

EnergyAustralia monitors ambient air quality at three locations, Blackmans Flat (continuously), Wallerawang (continuously) and Newnes Plateau (monthly), (monitoring Points 8, 9 and 10 in the EPL). To analyse the long-term trends of the ambient air monitoring, the available monitoring results for the current year (2023) and previous four years are reviewed and analysed in this section.

The statistics of the hourly ambient air monitoring results for Points 8 & 9 and monthly ambient air monitoring results for Point 10 are summarised in Table 3.3. The annual average concentrations are shown in Figure 3.17 and Figure 3.18 for NO_2 and SO_2, respectively. Blackmans Flat (Point 8) and Wallerawang (Point 9) have similar NO_2 concentrations from 2019 through to 2023, with both locations recording the highest reading in 2019, which subsequently decreased from 2020 onwards, with a slight increase in 2023.

Blackmans Flat (Point 8) and Wallerawang (Point 9) had similar SO_2 concentrations in 2019 and 2020. However, Blackmans Flat then recorded the higher SO_2 concentrations for the next three years being over double the measurement of Wallerawang and Newnes Plateau, which is possibly due to a change in the instrumentation noise floor, as indicated in Figure 3.19.

When reviewing annual average trends and patterns in data at Point 10, it should be noted that samples that registered results below the LOR have been reported at half of the LOR (e.g. Figure 3.21).

The daily average concentrations for Point 8 and Point 9 are plotted in Figure 3.19 and Figure 3.20, respectively. The monthly concentrations for Point 10 are provided in Figure 3.21.

TABLE 3-3 SUMMARY OF AMBIENT AIR MONITORING RESULTS BETWEEN 2019 AND 2023

Pollutant	Year	Data Capture	Concentration (pphm)					
			Min	Average	Max	50th percentile	70th percentile	99th percentile
Point 8 (Blackmans Flat) – 1-hour average								
NO_2	2019	94%	0.000	0.442	11.3	0.300	0.483	2.22
	2020	95%	0.000	0.319	3.03	0.200	0.367	1.33
	2021	96%	0.000	0.256	2.42	0.150	0.283	1.15
	2022	94%	0.000	0.242	2.45	0.150	0.250	1.13
	2023	95%	-0.045	0.359	2.45	0.245	0.420	1.48
SO_2	2019	91%	0.000	0.204	20.9	0.021	0.095	1.07
	2020	93%	0.000	0.062	0.794	0.024	0.075	0.412
	2021	95%	0.000	0.183	0.634	0.184	0.202	0.500
	2022	95%	0.034	0.191	0.732	0.178	0.200	0.588
	2023	95%	-0.100	0.158	3.50	0.127	0.150	1.073
Point 9 (Wallerawang) – 1-hour average								
NO_2	2019	98%	0.053	0.441	1.91	0.406	0.534	1.46
	2020	97%	0.024	0.409	1.27	0.377	0.511	0.991
	2021	90%	0.000	0.292	0.952	0.272	0.369	0.819
	2022	87%	0.000	0.202	0.888	0.165	0.250	0.778

Pollutant	Year	Data Capture	Concentration (pphm)					
			Min	Average	Max	50th percentile	70th percentile	99th percentile
	2023	92%	-0.136	0.297	2.662	0.161	0.339	1.441
SO_2	2019	97%	0.000	0.105	1.68	0.024	0.060	0.935
	2020	91%	0.000	0.040	0.429	0.011	0.036	0.289
	2021	90%	0.000	0.071	0.463	0.030	0.081	0.393
	2022	99%	0.000	0.076	0.478	0.002	0.051	0.397
	2023	92%	-0.059	0.021	2.05	0.013	0.020	0.301
Point 10 (Newnes Plateau) – Monthly averaged								
NO_2	2019	100%	0.030	0.080	0.540	0.030	0.030	0.494
	2020	100%	0.030	0.038	0.080	0.030	0.030	0.079
	2021	100%	0.030	0.030	0.030	0.030	0.030	0.030
	2022	100%	0.030	0.055	0.330	0.030	0.030	0.297
	2023	100%	0.030	0.034	0.075	0.030	0.030	0.070
SO_2	2019	100%	0.045	0.045	0.045	0.045	0.045	0.045
	2020	100%	0.045	0.051	0.120	0.045	0.045	0.112
	2021	100%	0.045	0.091	0.435	0.045	0.045	0.411
	2022	100%	0.045	0.065	0.185	0.045	0.045	0.181
	2023	100%	0.045	0.045	0.045	0.045	0.045	0.045

FIGURE 3.17 AMBIENT AIR MONITORING RESULTS – ANNUAL AVERAGE NO_2

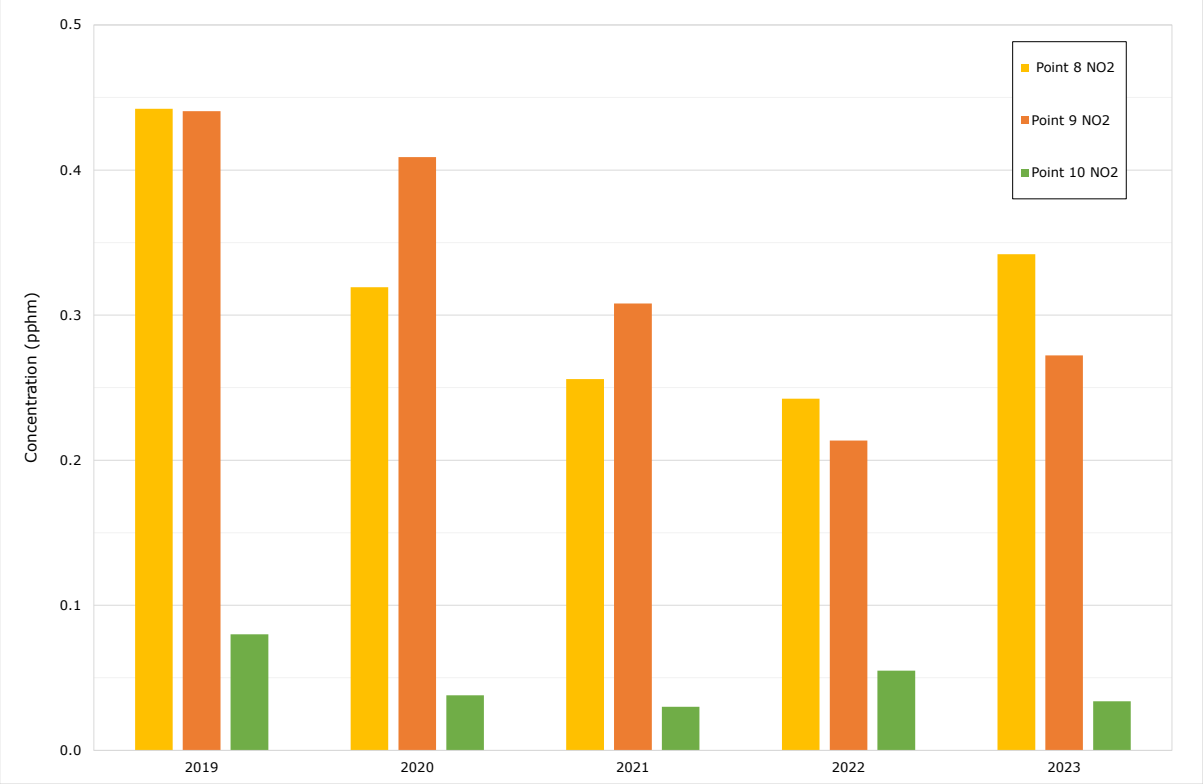


FIGURE 3.18 AMBIENT AIR MONITORING RESULTS – ANNUAL AVERAGE SO_2

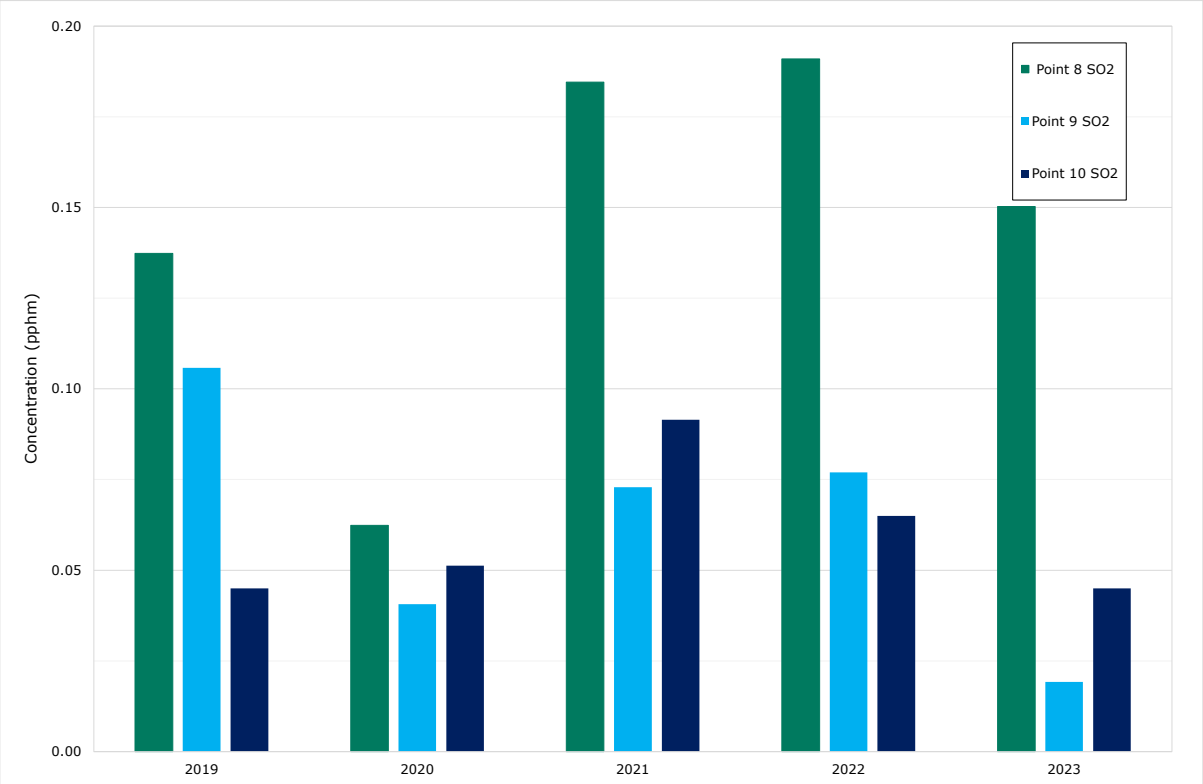


FIGURE 3.19 AMBIENT AIR MONITORING – POINT 8 (BLACKMANS FLAT)

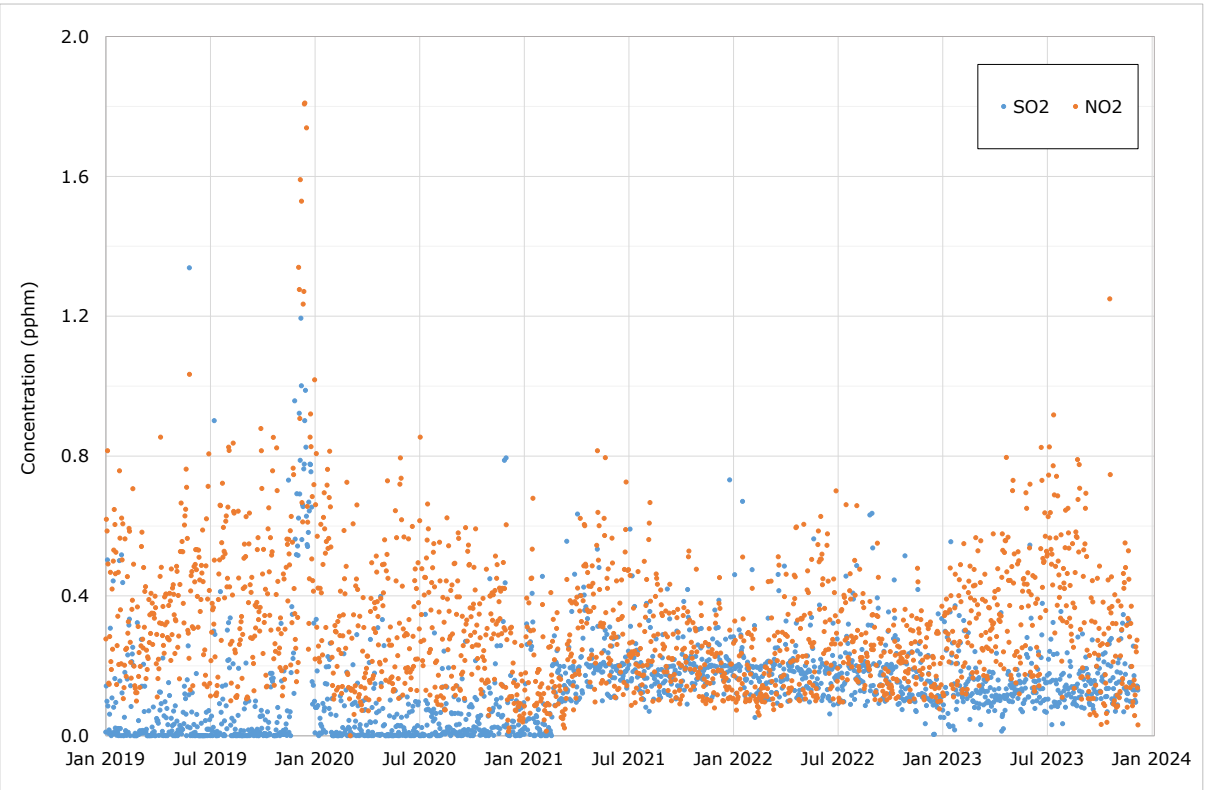


FIGURE 3.20 AMBIENT AIR MONITORING – POINT 9 (WALLERAWANG)

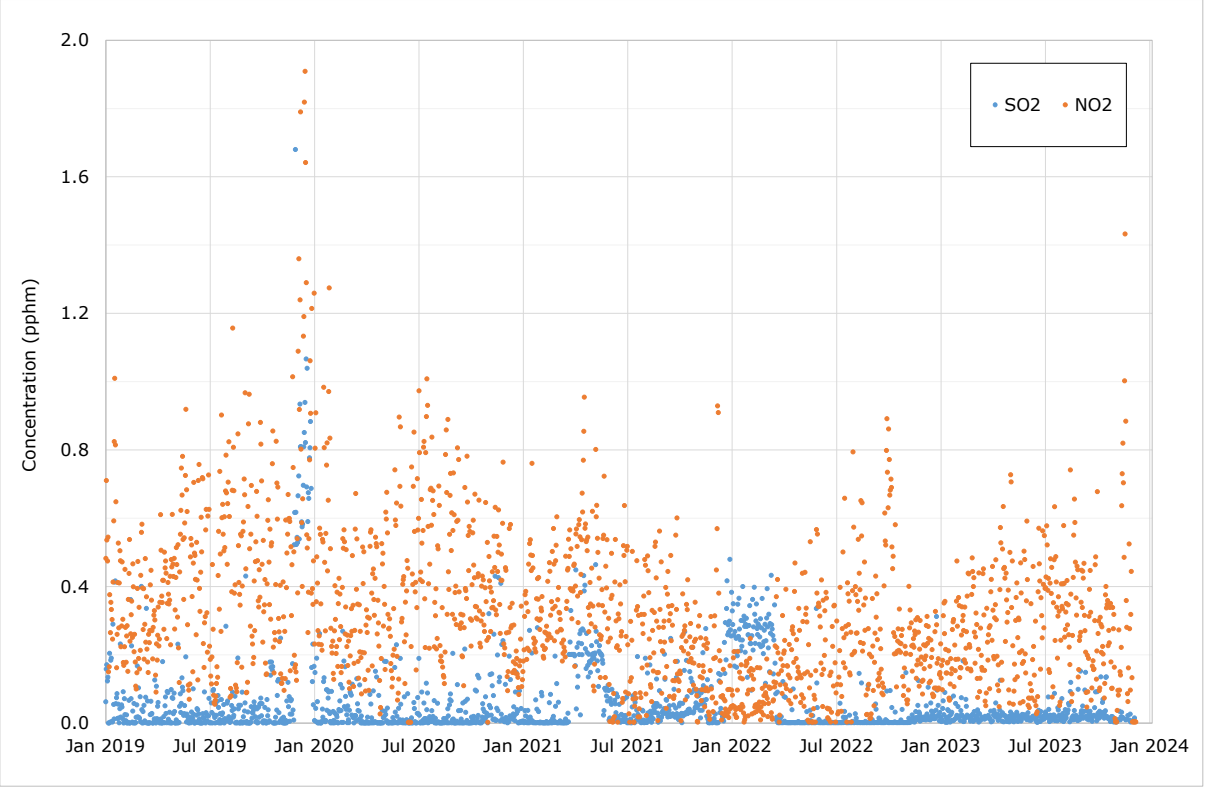
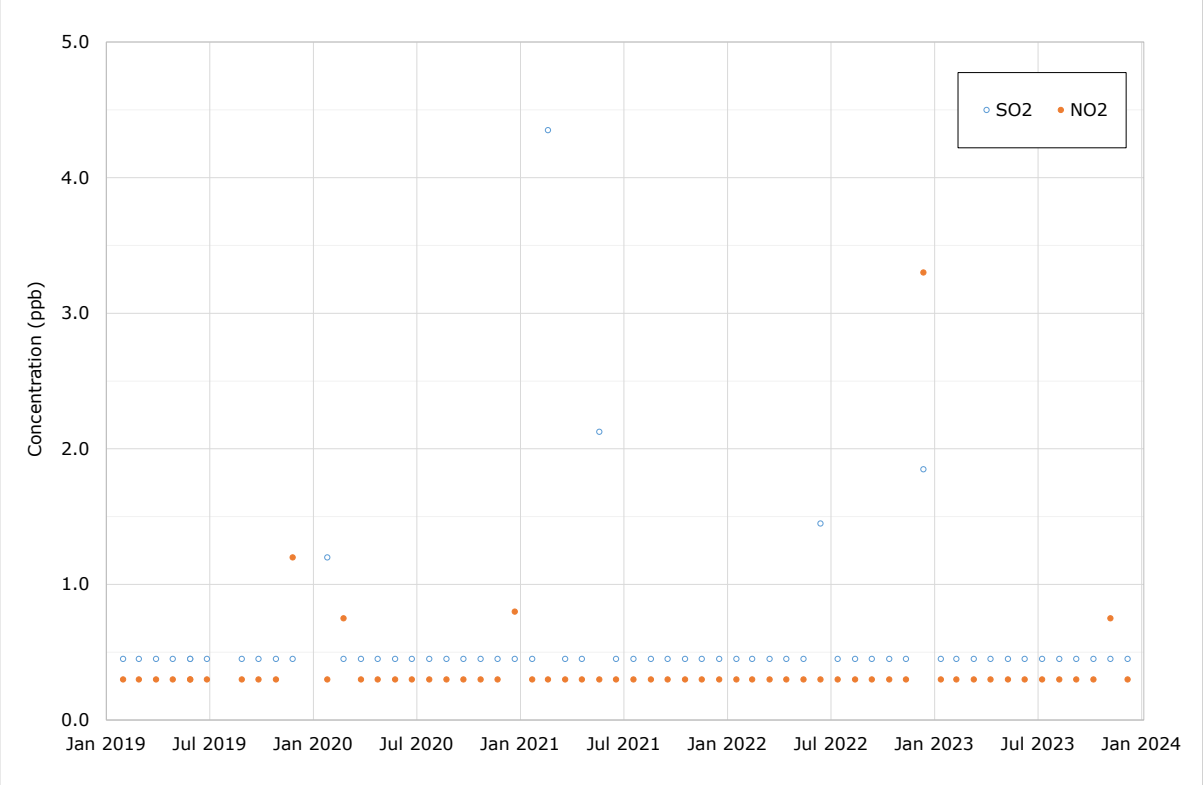


FIGURE 3.21 AMBIENT AIR MONITORING – POINT 10 (NEWNES PLATEAU)



4. DETAILED CALCULATIONS OF 2023 BOILER EMISSIONS

The annual emissions associated with the stack emission listed in R1.9 are detailed in this section. The annual emissions are either estimated from the CEMS data or the stack test results. The calculation method of annual emissions, based on data type, are detailed in the sections below.

4.1 NO_X AND SO_2 – CEMS

NO_x and SO_2 annual emission are determined using CEMS data. Monthly emissions are determined then summed for the annual reporting periods. The monthly emissions are calculated based on:

- Unit 1 and Unit 2's Continuous Emission Monitoring System (CEMS) daily monitoring concentration were used to obtain monthly weighted average (based on MWh) stack concentrations in dry, STP, 7% O_2 part per millions (ppm).
- The monthly volume of flue gas emitted from the stacks is calculated by EnergyAustralia based on the combustion reaction stoichiometry, i.e. based on gases present in the combustion air, elements present in the coal and fuel oil, and combustion products and by-products. The volume is calculation at dry, STP and 7% O_2 conditions.
- The monthly emissions are calculated by multiplying the CEMS ppm and the calculated volume of flue gas, divided by the ideal gas molar density and converted to the units of kilograms.
- The average CEMs value is determined from the average monthly values. The sums of the monthly values are reported as the annual emissions and the reported maximum and minimum are based on the hourly data.

4.2 OTHER POLLUTANTS – STACK TESTS

Stack test data and flue gas volumes were used by EnergyAustralia to estimate the 2023 annual pollutant loads for the majority of applicable pollutants. It is noted that in the annual returns TVOCs are reported using the NPI EET Manual emission factor that estimates emissions due to fuel storage only. The estimated PAH emissions were based on a site-specific emission factor (i.e. 5.90 x 10^{-08} kg/tonne of coal as received), which has been used since 2007.

Metal emissions are estimated as the product of measured flue gas concentrations and corresponding flue gas volumes. For each boiler, the flue gas volume is estimated as an output-weighted (MWh) proportion of the combined MPPS flue gas volume. The in-stack concentration for each 6-month period is assumed equal to the average of the two (A and B) duct measurements. It is noted that Unit 1 copper, zinc, lead and nickel annual emission estimates are based on concentration measurements performed during the first half of 2023 due to anomalies in Unit 1 emission measurements conducted during the second half of the year. These anomalies are discussed in Section 3.2.9, and Appendix B.

5. COAL ASH MONITORING

This section has been prepared to satisfy conditions M9.1 and R4.4 under EPL13007. Coal ash from the Mt Piper Power Station is disposed of in the Mt Piper Ash Repository (MPAR) and the Lamberts North Ash Repository (LNAR) which are both dry ash repositories.

The MPAR is approved under Development Consent DA80/10060. Water conditioned ash (WCA) was placed at MPAR up to reduced level (RL) 946 m, brine condition ash (BCA) has been placed above RL 946 m up to the maximum approved height of RL 980 m. MPAR has reached its maximum approved ash storage capacity and is in the process of being decommissioned. The eastern batter has been capped with mine overburden and seeded to stabilise the landform. It is proposed to cap the top of MPAR with a high-density polyethylene (HDPE) liner or equivalent which is the subject of a Modification Application being prepared for submission to the Department of Planning, Housing and Infrastructure (DPHI).

The LNAR operates under Project Approval 09_0186 and LNAR is managed in accordance with its approved Operational Environment Management Plan (OEMP). The OEMP provides the framework to manage the environmental aspects associated with the operation of the LNAR. The OEMP can be found on the EnergyAustralia website[1]. LNAR has been lined with a leachate barrier management system. WCA was placed below the liner and BCA is placed above the liner on LNAR.

Solid salt and mixed lime salts from the Springvale Water Treatment Plant (SWTP) are approved to be co-disposed at the MPAR and LNAR. LNAR and parts of MPAR will be capped with a HDPE liner or equivalent that will allow for future access and beneficial reuse of the stored coal ash.

Table 5-1 and Table 5-2 provides a summary of coal ash quantities for the 2023 reporting period.

TABLE 5-1: SUMMARY OF COAL ASH QUANTITIES

Item	Coal Ash	Tonnes
1	Coal consumed for electricity generation at the premises	2,536,555
2	Fly ash generated at the premises	618,274
3	Fly ash deposited and/or stored at the premises	*432,974
4	Bottom ash generated at the premises	68,697
5	Bottom ash deposited and/or stored at the premises	68,697

** Grade of fly ash is unknown.*

[1] Lamberts North Ash Repository | EnergyAustralia

TABLE 5-2: TRANSPORTED COAL ASH

Item	Transported from the premises	Tonnes	Location
6	Fly ash	179,944	Fly Ash Australia Pty Ltd
7	Repository reclaimed fly ash	5,347	Holcim Australia Pty Ltd
8	Repository reclaimed fly ash	311	Regional Quarries Australia Pty Ltd
9	Bottom ash	0	N/A

Note: N/A – Not Applicable

It is noted that the sum of transported, stored and deposited fly ash does not directly add to the amount generated. Transported fly ash can include reclaimed fly ash that has been generated and stored in years prior to the current reporting period.

6. SUMMARY OF COMPLIANCE WITH REPORTING CONDITIONS

This report has been completed to comply with EPL13007 Conditions R1.9, M9.1 and R4.4. The study has reviewed stack test reports, CEMS monitoring results and ambient monitoring results from 2019 to 2023.

Table 6-1 summarises the study's findings in relation to the EPL13007 Conditions R1.9, M9.1 and R4.4 requirements and where additional detail can be found in this report.

TABLE 6-1 EPL13007 CONDITIONS AND STUDY SUMMARY

Conditions		Review Comment	Compliant
R1.9			
a)	*a comprehensive summary (tabulated and graphical) of all periodic and continuous monitoring data as required by condition M2.2 of this licence, including a comparison with the concentration limits specified in condition L3.2 and L3.3;*	All monitoring results were reviewed and summarised in tables and graphs.	Yes
b)	*analysis of trends in emission performance for all pollutants monitored as required under condition M2.2. Trend analysis must include comparison of emission performance during the reporting period with emission performance from the previous 4 years;*	Historical monitoring data and coal quality from the most recent five years (2019 to 2023) were reviewed and analysed. No significant changes were identified in emission performance over this time period. Coal quality in 2023 is generally consistent with the previous four years. The observed variability in the stack monitoring data for 2023 is within the range of variability observed over the previous four years.	Yes
c)	*details of any exceedances of air emission licence limits and details of plant operating conditions at the times the exceedances occurred;*	There were no exceedances of air emission licence limits during the reporting period.	Yes
d)	*details of plant operating conditions, including Boiler load (MW), during sampling for each Boiler;*	The operation condition, including boiler load, during sampling for each boiler is presented in Table 2-1.	Yes
e)	*demonstrated compliance with the CEMS Quality Assurance and Control Procedures prepared for the premises;*	The procedure was reviewed no non-compliances were found.	Yes
f)	*summary of fuel usage, including:* *i) total coal and other permitted fuels consumed in each Boiler (including start-up);* *ii) a statement about the representativeness of fuel quality during periodic air emission sampling compared to non-sampling periods;*	The total coal consumption and coal quality during the reporting period is summarised in Table 3-1. The daily fuel consumption during stack sampling is shown in Table 2-1. Based on the review of the coal composition during 2023 and the long-term trends of coal quality, the coal quality during stack testing is	Yes

Conditions		Review Comment	Compliant
	ii) total fuel consumed by each Boiler during times when periodic air emission sampling was undertaken; *and*	representative of typical operating conditions.	
g)	*detailed calculations used to determine the aggregated pollutant emission rates for each boiler.*	The detailed methodology to determine the pollutant emission rates for each boiler has been presented in this report. Methods used to determine annual emission for reporting to the annual returns have also been provided.	Yes
M9.1			
a)	*Quantity of coal used for electricity generation at the premises;*	Quantities provided in Table 5-1.	Yes
b)	*Quantity of bottom ash; and quantity of fly ash, generated at the premises and the grade of fly ash produced (if the grade is known);*		
c)	*Quantity of bottom ash; and quantity of fly ash, deposited, and/or stored at the premises with a description of how it is stored and the processes for managing the storage;*		
d)	*Quantity of bottom ash; and quantity of fly ash, transported from the premises together with identification of the destination; and*	Quantities provided in Table 5-2.	Yes
e)	*Management measures used for coal ash repositories on the premises to maintain the viability of ash reuse, including identification of any other materials being stored concurrently with newly deposited coal ash.*	Description of management measures provided in Section 5.	Yes
R4.4			
The licensee must prepare an Annual Coal Ash Monitoring Report that details information required under condition M9.1 in respect of generation, deposition, storage, transport and reuse of coal ash generated at the premises for each Annual Return reporting period.		Provided in Section 5.	Yes

7. STATEMENT OF LIMITATIONS

1. This report is based solely on the scope of work described in our proposal P0659047 dated September 2023, and approved December 2023 (Scope of Work) and performed by Environmental Resources Management Australia Pty Ltd (ERM) for EnergyAustralia NSW Pty Ltd (the Client). The Scope of Work was governed by a contract between ERM and the Client (Contract).
2. No limitation, qualification or caveat set out below is intended to derogate from the rights and obligations of ERM and the Client under the Contract.
3. The findings of this report are solely based on, and the information provided in this report is strictly limited to that required by, the Scope of Work. Except to the extent stated otherwise, in preparing this report ERM has not considered any question, nor provides any information, beyond that required by the Scope of Work.
4. This report was prepared between January and February 2024 and is based on conditions encountered and information reviewed at the time of preparation. The report does not, and cannot, take into account changes in law, factual circumstances, applicable regulatory instruments or any other future matter. ERM does not, and will not, provide any on-going advice on the impact of any future matters unless it has agreed with the Client to amend the Scope of Work or has entered into a new engagement to provide a further report.
5. This report is based on analyses described in the report, and information provided by the Client or third parties (including regulatory agencies). All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved. Whilst normal checking of data accuracy was undertaken, except to the extent expressly set out in this report ERM:
    a. did not, nor was able to, make further enquiries to assess the reliability of the information or independently verify information provided by;
    b. assumes no responsibility or liability for errors in data obtained from,
    c. the Client, any third parties or external sources (including regulatory agencies).
6. Although the data that has been used in compiling this report is generally based on actual circumstances, if the report refers to hypothetical examples those examples may, or may not, represent actual existing circumstances.
7. Only the environmental conditions and or potential contaminants specifically referred to in this report have been considered. To the extent permitted by law and except as is specifically stated in this report, ERM makes no warranty or representation about:
    a. the suitability of the site(s) for any purpose or the permissibility of any use;
    b. the presence, absence or otherwise of any environmental conditions or contaminants at the site(s) or elsewhere; or
    c. the presence, absence or otherwise of asbestos, asbestos containing materials or any hazardous materials on the site(s).
8. This report should be read in full and no excerpts are to be taken as representative of the whole report. To ensure its contextual integrity, the report is not to be copied, distributed or referred to in part only. No responsibility or liability is accepted by ERM for use of any part of this report in any other context.

