![Eskom logo]

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Date:11 December 2023

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MAJUBA POWER STATION'S MONTHLY EMISSIONS REPORT FOR THE MONTH OF NOVEMBER 2023

This serves as the monthly report required in terms of Majuba Power Station's Atmospheric Emission License (MPS/0014/2019/F03) under section 7 routine reporting and record keeping. The emissions are for the month of November 2023. Verified emissions of particulates are included. SO_2 and NOx (as NO_2) emissions are included for all units. Greenhouse gasses are excluded as per the agreement reached between Eskom and the Department of Environmental, Forestry and Fisheries in the first quarter of 2017/18 financial year's MINTEC and MINMEC management meeting.

Raw Materials and Products

Table 1. Quantity of Raw Materials and Products used/produced for the month of November 2023

Raw Materials and Products used	Raw Material Type	Unit	Maximum Permitted Consumption/ Rate (Quantity)	Consumption/ Rate in Month of November 2023
	Coal	Tons/month	1 800 000	931 683
	Fuel Oil	Tons/month	6 000	10 972.8
Production Rates	**Product/ By-Product Name**	**Unit**	**Maximum Production Rate Permitted (Quantity)**	**Production Rate in Month of November 2023**
	Energy	*GWh	*3 058	1 553.53
	Ash	Tons/month	Not stated in the license	279 318.41

*Majuba AEL stipulates a maximum production capacity of 4110 MW. This equates to a production rate of 3058 GWh per month when converted, as indicated above. This is to align to the monthly production rates reported.

Abatement Technology
Table 2. Abatement Equipment Control Technology for the month of November 2023

Associated Unit	Technology Type	Actual Utilisation (%) for the month of November 2023	*Minimum Control Efficiency (%)
Unit 1	Fabric Filter Plant	100	99.94
Unit 2	Fabric Filter Plant	100	99.89
Unit 3	Fabric Filter Plant	100	99.92
Unit 4	Fabric Filter Plant	100	99.97
Unit 5	Fabric Filter Plant	100	99.79

| Unit 6 | Fabric Filter Plant | 100 | 99.89 |

*Calculated from the assumption of 90% fly ash to 10% bottom ash and percentage ash as measured in coal.

Energy Source Characteristics

Table 3. Energy Source Material Characteristics for the month of November 2023

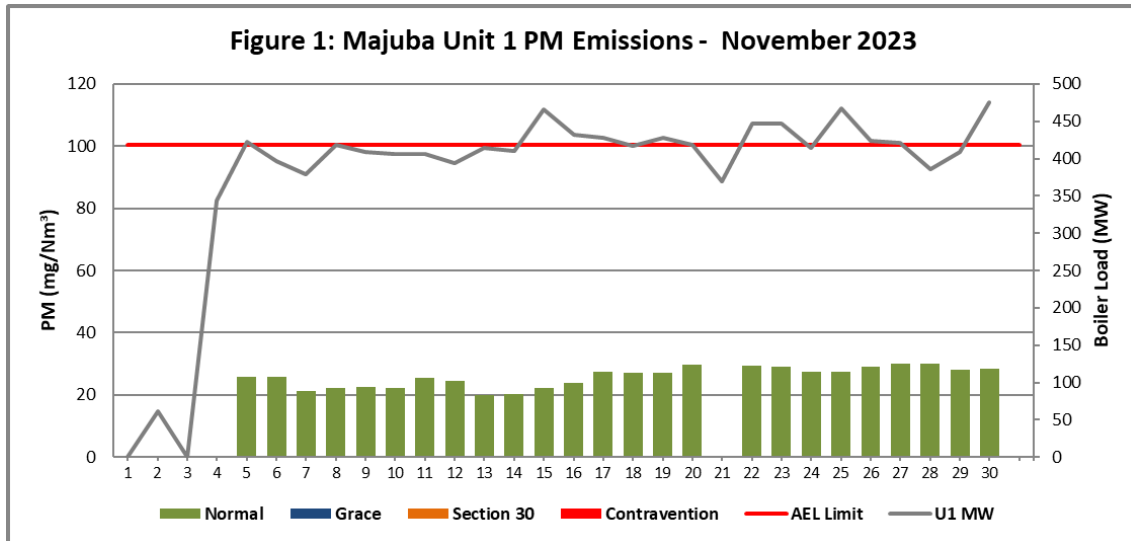| Characteristic	Stipulated Limit (Unit)	Monthly Average Content
Sulphur Content	0.94%	0.65
Ash Content	30%	29.98

Emissions Reporting

Figure 1. Particulate Matter emissions (daily averages) for the month of November 2023 against emission limit for Unit 1.
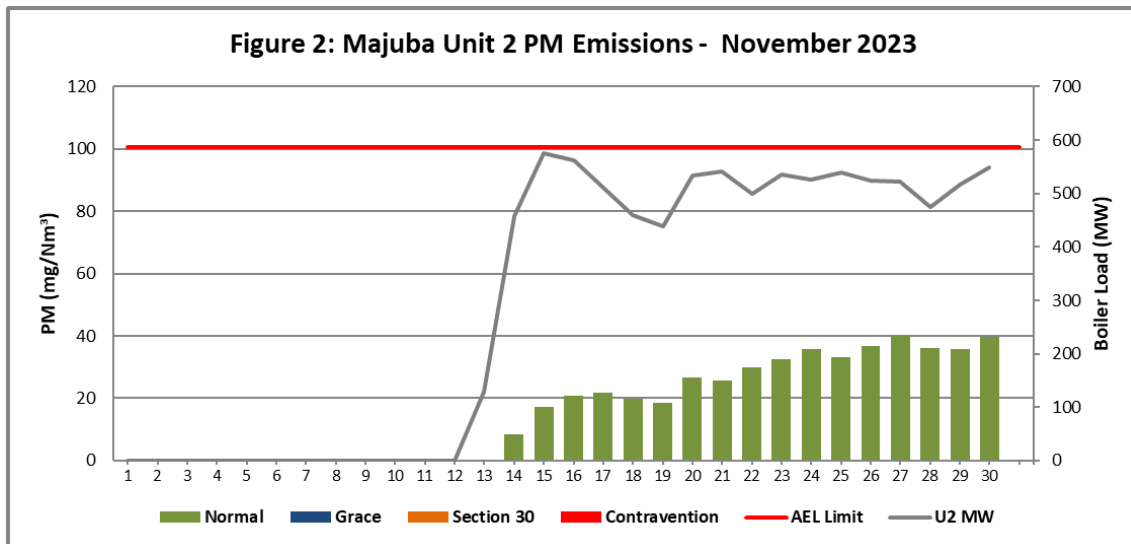