9. Except to the extent that ERM has agreed otherwise with the Client in the Scope of Work or the Contract, this report:
   a. has been prepared and is intended only for the exclusive use of the Client;
   b. must not to be relied upon or used by any other party;
   c. has not been prepared nor is intended for the purpose of advertising, sales, promoting or endorsing any Client interests including raising investment capital, recommending investment decisions, or other publicity purposes;
   d. does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise in or in relation to the site(s); and
   e. does not purport to provide, nor should be construed as, legal advice.

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APPENDIX A 2023 EMISSION TESTING REPORTS

Ektimo

EnergyAustralia NSW Pty Ltd, Mt Piper Power Station

Emission Testing Report

Report Number R014323

Document Information

Template Version 190722

Client Name:	Energy Australia NSW Pty Ltd (Mt Piper)
Report Number:	R014323
Date of Issue:	26 April 2023
Attention:	Kane Hoskins
Address:	Mt Piper Power Station, Locked Mail Bag 1 Portland NSW 2847
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation

Aaron Davis
Ektimo Signatory

NATA Accredited Laboratory
No. 14601

Table of Contents

1 Executive Summary

1.1 Background

Ektimo was engaged by Energy Australia NSW Pty Ltd (Mt Piper) to perform emission testing at Mt Piper Power Station. Testing was carried out in accordance with Licence 13007.

1.2 Project Objective & Overview

The objective of the project was to quantify emissions from four (4) discharge points to determine compliance with Energy Australia NSW Pty Ltd (Mt Piper) 's Environmental Licence.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 4 – Unit 1, Duct B	31 January 2023	Solid particles (total) Metals type 1 and 2 substances, copper, zinc ***Coarse particulates – Not sampled.*** ***Particulate matter < 10µm (PM_{10}) – Not sampled***
EPA 5 – Unit 1, Duct A	01 February 2023	Solid particles (total) Coarse particulates Metals type 1 and 2 substances, copper, zinc Particulate matter < 10µm (PM_{10})
EPA 6– Unit 2, Duct A	02 February 2023	Solid particles (total) Coarse particulates Metals type 1 and 2 substances, copper, zinc Particulate matter < 10µm (PM_{10})
EPA 7 – Unit 2, Duct B	03 February 2023	Solid particles (total) Coarse particulates Metals type 1 and 2 substances, copper, zinc Particulate matter < 10µm (PM_{10})

* Flow rate, velocity, temperature and moisture were also determined.

All results are reported on a dry basis at STP (Dry, 273 K, 101.3 kPa).

Plant operating conditions have been noted in the report.

1.3 Results Summary

All analytes are within the licence limit set by the NSW EPA as per licence 13007 (last amended on 27 January 2023).

Report Number			R014323	R014323	
Test Date			1/02/23	31/01/23	
EPA			5	4	
Unit			Unit 1 Duct A	Unit 1 Duct B	
					EPA 2
	LIMIT	**UNITS**	*Measured Results*		*Combined Ducts*
Type 1 and Type 2 substances in aggregate	**0.75**	**mg/m³**	<0.036	<0.027	**<0.03**
Antimony		mg/m³	<0.002	<0.003	<0.002
Arsenic (LBL)		mg/m³	<0.001	<0.001	<0.001
Beryllium		mg/m³	<0.0003	<0.0004	<0.0003
Cadmium	**0.2**	mg/m³	<0.0004	0.00069	**<0.0005**
Chromium		mg/m³	0.0013	0.0019	0.0016
Cobalt		mg/m³	<0.0004	<0.0005	<0.0004
Copper		mg/m³	0.0053	0.0086	0.0067
Lead (LBL)		mg/m³	0.0025	0.0013	0.002
Manganese		mg/m³	0.0022	<0.001	<0.002
Mercury	**0.05**	mg/m³	0.0037	0.0028	**0.0033**
Nickel		mg/m³	0.002	0.003	0.0024
Selenium		mg/m³	0.011	<0.006	<0.009
Tin		mg/m³	0.0082	0.0044	0.0066
Vanadium		mg/m³	<0.0006	<0.0008	<0.0007
Zinc		mg/m³	0.054	0.013	0.036
Solid particles	**50**	**mg/m³**	**7.5**	**2.2**	**5.3**
PM10		mg/m³	2.3	-	-
Coarse particulates		mg/m³	5.2	-	-

*Combined air emissions from **boiler 1** via points 4 & 5 (except for PM10 and Coarse Particulates)*
All results corrected to 7% oxygen correction.

Report Number			R014323	R014323	
Test Date			2/02/23	3/02/23	
EPA			6	7	
Unit			Unit 2 Duct A	Unit 2 Duct B	
					EPA 3
	LIMIT	**UNITS**	*Measured Results*		*Combined Ducts*
Type 1 and Type 2 substances in aggregate	**0.75**	**mg/m³**	<0.029	<0.028	**<0.03**
Antimony		mg/m³	<0.002	<0.003	<0.002
Arsenic (LBL)		mg/m³	<0.0009	<0.001	<0.0009
Beryllium		mg/m³	<0.0003	<0.0003	<0.0003
Cadmium	**0.2**	mg/m³	<0.0003	0.00036	**<0.0003**
Chromium		mg/m³	0.0017	0.0011	0.0014
Cobalt		mg/m³	<0.0003	<0.0004	<0.0003
Copper		mg/m³	0.0032	0.0031	0.0032
Lead (LBL)		mg/m³	0.002	0.0019	0.002
Manganese		mg/m³	0.0015	<0.001	<0.001
Mercury	**0.05**	mg/m³	0.0027	0.0042	**0.0034**
Nickel		mg/m³	0.0016	0.0008	0.0012
Selenium		mg/m³	0.012	0.011	0.012
Tin		mg/m³	0.0029	0.0024	0.0027
Vanadium		mg/m³	<0.0005	<0.0006	<0.0005
Zinc		mg/m³	0.016	0.011	0.014
Solid particles	**50**	**mg/m³**	**3.9**	**2.9**	**3.4**
PM10		mg/m³	<1	1.7	-
Coarse particulates		mg/m³	≤2.6	1.2	-

*Combined air emissions from **boiler 2** via points 6 & 7*
All results corrected to 7% oxygen correction.

*Please note that the measurement uncertainty associated with the test results **was not** considered when determining whether the results were compliant or non-compliant.*

Refer to the Test Methods table for the measurement uncertainties.

2 Results

2.1 EPA 4 – Unit 1, Duct B

Date	31/01/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 4 Unit 1 Duct B (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta, Breandan Scholand	**State**	NSW
Process Conditions	Load: 350MW		*230116*

Sampling Plane Details		
Sampling plane dimensions	5460 x 6600 mm	
Sampling plane area	36 m²	
Sampling port size, number	6" Flange (x6)	
Duct orientation & shape	Horizontal Rectangular	
Downstream disturbance	Junction 0.5 D	
Upstream disturbance	Damper 0.6 D	
No. traverses & points sampled	6 42	
Sample plane conformance to USEPA Method 1	Compliant	

Stack Parameters		
Moisture content, %v/v	5.1	
Gas molecular weight, g/g mole	29.5 (wet)	30.1 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.34 (dry)
Gas density at discharge conditions, kg/m³	0.80	
% Oxygen correction & Factor	7 %	1.34
Gas Flow Parameters		
Temperature, °C	122	
Temperature, K	395	
Velocity at sampling plane, m/s	8.3	
Volumetric flow rate, actual, m³/s	300	
Volumetric flow rate (wet STP), m³/s	180	
Volumetric flow rate (dry STP), m³/s	170	
Mass flow rate (wet basis), kg/hour	870000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	1204 - 1547	1204 - 1547	1204 - 1547
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	9.8	7.6	10.2
Oxygen	10.5	10.1	12.4

Date	31/01/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 4 Unit 1 Duct B (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta, Breandan Scholand	**State**	NSW
Process Conditions	Load: 350MW		*230116*

Isokinetic Results	Results		
Sampling time	1204-1542		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	1.6	2.2	17
Antimony	<0.002	<0.003	<0.02
Arsenic	<0.001	<0.001	<0.01
Beryllium	<0.0003	<0.0004	<0.003
Cadmium	**0.00052**	**0.00069**	**0.0054**
Chromium	**0.0014**	**0.0019**	**0.015**
Cobalt	<0.0004	<0.0005	<0.004
Copper	**0.0064**	**0.0086**	**0.067**
Lead	**0.00097**	**0.0013**	**0.01**
Manganese	<0.001	<0.001	<0.01
Mercury	**0.0021**	**0.0028**	**0.022**
Nickel	**0.0022**	**0.003**	**0.023**
Selenium	<0.004	<0.006	<0.05
Tin	**0.0033**	**0.0044**	**0.034**
Vanadium	<0.0006	<0.0008	<0.006
Zinc	**0.01**	**0.013**	**0.1**
Type 1 & 2 Substances			
Upper Bound			
Total Type 1 Substances	≤0.0069	≤0.0092	≤0.072
Total Type 2 Substances	≤0.014	≤0.018	≤0.14
Total Type 1 & 2 Substances	≤0.02	≤0.027	≤0.21
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		100	
Gravimetric analysis date (total particulate)		15-02-2023	

2.2 EPA 5 – Unit 1, Duct A

Date	1/02/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 5 Unit 1 Duct A (Upper)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta, Breandan Scholand	**State**	NSW
Process Conditions	Load: 350MW		*230116*

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Compliant

Stack Parameters		
Moisture content, %v/v	5.4	
Gas molecular weight, g/g mole	29.4 (wet)	30.1 (dry)
Gas density at STP, kg/m³	1.31 (wet)	1.34 (dry)
Gas density at discharge conditions, kg/m³	0.81	
% Oxygen correction & Factor	7 %	1.31
Gas Flow Parameters		
Temperature, °C	115	
Temperature, K	389	
Velocity at sampling plane, m/s	11	
Volumetric flow rate, actual, m³/s	400	
Volumetric flow rate (wet STP), m³/s	250	
Volumetric flow rate (dry STP), m³/s	230	
Mass flow rate (wet basis), kg/hour	1200000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	0800 - 1141	0800 - 1141	0800 - 1141
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	9.5	8.6	9.9
Oxygen	10.3	10	11.2

Date	1/02/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 5 Unit 1 Duct A (Upper)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta, Breandan Scholand	**State**	NSW
Process Conditions	Load: 350MW		*230116*

Isokinetic Results	Results		
Sampling time	0800-1141		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	5.7	7.5	80
Antimony	<0.002	<0.002	<0.02
Arsenic	<0.0008	<0.001	<0.01
Beryllium	<0.0002	<0.0003	<0.003
Cadmium	<0.0003	<0.0004	<0.004
Chromium	**0.00099**	**0.0013**	**0.014**
Cobalt	<0.0003	<0.0004	<0.004
Copper	**0.004**	**0.0053**	**0.056**
Lead	**0.0019**	**0.0025**	**0.026**
Manganese	**0.0017**	**0.0022**	**0.023**
Mercury	**0.0028**	**0.0037**	**0.04**
Nickel	**0.0015**	**0.002**	**0.021**
Selenium	**0.0087**	**0.011**	**0.12**
Tin	**0.0062**	**0.0082**	**0.087**
Vanadium	<0.0004	<0.0006	<0.006
Zinc	**0.041**	**0.054**	**0.57**
Type 1 & 2 Substances			
Upper Bound			
Total Type 1 Substances	≤0.0075	≤0.0099	≤0.1
Total Type 2 Substances	≤0.02	≤0.026	≤0.28
Total Type 1 & 2 Substances	≤0.028	≤0.036	≤0.38
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		100	
Gravimetric analysis date (total particulate)		15-02-2023	

Date	1/02/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 5 Unit 1 Duct A (Upper)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta, Breandan Scholand	**State**	NSW
Process Conditions	Load: 350MW		*230116*

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Compliant

Stack Parameters		
Moisture content, %v/v	4.9	
Gas molecular weight, g/g mole	29.5 (wet)	30.1 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.34 (dry)
Gas density at discharge conditions, kg/m³	0.81	
% Oxygen correction & Factor	7 %	1.31
Gas Flow Parameters		
Temperature, °C	119	
Temperature, K	392	
Velocity at sampling plane, m/s	12	
Volumetric flow rate, actual, m³/s	430	
Volumetric flow rate (wet STP), m³/s	270	
Volumetric flow rate (dry STP), m³/s	250	
Mass flow rate (wet basis), kg/hour	1300000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	1210 - 1553	1210 - 1553	1210 - 1553
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	9.6	7.2	10
Oxygen	10.3	9.9	12.6

Isokinetic Results	Results		
Sampling time	1210-1553 (PM10)		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Fine particulates (PM10)	1.7	2.3	26
Coarse Particulates*	4	5.2	**
D50 cut size, 10µm		9.9	
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		88	
Gravimetric analysis date (PM_{10})		15-02-2023	

** Due to the inability for two x 6m sampling probes to be used simultaneously at the sampling plane, monitoring for Fine Particulates (PM_{10}) was not conducted simultaneously with monitoring for Solid Particles (Total). Accordingly, Coarse Particulate reported concentration is indicative only.*

*** Due to differing volumetric gas flowrates measured during monitoring for Solid Particles (Total) and Fine Particulates (PM_{10}) mass rate of Coarse Particulates has not been reported.*

2.3 EPA 6– Unit 2, Duct A

Date	2/02/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 6 Unit 2 Duct A (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta, Breandan Scholand	**State**	NSW
Process Conditions	Load: 350MW (Mill running/adjustment with liquid fuel introduced)		*230116*

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Compliant

Stack Parameters		
Moisture content, %v/v	5.7	
Gas molecular weight, g/g mole	29.6 (wet)	30.2 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.81	
% Oxygen correction & Factor	7 %	1.17
Gas Flow Parameters		
Temperature, °C	117	
Temperature, K	390	
Velocity at sampling plane, m/s	14	
Volumetric flow rate, actual, m³/s	500	
Volumetric flow rate (wet STP), m³/s	310	
Volumetric flow rate (dry STP), m³/s	290	
Mass flow rate (wet basis), kg/hour	1500000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	0813 - 1153	0813 - 1153	0813 - 1153
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	11	9.8	11.4
Oxygen	9.1	8.5	10.2

Date	2/02/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 6 Unit 2 Duct A (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta, Breandan Scholand	**State**	NSW
Process Conditions	Load: 350MW (Mill running/adjustment with liquid fuel introduced)		*230116*

Isokinetic Results	Results		
Sampling time	0813-1153		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	3.3	3.9	58
Antimony	<0.002	<0.002	<0.03
Arsenic	<0.0008	<0.0009	<0.01
Beryllium	<0.0002	<0.0003	<0.004
Cadmium	<0.0002	<0.0003	<0.004
Chromium	**0.0015**	**0.0017**	**0.025**
Cobalt	<0.0003	<0.0003	<0.005
Copper	**0.0027**	**0.0032**	**0.047**
Lead	**0.0017**	**0.002**	**0.029**
Manganese	**0.0012**	**0.0015**	**0.022**
Mercury	**0.0023**	**0.0027**	**0.039**
Nickel	**0.0013**	**0.0016**	**0.023**
Selenium	**0.01**	**0.012**	**0.18**
Tin	**0.0024**	**0.0029**	**0.042**
Vanadium	<0.0005	<0.0005	<0.008
Zinc	**0.013**	**0.016**	**0.23**
Type 1 & 2 Substances			
Upper Bound			
Total Type 1 Substances	≤0.0067	≤0.0079	≤0.12
Total Type 2 Substances	≤0.018	≤0.021	≤0.31
Total Type 1 & 2 Substances	≤0.024	≤0.029	≤0.42
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		101	
Gravimetric analysis date (total particulate)		15-02-2023	

Date	2/02/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 6 Unit 2 Duct A (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta, Breandan Scholand	**State**	NSW
Process Conditions	Load: 350MW (Mill running/adjustment with liquid fuel introduced)		230131

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Compliant

Stack Parameters		
Moisture content, %v/v	5.7	
Gas molecular weight, g/g mole	29.6 (wet)	30.3 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.81	
% Oxygen correction & Factor	7 %	1.16
Gas Flow Parameters		
Temperature, °C	120	
Temperature, K	393	
Velocity at sampling plane, m/s	14	
Volumetric flow rate, actual, m³/s	520	
Volumetric flow rate (wet STP), m³/s	320	
Volumetric flow rate (dry STP), m³/s	300	
Mass flow rate (wet basis), kg/hour	1500000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	1205 - 1548	1205 - 1548	1205 - 1548
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	11.1	10.1	11.9
Oxygen	8.9	8	10.2

Isokinetic Results	Results		
Sampling time	1205-1548 (PM10)		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Fine particulates (PM10)	<1	<1	<20
Coarse Particulates*	≤2.3	≤2.6	**
D50 cut size, 10µm		9.9	
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		98	
Gravimetric analysis date (PM_{10})		15-02-2023	

** Due to the inability for two x 6m sampling probes to be used simultaneously at the sampling plane, monitoring for Fine Particulates (PM_{10}) was not conducted simultaneously with monitoring for Solid Particles (Total). Accordingly, Coarse Particulate reported concentration is indicative only.*

*** Due to differing volumetric gas flowrates measured during monitoring for Solid Particles (Total) and Fine Particulates (PM_{10}) mass rate of Coarse Particulates has not been reported.*

2.4 EPA 7 – Unit 2, Duct B

Date	3/02/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 7 Unit 2 Duct B (Upper)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta, Breandan Scholand	**State**	NSW
Process Conditions	Load: 350MW		*230116*

Sampling Plane Details		
Sampling plane dimensions	5460 x 6600 mm	
Sampling plane area	36 m²	
Sampling port size, number	6" Flange (x6)	
Duct orientation & shape	Horizontal Rectangular	
Downstream disturbance	Junction 0.5 D	
Upstream disturbance	Damper 0.6 D	
No. traverses & points sampled	6 42	
Sample plane conformance to USEPA Method 1	Compliant	
Stack Parameters		
Moisture content, %v/v	5.6	
Gas molecular weight, g/g mole	29.5 (wet)	30.2 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.82	
% Oxygen correction & Factor	7 %	1.21
Gas Flow Parameters		
Temperature, °C	113	
Temperature, K	386	
Velocity at sampling plane, m/s	12	
Volumetric flow rate, actual, m³/s	420	
Volumetric flow rate (wet STP), m³/s	260	
Volumetric flow rate (dry STP), m³/s	250	
Mass flow rate (wet basis), kg/hour	1200000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	0750 - 1127	0750 - 1127	0750 - 1127
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	10.6	10.1	11.1
Oxygen	9.4	8.9	10

Date	3/02/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 7 Unit 2 Duct B (Upper)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta, Breandan Scholand	**State**	NSW
Process Conditions	Load: 350MW		*230116*

Isokinetic Results	Results		
Sampling time	0750-1127		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	2.4	2.9	36
Antimony	<0.002	<0.003	<0.03
Arsenic	<0.0009	<0.001	<0.01
Beryllium	<0.0003	<0.0003	<0.004
Cadmium	**0.0003**	**0.00036**	**0.0044**
Chromium	**0.00094**	**0.0011**	**0.014**
Cobalt	<0.0003	<0.0004	<0.005
Copper	**0.0025**	**0.0031**	**0.038**
Lead	**0.0015**	**0.0019**	**0.023**
Manganese	<0.001	<0.001	<0.01
Mercury	**0.0035**	**0.0042**	**0.052**
Nickel	**0.00066**	**0.0008**	**0.0098**
Selenium	**0.0089**	**0.011**	**0.13**
Tin	**0.002**	**0.0024**	**0.03**
Vanadium	<0.0005	<0.0006	<0.008
Zinc	**0.0092**	**0.011**	**0.14**
Type 1 & 2 Substances			
Upper Bound			
Total Type 1 Substances	≤0.0083	≤0.01	≤0.12
Total Type 2 Substances	≤0.015	≤0.018	≤0.22
Total Type 1 & 2 Substances	≤0.023	≤0.028	≤0.34
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		101	
Gravimetric analysis date (total particulate)		15-02-2023	

Date	3/02/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 7 Unit 2 Duct B (Upper)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta, Breandan Scholand	**State**	NSW
Process Conditions	Load: 350MW		230131

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to AS 4323.1	Compliant

Stack Parameters		
Moisture content, %v/v	5.1	
Gas molecular weight, g/g mole	29.6 (wet)	30.2 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.81	
% Oxygen correction & Factor	7 %	1.20
Gas Flow Parameters		
Temperature, °C	118	
Temperature, K	391	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/s	490	
Volumetric flow rate (wet STP), m³/s	300	
Volumetric flow rate (dry STP), m³/s	280	
Mass flow rate (wet basis), kg/hour	1400000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	1137 - 1516	1137 - 1516	1137 - 1516
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	10.6	9.5	11.2
Oxygen	9.4	8.8	10.4

Isokinetic Results	Results		
Sampling time	1137-1517 (PM10)		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Fine particulates (PM10)	1.4	1.7	24
Coarse Particulates*	1	1.2	**
D50 cut size, 10µm		9.4	
Isokinetic Sampling Parameters			
Sampling time, min		209	
Isokinetic rate, %		111	
Gravimetric analysis date (PM_{10})		15-02-2023	

** Due to the inability for two x 6m sampling probes to be used simultaneously at the sampling plane, monitoring for Fine Particulates (PM_{10}) was not conducted simultaneously with monitoring for Solid Particles (Total). Accordingly, Coarse Particulate reported concentration is indicative only.*

*** Due to differing volumetric gas flowrates measured during monitoring for Solid Particles (Total) and Fine Particulates (PM_{10}) mass rate of Coarse Particulates has not been reported.*

3 Plant Operating Conditions

See Energy Australia NSW Pty Ltd (Mt Piper) records for complete process conditions.

From information received from the site operator, unless otherwise noted it is our understanding that samples were collected during normal plant operations. Unless otherwise noted all samples were collected in compliance with Ektimo's QA/QC standards.

4 Test Methods

All sampling and analysis performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling method	Analysis method	Uncertainty*	NATA accredited Sampling	NATA accredited Analysis
Sampling points - Selection	NSW EPA TM-1 (USEPA Method 1)	NA	NA	✓	NA
Flow rate, temperature & velocity	NSW EPA TM-2 (USEPA Method 2)	NSW EPA TM-2 (USEPA Method 2)	8%, 2%, 7%	NA	✓
Moisture content	NSW EPA TM-22 (USEPA Method 4)	NSW EPA TM-22 (USEPA Method 4)	8%	✓	✓
Molecular weight	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Dry gas density	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Carbon dioxide	NSW EPA TM-24 (USEPA Method 3A)	NSW EPA TM-24 (USEPA Method 3A)	13%	✓	✓
Oxygen	NSW EPA TM-25 (USEPA Method 3A)	NSW EPA TM-25 (USEPA Method 3A)	13%	✓	✓
Particulate matter (PM_{10} & $PM_{2.5}$)	NSW EPA OM-5 (USEPA Method 201A)	NSW EPA OM-5 (USEPA Method 201A)	6%	✓	✓††
Coarse particulates	NSW EPA OM-9	NSW EPA OM-9	not specified	✓	✓††
Solid particles (total)	NSW EPA TM-15 (AS 4323.2)	NSW EPA TM-15 (AS 4323.2)	3%	✓	✓††
Total (gaseous & particulate) metals & metallic compounds	NSW EPA TM-12, NSW EPA TM-13, NSW EPA TM-14 (USEPA Method	Envirolab in-house methods Metals-006, Metals-022	15%	✓	✓‡
Type 1 substances (As, Cd, Hg, Pb, Sb)	NSW EPA TM-12 (USEPA Method 29)	Envirolab in-house methods Metals-006, Metals-022	15%	✓	✓‡
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW EPA TM-13 (USEPA Method 29)	Envirolab in-house methods Metals-006, Metals-022	15%	✓	✓‡

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* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

†† Gravimetric analysis conducted at the Ektimo NSW laboratory.

‡ Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 20 February 2023 in report 316236, and on 8 March 2023 in report 317680.