Figure 2. Particulate Matter emissions (daily averages) for the month of November 2023 against emission limit for Unit 2.
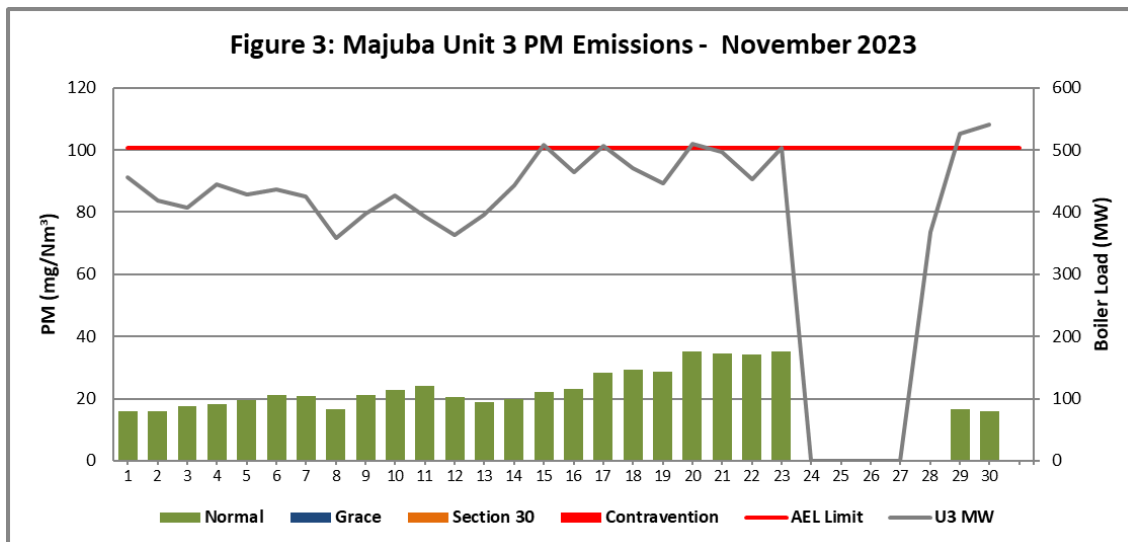
Figure 3. Particulate Matter emissions (daily averages) for the month of November 2023 against emission limit for Unit 3.
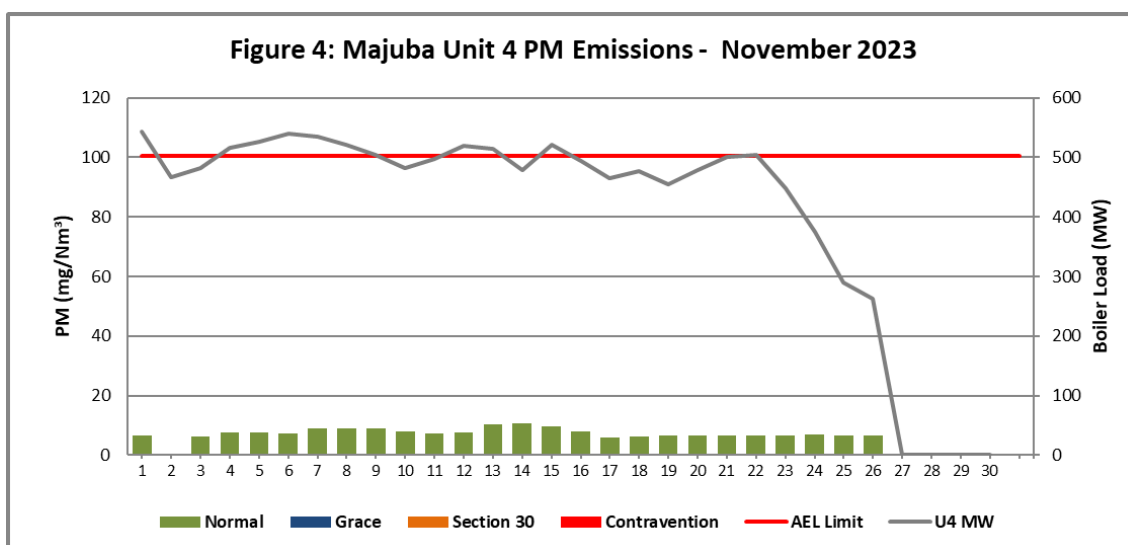

Figure 4. Particulate Matter emissions (daily averages) for the month of November 2023 against emission limit for Unit 4.
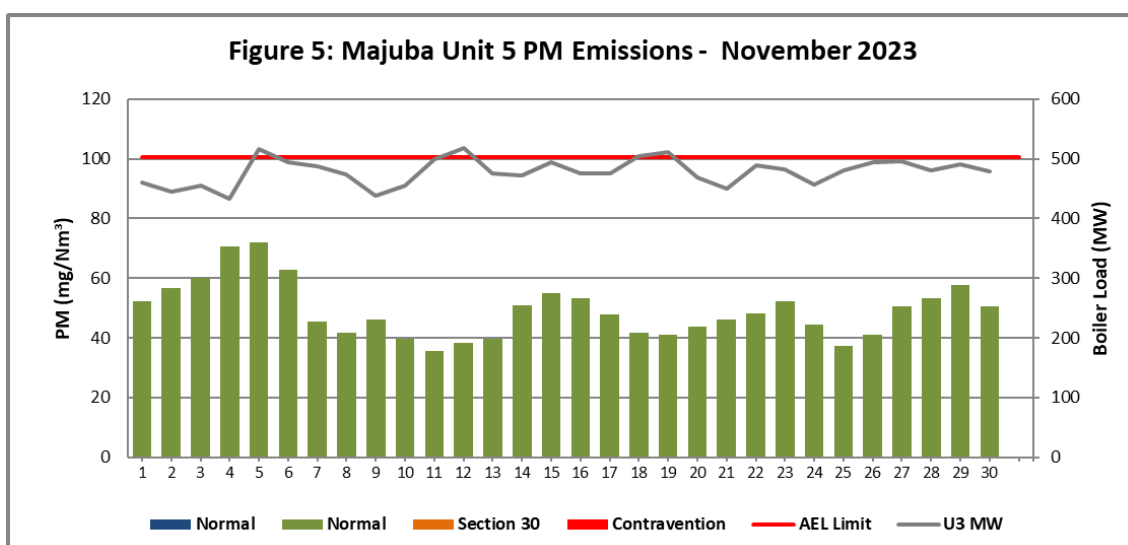

Figure 5. Particulate Matter emissions (daily averages) for the month of November 2023 against emission limit for Unit 5.