5 Quality Assurance/Quality Control Information

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

6 Definitions

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
AS	Australian Standard
D	Duct diameter or equivalent duct diameter for rectangular ducts
D_{50}	'Cut size' of a cyclone is defined as the particle diameter at which the cyclone achieves a 50% collection efficiency i.e. half of the particles are retained by the cyclone and half pass through it. The D_{50} method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D_{50} of that cyclone and less than the D_{50} of the preceding cyclone.
DECC	Department of Environment & Climate Change (NSW)
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
EPA	Environment Protection Authority
FTIR	Fourier transform infra-red
ISC	Intersociety Committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
Lower bound	When an analyte is not present above the detection limit, the result is assumed to be equal to zero.
Medium bound	When an analyte is not present above the detection limit, the result is assumed to be equal to half of the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
PM_{10}	Particulate matter having an equivalent aerodynamic diameter less than or equal to 10 microns (µm).
$PM_{2.5}$	Particulate matter having an equivalent aerodynamic diameter less than or equal to 2.5 microns (µm).
Semi-quantified VOCs	Unknown VOCs (those for which an analytical standard is not available), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration is determined by matching the area of the peak with the nearest suitable compound in the analytical calibration standard mixture.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0 °C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa.
TM	Test method
TOC	Total organic carbon. This is the sum of all compounds of carbon which contain at least one carbon-to-carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
Velocity difference	The percentage difference between the average of initial flows and after flows.
Upper bound	When an analyte is not present above the detection limit, the result is assumed to be equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

7 Appendix 1: Laboratory Results

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ph 02 9910 6200 fax 02 9910 6201
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www.envirolab.com.au

CERTIFICATE OF ANALYSIS 316236

Client Details

Client	Ektimo (Unanderra)
Attention	Rick Peralta
Address	1/251 Princes Hwy, Unanderra, NSW, 2526

Sample Details

Your Reference	**R014323**
Number of Samples	10 Liquid
Date samples received	10/02/2023
Date completed instructions received	10/02/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	17/02/2023
Date of Issue	17/02/2023

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Hannah Nguyen, Metals Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

Metals in water - mass units						
Our Reference		316236-1	316236-2	316236-3	316236-4	316236-5
Your Reference	UNITS	N 19013	N 19014	N 19015	N 19016	N 19018
Type of sample		Liquid	Liquid	Liquid	Liquid	Liquid
Volume	mL	343	207	363	241	78
Antimony	µg	<0.5	[NA]	<0.5	[NA]	<0.5
Arsenic	µg	<0.5	[NA]	<0.5	[NA]	<0.5
Cadmium	µg	0.2	[NA]	0.4	[NA]	<0.05
Lead	µg	2	[NA]	4	[NA]	<0.5
Mercury	µg	<10	<1	<10	1	<10
Beryllium	µg	<0.5	[NA]	<0.5	[NA]	<0.5
Chromium	µg	1	[NA]	3	[NA]	<0.5
Cobalt	µg	<0.5	[NA]	<0.5	[NA]	<0.5
Manganese	µg	<3	[NA]	<3	[NA]	<3
Nickel	µg	5.0	[NA]	5	[NA]	<0.5
Selenium	µg	5.2	[NA]	27	[NA]	<0.5
Vanadium	µg	<0.5	[NA]	<0.5	[NA]	<0.5
Tin	µg	7.5	[NA]	19	[NA]	<0.5
Copper	µg	16	[NA]	14	[NA]	1
Zinc	µg	24	[NA]	39	[NA]	2
Date prepared	-	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023
Date analysed	-	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023
Antimony-Dissolved	µg/L	<1	[NA]	<1	[NA]	<1
Arsenic-Dissolved	µg/L	<1	[NA]	<1	[NA]	<1
Cadmium-Dissolved	µg/L	0.6	[NA]	1	[NA]	0.1
Lead-Dissolved	µg/L	7	[NA]	11	[NA]	2
Mercury-Dissolved	µg/L	11	4.8	21	4.8	<1
Beryllium-Dissolved	µg/L	<0.5	[NA]	<0.5	[NA]	<0.5
Chromium-Dissolved	µg/L	4	[NA]	7	[NA]	1
Cobalt-Dissolved	µg/L	<1	[NA]	<1	[NA]	<1
Manganese-Dissolved	µg/L	<5	[NA]	6	[NA]	<5
Nickel-Dissolved	µg/L	15	[NA]	13	[NA]	<1
Selenium-Dissolved	µg/L	15	[NA]	74	[NA]	<1
Vanadium-Dissolved	µg/L	<1	[NA]	<1	[NA]	<1
Tin-Dissolved	µg/L	22	[NA]	53	[NA]	<1
Copper-Dissolved	µg/L	47	[NA]	38	[NA]	17
Zinc-Dissolved	µg/L	70	[NA]	110	[NA]	25

Metals in water - mass units						
Our Reference		316236-6	316236-7	316236-8	316236-9	316236-10
Your Reference	UNITS	N 19019	N 19021	N 19022	N 19024	N 19025
Type of sample		Liquid	Liquid	Liquid	Liquid	Liquid
Volume	mL	78	364	315	338	232
Antimony	µg	[NA]	<0.5	[NA]	<0.5	[NA]
Arsenic	µg	[NA]	<0.5	[NA]	<0.5	[NA]
Cadmium	µg	[NA]	0.1	[NA]	0.08	[NA]
Lead	µg	[NA]	5.1	[NA]	4	[NA]
Mercury	µg	<1	<10	<1	<10	<1
Beryllium	µg	[NA]	<0.5	[NA]	<0.5	[NA]
Chromium	µg	[NA]	4	[NA]	2	[NA]
Cobalt	µg	[NA]	<0.5	[NA]	<0.5	[NA]
Manganese	µg	[NA]	<3	[NA]	<3	[NA]
Nickel	µg	[NA]	4	[NA]	2	[NA]
Selenium	µg	[NA]	30	[NA]	23	[NA]
Vanadium	µg	[NA]	<0.5	[NA]	<0.5	[NA]
Tin	µg	[NA]	7.2	[NA]	5.1	[NA]
Copper	µg	[NA]	9.4	[NA]	7.7	[NA]
Zinc	µg	[NA]	37	[NA]	22	[NA]
Date prepared	-	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023
Date analysed	-	17/02/2023	17/02/2023	17/02/2023	17/02/2023	17/02/2023
Antimony-Dissolved	µg/L	[NA]	<1	[NA]	<1	[NA]
Arsenic-Dissolved	µg/L	[NA]	<1	[NA]	<1	[NA]
Cadmium-Dissolved	µg/L	[NA]	0.4	[NA]	0.2	[NA]
Lead-Dissolved	µg/L	[NA]	14	[NA]	12	[NA]
Mercury-Dissolved	µg/L	<0.1	16	3.0	24	3.4
Beryllium-Dissolved	µg/L	[NA]	<0.5	[NA]	<0.5	[NA]
Chromium-Dissolved	µg/L	[NA]	10	[NA]	5	[NA]
Cobalt-Dissolved	µg/L	[NA]	<1	[NA]	<1	[NA]
Manganese-Dissolved	µg/L	[NA]	8	[NA]	6	[NA]
Nickel-Dissolved	µg/L	[NA]	11	[NA]	5	[NA]
Selenium-Dissolved	µg/L	[NA]	83	[NA]	67	[NA]
Vanadium-Dissolved	µg/L	[NA]	<1	[NA]	<1	[NA]
Tin-Dissolved	µg/L	[NA]	20	[NA]	15	[NA]
Copper-Dissolved	µg/L	[NA]	26	[NA]	23	[NA]
Zinc-Dissolved	µg/L	[NA]	100	[NA]	66	[NA]

Method ID	Methodology Summary
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Metals in water - mass units						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	316236-3
Antimony	µg	0.5	Metals-022	<0.5	1	<0.5	<0.5	0	[NT]	[NT]
Arsenic	µg	0.5	Metals-022	<0.5	1	<0.5	<0.5	0	[NT]	[NT]
Cadmium	µg	0.05	Metals-022	<0.05	1	0.2	0.2	0	[NT]	[NT]
Lead	µg	0.5	Metals-022	<0.5	1	2	2	0	[NT]	[NT]
Mercury	µg	0.5	Metals-021	<0.5	1	<10	<10	0	[NT]	[NT]
Beryllium	µg	0.5	Metals-022	<0.5	1	<0.5	<0.5	0	[NT]	[NT]
Chromium	µg	0.5	Metals-022	<0.5	1	1	2	67	[NT]	[NT]
Cobalt	µg	0.5	Metals-022	<0.5	1	<0.5	<0.5	0	[NT]	[NT]
Manganese	µg	3	Metals-022	<3	1	<3	<3	0	[NT]	[NT]
Nickel	µg	0.5	Metals-022	<0.5	1	5.0	5.5	10	[NT]	[NT]
Selenium	µg	0.5	Metals-022	<0.5	1	5.2	5.4	4	[NT]	[NT]
Vanadium	µg	0.5	Metals-022	<0.5	1	<0.5	<0.5	0	[NT]	[NT]
Tin	µg	0.5	Metals-022	<0.5	1	7.5	8.0	6	[NT]	[NT]
Copper	µg	0.5	Metals-022	<0.5	1	16	18	12	[NT]	[NT]
Zinc	µg	0.5	Metals-022	<0.5	1	24	26	8	[NT]	[NT]
Date prepared	-			17/02/2023	1	17/02/2023	17/02/2023		17/02/2023	17/02/2023
Date analysed	-			17/02/2023	1	17/02/2023	17/02/2023		17/02/2023	17/02/2023
Antimony-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	80	110
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	101	101
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	0.6	0.6	0	102	95
Lead-Dissolved	µg/L	1	Metals-022	<1	1	7	7	0	97	100
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	11	10	10	97	[NT]
Beryllium-Dissolved	µg/L	0.5	Metals-022	<0.5	1	<0.5	<0.5	0	109	82
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	4	5	22	94	99
Cobalt-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	94	100
Manganese-Dissolved	µg/L	5	Metals-022	<5	1	<5	<5	0	99	99
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	15	16	6	92	105
Selenium-Dissolved	µg/L	1	Metals-022	<1	1	15	16	6	99	104
Vanadium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	93	99
Tin-Dissolved	µg/L	1	Metals-022	<1	1	22	23	4	87	90
Copper-Dissolved	µg/L	1	Metals-022	<1	1	47	52	10	91	105
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	70	76	8	101	93

QUALITY CONTROL: Metals in water - mass units					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	316236-6
Mercury	µg	0.5	Metals-021	[NT]	4	1	1	0	[NT]	[NT]
Date prepared	-			[NT]	4	17/02/2023	17/02/2023		[NT]	17/02/2023
Date analysed	-			[NT]	4	17/02/2023	17/02/2023		[NT]	17/02/2023
Mercury-Dissolved	µg/L	0.05	Metals-021	[NT]	4	4.8	5.0	4	[NT]	94

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

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For VOCs in water samples, three vials are required for duplicate or spike analysis.

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Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Metals in water - mass units:
- The PQL has been raised due to the sample matrix requiring dilution.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 317680

Client Details

Client	Ektimo (Unanderra)
Attention	Rick Peralta
Address	1/251 Princes Hwy, Unanderra, NSW, 2526

Sample Details

Your Reference	**R014323**
Number of Samples	5 Filter
Date samples received	02/03/2023
Date completed instructions received	02/03/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

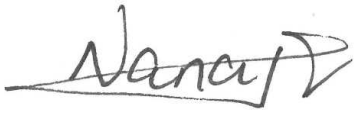
Date results requested by	08/03/2023
Date of Issue	08/03/2023

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Loren Bardwell, Development Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Metals on filters						
Our Reference		317680-1	317680-2	317680-3	317680-4	317680-5
Your Reference	UNITS	N19011	N19012	N19017	N19020	N19023
Type of sample		Filter	Filter	Filter	Filter	Filter
Date prepared	-	06/03/2023	06/03/2023	06/03/2023	06/03/2023	06/03/2023
Date analysed	-	06/03/2023	06/03/2023	06/03/2023	06/03/2023	06/03/2023
Arsenic	µg/filter	<2	<2	<2	<2	<2
Mercury	µg/filter	<0.2	<0.2	<0.2	<0.2	<0.2
Beryllium	µg/filter	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/filter	0.6	2	<0.5	0.8	0.8
Cobalt	µg/filter	<0.5	<0.5	<0.5	<0.5	<0.5
Manganese	µg/filter	3	0.7	<0.5	0.8	<0.5
Selenium	µg/filter	<5	<5	<5	<5	<5
Vanadium	µg/filter	<1	<1	<1	<1	<1
Tin	µg/filter	<2	<2	<2	<2	<2
Antimony	µg/filter	<5	<5	<5	<5	<5
Cadmium	µg/filter	<0.5	1	<0.5	<0.5	0.7
Copper	µg/filter	<0.5	<0.5	<0.5	<0.5	<0.5
Lead	µg/filter	2	<1	<1	<1	<1
Nickel	µg/filter	<1	<1	<1	<1	<1
Zinc	µg/filter	88	1	<1	5	3

Method ID	Methodology Summary
Metals-020/021/022	Determination of various metals on filters by ICP-AES/MS and or CV/AAS. Note - air volume measurements are not covered by Envirolab's NATA accreditation.

QUALITY CONTROL: Metals on filters					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			06/03/2023	[NT]	[NT]	[NT]	[NT]	06/03/2023	[NT]
Date analysed	-			06/03/2023	[NT]	[NT]	[NT]	[NT]	06/03/2023	[NT]
Arsenic	µg/filter	2	Metals-020/021/022	<2	[NT]	[NT]	[NT]	[NT]	100	[NT]
Mercury	µg/filter	0.2	Metals-020/021/022	<0.2	[NT]	[NT]	[NT]	[NT]	111	[NT]
Beryllium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	115	[NT]
Chromium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	98	[NT]
Cobalt	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	96	[NT]
Manganese	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	102	[NT]
Selenium	µg/filter	5	Metals-020/021/022	<5	[NT]	[NT]	[NT]	[NT]	99	[NT]
Vanadium	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Tin	µg/filter	2	Metals-020/021/022	<2	[NT]	[NT]	[NT]	[NT]	116	[NT]
Antimony	µg/filter	5	Metals-020/021/022	<5	[NT]	[NT]	[NT]	[NT]	106	[NT]
Cadmium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	106	[NT]
Copper	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	90	[NT]
Lead	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Nickel	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Zinc	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	130	[NT]

Result Definitions

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INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
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>	Greater than
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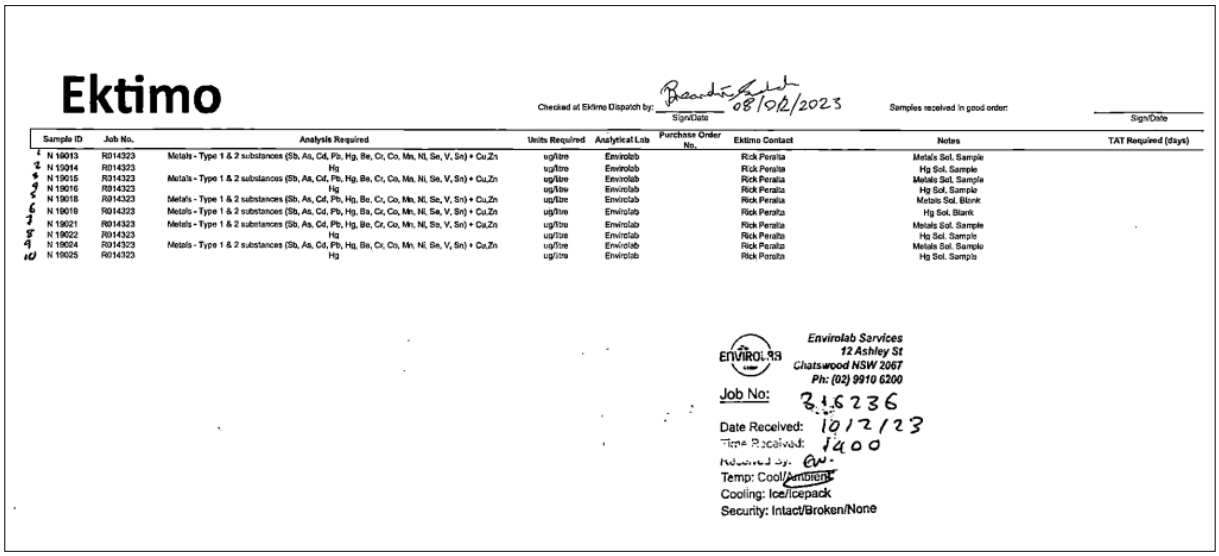
Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

8 Appendix 2: Chain of Custody



Ektimo

Checked at Ektimo Dispatch by: _____ Sign/Date 08/12/2023

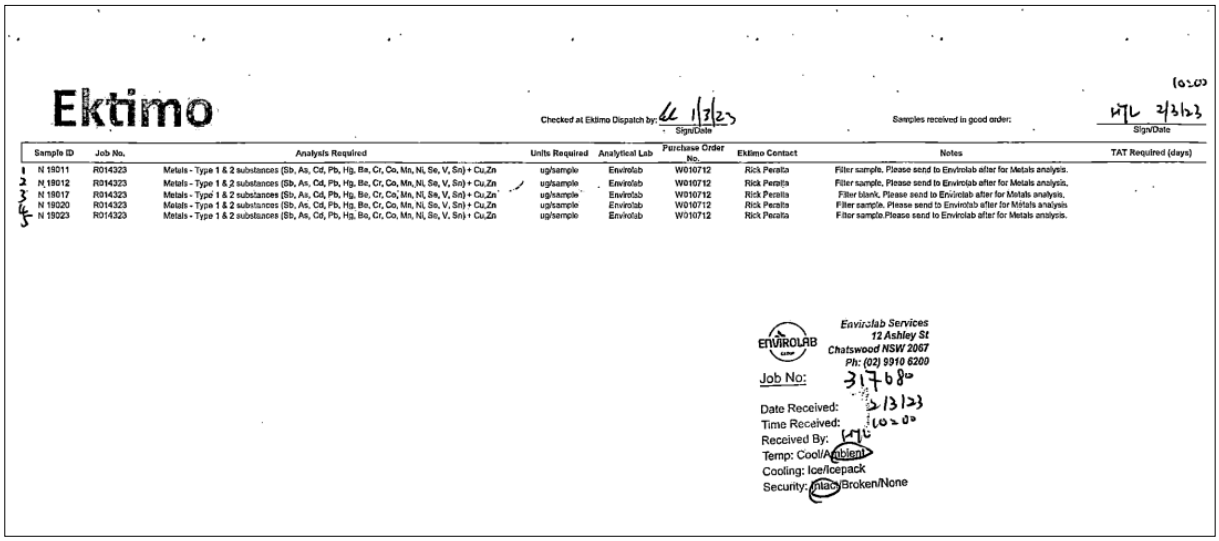
Samples received in good order: _____ Sign/Date

	Sample ID	Job No.	Analysis Required	Units Required	Analytical Lab	Purchase Order No.	Ektimo Contact	Notes	TAT Required (days)
1	N 19013	R014323	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu,Zn	ug/litre	Envirolab		Rick Peralta	Metals Sol. Sample	
2	N 19014	R014323	Hg	ug/litre	Envirolab		Rick Peralta	Hg Sol. Sample	
4	N 19015	R014323	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu,Zn	ug/litre	Envirolab		Rick Peralta	Metals Sol. Sample	
3	N 19016	R014323	Hg	ug/litre	Envirolab		Rick Peralta	Hg Sol. Sample	
6	N 19018	R014323	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu,Zn	ug/litre	Envirolab		Rick Peralta	Metals Sol. Blank	
7	N 19019	R014323	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu,Zn	ug/litre	Envirolab		Rick Peralta	Hg Sol. Blank	
5	N 19021	R014323	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu,Zn	ug/litre	Envirolab		Rick Peralta	Metals Sol. Sample	
9	N 19022	R014323	Hg	ug/litre	Envirolab		Rick Peralta	Hg Sol. Sample	
8	N 19024	R014323	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu,Zn	ug/litre	Envirolab		Rick Peralta	Metals Sol. Sample	
10	N 19025	R014323	Hg	ug/litre	Envirolab		Rick Peralta	Hg Sol. Sample	

ENVIROLAB

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 316236
Date Received: 10/12/23
Time Received: 1400
Received By: GW
Temp: Cool/~~Ambient~~
Cooling: Ice/Icepack
Security: Intact/Broken/None



Ektimo

Checked at Ektimo Dispatch by: 1/12/23 Sign/Date

Samples received in good order: MTL 2/12/23 Sign/Date

(0200)

	Sample ID	Job No.	Analysis Required	Units Required	Analytical Lab	Purchase Order No.	Ektimo Contact	Notes	TAT Required (days)
1	N 19011	R014323	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu,Zn	ug/sample	Envirolab	W010712	Rick Peralta	Filter sample. Please send to Envirolab after for Metals analysis.	
2	N 19012	R014323	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu,Zn	ug/sample	Envirolab	W010712	Rick Peralta	Filter sample. Please send to Envirolab after for Metals analysis.	
3	N 19017	R014323	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu,Zn	ug/sample	Envirolab	W010712	Rick Peralta	Filter blank. Please send to Envirolab after for Metals analysis.	
4	N 19020	R014323	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu,Zn	ug/sample	Envirolab	W010712	Rick Peralta	Filter sample. Please send to Envirolab after for Metals analysis	
5	N 19023	R014323	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu,Zn	ug/sample	Envirolab	W010712	Rick Peralta	Filter sample.Please send to Envirolab after for Metals analysis.	

ENVIROLAB

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 317680
Date Received: 2/12/23
Time Received: 0200
Received By: MTL
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Ektimo

ektimo.com.au
1300 364 005

MELBOURNE (Head Office)
26 Redland Drive
Mitcham
VIC 3132
AUSTRALIA

SYDNEY
6/78 Reserve Road
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AUSTRALIA

WOLLONGONG
1/251 Princes Highway
Unanderra
NSW 2526
AUSTRALIA

PERTH
52 Cooper Road
Cockburn Central
WA 6164
AUSTRALIA

BRISBANE
3/109 Riverside Place
Morningside
QLD 4170
AUSTRALIA

Ektimo

EnergyAustralia NSW Pty Ltd, Mt Piper Power Station

Emission Testing Report

Report Number R014518

Document Information

Template Version 130223

Client Name:	Energy Australia NSW Pty Ltd (Mt Piper)
Report Number:	R014518
Date of Issue:	5 April 2023
Attention:	Kane Hoskins
Address:	Mt Piper Power Station, Locked Mail Bag 1 Portland NSW 2847
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation

Rick Peralta
Air Monitoring Consultant

NATA Accredited Laboratory
No. 14601

Aaron Davis
Ektimo Signatory

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration, and inspection reports.

Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo's terms of NATA accreditation as described in the Test Methods table. This does not include calculations that use data supplied by third-parties, comments, conclusions, or recommendations based upon the results. Refer to 'Test Methods' for full details of testing covered by NATA accreditation.

Table of Contents

1 Executive Summary

1.1 Background

Ektimo was engaged by EnergyAustralia NSW Pty Ltd (Mt Piper) to perform emission testing at Mt Piper Power Station, Portland, NSW. Testing was carried out in accordance with Environment Protection Licence 13007.

1.2 Project Objective

The objective of the project was to conduct a monitoring programme to quantify emissions from two (2) discharge points to determine compliance with EnergyAustralia NSW Pty Ltd (Mt Piper)'s Environmental Licence.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 4 – Unit 1, Duct B	21 February 2023	Sulfuric acid mist and/or sulfur trioxide (as SO_3) Fluorine and fluorine compounds as (as total fluoride) Hydrogen chloride (HCl) Chlorine and chlorine compounds (as Cl_2) Volatile organic compounds (VOCs)
EPA 6 – Unit 2, Duct A	23 February 2023	Sulfuric acid mist and/or sulfur trioxide (as SO_3) Fluorine and fluorine compounds as (as total fluoride) Hydrogen chloride (HCl) Chlorine and chlorine compounds (as Cl_2) Volatile organic compounds (VOCs)

* Flow rate, velocity, temperature, and moisture were also determined.

All results are reported on a dry basis at STP.

Plant operating conditions have been noted in the report.

1.3 Results Summary

Report Number			R014518
Test Date			21/02/23
EPA			4
Unit			Unit 1 Duct B
	LIMIT	**UNITS**	*Measured Results*
Volatile organic compounds as n-propane equivalent	**10**	**mg/m³**	0.13
Fluorine	**30**	**mg/m³**	13
Hydrogen chloride	**50**	**mg/m³**	4.1
Chlorine	**20**	**mg/m³**	0.16
Sulfuric acid mist and sulfur trioxide (as SO_3)	**100**	**mg/m³**	5

Report Number			R014518
Test Date			23/02/23
EPA			6
Unit			Unit 2 Duct A
	LIMIT	**UNITS**	*Measured Results*
Volatile organic compounds as n-propane equivalent	**10**	**mg/m³**	<0.08
Fluorine	**30**	**mg/m³**	6.8
Hydrogen chloride	**50**	**mg/m³**	1.8
Chlorine	**20**	**mg/m³**	0.051
Sulfuric acid mist and sulfur trioxide (as SO_3)	**100**	**mg/m³**	8.8

All results corrected to 7% oxygen correction.

*Please note that the measurement uncertainty associated with the test results **was not** considered when determining whether the results were compliant or non-compliant.*

Refer to the Test Methods table for the measurement uncertainties.

2 Results

2.1 EPA 4 – Unit 1, Duct B

Date	21/02/2023	**Client**	EnergyAustralia
Report	R014518	**Stack ID**	Mt Piper Power Station - EPA 4 Unit 1 Duct B
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Ish Alam	**State**	NSW
Process Conditions	Boiler load stable at 220MW		230210

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Compliant

Stack Parameters		
Moisture content, %v/v	4.7	
Gas molecular weight, g/g mole	29.3 (wet)	29.9 (dry)
Gas density at STP, kg/m³	1.31 (wet)	1.33 (dry)
Gas density at discharge conditions, kg/m³	0.84	
% Oxygen correction & Factor	7 %	1.54
Gas Flow Parameters		
Temperature, °C	108	
Temperature, K	381	
Velocity at sampling plane, m/s	11	
Volumetric flow rate, actual, m³/s	390	
Volumetric flow rate (wet STP), m³/s	250	
Volumetric flow rate (dry STP), m³/s	240	
Mass flow rate (wet basis), kg/hour	1200000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	0820 - 1203	0820 - 1203	0820 - 1203
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	8.2	5.9	9.4
Oxygen	11.9	10.5	14.6

Isokinetic Results	Results		
Sampling time	0820-1203		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Sulfur trioxide and/or Sulfuric acid (as SO3)	3.3	5	47
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		99	

Date	21/02/2023	**Client**	EnergyAustralia
Report	R014518	**Stack ID**	Mt Piper Power Station - EPA 4 Unit 1 Duct B
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Ish Alam	**State**	NSW
Process Conditions	Boiler load stable at 220MW		230210

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Compliant

Stack Parameters		
Moisture content, %v/v	4.7	
Gas molecular weight, g/g mole	29.3 (wet)	29.9 (dry)
Gas density at STP, kg/m³	1.31 (wet)	1.33 (dry)
Gas density at discharge conditions, kg/m³	0.83	
% Oxygen correction & Factor	7 %	1.57
Gas Flow Parameters		
Temperature, °C	114	
Temperature, K	387	
Velocity at sampling plane, m/s	9.7	
Volumetric flow rate, actual, m³/s	350	
Volumetric flow rate (wet STP), m³/s	220	
Volumetric flow rate (dry STP), m³/s	210	
Mass flow rate (wet basis), kg/hour	1000000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	1219 - 1603	1219 - 1603	1219 - 1603
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	8	7.5	8.4
Oxygen	12.1	11.6	12.8

Isokinetic Results	Results		
Sampling time	1219-1603		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Chlorine	0.1	0.16	1.3
Total fluoride (as HF)	8.1	13	100
Hydrogen chloride	2.6	4.1	33
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		99	

Date	21/02/2023	**Client**	EnergyAustralia
Report	R014518	**Stack ID**	Mt Piper Power Station - EPA 4 Unit 1 Duct B
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Ish Alam	**State**	NSW
Process Conditions	Boiler load stable at 220MW		*230210*

Total VOCs (as n-Propane)	Results		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Total	0.084	0.13	1.1

VOC (speciated)	Results		
Sampling time		1253-1353	
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Detection limit[1]	<0.08	<0.1	<1
Toluene	0.18	0.28	2.2

(1) Unless otherwise reported, the following target compounds were found to be below detection:
Ethanol, Acetone, Isopropanol, Pentane, 1,1-Dichloroethene, Acrylonitrile, Dichloromethane, trans-1,2-Dichloroethene, Methyl ethyl ketone, n-Hexane, cis-1,2-Dichloroethene, Ethyl acetate, Chloroform, 1,1,1-Trichloroethane,1,2-Dichloroethane, Cyclohexane, Benzene, Carbon tetrachloride, Butanol, Isopropyl acetate, 2-Methylhexane, 2,3-Dimethylpentane, 1-Methoxy-2-propanol, 3-Methylhexane, Heptane, Ethyl acrylate, Trichloroethylene, Methyl methacrylate, Propyl acetate, Methylcyclohexane, Methyl Isobutyl Ketone, 1,1,2 Trichloroethane, 2-Hexanone, Octane, Tetrachloroethene, Butyl acetate, Chlorobenzene, Ethylbenzene, m + p-Xylene, 1-Methoxy-2-propyl acetate, Styrene, o-Xylene, Butyl acrylate, Nonane, 2-Butoxyethanol, Cellosolve acetate, 1,1,2,2-Tetrachloroethane, Isopropylbenzene, alpha-Pinene, Propylbenzene, 1,3,5-Trimethylbenzene,beta-Pinene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, Decane, 3-Carene, 1,2,3-Trimethylbenzene, D-Limonene, Undecane, Dodecane, Tridecane, Tetradecane

2.2 EPA 6 – Unit 2, Duct A

Date	23/02/2023	**Client**	EnergyAustralia
Report	R014518	**Stack ID**	Mt Piper Power Station - EPA 6 Unit 2 Duct A
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Ish Alam	**State**	NSW
Process Conditions	Boiler load stable at 220MW		*230210*

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Compliant

Stack Parameters		
Moisture content, %v/v	4.3	
Gas molecular weight, g/g mole	29.4 (wet)	29.9 (dry)
Gas density at STP, kg/m³	1.31 (wet)	1.33 (dry)
Gas density at discharge conditions, kg/m³	0.85	
% Oxygen correction & Factor	7 %	1.61
Gas Flow Parameters		
Temperature, °C	104	
Temperature, K	378	
Velocity at sampling plane, m/s	9.8	
Volumetric flow rate, actual, m³/s	350	
Volumetric flow rate (wet STP), m³/s	230	
Volumetric flow rate (dry STP), m³/s	220	
Mass flow rate (wet basis), kg/hour	1100000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	0921 - 1257	0921 - 1257	0921 - 1257
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	8.1	7.1	8.3
Oxygen	12.2	12	13.3

Isokinetic Results	Results		
Sampling time	0920-1257		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Sulfur trioxide and/or Sulfuric acid (as SO3)	5.5	8.8	72
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		99	

Date	23/02/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 6 Unit 2 Duct A
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Ish Alam	**State**	NSW
Process Conditions	Boiler load stable at 220MW		230210

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Compliant

Stack Parameters		
Moisture content, %v/v	4.3	
Gas molecular weight, g/g mole	29.4 (wet)	29.9 (dry)
Gas density at STP, kg/m³	1.31 (wet)	1.33 (dry)
Gas density at discharge conditions, kg/m³	0.85	
% Oxygen correction & Factor	7 %	1.58
Gas Flow Parameters		
Temperature, °C	107	
Temperature, K	380	
Velocity at sampling plane, m/s	9.9	
Volumetric flow rate, actual, m³/s	360	
Volumetric flow rate (wet STP), m³/s	230	
Volumetric flow rate (dry STP), m³/s	220	
Mass flow rate (wet basis), kg/hour	1100000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	1308 - 1644	1308 - 1644	1308 - 1644
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	8.1	5.8	8.6
Oxygen	12.1	11.6	14.9

Isokinetic Results	Results		
Sampling time	1308-1644		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Chlorine	0.032	0.051	0.42
Total fluoride (as HF)	4.3	6.8	57
Hydrogen chloride	1.1	1.8	15
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		99	

Date	23/02/2023	**Client**	EnergyAustralia
Report	R014323	**Stack ID**	Mt Piper Power Station - EPA 6 Unit 2 Duct A
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Ish Alam	**State**	NSW
Process Conditions	Boiler load stable at 220MW		230210

Total VOCs (as n-Propane)	Results		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Total	<0.05	<0.08	<0.7

VOC (speciated)	Results		
Sampling time		1300-1400	
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Detection limit(1)	<0.05	<0.09	<0.7

(1) Unless otherwise reported, the following target compounds were found to be below detection:
Ethanol, Acetone, Isopropanol, Pentane, 1,1-Dichloroethene, Acrylonitrile, Dichloromethane, trans-1,2-Dichloroethene, Methyl ethyl ketone, n-Hexane, cis-1,2-Dichloroethene, Ethyl acetate, Chloroform, 1,1,1-Trichloroethane,1,2-Dichloroethane, Cyclohexane, Benzene, Carbon tetrachloride, Butanol, Isopropyl acetate, 2-Methylhexane, 2,3-Dimethylpentane, 1-Methoxy-2-propanol, 3-Methylhexane, Heptane, Ethyl acrylate, Trichloroethylene, Methyl methacrylate, Propyl acetate, Methylcyclohexane, Methyl Isobutyl Ketone, Toluene, 1,1,2 Trichloroethane, 2-Hexanone, Octane, Tetrachloroethene, Butyl acetate, Chlorobenzene, Ethylbenzene, m + p-Xylene, 1-Methoxy-2-propyl acetate, Styrene, o-Xylene, Butyl acrylate, Nonane, 2-Butoxyethanol, Cellosolve acetate, 1,1,2,2-Tetrachloroethane, Isopropylbenzene, alpha-Pinene, Propylbenzene, 1,3,5-Trimethylbenzene,beta-Pinene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, Decane, 3-Carene, 1,2,3-Trimethylbenzene, D-Limonene, Undecane, Dodecane, Tridecane, Tetradecane

3 Plant Operating Conditions

See Energy Australia NSW Pty Ltd (Mt Piper) records for complete process conditions.

4 Test Methods

All sampling and analysis performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling method	Analysis method	Uncertainty*	NATA accredited	
				Sampling	Analysis
Sampling points - Selection	NSW EPA TM-1 (USEPA Method 1)	NA	NA	✓	NA
Flow rate, temperature & velocity	NSW EPA TM-2 (USEPA Method 2)	NSW EPA TM-2 (USEPA Method 2)	8%, 2%, 7%	NA	✓
Moisture content	NSW EPA TM-22 (USEPA Method 4)	NSW EPA TM-22 (USEPA Method 4)	8%	✓	✓
Molecular weight	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Dry gas density	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Carbon dioxide	NSW EPA TM-24 (USEPA Method 3A)	NSW EPA TM-24 (USEPA Method 3A)	13%	✓	✓
Oxygen	NSW EPA TM-25 (USEPA Method 3A)	NSW EPA TM-25 (USEPA Method 3A)	13%	✓	✓
Hydrogen halides & halogens∞	USEPA Method 26A	Ektimo 235	14%	✓	✓†
Hydrogen halides (including soluble fluoride)[2]	NSW EPA TM-8 (USEPA Method 26A)	Ektimo 235	not specified	✓	✓†i
Speciated volatile organic compounds (VOCs)	NSW EPA TM-34[d] (USEPA Method 18)	Ektimo 344	19%	✓	✓†
Hydrogen chloride	NSW EPA TM-8 (USEPA Method 26A)	Ektimo 235	14%	✓	✓†i
Chlorine	NSW EPA TM-7 (USEPA Method 26A)	Ektimo 235	14%	✓	✓†i
Sulfuric acid mist and/or sulfur trioxide	NSW EPA TM-3 (USEPA Method 8)	Ektimo 235	16%	✓	✓†

230220

* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

† Analysis performed by Ektimo. Results were reported to Ektimo on:

- 9 March 2023 in report LV-004043.
- 9 March 2023 in report LV-004056.
- 16 March 2023 in report LV-004080.
- 17 March 2023 in report LV-004096.

2 Sampling follows USEPA Method 26A and analysis follows Ektimo 235 (ion chromatography) which uses the same principle as USEPA Method 26A. Includes sampling & analysis of soluble fluoride.

d Excludes recovery study as specified in section 8.4.3 of USEPA Test Method 18.

i Includes analysis of chlorine/chloride by Ektimo 235 which uses the same principle as USEPA Method 26/26A.

∞ Sampling follows USEPA Method 26A and analysis follows Ektimo 235 (ion chromatography) which uses the same principle as USEPA Method 26A and USEPA SW-846 Method 9056A (which is the NSW EPA approved alternative analysis method to USEPA Method 13B). Includes sampling & analysis of particulate fluoride.

4.1 Deviations to Test Methods

TM-9 FLUORINE

Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (NSW EPA) (2022) specifies TM-9 (USEPA 13B) for measurement of total fluoride emissions.

As per site-specific agreement between EnergyAustralia NSW and NSW EPA, Ektimo conducts sampling for particulate fluoride according to USEPA Method 26A (hydrogen halides and halogens) and analysis according to Ektimo Method 235 (ion chromatography). Ektimo Method 235 uses the same principle as USEPA SW-846 Method 9056A (which is the NSW EPA approved alternative analysis method to USEPA Method 13B).

Ektimo conducts sampling for soluble fluoride according to USEPA Method 26A (hydrogen halides and halogens) and analysis according to Ektimo Method 235 (ion chromatography) which uses the same principle as USEPA Method 26A.

NSW EPA TM-34 (USEPA 18)

Ektimo notes that the sampling and analysis of Volatile Organic Compounds (VOCs), per USEPA 18 has excluded the recovery study as specified in Section 8.4.3. Performing the recovery study described in Section 8.4.3 of USEPA Method 18 for analytes present at low levels is problematic. Given this, Ektimo applies a threshold of 50µg as a lower-bound mass, below which the 'spiking' of specific volatile organic compounds is not performed. For the purposes of this round of monitoring, no VOCs were detected above 10µg. Therefore, recovery studies were not deemed necessary for this sampling round.

5 Quality Assurance/Quality Control Information

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

6 Definitions

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
AS	Australian Standard
D	Duct diameter or equivalent duct diameter for rectangular ducts
D_{50}	'Cut size' of a cyclone is defined as the particle diameter at which the cyclone achieves a 50% collection efficiency i.e. half of the particles are retained by the cyclone and half pass through it. The D_{50} method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D_{50} of that cyclone and less than the D_{50} of the preceding cyclone.
DECC	Department of Environment & Climate Change (NSW)
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
EPA	Environment Protection Authority
FTIR	Fourier transform infra-red
Lower bound	When an analyte is not present above the detection limit, the result is assumed to be equal to zero.
Medium bound	When an analyte is not present above the detection limit, the result is assumed to be equal to half of the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
PM_{10}	Particulate matter having an equivalent aerodynamic diameter less than or equal to 10 microns (µm).
Semi-quantified VOCs	Unknown VOCs (those for which an analytical standard is not available), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration is determined by matching the area of the peak with the nearest suitable compound in the analytical calibration standard mixture.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0 °C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa.
TM	Test method
TOC	Total organic carbon. This is the sum of all compounds of carbon which contain at least one carbon-to-carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound. A carbon-based chemical compound with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the given conditions of use. VOCs may contain oxygen, nitrogen and other elements. VOCs do not include carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
Upper bound	When an analyte is not present above the detection limit, the result is assumed to be equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

7 Appendices

7.1 Appendix 1: Laboratory Results

7.2 Appendix 2: Chain of Custody

Appendix 1: Laboratory Results

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-004096
Job Number:	R014518
Date of Issue:	17/03/2023
Attention:	Kane Hoskins
Address:	Mt Piper Power Station, Locked Portland, NSW 2847
Date samples received:	1/03/2023
Number of samples received:	3
Date samples analysed:	16/03/2023
No of samples analysed:	3
Test method(s) used:	Ektimo 235

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

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Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of these organisations, NATA accreditation is recognised world –wide.
A formal Quality Control program is in place at Ektimo to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

REPORT AUTHORISATION

Version 221129

Cappi Tuffery
Laboratory Technician

Daniel Balaam
Senior Laboratory Chemist

NATA Accredited Laboratory 14601

Report No. LV-004096

Job No. R014518

Client Name: Energy Australia NSW Pty Ltd (Mt Piper)

Parameter	PQL	Units	N 16447 Energy Australia NSW Pty Ltd (Mt Piper) EPA 4 1B SO3 Sample (SO3)	N 16448 Energy Australia NSW Pty Ltd (Mt Piper) Blank All SO3 Blank	N 16449 Energy Australia NSW Pty Ltd (Mt Piper) EPA 6 2A SO3 Sol. Sample
Sulphate	0.2	mg/L	75	<0.2	110
Fluoride	0.1	mg/L	<0.1	<0.1	<0.1
Chloride	0.1	mg/L	<0.1	<0.1	<0.1

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-004080
Job Number:	R014518
Date of Issue:	16/03/2023
Attention:	Kane Hoskins
Address:	Mt Piper Power Station, Locked Portland, NSW 2847
Date samples received:	1/03/2023
Number of samples received:	3
Date samples analysed:	16/03/2023
No of samples analysed:	3
Test method(s) used:	Ektimo 344

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	NA

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.
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NATA is a member of APAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of these organisations, NATA accreditation is recognised world –wide.
A formal Quality Control program is in place at Ektimo to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

REPORT AUTHORISATION

Version 221129

Matthew Cook
Laboratory Manager

Daniel Balaam
Senior Laboratory Chemist

NATA Accredited Laboratory 14601

Report No. LV-004080

Job No. R014518

Client Name: Energy Australia Mt Piper

Parameter		Units	N16450 Energy Australia Mt Piper EPA 6 2A T1 R014518	N19057 EPA 4 1B T1 R014518	N19058 Field Blank R014518
Version no. 221129		PQL:	1.0	1.0	1.0
Ethanol		µg	<1	<1	<1
Acetone		µg	<1	<1	<1
Isopropanol		µg	<1	<1	<1
Pentane		µg	<1	<1	<1
1,1-Dichloroethene		µg	<1	<1	<1
Acrylonitrile		µg	<1	<1	<1
Dichloromethane		µg	<1	<1	<1
trans-1,2-Dichloroethene		µg	<1	<1	<1
Methyl ethyl ketone		µg	<1	<1	<1
n-Hexane		µg	<1	<1	<1
cis-1,2-Dichloroethene		µg	<1	<1	<1
Ethyl acetate		µg	<1	<1	<1
Chloroform		µg	<1	<1	<1
1,1,1-Trichloroethane		µg	<1	<1	<1
1,2-Dichloroethane		µg	<1	<1	<1
Cyclohexane		µg	<1	<1	<1
Benzene		µg	<1	<1	<1
Carbon tetrachloride		µg	<1	<1	<1
Butanol		µg	<1	<1	<1
Isopropyl acetate		µg	<1	<1	<1
2-Methylhexane		µg	<1	<1	<1
2,3-Dimethylpentane		µg	<1	<1	<1
1-Methoxy-2-propanol		µg	<1	<1	<1
3-Methylhexane		µg	<1	<1	<1
Heptane		µg	<1	<1	<1

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

Parameter	PQL	Units	N16450 Energy Australia Mt Piper EPA 6 2A T1 R014518	N19057 EPA 4 1B T1 R014518	N19058 Field Blank R014518
Version no. 221129		PQL:	1.0	1.0	1.0
Ethyl acrylate		µg	<1	<1	<1
Trichloroethylene		µg	<1	<1	<1
Methyl methacrylate		µg	<1	<1	<1
Propyl acetate		µg	<1	<1	<1
Methylcyclohexane		µg	<1	<1	<1
Methyl Isobutyl Ketone		µg	<1	<1	<1
Toluene		µg	<1	2.3	<1
1,1,2-Trichloroethane		µg	<1	<1	<1
2-Hexanone		µg	<1	<1	<1
Octane		µg	<1	<1	<1
Tetrachloroethene		µg	<1	<1	<1
Butyl acetate		µg	<1	<1	<1
Chlorobenzene		µg	<1	<1	<1
Ethylbenzene		µg	<1	<1	<1
m + p-Xylene		µg	<1	<1	<1
1-Methoxy-2-propyl acetate		µg	<1	<1	<1
Styrene		µg	<1	<1	<1
o-Xylene		µg	<1	<1	<1
Butyl acrylate		µg	<1	<1	<1
Nonane		µg	<1	<1	<1
2-Butoxyethanol		µg	<1	<1	<1
Cellosolve acetate		µg	<1	<1	<1
1,1,2,2-Tetrachloroethane		µg	<1	<1	<1
Isopropylbenzene		µg	<1	<1	<1
alpha-Pinene		µg	<1	<1	<1
Propylbenzene		µg	<1	<1	<1
1,3,5-Trimethylbenzene		µg	<1	<1	<1
beta-Pinene		µg	<1	<1	<1

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

Parameter	PQL	Units	N16450 Energy Australia Mt Piper EPA 6 2A T1 R014518	N19057 EPA 4 1B T1 R014518	N19058 Field Blank R014518
Version no. 221129		PQL:	1.0	1.0	1.0
tert-Butylbenzene		µg	<1	<1	<1
1,2,4-Trimethylbenzene		µg	<1	<1	<1
Decane		µg	<1	<1	<1
3-Carene		µg	<1	<1	<1
1,2,3-Trimethylbenzene		µg	<1	<1	<1
D-Limonene		µg	<1	<1	<1
Undecane		µg	<1	<1	<1
Dodecane		µg	<1	<1	<1
Tridecane		µg	<1	<1	<1
Tetradecane		µg	<1	<1	<1

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-004056
Job Number:	R014518
Date of Issue:	9/03/2023
Attention:	Kane Hoskins
Address:	Mt Piper Power Station, Locked Portland, NSW 2847
Date samples received:	1/03/2023
Number of samples received:	3
Date samples analysed:	8/03/2023
No of samples analysed:	3
Test method(s) used:	Ektimo 235

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.
Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of these organisations, NATA accreditation is recognised world –wide.
A formal Quality Control program is in place at Ektimo to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

REPORT AUTHORISATION

Version 221129

Cappi Tuffery
Laboratory Technician

Daniel Balaam
Senior Laboratory Chemist

NATA Accredited Laboratory 14601

Report No. LV-004056

Job No. R014518

Client Name: Energy Australia NSW Pty Ltd (Mt Piper)

Parameter	PQL	Units	N 19048 Energy Australia NSW Pty Ltd (Mt Piper) EPA 4 1B Filter Sample (HF)	N 19051 Energy Australia NSW Pty Ltd (Mt Piper) For All Filter Blank	N 19059 Energy Australia NSW Pty Ltd (Mt Piper) EPA 6 2A Filter Sample
Fluoride	0.1	mg/L	0.51	<0.1	1.1
Chloride	0.1	mg/L	0.33	0.19	0.25

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-004043
Job Number:	R014518
Date of Issue:	9/03/2023
Attention:	Kane Hoskins
Address:	Mt Piper Power Station, Locked Portland, NSW 2847
Date samples received:	1/03/2023
Number of samples received:	6
Date samples analysed:	8/03/2023
No of samples analysed:	6
Test method(s) used:	Ektimo 235

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.
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A formal Quality Control program is in place at Ektimo to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

REPORT AUTHORISATION

Version 221129

Cappi Tuffery
Laboratory Technician

Daniel Balaam
Senior Laboratory Chemist

NATA Accredited Laboratory 14601

Report No. LV-004043

Job No. R014518

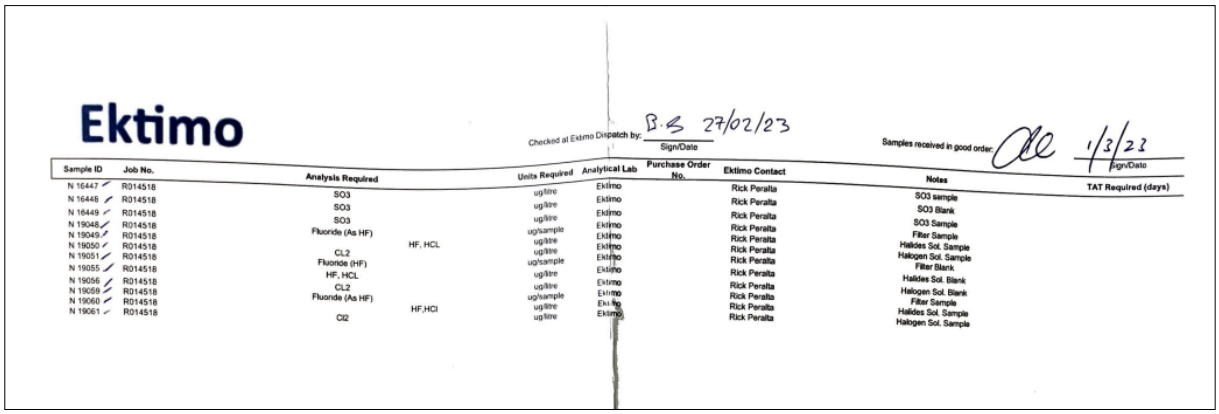
Client Name: Energy Australia NSW Pty Ltd (Mt Piper)

Parameter	PQL	Units	N 19050 Energy Australia NSW Pty Ltd (Mt Piper) EPA 4 1B Halogen Sol. Sample (CL2)	N 19056 Energy Australia NSW Pty Ltd (Mt Piper) For All Halogen Sol. Blank	N 19061 Energy Australia NSW Pty Ltd (Mt Piper) EPA 6 2A Halogen Sol. Sample	N 19049 Energy Australia NSW Pty Ltd (Mt Piper) EPA 4 1B Halides Sol. Sample (HF, HCL)	N 19055 Energy Australia NSW Pty Ltd (Mt Piper) For All Halides Sol. Blank	N 19060 Energy Australia NSW Pty Ltd (Mt Piper) EPA 6 2A Halides Sol.Sample
Fluoride	0.1	mg/L	0.31	<0.1	<0.1	68	0.23	34
Chloride	0.1	mg/L	0.81	0.23	0.3	22	<0.1	8.9

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

Appendix 2: Chain of Custody

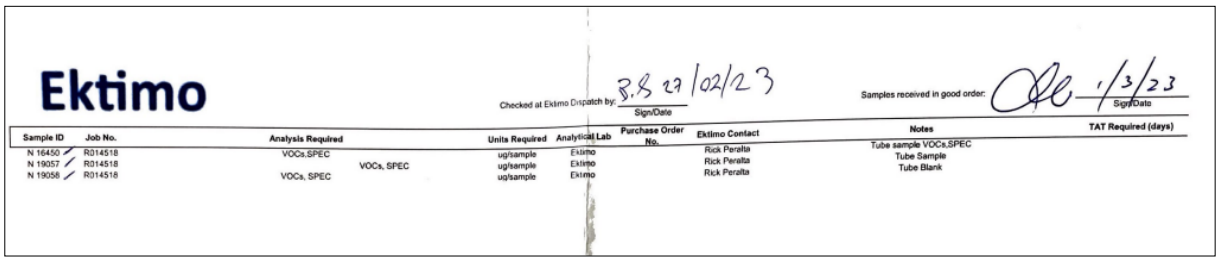


Ektimo

Checked at Ektimo Dispatch by: B.S 27/02/23 (Sign/Date)

Samples received in good order: 1/3/23 (Sign/Date)

Sample ID	Job No.	Analysis Required		Units Required	Analytical Lab	Purchase Order No.	Ektimo Contact	Notes	TAT Required (days)
N 16447	R014518	SO3		ug/litre	Ektimo		Rick Peralta	SO3 sample	
N 16448	R014518	SO3		ug/litre	Ektimo		Rick Peralta	SO3 Blank	
N 16449	R014518	SO3		ug/litre	Ektimo		Rick Peralta	SO3 Sample	
N 19048	R014518	Fluoride (As HF)		ug/sample	Ektimo		Rick Peralta	Filter Sample	
N 19049	R014518		HF, HCL	ug/litre	Ektimo		Rick Peralta	Halides Sol. Sample	
N 19050	R014518	CL2		ug/litre	Ektimo		Rick Peralta	Halogen Sol. Sample	
N 19051	R014518	Fluoride (HF)		ug/sample	Ektimo		Rick Peralta	Filter Blank	
N 19055	R014518	HF, HCL		ug/litre	Ektimo		Rick Peralta	Halides Sol. Blank	
N 19056	R014518	CL2		ug/litre	Ektimo		Rick Peralta	Halogen Sol. Blank	
N 19059	R014518	Fluoride (As HF)		ug/sample	Ektimo		Rick Peralta	Filter Sample	
N 19060	R014518		HF,HCl	ug/litre	Ektimo		Rick Peralta	Halides Sol. Sample	
N 19061	R014518	Cl2		ug/litre	Ektimo		Rick Peralta	Halogen Sol. Sample	



Ektimo

Checked at Ektimo Dispatch by: B.S 27/02/23 (Sign/Date)

Samples received in good order: 1/3/23 (Sign/Date)

Sample ID	Job No.	Analysis Required		Units Required	Analytical Lab	Purchase Order No.	Ektimo Contact	Notes	TAT Required (days)
N 16450	R014518	VOCs,SPEC		ug/sample	Ektimo		Rick Peralta	Tube sample VOCs,SPEC	
N 19057	R014518		VOCs, SPEC	ug/sample	Ektimo		Rick Peralta	Tube Sample	
N 19058	R014518	VOCs, SPEC		ug/sample	Ektimo		Rick Peralta	Tube Blank	

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Ektimo

EnergyAustralia NSW Pty Ltd, Mt Piper Power Station

Emission Testing Report

Report Number R014882a

Document Information

Template Version 130223

Client Name:	Energy Australia NSW Pty Ltd (Mt Piper)
Report Number:	R014882a
Date of Issue:	15 January 2024
Attention:	Kane Hoskins
Address:	Mt Piper Power Station, Locked Mail Bag 1 Portland NSW 2847
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Amendment Record

Original Document Number	Initiator	Original Report Date	Section (s)	Reason for revision
R014882	Client KHo	31 May 2023	Results pages 6,7	Results table amended to correct location, "EPA 4 – Unit 1, Duct B"

Report Authorisation

Adnan Latif
Air Monitoring Consultant

NATA Accredited Laboratory
No. 14601

Aaron Davis
Ektimo Signatory

Table of Contents

1 Executive Summary

1.1 Background

Ektimo was engaged by Energy Australia NSW Pty Ltd (Mt Piper) to perform emission testing at Mt Piper Power Station. Testing was carried out in accordance with Environment Protection Licence 13007.

1.2 Project Objective

The objective of the project was to conduct a monitoring programme to quantify emissions from four (4) discharge points to determine compliance with Energy Australia NSW Pty Ltd (Mt Piper) 's Environmental Licence.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 4 – Unit 1, Duct B	10 May 2023	Solid particles (total) Carbon dioxide, Oxygen Coarse particulates Particulate matter < 10µm (PM_{10})
EPA 5 – Unit 1, Duct A	11 May 2023	Solid particles (total) Carbon dioxide, Oxygen
EPA 6– Unit 2, Duct A	09 May 2023	
EPA 7 – Unit 2, Duct B		

* Flow rate, velocity, temperature, and moisture were also determined.

All results are reported on a dry basis at STP.

Plant operating conditions have been noted in the report.

1.3 Results Summary

All analytes are within the licence limit set by the NSW EPA as per licence 13007 (last amended on 6 March 2023).

Report Number			R014882	R014882	
Test Date			11/05/23	10/05/23	
EPA			5	4	
Unit			Unit 1 Duct A	Unit 1 Duct B	
					EPA 2
	LIMIT	**UNITS**	*Measured Results*		*Combined Ducts*
Solid particles	**50**	**mg/m³**	**3.3**	**2**	**2.7**
PM10		mg/m³	-	1.4	
Coarse particulates		mg/m³	-	0.42	

*Combined air emissions from **boiler 1** via points 4 & 5 (except for PM_{10} and Coarse Particulates)*
All results corrected to 7% oxygen correction.

Report Number			R014882	R014882	
Test Date			9/05/23	9/05/23	
EPA			6	7	
Unit			Unit 2 Duct A	Unit 2 Duct B	
					EPA 3
	LIMIT	**UNITS**	*Measured Results*		*Combined Ducts*
Solid particles	**50**	**mg/m³**	**<2**	**1.2**	**<2**

*Combined air emissions from **boiler 2** via points 6 & 7*
All results corrected to 7% oxygen correction.

*Please note that the measurement uncertainty associated with the test results **was not** considered when determining whether the results were compliant or non-compliant.*

Refer to the Test Methods table for the measurement uncertainties.

2 Results

2.1 EPA 4 – Unit 1, Duct B

Date	10/05/2023	**Client**	EnergyAustralia
Report	R014882	**Stack ID**	Mt Piper Power Station - EPA 4 Unit 1 Duct B (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Adnan Latif / Ahmad Ramiz	**State**	NSW
Process Conditions	Boiler load was stable at 280MW and increased to 350MW around 12:10PM		230505

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Compliant

Stack Parameters		
Moisture content, %v/v	5.9	
Gas molecular weight, g/g mole	29.5 (wet)	30.3 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.83	
% Oxygen correction & Factor	7 %	1.35
Gas Flow Parameters		
Temperature, °C	115	
Temperature, K	389	
Velocity at sampling plane, m/s	9.7	
Volumetric flow rate, actual, m³/s	350	
Volumetric flow rate (wet STP), m³/s	220	
Volumetric flow rate (dry STP), m³/s	210	
Mass flow rate (wet basis), kg/hour	1000000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	0857 - 1232	0857 - 1232	0857 - 1232
	Concentration %v/v	Concentration %v/v	Concentration %v/v
Carbon dioxide	10.8	9.5	12.0
Oxygen	10.6	9.5	11.0

Isokinetic Results	Results		
Sampling time	0857-1232		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	1.5	2	19
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		102	
Gravimetric analysis date (total particulate)		23-05-2023	

** Due to the inability for two x 6m sampling probes to be used simultaneously at the sampling plane, monitoring for Fine Particulates (PM_{10}) was not conducted simultaneously with monitoring for Solid Particles (Total). Accordingly, Coarse Particulate reported concentration is indicative only.*

Date	10/05/2023	**Client**	EnergyAustralia
Report	R014882	**Stack ID**	Mt Piper Power Station - EPA 4 Unit 1 Duct B (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Adnan Latif / Ahmad Ramiz	**State**	NSW
Process Conditions	Boiler load stable at 350MW		*230505*

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Compliant

Stack Parameters		
Moisture content, %v/v	5.5	
Gas molecular weight, g/g mole	29.7 (wet)	30.4 (dry)
Gas density at STP, kg/m³	1.33 (wet)	1.36 (dry)
Gas density at discharge conditions, kg/m³	0.84	
% Oxygen correction & Factor	7 %	1.22
Gas Flow Parameters		
Temperature, °C	116	
Temperature, K	389	
Velocity at sampling plane, m/s	10	
Volumetric flow rate, actual, m³/s	360	
Volumetric flow rate (wet STP), m³/s	230	
Volumetric flow rate (dry STP), m³/s	210	
Mass flow rate (wet basis), kg/hour	1100000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	1246 - 1618	1246 - 1618	1246 - 1618
	Concentration %v/v	Concentration %v/v	Concentration %v/v
Carbon dioxide	12	11.7	12.3
Oxygen	9.5	9.2	9.8

Isokinetic Results	Results		
Sampling time	1245-1619 (PM10)		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Fine particulates (PM10)	1.2	1.4	15
Coarse Particulates*	0.35	0.42	**
D50 cut size, 10µm		10.0	
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		108	
Gravimetric analysis date (PM_{10})		23-05-2023	

*** Due to differing volumetric gas flowrates measured during monitoring for Solid Particles (Total) and Fine Particulates (PM_{10}) mass rate of Coarse Particulates has not been reported.*

2.2 EPA 5 – Unit 1, Duct A

Date	11/05/2023	**Client**	EnergyAustralia
Report	R014882	**Stack ID**	Mt Piper Power Station - EPA 5 Unit 1 Duct A (Upper)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Adnan Latif / Ahmad Ramiz	**State**	NSW
Process Conditions	Boiler load stable at 280MW		230505

Sampling Plane Details		
Sampling plane dimensions	5460 x 6600 mm	
Sampling plane area	36 m²	
Sampling port size, number	6" Flange (x6)	
Duct orientation & shape	Horizontal Rectangular	
Downstream disturbance	Junction 0.5 D	
Upstream disturbance	Damper 0.6 D	
No. traverses & points sampled	6 42	
Sample plane conformance to USEPA Method 1	Compliant	

Stack Parameters		
Moisture content, %v/v	5.9	
Gas molecular weight, g/g mole	29.6 (wet)	30.3 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.83	
% Oxygen correction & Factor	7 %	1.30
Gas Flow Parameters		
Temperature, °C	118	
Temperature, K	391	
Velocity at sampling plane, m/s	9.7	
Volumetric flow rate, actual, m³/s	350	
Volumetric flow rate (wet STP), m³/s	220	
Volumetric flow rate (dry STP), m³/s	210	
Mass flow rate (wet basis), kg/hour	1000000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	0820 - 1155	0820 - 1155	0820 - 1155
	Concentration % v/v	Concentration % v/v	Concentration % v/v
Carbon dioxide	11.2	10.4	11.6
Oxygen	10.2	9.8	10.7

Isokinetic Results	Results		
Sampling time	0820-1155		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	2.5	3.3	31
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		102	
Gravimetric analysis date (total particulate)		18-05-2023	

2.3 EPA 6 – Unit 2, Duct A

Date	9/05/2023	**Client**	EnergyAustralia
Report	R014882	**Stack ID**	Mt Piper Power Station - EPA 6 Unit 2 Duct A (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Adnan Latif / Ahmad Ramiz	**State**	NSW
Process Conditions	Boiler load stable at 280MW		230505

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Compliant

Stack Parameters		
Moisture content, %v/v	4.8	
Gas molecular weight, g/g mole	29.5 (wet)	30.1 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.34 (dry)
Gas density at discharge conditions, kg/m³	0.85	
% Oxygen correction & Factor	7 %	1.35
Gas Flow Parameters		
Temperature, °C	106	
Temperature, K	379	
Velocity at sampling plane, m/s	11	
Volumetric flow rate, actual, m³/s	390	
Volumetric flow rate (wet STP), m³/s	250	
Volumetric flow rate (dry STP), m³/s	240	
Mass flow rate (wet basis), kg/hour	1200000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	0815 - 1149	0815 - 1149	0815 - 1149
	Concentration %v/v	Concentration %v/v	Concentration %v/v
Carbon dioxide	9.5	9.1	10.3
Oxygen	10.6	9.8	11

Isokinetic Results	Results		
Sampling time	0815-1150		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	<1	<2	<20
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		100	
Gravimetric analysis date (total particulate)		18-05-2023	

2.4 EPA 7 – Unit 2, Duct B

Date	9/05/2023	**Client**	EnergyAustralia
Report	R014882	**Stack ID**	Mt Piper Power Station - EPA 7 Unit 2 Duct B (Upper)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Adnan Latif / Ahmad Ramiz	**State**	NSW
Process Conditions	Boiler load stable at 450MW		230505

Sampling Plane Details	
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Compliant

Stack Parameters		
Moisture content, %v/v	5	
Gas molecular weight, g/g mole	29.6 (wet)	30.3 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.82	
% Oxygen correction & Factor	7 %	1.08
Gas Flow Parameters		
Temperature, °C	120	
Temperature, K	393	
Velocity at sampling plane, m/s	12	
Volumetric flow rate, actual, m³/s	440	
Volumetric flow rate (wet STP), m³/s	270	
Volumetric flow rate (dry STP), m³/s	260	
Mass flow rate (wet basis), kg/hour	1300000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	1240 - 1613	1240 - 1613	1240 - 1613
	Concentration %v/v	Concentration %v/v	Concentration %v/v
Carbon dioxide	11.3	9.6	11.9
Oxygen	8.1	7.4	9.2

Isokinetic Results	Results		
Sampling time	1240-1615		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	1.1	1.2	17
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		100	
Gravimetric analysis date (total particulate)		18-05-2023	

3 Plant Operating Conditions

See Energy Australia NSW Pty Ltd (Mt Piper) records for complete process conditions.