Figure 6. Particulate Matter emissions (daily averages) for the month of November 2023 against emission limit for Unit 6.
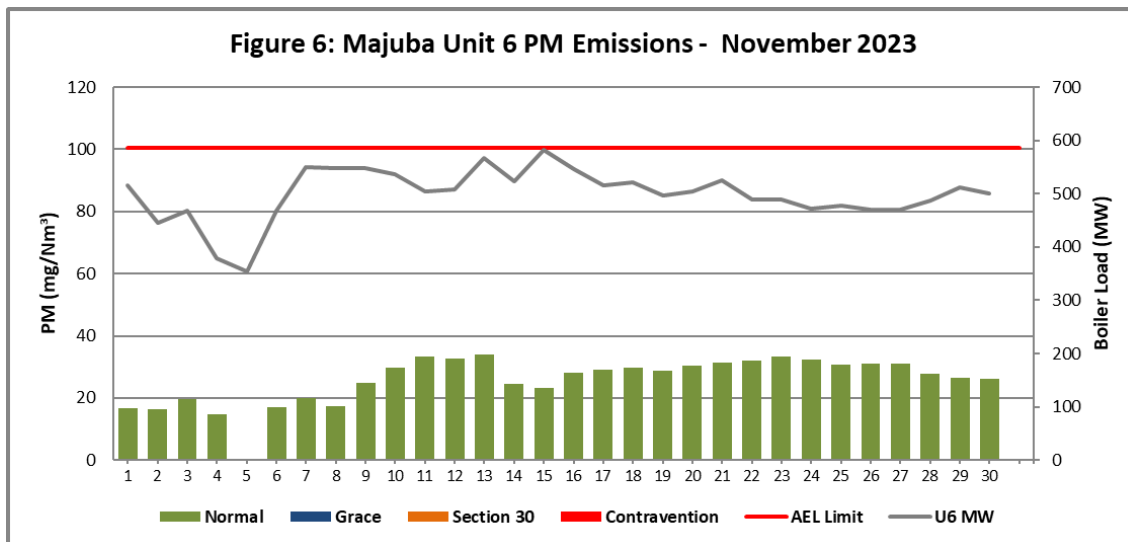

Figure 7. SO$_2$ emissions (daily averages) for the month of November 2023 against emission limit for Unit 1.