From information received from the site operator, unless otherwise noted it is our understanding that samples were collected during normal plant operations. Unless otherwise noted all samples were collected in compliance with Ektimo's QA/QC standards.

4 Test Methods

All sampling and analysis performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling method	Analysis method	Uncertainty*	NATA accredited	
				Sampling	Analysis
Sampling points - Selection	NSW EPA TM-1 (USEPA Method 1)	NA	NA	✓	NA
Flow rate, temperature & velocity	NSW EPA TM-2 (USEPA Method 2)	NSW EPA TM-2 (USEPA Method 2)	8%, 2%, 7%	NA	✓
Moisture content	NSW EPA TM-22 (USEPA Method 4)	NSW EPA TM-22 (USEPA Method 4)	8%	✓	✓
Molecular weight	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Dry gas density	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Carbon dioxide	NSW EPA TM-24 (USEPA Method 3A)	NSW EPA TM-24 (USEPA Method 3A)	13%	✓	✓
Oxygen	NSW EPA TM-25 (USEPA Method 3A)	NSW EPA TM-25 (USEPA Method 3A)	13%	✓	✓
Particulate matter (PM_{10} & $PM_{2.5}$)	NSW EPA OM-5 (USEPA Method 201A)	NSW EPA OM-5 (USEPA Method 201A)	6%	✓	✓††
Coarse particulates	NSW EPA OM-9	NSW EPA OM-9	not specified	✓	✓††
Solid particles (total)	NSW EPA TM-15 (USEPA Method 17)	NSW EPA TM-15 (USEPA Method 17)	3%	✓	✓††

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* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

†† Gravimetric analysis conducted at the Ektimo NSW laboratory.

5 Quality Assurance/Quality Control Information

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

6 Definitions

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
AS	Australian Standard
D	Duct diameter or equivalent duct diameter for rectangular ducts
D_{50}	'Cut size' of a cyclone is defined as the particle diameter at which the cyclone achieves a 50% collection efficiency i.e. half of the particles are retained by the cyclone and half pass through it. The D_{50} method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D_{50} of that cyclone and less than the D_{50} of the preceding cyclone.
DECC	Department of Environment & Climate Change (NSW)
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
EPA	Environment Protection Authority
FTIR	Fourier transform infra-red
ISO	International Organisation for Standardisation
I-TEQ	International toxic equivalents
Lower bound	When an analyte is not present above the detection limit, the result is assumed to be equal to zero.
Medium bound	When an analyte is not present above the detection limit, the result is assumed to be equal to half of the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
PM_{10}	Particulate matter having an equivalent aerodynamic diameter less than or equal to 10 microns (µm).
$PM_{2.5}$	Particulate matter having an equivalent aerodynamic diameter less than or equal to 2.5 microns (µm).
PSA	Particle size analysis. PSA provides a distribution of geometric diameters, for a given sample, determined using laser diffraction.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0 °C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa.
TM	Test method
USEPA	United States Environmental Protection Agency
Velocity difference	The percentage difference between the average of initial flows and after flows.
Upper bound	When an analyte is not present above the detection limit, the result is assumed to be equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

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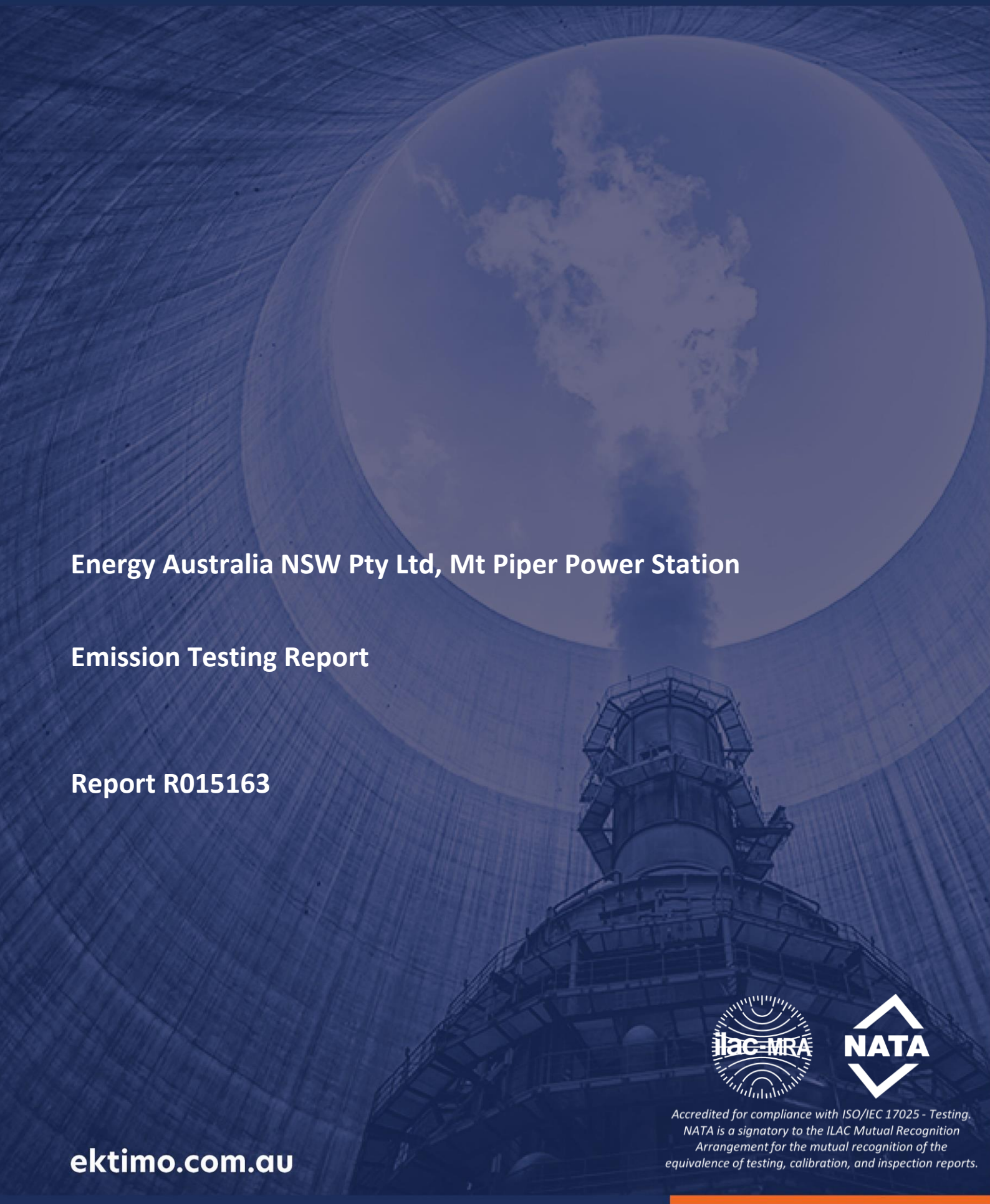

Energy Australia NSW Pty Ltd, Mt Piper Power Station

Emission Testing Report

Report R015163

Document Information

Client Name:	Energy Australia NSW Pty Ltd (Mt Piper)
Report Number:	R015163
Date of Issue:	14 August 2023
Attention:	Kane Hoskins
Address:	Mt Piper Power Station, Locked Mail Bag 1 Portland NSW 2847
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation

Rick Peralta
Air Monitoring Consultant

NATA Accredited Laboratory
No. 14601

Steven Cooper
Ektimo Signatory

Please note that only numerical results pertaining to measurements conducted directly by Ektimo are covered by Ektimo terms of NATA accreditation as described in the Test Methods table. This does not include calculations that use data supplied by third-parties, comments, conclusions, or recommendations based upon the results. Refer to Test Methods section for full details of testing covered by NATA accreditation.

Ektimo

Table of Contents

1 Executive Summary

1.1 Background

Ektimo was engaged by Energy Australia NSW Pty Ltd (Mt Piper) to perform emission testing at Mt Piper Power Station, Portland, NSW. Testing was carried out in accordance with Environment Protection Licence 13007.

1.2 Project Objective

The objective of the project was to quantify emissions from four (4) discharge points to determine compliance with Energy Australia NSW Pty Ltd (Mt Piper) 's Environmental Licence.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 5 Unit 1A (Upper)	04 July 2023	Solid particles (total) Metals type 1 and 2 substances, copper, zinc Sulfur dioxide (SO_2), nitrogen oxides (as NO_2) Oxygen (O_2), carbon dioxide (CO_2)
EPA 4 Unit 1B (Lower)	05 July 2023	Solid particles (total) Metals type 1 and 2 substances, copper, zinc Sulfur dioxide (SO_2), nitrogen oxides (as NO_2) Oxygen (O_2), carbon dioxide (CO_2) Fluorine and fluorine compounds as (as total fluoride) Hydrogen chloride (HCl), chlorine and chlorine compounds (as Cl_2)
EPA 6 Unit 2A (Lower)	06 July 2023	Fluorine and fluorine compounds as (as total fluoride) Hydrogen chloride (HCl), chlorine and chlorine compounds (as Cl_2) Solid particles (total) Metals type 1 and 2 substances, copper, zinc Sulfur dioxide (SO_2), nitrogen oxides (as NO_2) Oxygen (O_2), carbon dioxide (CO_2)
EPA 7 Unit 2B (Upper)	07 July 2023	Solid particles (total) Metals type 1 and 2 substances, copper, zinc Sulfur dioxide (SO_2), nitrogen oxides (as NO_2) Oxygen (O_2), carbon dioxide (CO_2)

* Flow rate, velocity, temperature, and moisture were also determined.

All results are reported on a dry basis at STP.

Plant operating conditions have been noted in this report.

1.3 Results Summary

The following tables summarise the results of the testing programme. All analytes are within the licence limit set by the NSW EPA as per licence 13007 (last amended on 6 March 2023).

Report Number			R015163	R015163	
Test Date			4/07/23	5/07/23	
EPA			5	4	
Unit			Unit 1 Duct A	Unit 1 Duct B	
					EPA 2
	LIMIT	**UNITS**	*Measured Results*		*Combined Ducts*
Fluorine	**30**	**mg/m³**	-	12	-
Hydrogen chloride	**50**	**mg/m³**	-	1.2	-
Chlorine	**20**	**mg/m³**	-	<0.02	-
Type 1 and Type 2 substances in aggregate	**0.75**	**mg/m³**	<0.25	<0.085	**<0.2**
Antimony		mg/m³	<0.003	<0.002	<0.002
Arsenic (LBL)		mg/m³	<0.001	<0.0008	<0.0009
Beryllium		mg/m³	<0.0003	<0.0002	<0.0002
Cadmium	**0.2**	mg/m³	0.00088	<0.0004	**<0.0006**
Chromium		mg/m³	0.0048	0.011	0.0081
Cobalt		mg/m³	<0.0003	<0.0003	<0.0003
Copper		mg/m³	1.8	0.025	0.87
Lead (LBL)		mg/m³	0.16	0.019	0.086
Manganese		mg/m³	0.0016	0.034	0.019
Mercury	**0.05**	mg/m³	0.0014	0.00068	**0.001**
Nickel		mg/m³	0.061	0.0064	0.032
Selenium		mg/m³	0.014	0.0084	0.011
Tin		mg/m³	0.0096	0.0012	0.0052
Vanadium		mg/m³	<0.0005	<0.0005	<0.0005
Zinc		mg/m³	1.2	0.0063	0.57
Solid particles	**50**	**mg/m³**	**<1**	**1.6**	**<1**

All results corrected to 7% oxygen correction.

*Please note that the measurement uncertainty associated with the test results **was not** considered when determining whether the results were compliant or non-compliant.*

Refer to the Test Method table for the measurement uncertainties.

Ektimo

Report Number			R015163	R015163	
Test Date			6/07/23	7/07/23	
EPA			6	7	
Unit			Unit 2 Duct A	Unit 2 Duct B	
					EPA 3
	LIMIT	**UNITS**	*Measured Results*		*Combined Ducts*
Fluorine	**30**	**mg/m³**	16	-	**-**
Hydrogen chloride	**50**	**mg/m³**	1.7	-	**-**
Chlorine	**20**	**mg/m³**	<0.02	-	**-**
Type 1 and Type 2 substances in aggregate	**0.75**	**mg/m³**	<0.048	<0.043	**<0.05**
Antimony		mg/m³	<0.002	<0.003	<0.002
Arsenic (LBL)		mg/m³	<0.001	<0.001	<0.001
Beryllium		mg/m³	<0.0003	<0.0003	<0.0003
Cadmium	**0.2**	mg/m³	<0.0002	0.0003	**<0.0002**
Chromium		mg/m³	0.0034	0.0051	0.0042
Cobalt		mg/m³	<0.0004	<0.0004	<0.0004
Copper		mg/m³	0.021	0.0044	0.013
Lead (LBL)		mg/m³	0.0084	0.0067	0.0076
Manganese		mg/m³	0.022	0.0067	0.014
Mercury	**0.05**	mg/m³	0.0004	0.00038	**0.00039**
Nickel		mg/m³	0.00069	0.011	0.0058
Selenium		mg/m³	0.0064	0.0067	0.0065
Tin		mg/m³	0.0022	0.0019	0.0021
Vanadium		mg/m³	<0.0006	<0.0006	<0.0006
Zinc		mg/m³	0.0029	0.027	0.015
Solid particles	**50**	**mg/m³**	**2.2**	**1.1**	**1.7**

All results corrected to 7% oxygen correction.

*Please note that the measurement uncertainty associated with the test results **was not** considered when determining whether the results were compliant or non-compliant.*

Refer to the Test Method table for the measurement uncertainties.

2 Results

2.1 EPA 5 - Unit 1, Duct A

Date	4/07/2023	**Client**	EnergyAustralia
Report	R015163	**Stack ID**	Mt Piper Power Station - EPA 5 Unit 1 Duct A (Upper)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Mohamed Trabelsi	**State**	NSW
Process Conditions	Boiler load stable at 550 MW		230616

Stack Parameters		
Moisture content, %v/v	5.5	
Gas molecular weight, g/g mole	29.6 (wet)	30.3 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.82	
% Oxygen correction & Factor	7 %	1.07
Gas Flow Parameters		
Temperature, °C	121	
Temperature, K	394	
Velocity at sampling plane, m/s	12	
Volumetric flow rate, actual, m³/s	440	
Volumetric flow rate (wet STP), m³/s	280	
Volumetric flow rate (dry STP), m³/s	260	
Mass flow rate (wet basis), kg/hour	1300000	

Gas Analyser Results	Average			Minimum			Maximum		
Sampling time	0928 - 1326			0928 - 1326			0928 - 1326		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Combustion Gases									
Nitrogen oxides (as NO_2)	690	740	11000	280	310	4500	800	860	13000
Sulfur dioxide	1100	1200	17000	930	1000	15000	1200	1300	19000
		Concentration %v/v			Concentration %v/v			Concentration %v/v	
Carbon dioxide		11.3			9.6			12.4	
Oxygen		8			7.1			10.4	

Isokinetic Results	Results		
Sampling time	0948-1326		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	<1	<1	<20
Antimony	<0.003	<0.003	<0.04
Arsenic	<0.001	<0.001	<0.02
Beryllium	<0.0003	<0.0003	<0.004
Cadmium	**0.00082**	**0.00088**	**0.013**
Chromium	**0.0044**	**0.0048**	**0.07**
Cobalt	<0.0003	<0.0003	<0.005
Copper	**1.7**	**1.8**	**27**
Lead	**0.14**	**0.16**	**2.3**
Manganese	**0.0015**	**0.0016**	**0.024**
Mercury	**0.0013**	**0.0014**	**0.02**
Nickel	**0.057**	**0.061**	**0.89**
Selenium	**0.013**	**0.014**	**0.2**
Tin	**0.0089**	**0.0096**	**0.14**
Vanadium	<0.0005	<0.0005	<0.008
Zinc	**1.1**	**1.2**	**18**
Type 1 & 2 Substances			
Upper Bound			
Total Type 1 Substances	≤0.15	≤0.16	≤2.4
Total Type 2 Substances	≤0.086	≤0.092	≤1.3
Total Type 1 & 2 Substances	≤0.24	≤0.25	≤3.7
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		101	
Gravimetric analysis date (total particulate)		21-07-2023	

2.2 EPA 4 - Unit 1, Duct B

Date	5/07/2023	**Client**	EnergyAustralia
Report	R015163	**Stack ID**	Mt Piper Power Station - EPA 4 Unit 1 Duct B (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Mohamed Trabelsi	**State**	NSW
Process Conditions	Boiler load stable at 400 MW		

Stack Parameters		
Moisture content, %v/v	4.6	
Gas molecular weight, g/g mole	29.7 (wet)	30.3 (dry)
Gas density at STP, kg/m³	1.33 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.82	
% Oxygen correction & Factor	7 %	1.06
Gas Flow Parameters		
Temperature, °C	122	
Temperature, K	395	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/s	490	
Volumetric flow rate (wet STP), m³/s	300	
Volumetric flow rate (dry STP), m³/s	290	
Mass flow rate (wet basis), kg/hour	1400000	

Gas Analyser Results*	Average	Minimum	Maximum
Sampling time	0810 - 0837	0810 - 0837	0810 - 0837
	Concentration %v/v	Concentration %v/v	Concentration %v/v
Carbon dioxide	11.6	11.2	12.1
Oxygen	7.8	7.2	8.2

Isokinetic Results	Results		
Sampling time	0805-1146		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	1.5	1.6	26
Antimony	<0.002	<0.002	<0.03
Arsenic	<0.0008	<0.0008	<0.01
Beryllium	<0.0002	<0.0002	<0.004
Cadmium	<0.0003	<0.0004	<0.006
Chromium	**0.01**	**0.011**	**0.18**
Cobalt	<0.0003	<0.0003	<0.005
Copper	**0.024**	**0.025**	**0.41**
Lead	**0.018**	**0.019**	**0.32**
Manganese	**0.032**	**0.034**	**0.55**
Mercury	**0.00064**	**0.00068**	**0.011**
Nickel	**0.0061**	**0.0064**	**0.1**
Selenium	**0.008**	**0.0084**	**0.14**
Tin	**0.0011**	**0.0012**	**0.019**
Vanadium	<0.0004	<0.0005	<0.008
Zinc	**0.006**	**0.0063**	**0.1**
Type 1 & 2 Substances			
Upper Bound			
Total Type 1 Substances	≤0.022	≤0.023	≤0.38
Total Type 2 Substances	≤0.058	≤0.061	≤1
Total Type 1 & 2 Substances	≤0.08	≤0.085	≤1.4
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		100	
Gravimetric analysis date (total particulate)		21-07-2023	

*Due to a gas analyser malfunction only 27 minutes of data was able to be recorded during this test.

Ektimo

Date	5/07/2023	**Client**	EnergyAustralia
Report	R015163	**Stack ID**	Mt Piper Power Station - EPA 4 Unit 1 Duct B (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Mohamed Trabelsi	**State**	NSW
Process Conditions	Boiler load stable at 500-470 MW		230616

Stack Parameters		
Moisture content, %v/v	4.6	
Gas molecular weight, g/g mole	29.9 (wet)	30.4 (dry)
Gas density at STP, kg/m³	1.33 (wet)	1.36 (dry)
Gas density at discharge conditions, kg/m³	0.81	
% Oxygen correction & Factor	7 %	1.12
Gas Flow Parameters		
Temperature, °C	125	
Temperature, K	398	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/s	460	
Volumetric flow rate (wet STP), m³/s	280	
Volumetric flow rate (dry STP), m³/s	270	
Mass flow rate (wet basis), kg/hour	1400000	

Gas Analyser Results	Average			Minimum			Maximum		
Sampling time	1427 - 1621			1427 - 1621			1427 - 1621		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Combustion Gases									
Nitrogen oxides (as NO_2)	770	870	13000	720	810	12000	810	910	13000
Sulfur dioxide	990	1100	16000	950	1100	15000	1000	1100	16000
		Concentration %v/v			Concentration %v/v			Concentration %v/v	
Carbon dioxide		12.2			12			12.5	
Oxygen		8.5			8.2			9	

Isokinetic Results	Results		
Sampling time	1240-1621		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Chlorine	<0.02	<0.02	<0.3
Total fluoride (as HF)	10	12	170
Hydrogen chloride	1.1	1.2	18
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		100	

2.3 EPA 6 - Unit 2, Duct A

Date	6/07/2023	**Client**	EnergyAustralia
Report	R015163	**Stack ID**	Mt Piper Power Station - EPA 6 Unit 2 Duct A (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Mohamed Trabelsi	**State**	NSW
Process Conditions	Boiler load stable at 500-450 MW		

Stack Parameters		
Moisture content, %v/v	5.9	
Gas molecular weight, g/g mole	29.7 (wet)	30.4 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.36 (dry)
Gas density at discharge conditions, kg/m³	0.84	
% Oxygen correction & Factor	7 %	1.14
Gas Flow Parameters		
Temperature, °C	113	
Temperature, K	386	
Velocity at sampling plane, m/s	13	
Volumetric flow rate, actual, m³/s	470	
Volumetric flow rate (wet STP), m³/s	300	
Volumetric flow rate (dry STP), m³/s	280	
Mass flow rate (wet basis), kg/hour	1400000	

Gas Analyser Results	Average	Minimum	Maximum
Sampling time	0800 - 1139	0800 - 1139	0800 - 1139
	Concentration %v/v	Concentration %v/v	Concentration %v/v
Carbon dioxide	12	6.9	12.5
Oxygen	8.7	8.3	13.2

Isokinetic Results	Results		
Sampling time	0800-1139		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Chlorine	<0.02	<0.02	<0.3
Total fluoride (as HF)	14	16	240
Hydrogen chloride	1.5	1.7	25
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		101	

Ektimo

Date	6/07/2023	**Client**	EnergyAustralia
Report	R015163	**Stack ID**	Mt Piper Power Station - EPA 6 Unit 2 Duct A (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Mohamed Trabelsi	**State**	NSW
Process Conditions	Boiler load stable at 400-350MW (1 mill down)		230616

Stack Parameters		
Moisture content, %v/v	4.8	
Gas molecular weight, g/g mole	29.7 (wet)	30.3 (dry)
Gas density at STP, kg/m³	1.33 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.84	
% Oxygen correction & Factor	7 %	1.21
Gas Flow Parameters		
Temperature, °C	109	
Temperature, K	382	
Velocity at sampling plane, m/s	12	
Volumetric flow rate, actual, m³/s	430	
Volumetric flow rate (wet STP), m³/s	270	
Volumetric flow rate (dry STP), m³/s	260	
Mass flow rate (wet basis), kg/hour	1300000	

Gas Analyser Results	Average			Minimum			Maximum		
Sampling time	1210 - 1530			1210 - 1530			1210 - 1530		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Combustion Gases									
Nitrogen oxides (as NO_2)	690	830	11000	540	650	8300	820	990	13000
Sulfur dioxide	920	1100	14000	850	1000	13000	1000	1200	16000
		Concentration %v/v			Concentration %v/v			Concentration %v/v	
Carbon dioxide		11.3			9.1			12.7	
Oxygen		9.4			7.9			11.3	

Isokinetic Results	Results		
Sampling time	1210-1550		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	1.8	2.2	28
Antimony	<0.002	<0.002	<0.03
Arsenic	<0.0009	<0.001	<0.01
Beryllium	<0.0003	<0.0003	<0.004
Cadmium	<0.0002	<0.0002	<0.003
Chromium	**0.0028**	**0.0034**	**0.043**
Cobalt	<0.0003	<0.0004	<0.005
Copper	**0.017**	**0.021**	**0.27**
Lead	**0.007**	**0.0084**	**0.11**
Manganese	**0.018**	**0.022**	**0.28**
Mercury	**0.00033**	**0.0004**	**0.0051**
Nickel	**0.00057**	**0.00069**	**0.0088**
Selenium	**0.0053**	**0.0064**	**0.081**
Tin	**0.0018**	**0.0022**	**0.028**
Vanadium	<0.0005	<0.0006	<0.008
Zinc	**0.0024**	**0.0029**	**0.037**
Type 1 & 2 Substances			
Upper Bound			
Total Type 1 Substances	≤0.01	≤0.013	≤0.16
Total Type 2 Substances	≤0.029	≤0.036	≤0.45
Total Type 1 & 2 Substances	≤0.04	≤0.048	≤0.61
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		100	
Gravimetric analysis date (total particulate)		21-07-2023	

2.4 EPA 7 - Unit 2, Duct B

Date	7/07/2023	**Client**	EnergyAustralia
Report	R015163	**Stack ID**	Mt Piper Power Station - EPA 7 Unit 2 Duct B (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Ish Alam	**State**	NSW
Process Conditions	Boiler load stable at 350 MW		230616

Stack Parameters		
Moisture content, %v/v	5.7	
Gas molecular weight, g/g mole	29.6 (wet)	30.3 (dry)
Gas density at STP, kg/m³	1.32 (wet)	1.35 (dry)
Gas density at discharge conditions, kg/m³	0.84	
% Oxygen correction & Factor	7 %	1.22
Gas Flow Parameters		
Temperature, °C	107	
Temperature, K	380	
Velocity at sampling plane, m/s	12	
Volumetric flow rate, actual, m³/s	420	
Volumetric flow rate (wet STP), m³/s	270	
Volumetric flow rate (dry STP), m³/s	250	
Mass flow rate (wet basis), kg/hour	1300000	

Gas Analyser Results	Average			Minimum			Maximum		
Sampling time	0802 - 1141			0802 - 1141			0802 - 1141		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Combustion Gases									
Nitrogen oxides (as NO_2)	550	680	8300	430	530	6500	670	820	10000
Sulfur dioxide	940	1100	14000	700	860	11000	1000	1300	15000
		Concentration %v/v			Concentration %v/v			Concentration %v/v	
Carbon dioxide		11.3			7.6			12.1	
Oxygen		9.5			8.6			11.8	

Isokinetic Results	Results		
Sampling time	0802-1141		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	0.89	1.1	13
Antimony	<0.002	<0.003	<0.03
Arsenic	<0.0009	<0.001	<0.01
Beryllium	<0.0003	<0.0003	<0.004
Cadmium	**0.00025**	**0.0003**	**0.0037**
Chromium	**0.0042**	**0.0051**	**0.063**
Cobalt	<0.0003	<0.0004	<0.005
Copper	**0.0036**	**0.0044**	**0.054**
Lead	**0.0055**	**0.0067**	**0.083**
Manganese	**0.0054**	**0.0067**	**0.082**
Mercury	**0.00031**	**0.00038**	**0.0046**
Nickel	**0.0087**	**0.011**	**0.13**
Selenium	**0.0055**	**0.0067**	**0.082**
Tin	**0.0015**	**0.0019**	**0.023**
Vanadium	<0.0005	<0.0006	<0.008
Zinc	**0.022**	**0.027**	**0.34**
Type 1 & 2 Substances			
Upper Bound			
Total Type 1 Substances	≤0.009	≤0.011	≤0.14
Total Type 2 Substances	≤0.026	≤0.032	≤0.4
Total Type 1 & 2 Substances	≤0.035	≤0.043	≤0.53
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		101	
Gravimetric analysis date (total particulate)		24-07-2023	

Ektimo

3 Sample Plane Compliance

Date	4/07/2023	**Client**	EnergyAustralia
Report	R015163	**Stack ID**	Mt Piper Power Station - EPA 5 Unit 1 Duct A (Upper)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Mohamed Trabelsi	**State**	NSW
Process Conditions	Boiler load stable at 550 MW		230616

Sampling Plane Details	
Source tested	Power plant - coal-fired
Pollution control equipment	Filter baghouse
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Conforming

Date	5/07/2023	**Client**	EnergyAustralia
Report	R015163	**Stack ID**	Mt Piper Power Station - EPA 4 Unit 1 Duct B (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Mohamed Trabelsi	**State**	NSW
Process Conditions	Boiler load stable at 400 MW		230616

Sampling Plane Details	
Source tested	Power plant - coal-fired
Pollution control equipment	Filter baghouse
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Conforming

Date	6/07/2023	**Client**	EnergyAustralia
Report	R015163	**Stack ID**	Mt Piper Power Station - EPA 6 Unit 2 Duct A (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Mohamed Trabelsi	**State**	NSW
Process Conditions	Boiler load stable at 500-450 MW		230616

Sampling Plane Details	
Source tested	Power plant - coal-fired
Pollution control equipment	Filter baghouse
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Conforming

Ektimo

Date	7/07/2023	**Client**	EnergyAustralia
Report	R015163	**Stack ID**	Mt Piper Power Station - EPA 7 Unit 2 Duct B (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Rick Peralta / Ish Alam	**State**	NSW
Process Conditions	Boiler load stable at 350 MW		*230616*

Sampling Plane Details	
Source tested	Power plant - coal-fired
Pollution control equipment	Filter baghouse
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Conforming

4 Test Methods

All sampling and analysis were performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling method	Analysis method	Uncertainty*	NATA accredited	
				Sampling	Analysis
Sampling points - Selection	NSW EPA TM-1 (USEPA Method 1)	NA	NA	✓	NA
Flow rate, temperature & velocity	NSW EPA TM-2 (USEPA Method 2)	NSW EPA TM-2 (USEPA Method 2)	8%, 2%, 7%	NA	✓
Moisture content	NSW EPA TM-22 (USEPA Method 4)	NSW EPA TM-22 (USEPA Method 4)	8%	✓	✓
Molecular weight	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Dry gas density	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Carbon dioxide	NSW EPA TM-24 (USEPA Method 3A)	NSW EPA TM-24 (USEPA Method 3A)	13%	✓	✓
Nitrogen oxides	NSW EPA TM-11 (USEPA Method 7E)	NSW EPA TM-11 (USEPA Method 7E)	12%	✓	✓
Oxygen	NSW EPA TM-25 (USEPA Method 3A)	NSW EPA TM-25 (USEPA Method 3A)	13%	✓	✓
Sulfur dioxide	NSW EPA TM-4 (USEPA Method 6C)	NSW EPA TM-4 (USEPA Method 6C)	12%	✓	✓
Hydrogen halides & halogens∞	USEPA Method 26A	Ektimo 235	14%	✓	✓†
Hydrogen halides (including soluble fluoride)[2]	NSW EPA TM-8 (USEPA Method 26A)	Ektimo 235	not specified	✓	✓†i
Solid particles (total)	NSW EPA TM-15 (AS 4323.2)	NSW EPA TM-15 (AS 4323.2)	3%	✓	✓††
Total (gaseous & particulate) metals & metallic compounds	NSW EPA TM-12, NSW EPA TM-13, NSW EPA TM-14 (USEPA Method 29)	Envirolab in-house methods Metals-020/021/022	15%	✓	✓‡
Type 1 substances (As, Cd, Hg, Pb, Sb)	NSW EPA TM-12 (USEPA Method 29)	Envirolab in-house methods Metals-020/021/022	15%	✓	✓‡
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW EPA TM-13 (USEPA Method 29)	Envirolab in-house methods Metals-020/021/022	15%	✓	✓‡
Hydrogen chloride	NSW EPA TM-8 (USEPA Method 26A)	Ektimo 235	14%	✓	✓†i
Chlorine	NSW EPA TM-7 (USEPA Method 26A)	Ektimo 235	14%	✓	✓†i

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* Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).

† Analysis performed by Ektimo. Results were reported to Ektimo on.
27 July 2023 in report LV-004678.
1 August 2023 in report LV-004690.
1 August2023 in report LV-004695.

†† Gravimetric analysis conducted at the Ektimo NSW laboratory.

‡ Analysis performed by Envirolab, NATA accreditation number 2901. Results were reported to Ektimo on 1 August in report 328859.

[2] Sampling follows USEPA Method 26A and analysis follows Ektimo 235 (ion chromatography) which uses the same principle as USEPA Method 26A. Includes sampling & analysis of soluble fluoride.

[i] Includes analysis of chlorine/chloride by Ektimo 235 which uses the same principle as USEPA Method 26/26A.

∞ Sampling to follow USEPA Method 26A and analysis to follow Ektimo 235 (ion chromatography) which uses the same principle as USEPA Method 26A and USEPA SW-846 Method 9056A (which is the NSW EPA approved alternative analysis method to USEPA Method 13B). Includes sampling & analysis of particulate fluoride.

5 Deviations to Test Methods

TM-9 FLUORINE

Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (NSW EPA) (2022) specifies TM-9 (USEPA 13B) for measurement of total fluoride emissions.

As per site-specific agreement between Energy Australia NSW and the NSW EPA, Ektimo conducts sampling for particulate fluoride according to USEPA Method 26A (hydrogen halides and halogens) and analysis according to Ektimo Method 235 (ion chromatography). Ektimo Method 235 uses the same principle as USEPA SW-846 Method 9056A (which is the NSW EPA approved alternative analysis method to USEPA Method 13B).

Ektimo conducts sampling for soluble fluoride according to USEPA Method 26A (hydrogen halides and halogens) and analysis according to Ektimo Method 235 (ion chromatography) which uses the same principle as USEPA Method 26A.

NSW TM-12, 13 TYPE 1 & 2 SUBSTANCES

Copper and zinc have been sampled and analysed according to USEPA Method 29. Although not listed analytes under the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (NSW EPA) (2022) TM-12 (Type 1 Substances) or TM-13 (Type 2 Substances) they are approved analytes listed within USEPA Method 29.

6 Plant Operating Conditions

See Energy Australia NSW Pty Ltd (Mt Piper) records for complete process conditions.

From information received from the site operator, it is our understanding that samples were collected during normal plant operations and in compliance with Ektimo's QA/QC standards, unless otherwise noted.

7 Quality Assurance/Quality Control Information

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

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8 Definitions

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
AS	Australian Standard
CEM/CEMS	Continuous emission monitoring/Continuous emission monitoring system
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
D_{50}	'Cut size' of a cyclone is defined as the particle diameter at which the cyclone achieves a 50% collection efficiency i.e. half of the particles are retained by the cyclone and half pass through it. The D_{50} method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D_{50} of that cyclone and less than the D_{50} of the preceding cyclone.
DECC	Department of Environment & Climate Change (NSW)
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
EPA	Environment Protection Authority
FTIR	Fourier transform infra-red
ISC	Intersociety Committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
ITE	Individual threshold estimate
I-TEQ	International toxic equivalents
Lower bound	When an analyte is not present above the detection limit, the result is assumed to be equal to zero.
Medium bound	When an analyte is not present above the detection limit, the result is assumed to be equal to half of the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
PM_{10}	Particulate matter having an equivalent aerodynamic diameter less than or equal to 10 microns (µm).
$PM_{2.5}$	Particulate matter having an equivalent aerodynamic diameter less than or equal to 2.5 microns (µm).
PSA	Particle size analysis. PSA provides a distribution of geometric diameters, for a given sample, determined using laser diffraction.
RATA	Relative accuracy test audit
Semi-quantified VOCs	Unknown VOCs (those for which an analytical standard is not available), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration is determined by matching the area of the peak with the nearest suitable compound in the analytical calibration standard mixture.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0 °C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa.
TM	Test method
TOC	Total organic carbon. This is the sum of all compounds of carbon which contain at least one carbon-to-carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
Velocity difference	The percentage difference between the average of initial flows and after flows.
VOC	Volatile organic compound. A carbon-based chemical compound with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the given conditions of use. VOCs may contain oxygen, nitrogen and other elements. VOCs do not include carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
XRD	X-ray diffractometry
Upper bound	When an analyte is not present above the detection limit, the result is assumed to be equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

9 Appendices

Appendix A: Chain(s) of Custody

Ektimo

Checked at Ektimo Dispatch by: TTr 25/7/23 (Sign/Date)

Samples received in good order: (Sign/Date)

Sample ID	Job No.	Analysis Required	Units Required	Analytical Lab	Purchase Order No.	Ektimo Contact	Notes	TAT Required (days)
N 19554	R015163	VOC's	ug/sample	Ektimo		Ricardo Peralta		
N 19555	R015163	VOC's	ug/sample	Ektimo		Ricardo Peralta		
N 19556	R015163	Fluoride	ug/sample	Ektimo		Ricardo Peralta		
N 19557	R015163	F/HCL (Halides)	ug/litre	Ektimo		Ricardo Peralta		
N 19558	R015163	Cl2	ug/litre	Ektimo		Ricardo Peralta		
N 19559	R015163	Fluoride	ug/sample	Ektimo		Ricardo Peralta		
N 19560	R015163	F/HCL	ug/litre	Ektimo		Ricardo Peralta		
N 19561	R015163	Cl2	ug/litre	Ektimo		Ricardo Peralta		
N 19562	R015163	Fluoride	ug/sample	Ektimo		Ricardo Peralta		
N 19563	R015163	F/HCL	ug/litre	Ektimo		Ricardo Peralta		
N 19564	R015163	Cl2 (Halogens)	ug/litre	Ektimo		Ricardo Peralta		
N 19565	R015163	VOC's	ug/sample	Ektimo		Ricardo Peralta		

logged MW 25/7/23

Ektimo

29/7

Checked at Ektimo Dispatch by: SES (Sign/Date)

Samples received in good order: 25/7 (Sign/Date)

	Sample ID	Job No.	Analysis Required	Units Required	Analytical Lab	Purchase Order No.	Ektimo Contact	Notes	TAT Required (days)
1	N 19542	R015163	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu, Zn	ug/sample	Envirolab	W011765	Ricardo Peralta	Filter	
2	N 19543	R015163	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu, Zn	ug/litre	Envirolab	W011765	Ricardo Peralta	Impinger 1,2, Rinse	
3	N 19544	R015163	Hg	ug/litre	Envirolab	W011765	Ricardo Peralta	Impinger 4,5, Rinse	
4	N 19545	R015163	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu, Zn	ug/sample	Envirolab	W011765	Ricardo Peralta	Filter-Blank	
5	N 19546	R015163	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu, Zn	ug/litre	Envirolab	W011765	Ricardo Peralta	Metal soln-blank	
6	N 19547	R015163	Hg	ug/litre	Envirolab	W011765	Ricardo Peralta	Hg soln-Blank	
7	N 19548	R015163	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu, Zn	ug/sample	Envirolab	W011765	Ricardo Peralta	Filter	
8	N 19549	R015163	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu, Zn	ug/litre	Envirolab	W011765	Ricardo Peralta	Impinger 1,2, Rinse	
9	N 19550	R015163	Hg	ug/litre	Envirolab	W011765	Ricardo Peralta	Impinger 4,5, Rinse	
10	N 19551	R015163	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu, Zn	ug/sample	Envirolab	W011765	Ricardo Peralta	Filter	
11	N 19552	R015163	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu, Zn	ug/litre	Envirolab	W011765	Ricardo Peralta	Impinger 1,2, Rinse	
12	N 19553	R015163	Hg	ug/litre	Envirolab	W011765	Ricardo Peralta	Impinger 4,5, Rinse	
13	N 19566	R015163	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu, Zn	ug/sample	Envirolab	W011765	Ricardo Peralta	Filter	
14	N 19567	R015163	Metals - Type 1 & 2 substances (Sb, As, Cd, Pb, Hg, Be, Cr, Co, Mn, Ni, Se, V, Sn) + Cu, Zn	ug/litre	Envirolab	W011765	Ricardo Peralta	Impinger 1,2, Rinse	
15	N 19568	R015163	Hg	ug/litre	Envirolab	W011765	Ricardo Peralta	Impinger 4,5, Rinse	

ENVIROLAB SERVICES
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 32885 9
Date Received: 25/7/23
Time Received: 1425
Received By: MW
Temp: Cool/Ambient
Cooling: Ice/Icepack 16°c
Security: Intact/Broken/None

Appendix B: Laboratory Results

Ektimo

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-004690
Job Number:	R015163
Date of Issue:	1/08/2023
Attention:	Energy Australia-Mt Piper
Address:	Mt Piper Power Station, Locked Mail Bag 1 Portland, NSW, 2847
Date samples received:	24/07/2023
Number of samples received:	3
Date samples analysed:	27/07/2023
No of samples analysed:	3
Test method(s) used:	Ektimo 235

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

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NATA is a member of APAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of these organisations, NATA accreditation is recognised world –wide.
A formal Quality Control program is in place at Ektimo to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

REPORT AUTHORISATION

Version 230707

Cappi Tuffery
Laboratory Chemist

Daniel Balaam
Senior Laboratory Chemist

NATA Accredited Laboratory 14601

Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports

Report No. LV-004690
Job No. R015163
Client Name: Energy Australia-Mt Piper

Parameter	Analyte	Units	N 19556Energy Australia-Mt Piper EPA4 1B Fluoride filter Sample (HF)	N 19559 Energy Australia-Mt Piper Blank For All Fluoride Filter Blank	N 19562 Energy Australia-Mt Piper EPA6 2A Filter Sample
Sample Volume		mL	20	20	20
Hydrogen fluoride (HF)	F^-	µg/sample	17.82	<2	37.08
PQL	<	µg/sample	2	2	2

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

Ektimo

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-004678
Job Number:	R015163
Date of Issue:	27/07/2023
Attention:	Energy Australia-Mt Piper
Address:	Mt Piper Power Station, Locked Mail Bag 1 Portland, NSW, 2847
Date samples received:	24/07/2023
Number of samples received:	3
Date samples analysed:	27/07/2023
No of samples analysed:	3
Test method(s) used:	Ektimo 344

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

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REPORT AUTHORISATION

Version 230707

Matthew Cook
Laboratory Manager

Daniel Balaam
Senior Laboratory Chemist

NATA Accredited Laboratory 14601

Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports

Ektimo

Analytical Results

Report No. LV-004678

Job No. R015163

Client Name: Energy Australia-Mt Piper

Parameter	Units	N19554 R015163	N19555 R015163	N19565 R015163
	PQL	1.0	1.0	1.0
Ethanol	µg	<1	<1	<1
Acetone	µg	2	<1	2.2
Isopropanol	µg	<1	<1	<1
Pentane	µg	<1	<1	<1
1,1-Dichloroethene	µg	<1	<1	<1
Acrylonitrile	µg	<1	<1	<1
Dichloromethane	µg	<1	<1	<1
trans-1,2-Dichloroethene	µg	<1	<1	<1
Methyl ethyl ketone	µg	<1	<1	<1
n-Hexane	µg	<1	<1	<1
cis-1,2-Dichloroethene	µg	<1	<1	<1
Ethyl acetate	µg	<1	<1	<1
Chloroform	µg	<1	<1	<1
1,1,1-Trichloroethane	µg	<1	<1	<1
1,2-Dichloroethane	µg	<1	<1	<1
Cyclohexane	µg	<1	<1	<1
Benzene	µg	<1	<1	<1
Carbon tetrachloride	µg	<1	<1	<1
Butanol	µg	<1	<1	<1
Isopropyl acetate	µg	<1	<1	2.2
2-Methylhexane	µg	<1	<1	3.6
2,3-Dimethylpentane	µg	<1	<1	<1
1-Methoxy-2-propanol	µg	<1	<1	<1
3-Methylhexane	µg	<1	<1	4.8
Heptane	µg	<1	<1	<1
Ethyl acrylate	µg	<1	<1	<1
Trichloroethylene	µg	<1	<1	<1
Methyl methacrylate	µg	<1	<1	<1
Propyl acetate	µg	<1	<1	<1
Methylcyclohexane	µg	<1	<1	1.8
Methyl Isobutyl Ketone	µg	<1	<1	<1
Toluene	µg	<1	<1	<1
1,1,2-Trichloroethane	µg	<1	<1	<1
2-Hexanone	µg	<1	<1	<1
Octane	µg	<1	<1	1.5
Tetrachloroethene	µg	<1	<1	<1
Butyl acetate	µg	<1	<1	<1
Chlorobenzene	µg	<1	<1	<1
Ethylbenzene	µg	<1	<1	<1
m + p-Xylene	µg	<1	<1	1.7
1-Methoxy-2-propyl acetate	µg	<1	<1	<1
Styrene	µg	<1	<1	<1
o-Xylene	µg	<1	<1	2.5
Butyl acrylate	µg	<1	<1	<1
Nonane	µg	<1	<1	3

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

NATA Accredited Laboratory 14601

Ektimo

Analytical Results

Report No. LV-004678

Job No. R015163

Client Name: Energy Australia-Mt Piper

Parameter	Units	N19554 R015163	N19555 R015163	N19565 R015163
	PQL	1.0	1.0	1.0
2-Butoxyethanol	µg	<1	<1	<1
Cellosolve acetate	µg	<1	<1	<1
1,1,2,2-Tetrachloroethane	µg	<1	<1	<1
Isopropylbenzene	µg	<1	<1	<1
alpha-Pinene	µg	<1	<1	<1
Propylbenzene	µg	<1	<1	<1
1,3,5-Trimethylbenzene	µg	<1	<1	2.6
beta-Pinene	µg	<1	<1	<1
tert-Butylbenzene	µg	<1	<1	<1
1,2,4-Trimethylbenzene	µg	<1	<1	6.5
Decane	µg	<1	<1	5.2
3-Carene	µg	<1	<1	<1
1,2,3-Trimethylbenzene	µg	<1	<1	1.8
D-Limonene	µg	<1	<1	<1
Undecane	µg	<1	<1	5.9
Dodecane	µg	<1	<1	3.9
Tridecane	µg	<1	<1	<1
Tetradecane	µg	<1	<1	<1
Residuals as Toluene	µg	<1	<1	870

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

Ektimo

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-004695
Job Number:	R015163
Date of Issue:	1/08/2023
Attention:	Energy Australia-Mt Piper
Address:	Mt Piper Power Station, Locked Mail Bag 1 Portland, NSW, 2847
Date samples received:	24/07/2023
Number of samples received:	6
Date samples analysed:	27/07/2023
No of samples analysed:	6
Test method(s) used:	Ektimo 235

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.
Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of these organisations, NATA accreditation is recognised world –wide.
A formal Quality Control program is in place at Ektimo to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

REPORT AUTHORISATION

Version 230707

Cappi Tuffery
Laboratory Chemist

Daniel Balaam
Senior Laboratory Chemist

NATA Accredited Laboratory 14601

Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports

Ektimo

Analytical Results

Report No. LV-004695
Job No. R015163
Client Name: Energy Australia-Mt Piper

Parameter	Analyte	Units	N 19557 Energy Australia-Mt Piper EPA4 1B F/HCL Solution Sample (Hf,HCl)	N 19560Energy Australia-Mt Piper Blank For All F/HCL Blank	N 19563 Energy Australia-Mt Piper EPA6 2A Halogen Solution Sample	N 19558 Energy Australia-Mt Piper EPA4 1B Cl2 Solution Sample (Cl2)	N 19561 Energy Australia-Mt Piper Blank For All Cl2 Solution blank	N 19564Energy Australia-Mt Piper EPA6 2A Halogen Solution Sample
Sample Volume		mL	375	80	368	240	83	220
Hydrogen chloride (HCl)	Cl^-	mg/L	7.75	<0.1	11.55			
Chlorine (Cl_2)	Cl^-	mg/L				0.13	0.18	0.18
Hydrogen fluoride (HF)	F^-	mg/L	72.81	<0.1	105.37			
PQL	<	mg/L	0.1	0.1	0.1	0.1	0.1	0.1

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

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CERTIFICATE OF ANALYSIS 328859

Client Details

Client	Ektimo (Unanderra)
Attention	Ricardo Peralta
Address	1/251 Princes Hwy, Unanderra, NSW, 2526

Sample Details

Your Reference	**R015163**
Number of Samples	5 Filter, 10 Liquid
Date samples received	25/07/2023
Date completed instructions received	25/07/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	01/08/2023
Date of Issue	01/08/2023

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Hannah Nguyen, Metals Supervisor
Loren Bardwell, Development Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Metals on filters						
Our Reference		328859-1	328859-4	328859-7	328859-10	328859-13
Your Reference	UNITS	N 19542	N 19545	N 19548	N 19551	N 19566
Type of sample		Filter	Filter	Filter	Filter	Filter
Date prepared	-	26/07/2023	26/07/2023	26/07/2023	26/07/2023	26/07/2023
Date analysed	-	27/07/2023	27/07/2023	27/07/2023	27/07/2023	27/07/2023
Antimony	µg/filter	<5	<5	<5	<5	<5
Arsenic	µg/filter	<2	<2	<2	<2	<2
Cadmium	µg/filter	<0.5	<0.5	<0.5	<0.5	<0.5
Lead	µg/filter	1	<1	<1	<1	<1
Mercury	µg/filter	<0.2	<0.2	<0.2	<0.2	<0.2
Beryllium	µg/filter	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/filter	6.5	<0.5	25	2	6.6
Cobalt	µg/filter	<0.5	<0.5	<0.5	<0.5	<0.5
Manganese	µg/filter	2	<0.5	3	0.9	1
Nickel	µg/filter	4	<1	15	<1	4
Selenium	µg/filter	<5	<5	<5	<5	<5
Vanadium	µg/filter	<1	<1	<1	<1	<1
Tin	µg/filter	<2	<2	<2	<2	<2
Copper	µg/filter	3	0.7	2	1	0.6
Zinc	µg/filter	6	<1	6	4	4

Metals in water - mass units						
Our Reference		328859-2	328859-3	328859-5	328859-6	328859-8
Your Reference	UNITS	N 19543	N 19544	N 19546	N 19547	N 19549
Type of sample		Liquid	Liquid	Liquid	Liquid	Liquid
Volume	mL	354	240	71	73	301
Antimony	µg	2	[NA]	<0.5	[NA]	0.6
Arsenic	µg	1	[NA]	<0.5	[NA]	<0.5
Cadmium	µg	2.3	[NA]	0.08	[NA]	0.59
Lead	µg	390	[NA]	<0.5	[NA]	53
Mercury	µg	<10	<1	<10	<1	<10
Beryllium	µg	<0.5	[NA]	<0.5	[NA]	<0.5
Chromium	µg	5.5	[NA]	<0.5	[NA]	5.4
Cobalt	µg	<0.5	[NA]	<0.5	[NA]	<0.5
Manganese	µg	<3	[NA]	<3	[NA]	90
Nickel	µg	150	[NA]	<0.5	[NA]	3
Selenium	µg	35	[NA]	<0.5	[NA]	23
Vanadium	µg	<0.5	[NA]	<0.5	[NA]	<0.5
Tin	µg	26	[NA]	2	[NA]	5.2
Copper	µg	4,500	[NA]	0.6	[NA]	70
Zinc	µg	3,100	[NA]	1	[NA]	13
Date prepared	-	28/07/2023	28/07/2023	28/07/2023	28/07/2023	28/07/2023
Date analysed	-	28/07/2023	28/07/2023	28/07/2023	28/07/2023	28/07/2023
Antimony-Dissolved	µg/L	6	[NA]	<1	[NA]	2
Arsenic-Dissolved	µg/L	3	[NA]	<1	[NA]	<1
Cadmium-Dissolved	µg/L	6.5	[NA]	1.2	[NA]	1.9
Lead-Dissolved	µg/L	1,100	[NA]	3	[NA]	180
Mercury-Dissolved	µg/L	8.4	1.9	<1	<0.1	4.7
Beryllium-Dissolved	µg/L	<0.5	[NA]	<0.5	[NA]	<0.5
Chromium-Dissolved	µg/L	16	[NA]	3	[NA]	18
Cobalt-Dissolved	µg/L	<1	[NA]	<1	[NA]	<1
Manganese-Dissolved	µg/L	6	[NA]	<5	[NA]	300
Nickel-Dissolved	µg/L	420	[NA]	2	[NA]	10
Selenium-Dissolved	µg/L	99	[NA]	<1	[NA]	78
Vanadium-Dissolved	µg/L	<1	[NA]	<1	[NA]	<1
Tin-Dissolved	µg/L	73	[NA]	26	[NA]	17
Copper-Dissolved	µg/L	13,000	[NA]	9	[NA]	230
Zinc-Dissolved	µg/L	8,600	[NA]	14	[NA]	42

Metals in water - mass units						
Our Reference		328859-9	328859-11	328859-12	328859-14	328859-15
Your Reference	UNITS	N 19550	N 19552	N 19553	N 19567	N 19568
Type of sample		Liquid	Liquid	Liquid	Liquid	Liquid
Volume	mL	241	330	299	344	280
Antimony	µg	[NA]	<0.5	[NA]	<0.5	[NA]
Arsenic	µg	[NA]	<0.5	[NA]	<0.5	[NA]
Cadmium	µg	[NA]	0.08	[NA]	0.74	[NA]
Lead	µg	[NA]	18	[NA]	14	[NA]
Mercury	µg	<1	<10	<1	<10	<1
Beryllium	µg	[NA]	<0.5	[NA]	<0.5	[NA]
Chromium	µg	[NA]	5.6	[NA]	5	[NA]
Cobalt	µg	[NA]	<0.5	[NA]	<0.5	[NA]
Manganese	µg	[NA]	47	[NA]	10	[NA]
Nickel	µg	[NA]	2	[NA]	19	[NA]
Selenium	µg	[NA]	14	[NA]	14	[NA]
Vanadium	µg	[NA]	<0.5	[NA]	<0.5	[NA]
Tin	µg	[NA]	6.6	[NA]	5.9	[NA]
Copper	µg	[NA]	47	[NA]	9.8	[NA]
Zinc	µg	[NA]	3	[NA]	55	[NA]
Date prepared	-	28/07/2023	28/07/2023	28/07/2023	28/07/2023	28/07/2023
Date analysed	-	28/07/2023	28/07/2023	28/07/2023	28/07/2023	28/07/2023
Antimony-Dissolved	µg/L	[NA]	<1	[NA]	<1	[NA]
Arsenic-Dissolved	µg/L	[NA]	<1	[NA]	<1	[NA]
Cadmium-Dissolved	µg/L	[NA]	0.3	[NA]	2.1	[NA]
Lead-Dissolved	µg/L	[NA]	56	[NA]	42	[NA]
Mercury-Dissolved	µg/L	2.0	1.9	0.80	1.5	1.0
Beryllium-Dissolved	µg/L	[NA]	<0.5	[NA]	<0.5	[NA]
Chromium-Dissolved	µg/L	[NA]	17	[NA]	13	[NA]
Cobalt-Dissolved	µg/L	[NA]	<1	[NA]	<1	[NA]
Manganese-Dissolved	µg/L	[NA]	140	[NA]	38	[NA]
Nickel-Dissolved	µg/L	[NA]	5	[NA]	54	[NA]
Selenium-Dissolved	µg/L	[NA]	42	[NA]	41	[NA]
Vanadium-Dissolved	µg/L	[NA]	<1	[NA]	<1	[NA]
Tin-Dissolved	µg/L	[NA]	20	[NA]	17	[NA]
Copper-Dissolved	µg/L	[NA]	140	[NA]	29	[NA]
Zinc-Dissolved	µg/L	[NA]	10	[NA]	160	[NA]

Method ID	Methodology Summary
Metals-020/021/022	Determination of various metals on filters by ICP-AES/MS and or CV/AAS. Note - air volume measurements are not covered by Envirolab's NATA accreditation.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS. Please note for Bromine and Iodine, any forms of these elements that are present are included together in the one result reported for each of these two elements.