Figure 8. SO$_2$ emissions (daily averages) for the month of November 2023 against emission limit for Unit 2.
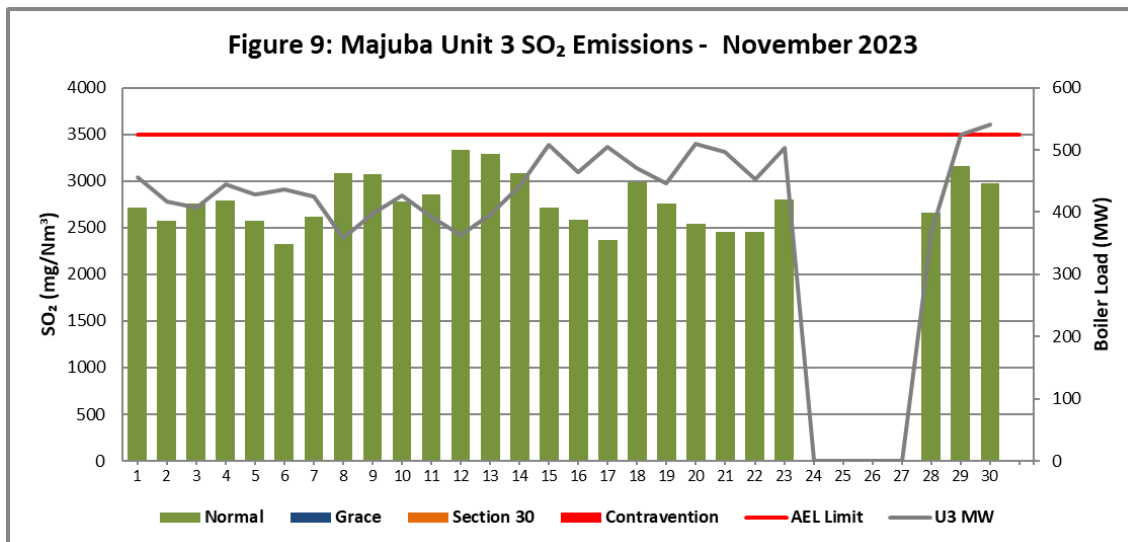
Figure 9. SO₂ emissions (daily averages) for the month of November 2023 against emission limit for Unit 3.
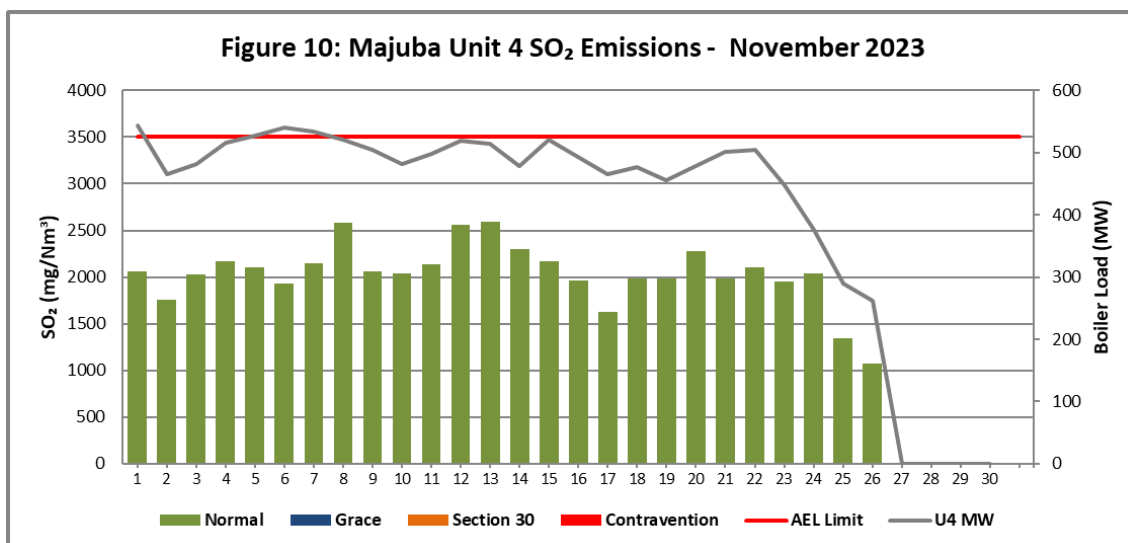
Figure 10. SO₂ emissions (daily averages) for the month of November 2023 against emission limit for Unit 4.
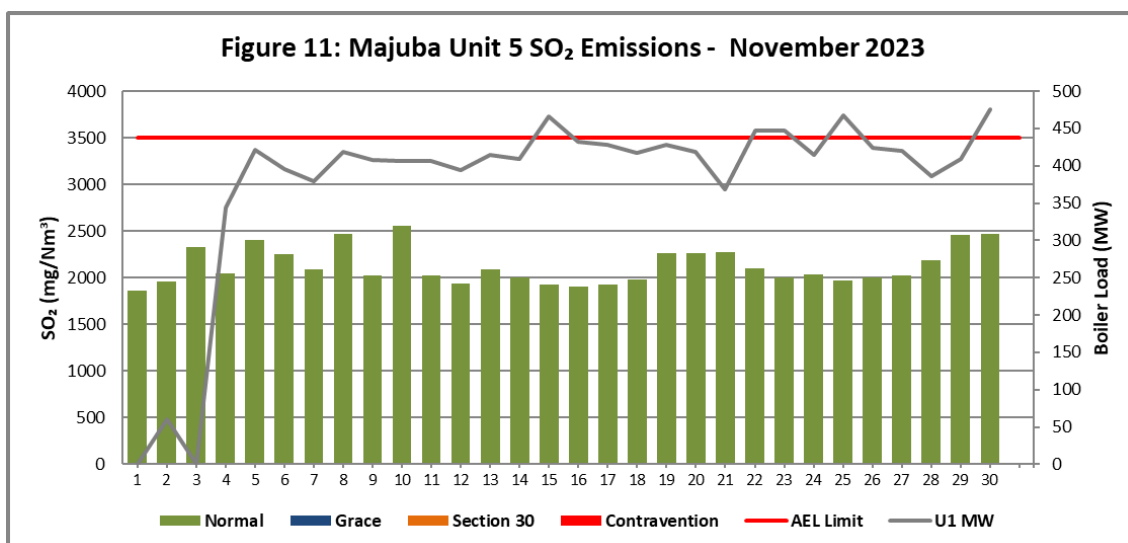
Figure 11. SO₂ emissions (daily averages) for the month of November 2023 against emission limit for Unit 5
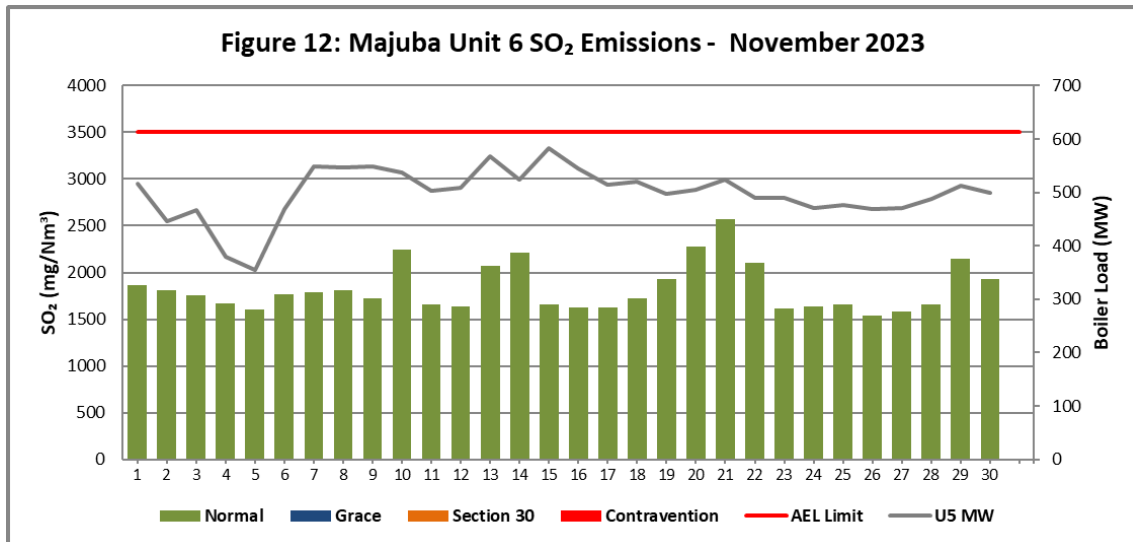
Figure 12. SO₂ emissions (daily averages) for the month of November 2023 against emission limit for Unit 6.
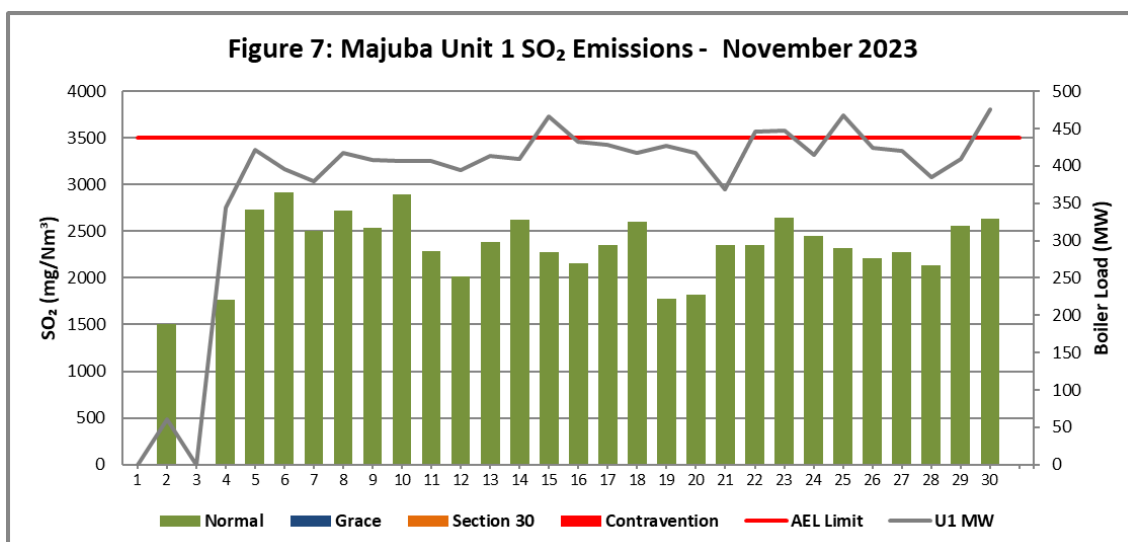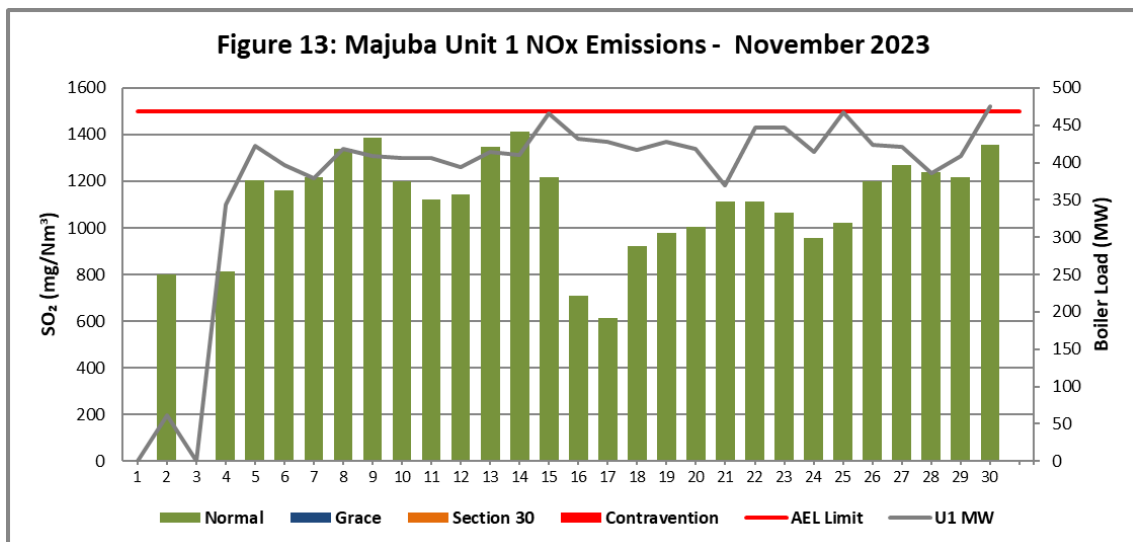

Figure 13. NOx emissions (daily averages) for the month of November 2023 against emission limit for Unit 1.
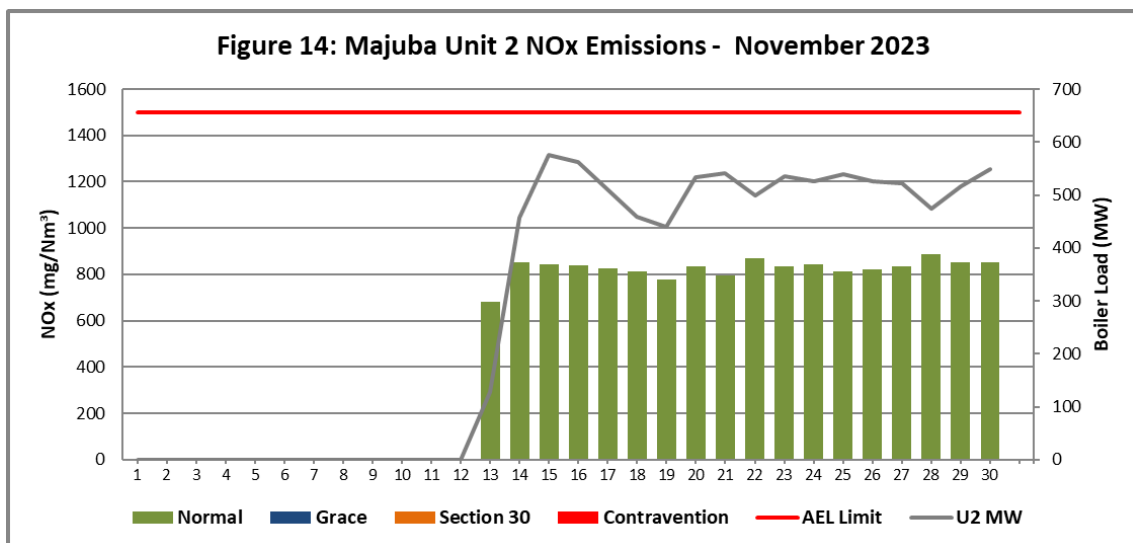
Figure 14. NOx emissions (daily averages) for the month of November 2023 against emission limit for Unit 2.
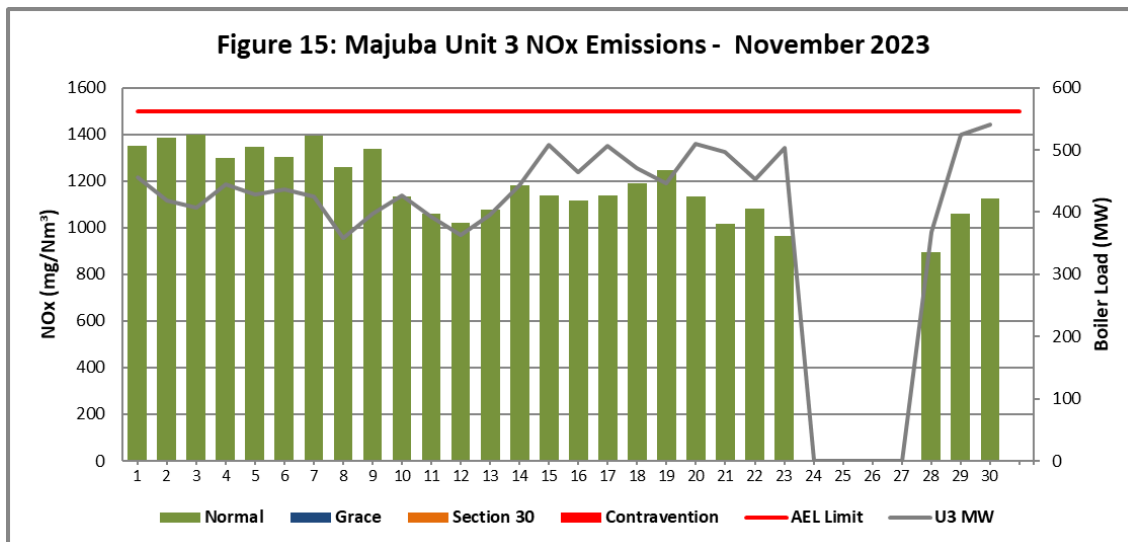
Figure 15. NOx emissions (daily averages) for the month of November 2023 against emission limit for Unit 3.
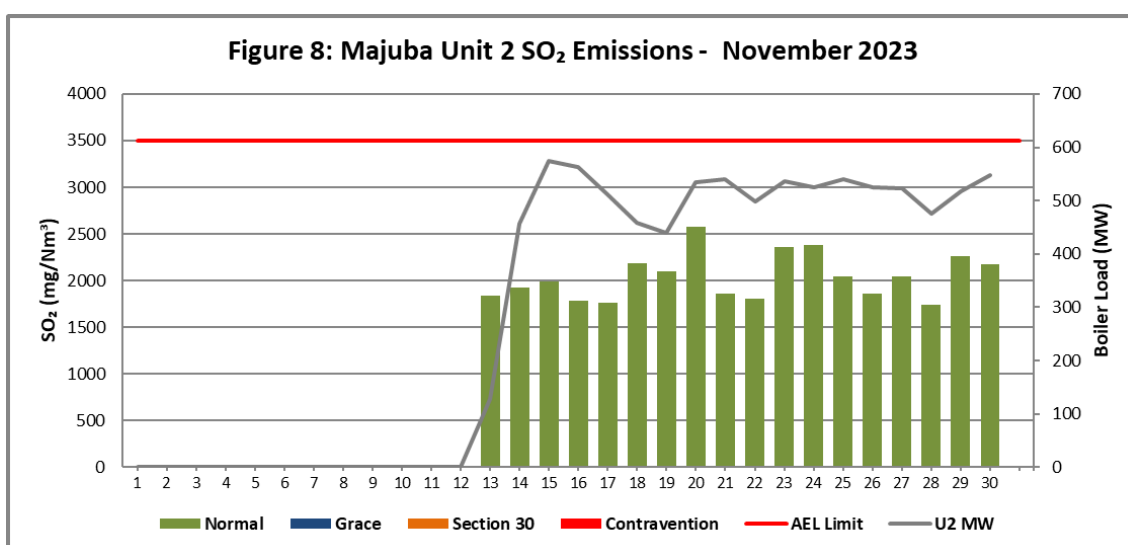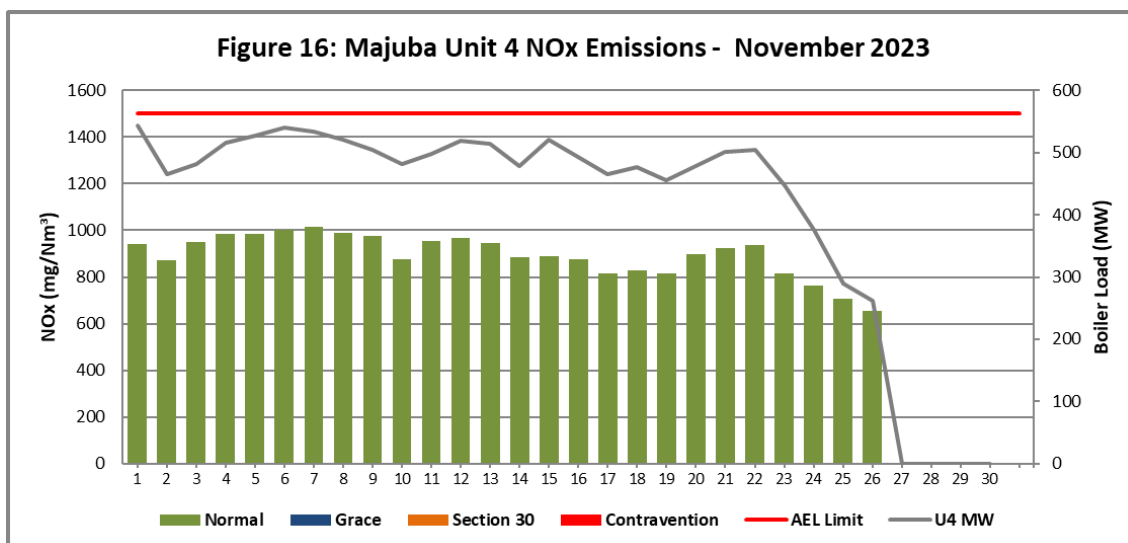