QUALITY CONTROL: Metals on filters						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			26/07/2023	[NT]	[NT]	[NT]	[NT]	26/07/2023	[NT]
Date analysed	-			27/07/2023	[NT]	[NT]	[NT]	[NT]	27/07/2023	[NT]
Antimony	µg/filter	5	Metals-020/021/022	<5	[NT]	[NT]	[NT]	[NT]	96	[NT]
Arsenic	µg/filter	2	Metals-020/021/022	<2	[NT]	[NT]	[NT]	[NT]	101	[NT]
Cadmium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	95	[NT]
Lead	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Mercury	µg/filter	0.2	Metals-020/021/022	<0.2	[NT]	[NT]	[NT]	[NT]	95	[NT]
Beryllium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	99	[NT]
Chromium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	98	[NT]
Cobalt	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	98	[NT]
Manganese	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	100	[NT]
Nickel	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Selenium	µg/filter	5	Metals-020/021/022	<5	[NT]	[NT]	[NT]	[NT]	89	[NT]
Vanadium	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Tin	µg/filter	2	Metals-020/021/022	<2	[NT]	[NT]	[NT]	[NT]	96	[NT]
Copper	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	102	[NT]
Zinc	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: Metals in water - mass units						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Antimony	µg	0.5	Metals-022	<0.5	2	2	2	0	[NT]	[NT]
Arsenic	µg	0.5	Metals-022	<0.5	2	1	1	0	[NT]	[NT]
Cadmium	µg	0.05	Metals-022	<0.05	2	2.3	2.3	0	[NT]	[NT]
Lead	µg	0.5	Metals-022	<0.5	2	390	390	0	[NT]	[NT]
Mercury	µg	0.5	Metals-021	<0.5	2	<10	<10	0	[NT]	[NT]
Beryllium	µg	0.5	Metals-022	<0.5	2	<0.5	<0.5	0	[NT]	[NT]
Chromium	µg	0.5	Metals-022	<0.5	2	5.5	5.3	4	[NT]	[NT]
Cobalt	µg	0.5	Metals-022	<0.5	2	<0.5	<0.5	0	[NT]	[NT]
Manganese	µg	3	Metals-022	<3	2	<3	<3	0	[NT]	[NT]
Nickel	µg	0.5	Metals-022	<0.5	2	150	150	0	[NT]	[NT]
Selenium	µg	0.5	Metals-022	<0.5	2	35	35	0	[NT]	[NT]
Vanadium	µg	0.5	Metals-022	<0.5	2	<0.5	<0.5	0	[NT]	[NT]
Tin	µg	0.5	Metals-022	<0.5	2	26	26	0	[NT]	[NT]
Copper	µg	0.5	Metals-022	<0.5	2	4500	4500	0	[NT]	[NT]
Zinc	µg	0.5	Metals-022	<0.5	2	3100	2900	7	[NT]	[NT]
Date prepared	-			28/07/2023	2	28/07/2023	28/07/2023		28/07/2023	[NT]
Date analysed	-			28/07/2023	2	28/07/2023	28/07/2023		28/07/2023	[NT]
Antimony-Dissolved	µg/L	1	Metals-022	<1	2	6	7	15	81	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	2	3	3	0	97	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	2	6.5	6.6	2	97	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	2	1100	1100	0	98	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	2	8.4	9.0	7	97	[NT]
Beryllium-Dissolved	µg/L	0.5	Metals-022	<0.5	2	<0.5	<0.5	0	95	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	2	16	15	6	98	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	<1	2	<1	<1	0	99	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	2	6	5	18	98	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	2	420	410	2	98	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	<1	2	99	99	0	96	[NT]
Vanadium-Dissolved	µg/L	1	Metals-022	<1	2	<1	<1	0	99	[NT]
Tin-Dissolved	µg/L	1	Metals-022	<1	2	73	74	1	100	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	2	13000	13000	0	97	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	2	8600	8200	5	98	[NT]

QUALITY CONTROL: Metals in water - mass units						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Mercury	µg	0.5	Metals-021	[NT]	3	<1	<1	0	[NT]	[NT]
Date prepared	-			[NT]	3	28/07/2023	28/07/2023		[NT]	[NT]
Date analysed	-			[NT]	3	28/07/2023	28/07/2023		[NT]	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	[NT]	3	1.9	2.0	5	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Metals in water - mass units - The PQL has been raised for Hg due to the sample matrix requiring dilution.

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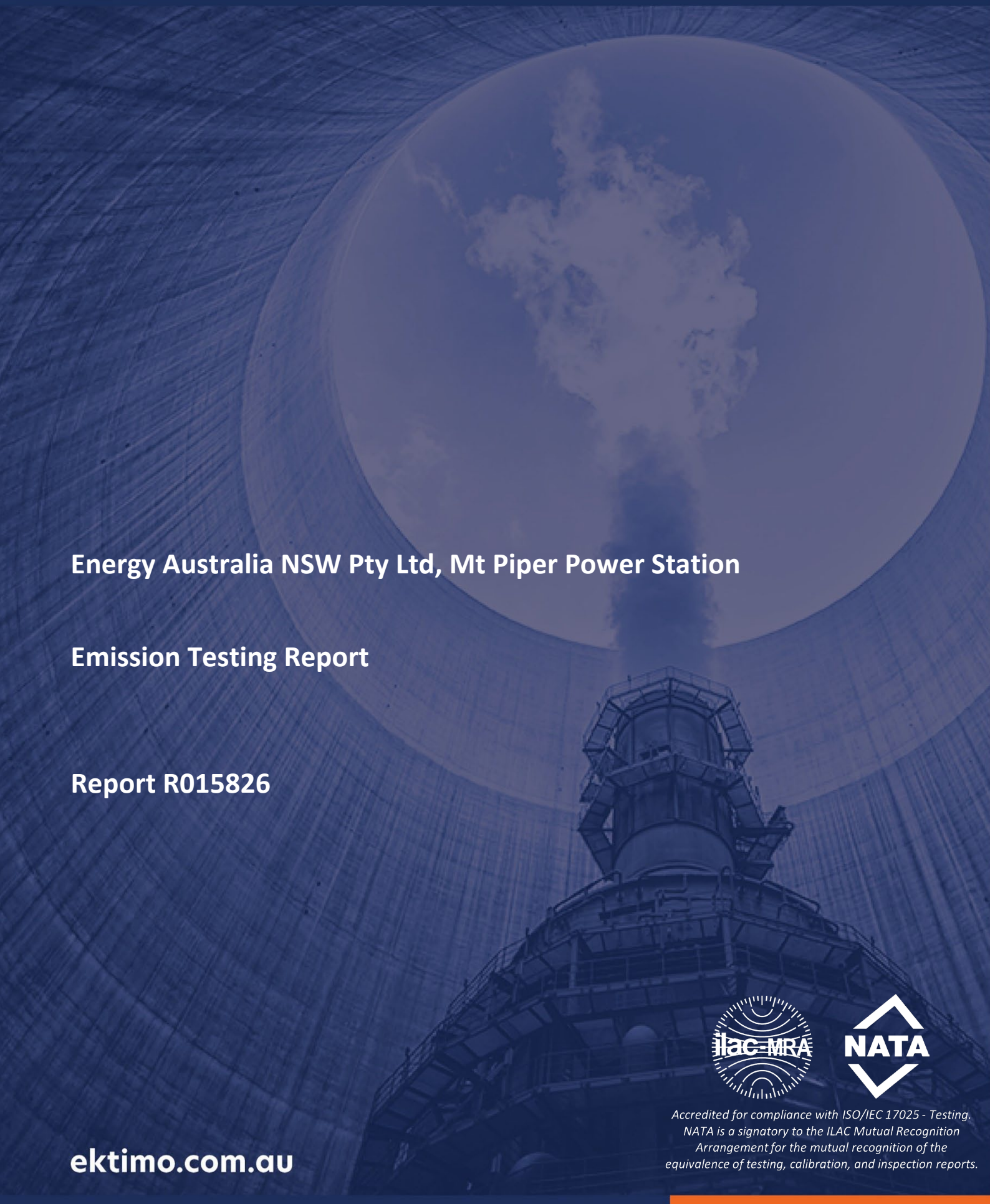


Energy Australia NSW Pty Ltd, Mt Piper Power Station

Emission Testing Report

Report R015826

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, calibration, and inspection reports.

ektimo.com.au

Document Information

Client Name:	Energy Australia NSW Pty Ltd (Mt Piper)
Report Number:	R015826
Date of Issue:	30 November 2023
Attention:	Kane Hoskins
Address:	Mt Piper Power Station, Locked Mail Bag 1 Portland NSW 2847
Testing Laboratory:	Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation

Aaron Davis
Operations Manager

NATA Accredited Laboratory
No. 14601

Table of Contents

1 Executive Summary

1.1 Background

Ektimo was engaged by Energy Australia NSW Pty Ltd (Mt Piper) to perform emission testing at Mt Piper Power Station. Testing was carried out in accordance with Environment Protection Licence 13007.

1.2 Project Objective

The objective of the project was to conduct a monitoring programme to quantify emissions from four (4) discharge points to determine compliance with Energy Australia NSW Pty Ltd (Mt Piper) 's Environmental Licence.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 4 – Unit 1, Duct B	24 October 2023	Solid particles (total) Sulfuric acid mist and/or sulfur trioxide (as SO_3) Volatile organic compounds (VOCs) Sulfur dioxide (SO_2), nitrogen oxides (as NO_2) Oxygen (O_2), carbon dioxide (CO_2)
EPA 5 – Unit 1, Duct A		Solid particles (total) Nitrogen oxides (as NO_2) Oxygen (O_2), carbon dioxide (CO_2)
EPA 6– Unit 2, Duct A	25 October 2023	Solid particles (total) Sulfuric acid mist and/or sulfur trioxide (as SO_3), Volatile organic compounds (VOCs) Sulfur dioxide (SO_2), nitrogen oxides (as NO_2) Oxygen (O_2), carbon dioxide (CO_2)
EPA 7 – Unit 2, Duct B		Solid particles (total) Sulfur dioxide (SO_2), nitrogen oxides (as NO_2) Oxygen (O_2), carbon dioxide (CO_2)

* Flow rate, velocity, temperature, and moisture were also determined.

All results are reported on a dry basis at STP.

Plant operating conditions have been noted in this report.

Ektimo

1.3 Results Summary

The following tables summarise the results of the testing programme. All analytes are within the licence limit set by the NSW EPA as per licence 13007 (last amended on 1 November 2023).

Report Number			R015826	R015826	
Test Date			24/10/23	24/10/23	
EPA			5	4	
Unit			Unit 1 Duct A	Unit 1 Duct B	
					EPA 2
	LIMIT	**UNITS**	*Measured Results*		*Combined Ducts*
Volatile organic compounds as n-propane equivalent	**10**	**mg/m³**	-	0.17	-
Sulfuric acid mist and sulfur trioxide (as SO3)	**100**	**mg/m³**	-	2.6	-
Solid particles	**50**	**mg/m³**	**3.3**	**1.6**	**2.4**

*Combined air emissions from **boiler 1** via points 4 & 5 (except for Volatile organic compounds, Sulfuric acid mist and sulfur trioxide). All results corrected to 7% oxygen correction.*

Report Number			R015826	R015826	
Test Date			25/10/23	25/10/23	
EPA			6	7	
Unit			Unit 2 Duct A	Unit 2 Duct B	
					EPA 3
	LIMIT	**UNITS**	*Measured Results*		*Combined Ducts*
Volatile organic compounds as n-propane equivalent	**10**	**mg/m³**	0.2	-	-
Sulfuric acid mist and sulfur trioxide (as SO3)	**100**	**mg/m³**	0.94	-	-
Solid particles	**50**	**mg/m³**	**2.8**	**2.9**	**2.9**

*Combined air emissions from **boiler 2** via points 6 & 7 (except for Volatile organic compounds, Sulfuric acid mist and sulfur trioxide). All results corrected to 7% oxygen correction.*

*Please note that the measurement uncertainty associated with the test results **was not** considered when determining whether the results were compliant or non-compliant.*

2 Results

2.1 EPA 4 – Unit 1, Duct B

Date	24/10/2023	**Client**	EnergyAustralia
Report	R015826	**Stack ID**	Mt Piper Power Station - EPA 4 Unit 1 Duct B (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Adnan Latif / Mohamed Trabelsi	**State**	NSW
Process Conditions	Boiler load stable at 220MW		231018

Stack Parameters		
Moisture content, %v/v	5.3	
Gas molecular weight, g/g mole	29.2 (wet)	29.9 (dry)
Gas density at STP, kg/m³	1.30 (wet)	1.33 (dry)
Gas density at discharge conditions, kg/m³	0.83	
% Oxygen correction & Factor	7 %	1.46
Gas Flow Parameters		
Temperature, °C	110	
Temperature, K	383	
Velocity at sampling plane, m/s	9.8	
Volumetric flow rate, actual, m³/s	350	
Volumetric flow rate (wet STP), m³/s	220	
Volumetric flow rate (dry STP), m³/s	210	
Mass flow rate (wet basis), kg/h	1100000	

Gas Analyser Results	Average			Minimum			Maximum		
Sampling time	1210 - 1548			1210 - 1548			1210 - 1548		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Combustion Gases									
Nitrogen oxides (as NO_2)	530	770	6700	460	680	5900	660	970	8500
Sulfur dioxide	600	880	7700	520	750	6600	700	1000	9000
Carbon monoxide	3.9	5.7	50	<3	<5	<40	16	24	210
	Concentration % v/v			Concentration % v/v			Concentration % v/v		
Carbon dioxide	7.9			7			8.5		
Oxygen	11.4			10.7			12.4		

Isokinetic Results	Results		
Sampling time	1210-1550		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	1.1	1.6	14
Sulfur trioxide and/or Sulfuric acid (as SO3)	1.8	2.6	23
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		98	
Gravimetric analysis date (total particulate)		27-10-2023	

Total VOCs (as n-Propane)	Results		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Total	0.11	0.17	1.5

VOC (speciated)	Results		
Sampling time	1330-1430		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Detection limit(1)	<0.08	<0.1	<1
Acetone	0.15	0.22	1.9

(1) Unless otherwise reported, the following target compounds were found to be below detection:
Ethanol, Isopropanol, Pentane, 1,1-Dichloroethene, Acrylonitrile, Dichloromethane, trans-1,2-Dichloroethene, Methyl ethyl ketone, n-Hexane, cis-1,2-Dichloroethene, Ethyl acetate, Chloroform, 1,1,1-Trichloroethane, 1,2-Dichloroethane, Cyclohexane, Benzene, Carbon tetrachloride, Butanol, Isopropyl acetate, 2-Methylhexane, 2,3-Dimethylpentane, 1-Methoxy-2-propanol, 3-Methylhexane, Heptane, Ethyl acrylate, Trichloroethylene, Methyl methacrylate, Propyl acetate, Methylcyclohexane, Methyl Isobutyl Ketone, Toluene, 1,1,2-Trichloroethane, 2-Hexanone, Octane, Tetrachloroethene, Butyl acetate, Chlorobenzene, Ethylbenzene, m + p-Xylene, 1-Methoxy-2-propyl acetate, Styrene, o-Xylene, Butyl acrylate, Nonane, 2-Butoxyethanol, Cellosolve acetate, 1,1,2,2-Tetrachloroethane, Isopropylbenzene, alpha-Pinene, Propylbenzene, 1,3,5-Trimethylbenzene, beta-Pinene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, Decane, 3-Carene, 1,2,3-Trimethylbenzene, D-Limonene, Undecane, Dodecane, Tridecane, Tetradecane, Residuals as Toluene

2.2 EPA 5 – Unit 1, Duct A

Date	24/10/2023	**Client**	EnergyAustralia
Report	R015826	**Stack ID**	Mt Piper Power Station - EPA 5 Unit 1 Duct A (Upper)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Adnan Latif / Mohamed Trabelsi	**State**	NSW
Process Conditions	Boiler load stable at 220 MW		*231018*

Stack Parameters		
Moisture content, %v/v	5.6	
Gas molecular weight, g/g mole	29.2 (wet)	29.9 (dry)
Gas density at STP, kg/m³	1.30 (wet)	1.33 (dry)
Gas density at discharge conditions, kg/m³	0.82	
% Oxygen correction & Factor	7 %	1.40
Gas Flow Parameters		
Temperature, °C	112	
Temperature, K	385	
Velocity at sampling plane, m/s	9.2	
Volumetric flow rate, actual, m³/s	330	
Volumetric flow rate (wet STP), m³/s	210	
Volumetric flow rate (dry STP), m³/s	200	
Mass flow rate (wet basis), kg/h	990000	

Gas Analyser Results	Average			Minimum			Maximum		
Sampling time	0809 - 1138			0809 - 1138			0809 - 1138		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Combustion Gases									
Nitrogen oxides (as NO_2)	500	710	6000	470	660	5600	560	790	6700
Carbon monoxide	<3	<5	<40	<3	<5	<40	3.7	5.3	45
		Concentration % v/v			Concentration % v/v			Concentration % v/v	
Carbon dioxide		8.1			7.8			8.5	
Oxygen		11			10.6			11.3	

Isokinetic Results	Results		
Sampling time	0800-1139		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	2.3	3.3	28
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		102	
Gravimetric analysis date (total particulate)		27-10-2023	

2.3 EPA 6 – Unit 2, Duct A

Date	25/10/2023	**Client**	EnergyAustralia
Report	R015826	**Stack ID**	Mt Piper Power Station - EPA 6 Unit 2 Duct A (Lower)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Adnan Latif / Mohamed Trabelsi	**State**	NSW
Process Conditions	Boiler load stable at 220MW		231018

Stack Parameters		
Moisture content, %v/v	5.9	
Gas molecular weight, g/g mole	29.2 (wet)	29.9 (dry)
Gas density at STP, kg/m³	1.30 (wet)	1.33 (dry)
Gas density at discharge conditions, kg/m³	0.83	
% Oxygen correction & Factor	7 %	1.44
Gas Flow Parameters		
Temperature, °C	105	
Temperature, K	378	
Velocity at sampling plane, m/s	8.3	
Volumetric flow rate, actual, m³/s	300	
Volumetric flow rate (wet STP), m³/s	190	
Volumetric flow rate (dry STP), m³/s	180	
Mass flow rate (wet basis), kg/h	900000	

Gas Analyser Results	Average			Minimum			Maximum		
Sampling time	1203 - 1533			1203 - 1533			1203 - 1533		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Combustion Gases									
Nitrogen oxides (as NO_2)	260	380	2800	220	320	2400	380	540	4100
Sulfur dioxide	590	840	6300	530	760	5700	660	950	7100
Carbon monoxide	12	18	130	<2	<4	<30	300	430	3200
	Concentration % v/v			Concentration % v/v			Concentration % v/v		
Carbon dioxide	8			7.4			9.1		
Oxygen	11.2			9.9			11.9		

Isokinetic Results	Results		
Sampling time	1200-1540		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	2	2.8	21
Sulfur trioxide and/or Sulfuric acid (as SO3)	0.65	0.94	7
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		100	
Gravimetric analysis date (total particulate)		27-10-2023	

Total VOCs (as n-Propane)	Results		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Total	0.14	0.2	1.5

VOC (speciated)	Results		
Sampling time	1315-1415		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Detection limit[1]	<0.08	<0.1	<0.9
Acetone	0.18	0.26	2

(1) Unless otherwise reported, the following target compounds were found to be below detection:
Ethanol, Isopropanol, Pentane, 1,1-Dichloroethene, Acrylonitrile, Dichloromethane, trans-1,2-Dichloroethene, Methyl ethyl ketone, n-Hexane, cis-1,2-Dichloroethene, Ethyl acetate, Chloroform, 1,1,1-Trichloroethane, 1,2-Dichloroethane, Cyclohexane, Benzene, Carbon tetrachloride, Butanol, Isopropyl acetate, 2-Methylhexane, 2,3-Dimethylpentane, 1-Methoxy-2-propanol, 3-Methylhexane, Heptane, Ethyl acrylate, Trichloroethylene, Methyl methacrylate, Propyl acetate, Methylcyclohexane, Methyl Isobutyl Ketone, Toluene, 1,1,2-Trichloroethane, 2-Hexanone, Octane, Tetrachloroethene, Butyl acetate, Chlorobenzene, Ethylbenzene, m + p-Xylene, 1-Methoxy-2-propyl acetate, Styrene, o-Xylene, Butyl acrylate, Nonane, 2-Butoxyethanol, Cellosolve acetate, 1,1,2,2-Tetrachloroethane, Isopropylbenzene, alpha-Pinene, Propylbenzene, 1,3,5-Trimethylbenzene, beta-Pinene, tert-Butylbenzene, 1,2,4-Trimethylbenzene, Decane, 3-Carene, 1,2,3-Trimethylbenzene, D-Limonene, Undecane, Dodecane, Tridecane, Tetradecane, Residuals as Toluene

2.4 EPA 7 – Unit 2, Duct B

Date	25/10/2023	**Client**	EnergyAustralia
Report	R015826	**Stack ID**	Mt Piper Power Station - EPA 7 Unit 2 Duct B (Upper)
Licence No.	13007	**Location**	Portland
Ektimo Staff	Adnan Latif / Mohamed Trabelsi	**State**	NSW
Process Conditions	Boiler load stable at 220MW		*231018*

Stack Parameters		
Moisture content, %v/v	5.6	
Gas molecular weight, g/g mole	29.2 (wet)	29.9 (dry)
Gas density at STP, kg/m³	1.30 (wet)	1.33 (dry)
Gas density at discharge conditions, kg/m³	0.84	
% Oxygen correction & Factor	7 %	1.34
Gas Flow Parameters		
Temperature, °C	102	
Temperature, K	375	
Velocity at sampling plane, m/s	9.2	
Volumetric flow rate, actual, m³/s	330	
Volumetric flow rate (wet STP), m³/s	220	
Volumetric flow rate (dry STP), m³/s	200	
Mass flow rate (wet basis), kg/h	1000000	

Gas Analyser Results	Average			Minimum			Maximum		
Sampling time	0800 - 1139			0800 - 1139			0800 - 1139		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Combustion Gases									
Nitrogen oxides (as NO_2)	250	340	3100	220	290	2600	430	580	5200
Sulfur dioxide	620	840	7600	520	700	6300	700	940	8500
Carbon monoxide	15	20	190	3.7	5	46	1100	1500	13000
		Concentration % v/v			Concentration % v/v			Concentration % v/v	
Carbon dioxide		8.5			7.2			9.8	
Oxygen		10.6			8.8			11.9	

Isokinetic Results	Results		
Sampling time	0800-1140		
	Concentration mg/m³	Corrected to 7% O2 mg/m³	Mass Rate g/min
Solid Particles	2.1	2.9	26
Isokinetic Sampling Parameters			
Sampling time, min		210	
Isokinetic rate, %		100	
Gravimetric analysis date (total particulate)		27-10-2023	

3 Sample Plane Compliance

3.1 EPA 4 – Unit 1, Duct B

Sampling Plane Details	
Source tested	Power plant - coal-fired
Pollution control equipment	Filter baghouse
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Conforming (alternative procedure)

3.2 EPA 5 – Unit 1, Duct A

Sampling Plane Details	
Source tested	Power plant - coal-fired
Pollution control equipment	Filter baghouse
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Conforming (alternative procedure)

3.3 EPA 6 – Unit 2, Duct A

Sampling Plane Details	
Source tested	Power plant - coal-fired
Pollution control equipment	Filter baghouse
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Conforming (alternative procedure)

3.4 EPA 7 – Unit 2, Duct B

Sampling Plane Details	
Source tested	Power plant - coal-fired
Pollution control equipment	Filter baghouse
Sampling plane dimensions	5460 x 6600 mm
Sampling plane area	36 m²
Sampling port size, number	6" Flange (x6)
Duct orientation & shape	Horizontal Rectangular
Downstream disturbance	Junction 0.5 D
Upstream disturbance	Damper 0.6 D
No. traverses & points sampled	6 42
Sample plane conformance to USEPA Method 1	Conforming (alternative procedure)

4 Test Methods

All sampling and analysis was performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling method	Analysis method	Uncertainty*	NATA accredited Sampling	NATA accredited Analysis
Sampling points - Selection	NSW EPA TM-1 (USEPA Method 1)	NA	NA	✓	NA
Flow rate, temperature & velocity	NSW EPA TM-2 (USEPA Method 2)	NSW EPA TM-2 (USEPA Method 2)	8%, 2%, 7%	NA	✓
Moisture content	NSW EPA TM-22 (USEPA Method 4)	NSW EPA TM-22 (USEPA Method 4)	8%	✓	✓
Molecular weight	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Dry gas density	NA	NSW EPA TM-23 (USEPA Method 3)	not specified	NA	✓
Combination of air impurities from two or more sources	NA	NSW EPA TM-38	not specified	NA	✓
Carbon dioxide	NSW EPA TM-24 (USEPA Method 3A)	NSW EPA TM-24 (USEPA Method 3A)	13%	✓	✓
Carbon monoxide	NSW EPA TM-32 (USEPA Method 10)	NSW EPA TM-32 (USEPA Method 10)	12%	✓	✓
Nitrogen oxides	NSW EPA TM-11 (USEPA Method 7E)	NSW EPA TM-11 (USEPA Method 7E)	12%	✓	✓
Oxygen	NSW EPA TM-25 (USEPA Method 3A)	NSW EPA TM-25 (USEPA Method 3A)	13%	✓	✓
Sulfur dioxide	NSW EPA TM-4 (USEPA Method 6C)	NSW EPA TM-4 (USEPA Method 6C)	12%	✓	✓
Speciated volatile organic compounds (VOCs)	NSW EPA TM-34[d] (USEPA Method 18)	Ektimo 344	19%	✓	✓[†]
Solid particles (total)	NSW EPA TM-15 (AS 4323.2)	NSW EPA TM-15 (AS 4323.2)	3%	✓	✓[††]
Sulfuric acid mist and/or sulfur trioxide	NSW EPA TM-3 (USEPA Method 8)	Ektimo 235	16%	✓	✓[†m]

270923

[*] Uncertainties cited in this table are estimated using typical values and are calculated at the 95% confidence level (coverage factor = 2).
[†] Analysis performed by Ektimo. Results were reported to Ektimo on:
31 October 2023 in report LV-005051.
8 November 2023 in report LV-005077.
[††] Gravimetric analysis conducted at the Ektimo NSW laboratory.
[d] Excludes recovery study as specified in section 8.4.3 of USEPA Test Method 18.
[m] Includes analysis of SO_3/H_2SO_4 by Ektimo 235 which uses the same principle as USEPA SW-846 Method 9056A which is an approved alternative to the analytical procedure of USEPA Method 8.

5 Deviations to Test Methods

TM-34 VOLATILE ORGANIC COMPOUNDS

Ektimo notes that the sampling and analysis of Volatile Organic Compounds (VOCs), per USEPA Method 18 has excluded the recovery study as specified in Section 8.4.3. Performing the recovery study described in Section 8.4.3 of USEPA Method 18 for analytes present at low levels is problematic. Given this, Ektimo applies a threshold of 50µg as a lower-bound mass, below which the 'spiking' of specific volatile organic compounds is not performed. For the purposes of this round of monitoring, the following compounds were present above the detection limit (0.1 µg) but were below 50µg (unless bolded). Therefore, recovery studies for the following analytes were not performed:

- Acetone (2.3 µg)

6 Plant Operating Conditions

See Energy Australia NSW Pty Ltd (Mt Piper) records for complete process conditions.

7 Quality Assurance/Quality Control Information

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APAC (Asia Pacific Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through mutual recognition arrangements with these organisations, NATA accreditation is recognised worldwide.

Unless specifically noted, all samples were collected and handled in accordance with Ektimo's QA/QC standards.