Figure 16. NOx emissions (daily averages) for the month of November 2023 against emission limit for Unit 4
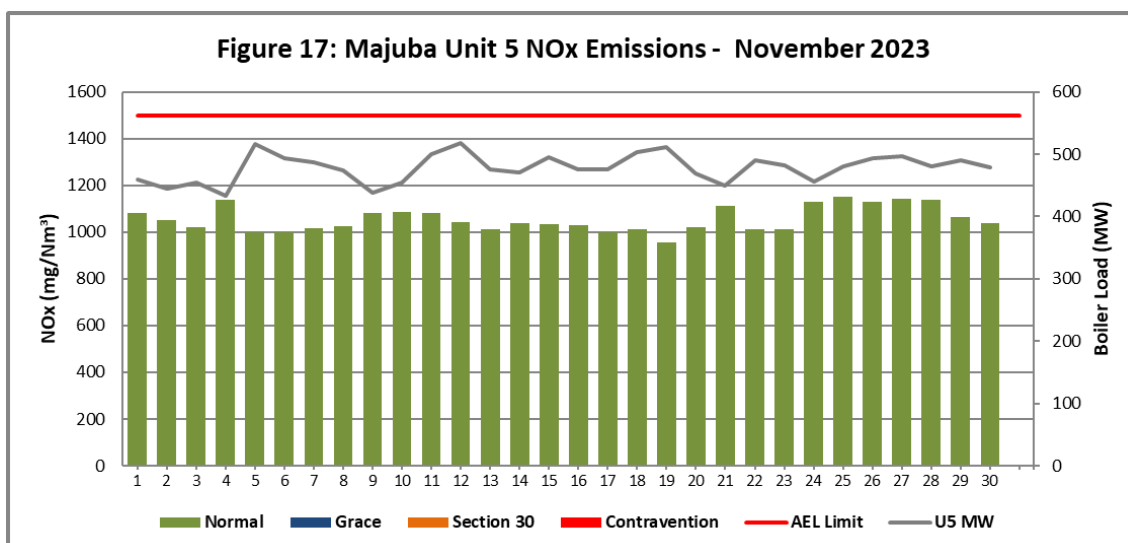
Figure 17. NOx emissions (daily averages) for the month of November 2023 against emission limit for Unit 5
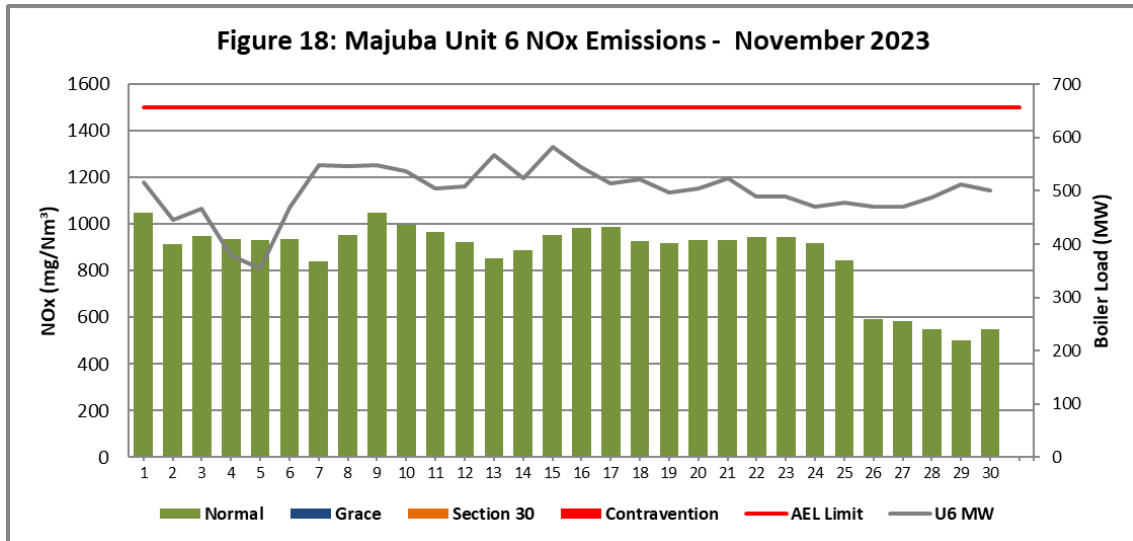
Figure 18. NOx emissions (daily averages) for the month November 2023 against emission limit for Unit 6

Table 4: Monthly tonnages for the month of November 2023

Unit	PM (tons)	SO$_2$ (tons)	NOx (tons)
Unit 1	25.4	2 664	1 242
Unit 2	34.4	2 551	1 038
Unit 3	32.8	4 300	1 831
Unit 4	12.1	3 861	1 691
Unit 5	99.1	4 285	2 124
Unit 6	54.9	4 067	1 930

Table 5: Average monthly concentrations (mg/Nm^3) for the month of November 2023

Unit	PM (Mg/Nm³)	SO$_2$ (Mg/Nm³)	NOx (Mg/Nm³)
1	26.1	2 351.0	1 112.1
2	28.3	2 038.3	826.7
3	22.9	2 782.0	1 178.9
4	7.5	2 037.7	894.8
5	49.2	2 127.5	1 055.1
6	27.3	1 830.3	875.1

Table 6: Each unit and respective days operating in compliance to the AEL Emission Limits (SO$_2$, NOx, and PM)

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance
Unit 1	25	0	0	0	0
Unit 2	17	0	0	0	0
Unit 3	25	0	0	0	0
Unit 4	25	0	0	0	0
Unit 5	30	0	0	0	0
Unit 6	29	0	0	0	0

Table 7: MONITOR RELIABILITY (%)

Associated Unit/Stack	PM	SO₂	NO	O₂
Unit 1	89.0	83.3	91.6	93.4
Unit 2	99.2	99.2	99.2	99.2
Unit 3	99.9	100.0	100.0	99.5
Unit 4	100.0	99.4	100.0	0.0
Unit 5	100.0	100.0	100.0	100.0
Unit 6	99.9	98.9	98.9	99.8