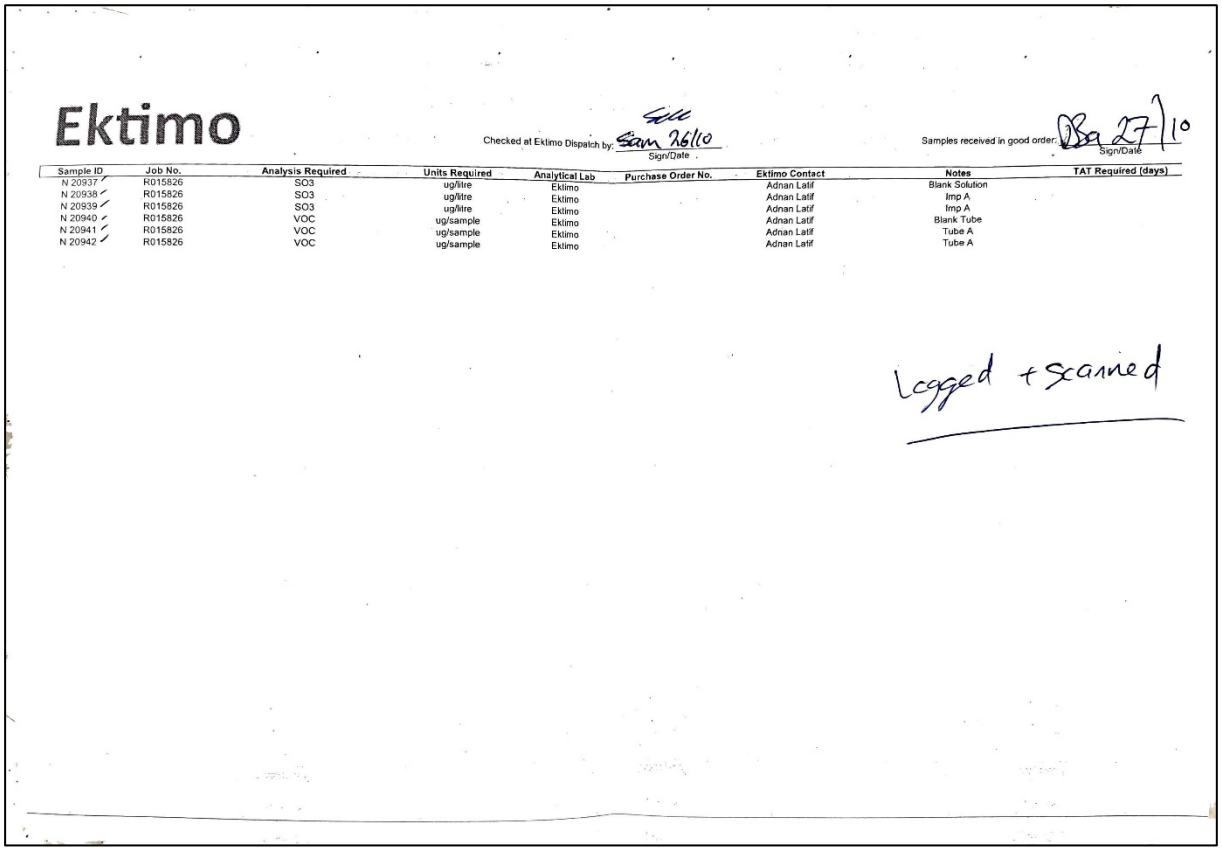
8 Definitions

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
APHA	American Public Health Association, Standard Methods for the Examination of Water and Waste Water
AS	Australian Standard
BaP-TEQ	Benzo(a)pyrene toxic equivalents
BSP	British standard pipe
CEM/CEMS	Continuous emission monitoring/Continuous emission monitoring system
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
D_{50}	'Cut size' of a cyclone is defined as the particle diameter at which the cyclone achieves a 50% collection efficiency i.e. half of the particles are retained by the cyclone and half pass through it. The D_{50} method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D_{50} of that cyclone and less than the D_{50} of the preceding cyclone.
DECC	Department of Environment & Climate Change (NSW)
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
DWER	Department of Water and Environmental Regulation (WA)
DEHP	Department of Environment and Heritage Protection (QLD)
EPA	Environment Protection Authority
FTIR	Fourier transform infra-red
ISC	Intersociety Committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
ITE	Individual threshold estimate
I-TEQ	International toxic equivalents
Lower bound	When an analyte is not present above the detection limit, the result is assumed to be equal to zero.
Medium bound	When an analyte is not present above the detection limit, the result is assumed to be equal to half of the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
OU	Odour unit. One OU is that concentration of odorant(s) at standard conditions that elicits a physiological response from a panel equivalent to that elicited by one Reference Odour Mass (ROM), evaporated in one cubic metre of neutral gas at standard conditions.
PM_{10}	Particulate matter having an equivalent aerodynamic diameter less than or equal to 10 microns (µm).
$PM_{2.5}$	Particulate matter having an equivalent aerodynamic diameter less than or equal to 2.5 microns (µm).
PSA	Particle size analysis. PSA provides a distribution of geometric diameters, for a given sample, determined using laser diffraction.
RATA	Relative accuracy test audit
Semi-quantified VOCs	Unknown VOCs (those for which an analytical standard is not available), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration is determined by matching the area of the peak with the nearest suitable compound in the analytical calibration standard mixture.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0 °C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa.
TM	Test method
TOC	Total organic carbon. This is the sum of all compounds of carbon which contain at least one carbon-to-carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
Velocity difference	The percentage difference between the average of initial flows and after flows.
Vic EPA	Victorian Environment Protection Authority
VOC	Volatile organic compound. A carbon-based chemical compound with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the given conditions of use. VOCs may contain oxygen, nitrogen and other elements. VOCs do not include carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
WHO05-TEQ	World Health Organisation toxic equivalents
XRD	X-ray diffractometry
Upper bound	When an analyte is not present above the detection limit, the result is assumed to be equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

9 Appendices

Appendix A: Chain(s) of Custody



Ektimo

Checked at Ektimo Dispatch by: Sam 26/10 Sign/Date

Samples received in good order: [signature] 27/10 Sign/Date

Sample ID	Job No.	Analysis Required	Units Required	Analytical Lab	Purchase Order No.	Ektimo Contact	Notes	TAT Required (days)
N 20937	R015826	SO3	ug/litre	Eklimo		Adnan Latif	Blank Solution	
N 20938	R015826	SO3	ug/litre	Eklimo		Adnan Latif	Imp A	
N 20939	R015826	SO3	ug/litre	Eklimo		Adnan Latif	Imp A	
N 20940	R015826	VOC	ug/sample	Eklimo		Adnan Latif	Blank Tube	
N 20941	R015826	VOC	ug/sample	Eklimo		Adnan Latif	Tube A	
N 20942	R015826	VOC	ug/sample	Eklimo		Adnan Latif	Tube A	

Logged + Scanned

Appendix B: Laboratory Results

Ektimo

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-005051
Job Number:	R015826
Date of Issue:	31/10/2023
Attention:	Energy Australia Mt Piper
Date samples received:	27/10/2023
Number of samples received:	3
Date samples analysed:	31/10/2023
No of samples analysed:	3
Test method(s) used:	Ektimo 344

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

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NATA is a member of APAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of these organisations, NATA accreditation is recognised world –wide.
A formal Quality Control program is in place at Ektimo to monitor analyses performed in the laboratory and sampling conducted in the field. The program is designed to check where appropriate; the sampling reproducibility, analytical method, accuracy, precision and the performance of the analyst. The Laboratory Manager is responsible for the administration and maintenance of this program.

REPORT AUTHORISATION

Version 230707

Matthew Cook
Laboratory Manager

Daniel Balaam
Senior Laboratory Chemist

NATA Accredited Laboratory 14601

Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports

Ektimo

Analytical Results

Report No. LV-005051

Job No. R015826

Client Name: Energy Australia Mt Piper

Parameter	Units	N20940 R015826	N20941 R015826	N20942 R015826
	PQL	1.0	1.0	1.0
Ethanol	µg	<1	<1	<1
Acetone	µg	<1	1.8	2.3
Isopropanol	µg	<1	<1	<1
Pentane	µg	<1	<1	<1
1,1-Dichloroethene	µg	<1	<1	<1
Acrylonitrile	µg	<1	<1	<1
Dichloromethane	µg	<1	<1	<1
trans-1,2-Dichloroethene	µg	<1	<1	<1
Methyl ethyl ketone	µg	<1	<1	<1
n-Hexane	µg	<1	<1	<1
cis-1,2-Dichloroethene	µg	<1	<1	<1
Ethyl acetate	µg	<1	<1	<1
Chloroform	µg	<1	<1	<1
1,1,1-Trichloroethane	µg	<1	<1	<1
1,2-Dichloroethane	µg	<1	<1	<1
Cyclohexane	µg	<1	<1	<1
Benzene	µg	<1	<1	<1
Carbon tetrachloride	µg	<1	<1	<1
Butanol	µg	<1	<1	<1
Isopropyl acetate	µg	<1	<1	<1
2-Methylhexane	µg	<1	<1	<1
2,3-Dimethylpentane	µg	<1	<1	<1
1-Methoxy-2-propanol	µg	<1	<1	<1
3-Methylhexane	µg	<1	<1	<1
Heptane	µg	<1	<1	<1
Ethyl acrylate	µg	<1	<1	<1
Trichloroethylene	µg	<1	<1	<1
Methyl methacrylate	µg	<1	<1	<1
Propyl acetate	µg	<1	<1	<1
Methylcyclohexane	µg	<1	<1	<1
Methyl Isobutyl Ketone	µg	<1	<1	<1
Toluene	µg	<1	<1	<1
1,1,2-Trichloroethane	µg	<1	<1	<1
2-Hexanone	µg	<1	<1	<1
Octane	µg	<1	<1	<1
Tetrachloroethene	µg	<1	<1	<1
Butyl acetate	µg	<1	<1	<1
Chlorobenzene	µg	<1	<1	<1
Ethylbenzene	µg	<1	<1	<1
m + p-Xylene	µg	<1	<1	<1
1-Methoxy-2-propyl acetate	µg	<1	<1	<1
Styrene	µg	<1	<1	<1
o-Xylene	µg	<1	<1	<1
Butyl acrylate	µg	<1	<1	<1
Nonane	µg	<1	<1	<1

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

Ektimo

Analytical Results

Report No. LV-005051

Job No. R015826

Client Name: Energy Australia Mt Piper

Parameter	Units	N20940 R015826	N20941 R015826	N20942 R015826
	PQL	1.0	1.0	1.0
2-Butoxyethanol	µg	<1	<1	<1
Cellosolve acetate	µg	<1	<1	<1
1,1,2,2-Tetrachloroethane	µg	<1	<1	<1
Isopropylbenzene	µg	<1	<1	<1
alpha-Pinene	µg	<1	<1	<1
Propylbenzene	µg	<1	<1	<1
1,3,5-Trimethylbenzene	µg	<1	<1	<1
beta-Pinene	µg	<1	<1	<1
tert-Butylbenzene	µg	<1	<1	<1
1,2,4-Trimethylbenzene	µg	<1	<1	<1
Decane	µg	<1	<1	<1
3-Carene	µg	<1	<1	<1
1,2,3-Trimethylbenzene	µg	<1	<1	<1
D-Limonene	µg	<1	<1	<1
Undecane	µg	<1	<1	<1
Dodecane	µg	<1	<1	<1
Tridecane	µg	<1	<1	<1
Tetradecane	µg	<1	<1	<1
Residuals as Toluene	µg	<1	<1	<1

* Results marked with an asterisk are outside the acceptable calibration range of the instrument.

Ektimo

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CERTIFICATE OF ANALYSIS

Testing Laboratory:	Ektimo 26 Redland Drive Mitcham, VIC 3132
Report Number:	LV-005077
Job Number:	R015826
Date of Issue:	08/11/2023
Attention:	EA Mt Piper
Date samples received:	27/10/2023
Number of samples received:	3
Date samples analysed:	03/11/2023
No of samples analysed:	3
Test method(s) used:	Ektimo 235

Comments

QC Acceptance Criteria:

Parameter	Criteria	Pass/Fail
Standard Curve	$R^2 > 0.99$	Pass
Range	All samples <110% of highest standard	Pass
Repeat samples	Between 80% - 120%	Pass
Method Blanks	All method blanks < PQL	Pass
QC sample	2 standard deviations of theoretical	Pass
Chemical Expiry	All chemicals within expiry date	Pass

This report supersedes any previous report(s) with this reference. Sample(s) have been analysed as received.

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REPORT AUTHORISATION

Version 230707

Cappi Tuffery
Laboratory Chemist

Daniel Balaam
Senior Laboratory Chemist

NATA Accredited Laboratory 14601

Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports

Ektimo

Analytical Results

Report No. LV-005077
Job No. R015826
Client Name: EA Mt Piper

Parameter	Analyte	Units	N 20937 EA Mt Piper All Locations Blank Solution (SO3)	N 20938 EA Mt Piper EPA 4 U1B Imp A	N 20939 EA Mt Piper EPA 6 U2A Imp A
Sample Volume		mL	123	132	138
Sulfur trioxide (SO_3)	SO_4^{2-}	mg/L	<0.2	51.49	15.35
PQL	<	mg/L	0.2	0.2	0.2

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APPENDIX B HRL ASSESSMENT OF JULY 2023 FLUE GAS METAL RESULTS

hrl : expertise in action

Assessment of July 2023 Elevated Flue Gas Metal Results Outlined in Ektimo Report R015163

Alex Blatchford 13 February 2024

1. Introduction

Ektimo conducted flue gas stack testing for metal analysis (Type 1 and 2 substances as well as copper and zinc) for both ducts per unit and for both units between the 4th and 7th July 2023 (with one test conducted per day). Extremely high concentrations of lead, copper, nickel and zinc were reported for the test conducted on 4th July 2023. Other tests also gave high concentrations.

HRL has conducted a review of the results.

2. Assessment of Results

The July 2023 results are presented in Table 1 below.

Table 1 : Stack Testing Results from July 2023

	U1 DA	U1 DB	U2 DA	U2 DB
Discharge Point	**5**	**4**	**6**	**7**
Date	**4/7/2023**	**5/7/2023**	**6/7/2023**	**7/7/2023**
	mg/m³ (Dry, STP, 7% O_2)	**mg/m³ (Dry, STP, 7% O_2)**	**mg/m³ (Dry, STP, 7% O_2)**	**mg/m³ (Dry, STP, 7% O_2)**
Antimony (Sb)	<0.003	<0.002	<0.002	<0.003
Arsenic (As)	<0.001	<0.0008	<0.001	<0.001
Beryllium (Be)	<0.0003	<0.0002	<0.0003	<0.0003
Cadmium (Cd)	0.00088	<0.0004	<0.0002	0.0003
Chromium (Cr)	0.0048	0.011	0.0034	0.0051
Cobalt (Co)	<0.0003	<0.0003	<0.0004	<0.0004
Copper (Cu)	1.8	0.025	0.021	0.0044
Lead (Pb)	0.16	0.019	0.0084	0.0067
Manganese (Mn)	0.0016	0.034	0.022	0.0067
Mercury (Hg)	0.0014	0.00068	0.0004	0.00038
Nickel (Ni)	0.061	0.0064	0.00069	0.011
Selenium (Se)	0.014	0.0084	0.0064	0.0067
Tin (Sn)	0.0096	0.0012	0.0022	0.0019
Vanadium (V)	<0.0005	<0.0005	<0.0006	<0.0006
Zinc (Zn)	1.2	0.0063	0.0029	0.027
Type 1 & 2 Total	<0.25	<0.085	<0.048	<0.043

Type 1 : As, Cd, Hg, Pb and Sb

Type 2 : Be, Cr, Co, Mn, Ni, Se, Sn and V.

Arsenic, Lead and Mercury are reportable under Load Based Licencing.

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Appendix A, Table 2 presents the maximum concentration for each analyte for the 24 stack tests conducted between 2019 and 2023 (excluding the test results for July 2023) with the maximum of the 4 tests conducted in July 2023.

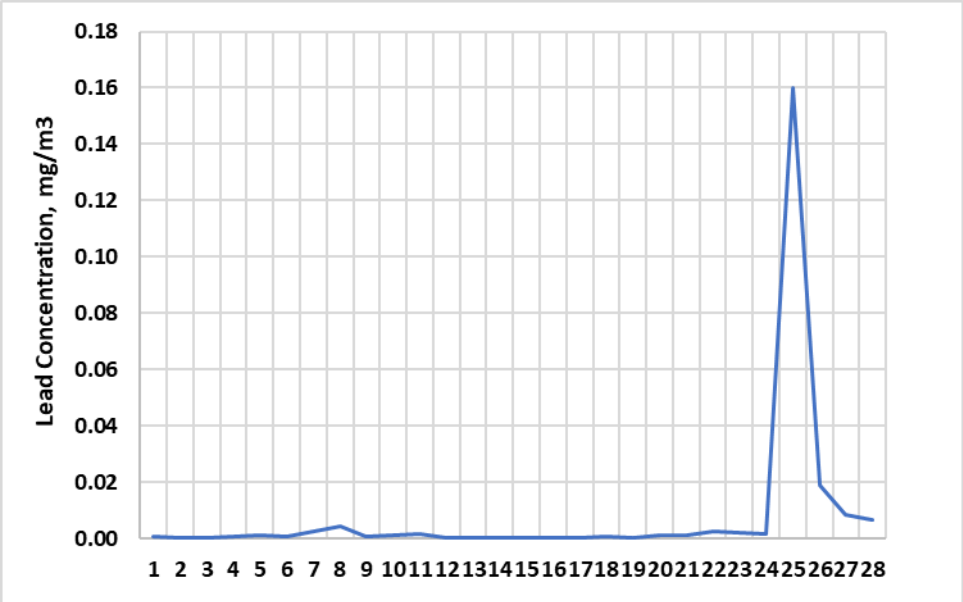
Appendix A, Table 3 presents the ranking of the test result for each analyte for the 4 tests conducted in July 2023 for the 28 stack tests conducted in this period (a value of 1 being the highest of all 28 tests, a value of 28 being the lowest).

2.1. Lead

The flue gas concentration results for lead for the 4 tests in July 2023 were the 1st, 2nd, 3rd and 4th highest results of all available 28 results from 2019 to 2023.

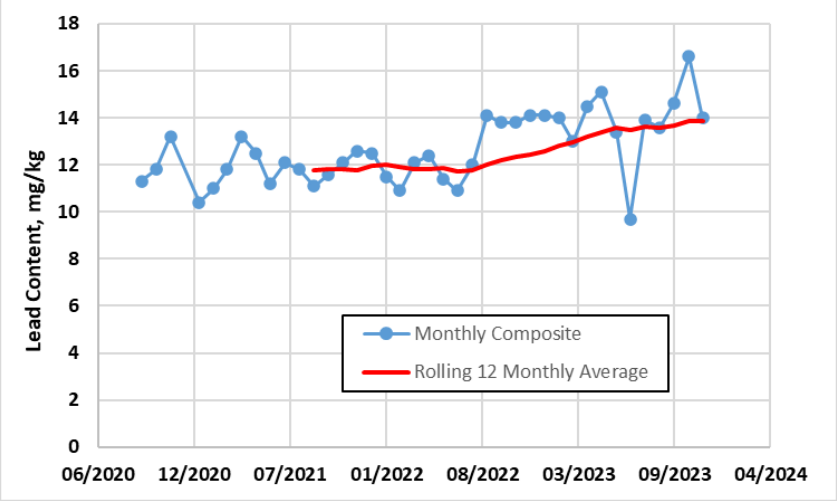
The lead concentration of the test on 4th July 2023 was 0.16 mg/m^3, which is 34 times higher than the highest between 2019 and 2023.

Figure 1 : Lead Concentration in Flue Gas from Stack Testing



Given the large increase in lead concentration in the stack gases, it can be expected that there be an increase in the lead concentration in the coal. However, there has only been a small upward trend of monthly average concentration from 12 mg/kg to 14 mg/kg. The lead concentration in July 2023 was 13.9 mg/kg, consistent with the concentration from August 2022 to November 2023.

Figure 2 : Lead Concentration in Coal



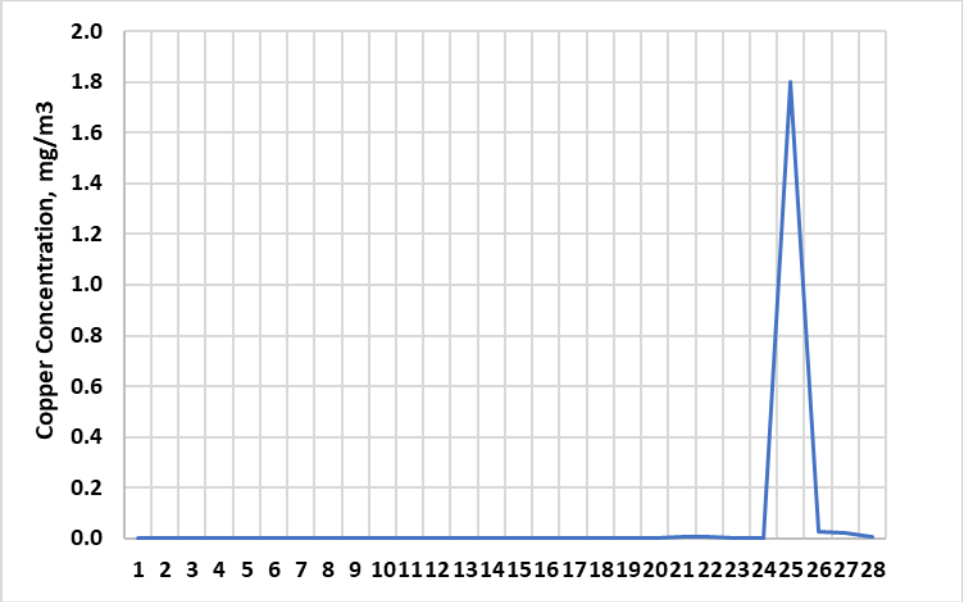
2.2. Copper

The flue gas concentration results for copper for the 4 tests in July 2023 were the 1st, 2nd, 3rd and 6th highest results of all available 28 results from 2019 to 2023.

The copper concentration of the test on 4th July 2023 was 1.8 mg/m^3, which is 209 times higher than the highest between 2019 and 2023.

Copper content in coal is not analysed.

Figure 3 : Copper Concentration in Flue Gas from Stack Testing

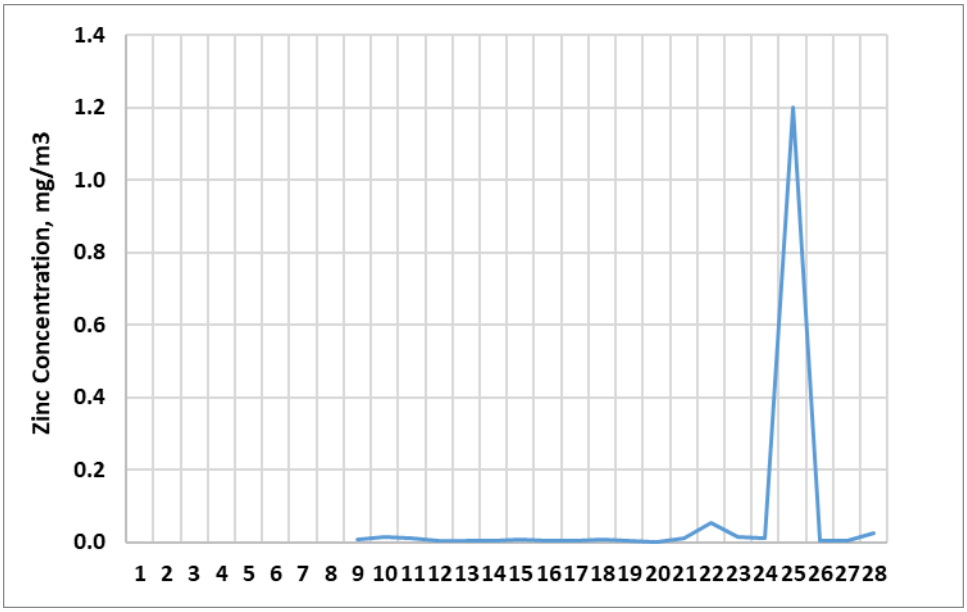


2.3. Zinc

The flue gas concentration results for zinc for the test on the 4th July 2023 was the highest result of all available 28 results from 2019 to 2023, namely 1.2 mg/m^3, which is 22.2 times higher than the highest between 2019 and 2023.

Zinc content in coal is not analysed.

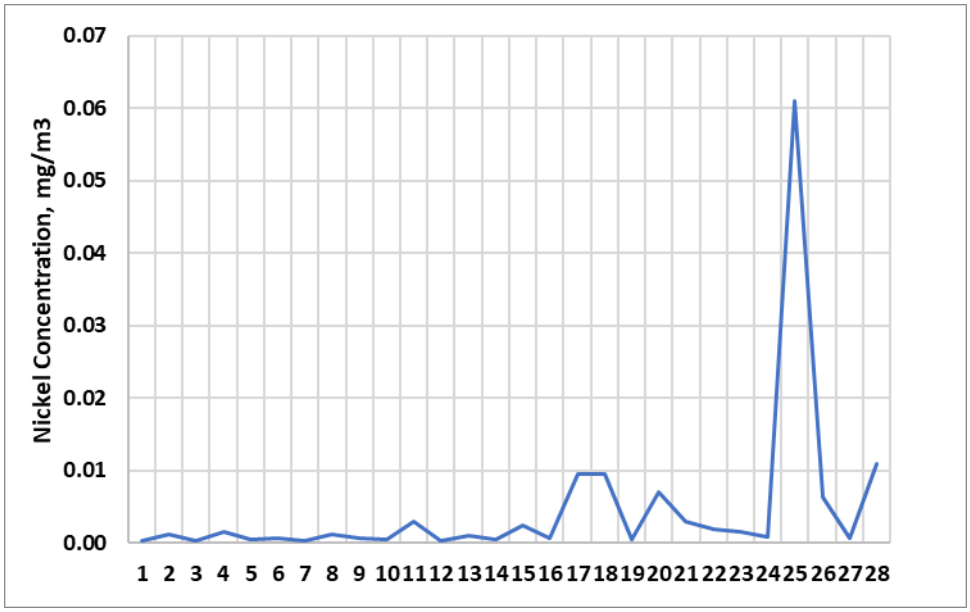
Figure 4 : Zinc Concentration in Flue Gas from Stack Testing



2.4. Nickel

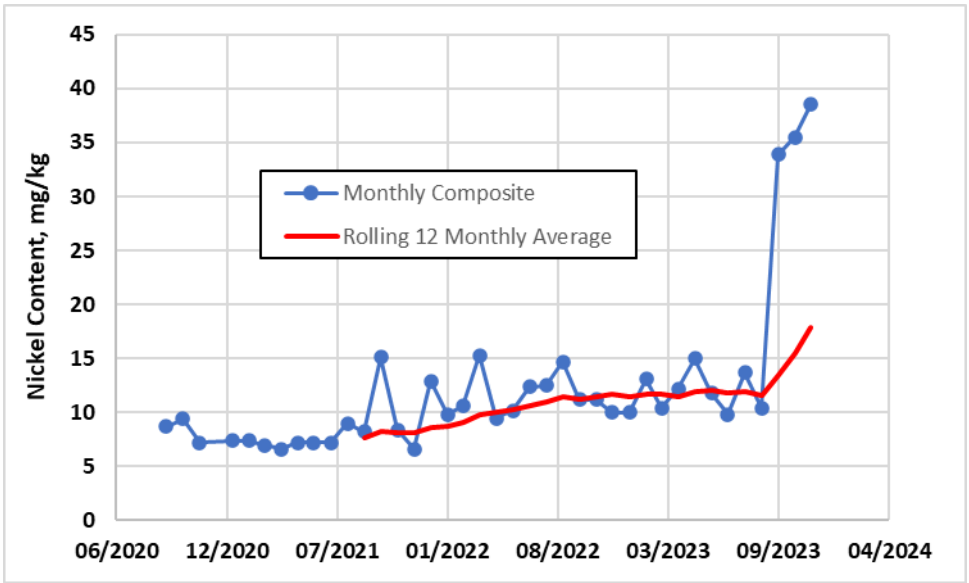
The flue gas concentration results for zinc for the test on the 4th July 2023 was the highest result of all available 28 results from 2019 to 2023, namely 0.061 mg/m^3, which is 6.35 times higher than the highest between 2019 and 2023.

Figure 5 : Nickel Concentration in Flue Gas from Stack Testing



Given the large increase in Nickel concentration in the flue gas, it can be expected that there be an increase in the Nickel content in the coal. Whilst there has been an increase in the monthly composite nickel content from ~ 12 to 35 mg/kg, this increase only occurred from September 2023. The value in July 2023 was consistent with the concentration for the previous 12 months.

Figure 6 : Nickel Concentration in Coal



3. Assessment of Results by Ektimo

EnergyAustralia requested that Ektimo complete an audit of the stack testing and laboratory analytical results.

An email from Ektimo dated the 9th February 2024 stated the following:

"We have reviewed these results, including site work, data entry and ensuing calculations and can confirm that we have found no errors or mistake in procedure.

Additionally please see below communications from Envirolab regarding QA/QC of the sample in question.

Envirolab have confirmed the results."

The email from Envirolab (who analysed the sample collected by Ektimo) stated:

"I have looked at the raw data in July 2023 for sample #2. The sample was prepped in duplicate and have been repeated twice for results confirmation at different dilution factors (5x and 50x). QA/QC of the initial and repeated analyses were all passed within the accepted criteria."

4. Coal Source and Quality

Coal was supplied from Springvale mine during the days of testing, which supplies the majority of the coal to Mt Piper Power Station. According to EA's Fuel Supply Coordinator there was nothing obvious or different with the coal supply from normal operations during the July 2023 testing period.

5. Conclusions and Recommendations

The metal results from stack testing from 4th to 7th July 2023 are clearly not consistent with previous results. A review of the stack testing and laboratory analysis procedures and results did not establish the cause of the abnormal results.

A likely explanation is that the sample collected by Ektimo was somehow contaminated. The cause of the contamination has not been able to be established. The contamination was at a peak with the first test, and reduced progressively through to the final test on the 7th July 2023.

It is my opinion that the results from all four tests conducted in July 2023 should not be relied upon for reporting of annual LBL emissions.

6. Appendix A

Table 2 presents the maximum concentration for each analyte for the 24 stack tests conducted between 2019 and 2023 (excluding the test results for July 2023) with the maximum of the 4 tests conducted in July 2023.

Table 2 : Maximum Concentration (2019 to 2023 Compared with July 2023 Results)

	Maximum Conc 2019 to 2023 Excluding July 23 Results	Maximum July 2023 Results	Ratio
Date			
	mg/m³ (Dry, STP, 7% O_2)	**mg/m³ (Dry, STP, 7% O_2)**	
Antimony (Sb)	0.00150	0.00150	1.00
Arsenic (As)	0.00050	0.00050	1.00
Beryllium (Be)	0.00020	0.00015	0.75
Cadmium (Cd)	0.00058	0.00088	1.52
Chromium (Cr)	0.00420	0.01100	2.62
Cobalt (Co)	0.00025	0.00020	0.80
Copper (Cu)	0.00860	1.80000	209
Lead (Pb)	0.00470	0.16000	34.0
Manganese (Mn)	0.01700	0.03400	2.00
Mercury (Hg)	0.00420	0.00140	0.33
Nickel (Ni)	0.00960	0.06100	6.35
Selenium (Se)	0.01200	0.01400	1.17
Tin (Sn)	0.00820	0.00960	1.17
Vanadium (V)	0.00089	0.00030	0.34
Zinc (Zn)	0.05400	1.20000	22.2
Type 1 & 2 Total	0.01900	0.12500	6.58

Table 3 presents the ranking of the tests result for each analyte for the 4 tests conducted in July 2023 for the 28 stack tests conducted in this period (a value of 1 being the highest of all 28 tests, a value of 28 being the lowest).

Table 3 : Ranking of July 2023 Results Compared with all 2019 to 2023 Results

	U1 DA	U1 DB	U2 DA	U2 DB
Discharge Point	**5**	**4**	**6**	**7**
Date	**4/7/2023**	**5/7/2023**	**6/7/2023**	**7/7/2023**
Antimony (Sb)	1	13	13	1
Arsenic (As)	1	27	1	1
Beryllium (Be)	3	25	3	3
Cadmium (Cd)	1	6	23	5
Chromium (Cr)	3	1	5	2
Cobalt (Co)	16	16	3	3
Copper (Cu)	1	2	3	6
Lead (Pb)	1	2	3	4
Manganese (Mn)	16	1	2	5
Mercury (Hg)	8	15	21	22
Nickel (Ni)	1	6	19	2
Selenium (Se)	1	6	8	7
Tin (Sn)	1	10	8	9
Vanadium (V)	21	21	10	10
Zinc (Zn)	1	12	19	3
Type 1 & 2 Total	1	2	3	4

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