Table 8: CO₂ and O₂ deviations of the Month of November 2023

*Blank spaces indicate that the unit was offline during that period

CO₂ and O₂ Relationship

Date (2023/12/05)	CO₂ (Actual Dry %)						Final O₂ CEMS Data (%)						SUM CO₂ + O₂ CEMS Data (%)					
	U1	U2	U3	U4	U5	U6	U1	U2	U3	U4	U5	U6	U1	U2	U3	U4	U5	U6
2023/11/01			8.4	9.2	9.4	10.1			12.4	11.0	11.4	10.2			20.8	20.2	20.8	20.3
2023/11/02	8.6		8.0	8.4	9.3	9.1	12.1		12.7	11.0	11.4	11.3	20.8		20.7	19.4	20.6	20.4
2023/11/03			7.7	8.7	9.3	9.4			13.1	11.0	11.3	10.8			20.8	19.7	20.6	20.3
2023/11/04	8.8		8.4	9.3	9.4	8.3	10.9		12.1	11.0	11.3	12.1	19.7		20.5	20.3	20.6	20.4
2023/11/05	8.7		8.1	9.6	10.4	9.3	12.4		12.4	11.0	10.0	10.9	21.1		20.6	20.5	20.4	20.2
2023/11/06	8.7		8.2	9.6	10.3	10.3	13.3		12.3	11.0	10.2	10.1	22.0		20.5	20.6	20.6	20.4
2023/11/07	8.7		7.9	9.5	10.3	11.7	12.9		12.5	11.0	10.3	8.6	21.6		20.5	20.5	20.5	20.3
2023/11/08	8.7		7.2	9.5	9.9	11.2	12.9		13.2	11.0	10.7	9.2	21.6		20.5	20.4	20.6	20.4
2023/11/09	8.6		7.7	9.5	9.6	11.2	13.3		12.8	11.0	11.1	9.1	22.0		20.5	20.4	20.8	20.3
2023/11/10	8.7		8.4	9.5	9.4	10.9	12.5		12.3	11.0	11.5	9.5	21.1		20.6	20.4	20.9	20.4
2023/11/11	8.7		8.1	9.6	9.9	11.1	11.4		12.5	11.0	10.9	9.4	20.0		20.6	20.6	20.7	20.5
2023/11/12	8.7		7.8	9.5	10.3	11.4	11.6		12.6	11.0	10.3	9.0	20.3		20.4	20.5	20.6	20.4
2023/11/13	8.7	6.6	8.2	9.3	9.8	11.9	13.1	13.1	12.3	11.0	10.9	8.7	21.7	19.7	20.5	20.3	20.7	20.6
2023/11/14	8.7	8.2	8.7	9.1	10.1	11.3	13.5	10.4	12.0	11.0	10.4	9.4	22.2	18.6	20.7	20.0	20.5	20.7
2023/11/15	8.7	9.5	9.3	9.4	10.2	11.9	11.9	9.6	11.2	11.0	10.3	8.9	20.6	19.2	20.5	20.3	20.4	20.8
2023/11/16	8.7	9.5	9.3	9.5	10.0	11.7	12.0	9.7	11.2	11.0	10.4	9.1	20.7	19.2	20.4	20.4	20.5	20.8
2023/11/17	8.7	8.9	9.5	9.5	9.8	11.5	11.6	10.5	10.8	11.0	10.7	9.2	20.2	19.4	20.4	20.4	20.4	20.7
2023/11/18	8.7	8.3	9.0	9.6	10.1	11.6	11.9	11.0	11.6	11.0	10.2	9.0	20.6	19.3	20.7	20.5	20.3	20.7
2023/11/19	8.8	8.1	8.9	9.4	10.2	11.1	11.4	11.1	11.8	11.0	10.1	9.6	20.2	19.2	20.7	20.4	20.3	20.8
2023/11/20	8.8	9.2	9.7	9.5	9.6	11.3	12.1	9.9	10.9	11.0	11.0	9.4	20.9	19.2	20.5	20.5	20.5	20.7
2023/11/21	8.7	9.3	9.6	9.5	9.4	11.5	10.8	9.8	10.9	11.0	11.4	9.1	19.6	19.2	20.5	20.5	20.7	20.6
2023/11/22	8.6	8.9	9.2	9.6	9.9	11.1	11.8	10.5	11.5	11.0	10.6	9.5	20.5	19.3	20.7	20.5	20.5	20.6
2023/11/23	8.7	9.4	9.5	9.4	9.9	10.9	12.1	9.8	11.0	11.0	10.7	9.9	20.7	19.2	20.5	20.3	20.6	20.8
2023/11/24	8.8	9.3		9.6	9.4	11.1	11.8	10.0		11.0	11.1	9.8	20.5	19.4		20.5	20.5	20.9
2023/11/25	8.7	9.4		9.7	9.7	11.0	11.4	9.9		11.0	10.7	10.2	20.1	19.3		20.7	20.4	21.2
2023/11/26	8.7	9.5		9.7	9.9	10.7	12.1	10.0		11.0	10.6	10.3	20.9	19.4		20.6	20.5	21.0
2023/11/27	8.7	9.5			9.8	11.3	12.5	9.9			10.8	9.8	21.2	19.4			20.6	21.2
2023/11/28	8.7	8.7	8.0		9.8	11.7	13.3	10.9	11.9		10.9	9.6	22.0	19.7	20.0		20.6	21.2
2023/11/29	8.8	8.9	9.3		9.7	12.0	12.2	10.5	11.2		11.0	9.2	20.9	19.4	20.5		20.7	21.2
2023/11/30	8.7	9.3	9.7		9.7	11.9	12.2	10.1	11.0		11.0	9.2	20.9	19.4	20.7		20.7	21.1

Calculation: CO₂% + O₂% = 19.5-21.5%

Emergency Generation
Table 9: Emergency Generation for the month of November 2023

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Emergency Generation hours declared by national Control	0	0	0	0	0	0

Emergency Hours declared including hours after stand down	0	0	0	0	0	0
Hours over the Limit during Emergency Generation	0	0	0	0	0	0

Comments on the performance and availability of each unit

UNIT 1

The unit base loaded for most of the days during the month and off for two days. Seven fabric filter bags were replaced during the month.

UNIT 2

The unit base loaded for most of the days during the month and off for thirteen days. Forty fabric filter bags were replaced during the month.

UNIT 3

The unit base loaded for most of the days during the month and off for four days. Twenty-six fabric filter bags were replaced during the month.

UNIT 4

The unit base loaded for most of the days during the month and off for four days. Ten fabric filter bags were replaced during the month.

UNIT 5

The unit base loaded for all of the days during the month. Twenty-nine fabric filter bags were replaced during the month.

UNIT 6

The unit base loaded for all of the days during the month. No fabric filter bags were replaced during the month.

Complaints Register

Table 10: Complaints for the month of November 2023

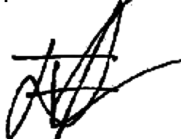| Source Code/ Name	Root Cause Analysis	Calculation of Impacts/ emissions associated with the incident	Dispersion modelling of pollutants where applicable	Measures implemented to prevent reoccurrence	Date by which measure will be implemented
	No complaints were received during the month of November 2023.				

General

Fuel oil consumption for the month of November 2023 exceeded the AEL limit of 6000 tons and the station will send an updated action addressing the high fuel oil consumption.

The investigations for the exceedances reported in March, May, June, and September have not been finalized because of parallel tests that needed to be carried out to identify the root cause. The stack lifts have been brought back to service and parallel tests on Unit 3 will be prioritized to complete the investigation. The O2 monitor at Unit 4 is faulty, the Original Equipment Manufacturer (OEM) has been called to site and they will be repairing the faulty monitor.

Yours sincerely

Report compiled by:

Faith Kagoda   Date 11/12/2023
ENVIRONMENTAL MANAGER: (MAJUBA)

Report verified by:

Lindani Madonsela   Date 11/12/2023
BOILER ENGINEERING MANAGER: (MAJUBA)

Report approved by:

                                                              2023/12/11
Johan Swanepoel   Date
ENGINEERING MANAGER: (MAJUBA)