Eskom

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Date:
06 September 2023

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Dear Ms. Nompumelelo Simelane

Ref: Kendal Power Station AEL (17/4/AEL/MP312/11/15)

KENDAL POWER STATION'S EMISSIONS REPORT FOR THE MONTH OF APRIL 2023.

This is a monthly report required in terms of Section 7.4 in the Kendal Power Station's Atmospheric Emission License. The emissions are for Eskom Kendal Power Station.

Compiled by:

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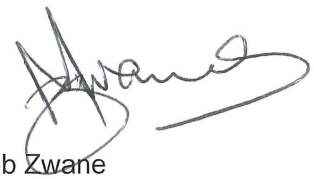
KENDAL POWER STATION'S EMISSIONS REPORT FOR THE MONTH OF APRIL 2023

Verified by:



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Eskom

APRIL 2023

KENDAL POWER STATION MONTHLY EMISSIONS REPORT

Atmospheric Emission License 17/4/AEL/MP312/11/15

1 RAW MATERIALS AND PRODUCTS

Raw Materials and Products	Raw Material Type	Units	Maximum Permitted Consumption Rate	Consumption Rate Apr-2023
	Coal	Tons	*2 260 000*	*622.506*
	Fuel Oil	Tons	*5 000*	*10013.39*
Production Rates	Product / By-Product Name	Units	Maximum Production Capacity Permitted	Production Rate Apr-2023
	Energy	GWh(MW)	*(3.153,600)4380*	*1 121 431.00*
	Ash	Tons	*770 000*	*211 278.5*
	RE Ash	kg/MWh	*not specified*	*3.490*

2 ENERGY SOURCE CHARACTERISTICS

Coal Characteristic	Units	Stipulated Range	Monthly Average Content
Sulphur Content	%	*<1 (%)*	*0.830*
Ash Content	%	*40 (%)*	*33.940*

3 EMISSION LIMITS (mg/Nm³)

Associated Unit/Stack	PM	SO_2	NOx
Unit 1	*100*	*3500*	*1100*
Unit 2	*100*	*3500*	*1100*
Unit 3	*100*	*3500*	*1100*
Unit 4	*100*	*3500*	*1100*
Unit 5	*100*	*3500*	*1100*
Unit 6	*100*	*3500*	*1100*

4 ABATEMENT TECHNOLOGY (%)

Associated Unit/Stack	Technology Type	Efficiency Apr-2023	Technology Type	SO_3 Utlization Apr-2023
Unit 1	$ESP + SO_3$	97.948%	SO_3	88.9%
Unit 2	$ESP + SO_3$	97.535%	SO_3	69.9%
Unit 3	$ESP + SO_3$	98.522%	SO_3	0.0%
Unit 4	$ESP + SO_3$	Off-line	SO_3	Off-line
Unit 5	$ESP + SO_3$	97.643%	SO_3	51.1%
Unit 6	$ESP + SO_3$	99.566%	SO_3	64.8%

SO3 plant for Unit 3 was in service and was injecting as required however the station was unable to archive the information to our PI system. It is the failure of the stations very old and obsolete windows 97 SCADA system which the station is looking to replace during the next GO outage on unit 3.

***Note**: ESP plant does not have bypass mode operation, hence plant 100% Utilised.*

SO3 plant off due to low converter cooling temperature low, SO3 shut down for repairs, Sulphur plant unavailable due to steam supply being isolated.SO3 on hold mode due to burner outlet Temp high, So3 plant tripped to off mode - Processes blower motor not running

5 MONITOR RELIABILITY (%)

Associated Unit/Stack	PM	SO_2	NO	O_2
Unit 1	68.3	74.8	0.0	0.0
Unit 2	52.2	100.0	100.0	0.0
Unit 3	67.5	32.1	36.4	29.2
Unit 4	Off-line	Off-line	Off-line	Off-line
Unit 5	100.0	100.0	98.7	100.0
Unit 6	52.4	93.1	94.3	96.7

Note: NOx emissions is measured as NO in PPM. Final NOx value is expressed as total NO_2

Note: Unit 1, 2 and 3 dust monitors realiability is low due to monitors maxing out. Unit 3 SO2 and Nox,Unit 1,2,and 3 O2, monitors reliability low due to defective monitors

6 EMISSION PERFORMANCE

Table 6.1: Monthly tonnages for the month of April 2023

Associated Unit/Stack	PM (tons)	SO_2 (tons)	NO_x (tons)
Unit 1	801.1	1 703	708
Unit 2	570.7	1 326	588
Unit 3	547.1	663	306
Unit 4	Off-line	Off-line	Off-line
Unit 5	981.7	1 770	705
Unit 6	122.3	2 414	706
SUM	3 022.77	7 877	3 013

Table 6.2: Operating days in compliance to PM AEL Limit - April 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average PM (mg/Nm³)
Unit 1	0	2	0	17	19	602.5
Unit 2	1	2	0	5	7	958.0
Unit 3	7	6	0	11	17	385.2
Unit 4	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
Unit 5	1	4	0	18	22	707.9
Unit 6	18	6	0	0	6	112.6
SUM	27	20	0	51	71	

Table 6.3: Operating days in compliance to SO_2 AEL Limit - April 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SO_2 (mg/Nm³)
Unit 1	24	0	0	0	0	1 636.4
Unit 2	14	0	0	0	0	1 784.5
Unit 3	13	0	0	0	0	1 206.7
Unit 4	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
Unit 5	23	0	0	0	0	1 657.1
Unit 6	30	0	0	0	0	1 378.6
SUM	104	0	0	0	0	

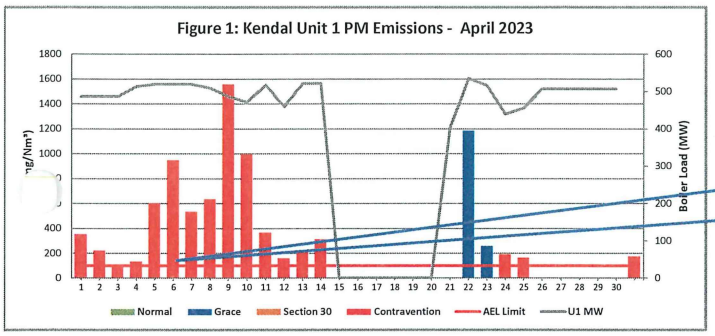
Table 6.4: Operating days in compliance to NOx AEL Limit - April 2023

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm³)
Unit 1	24	0	0	0	0	660.6
Unit 2	14	0	0	0	0	785.7
Unit 3	12	0	0	1	1	548.2
Unit 4	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
Unit 5	23	0	0	0	0	671.4
Unit 6	30	0	0	0	0	435.4
SUM	103	0	0	1	1	

Note: NOx emissions is measured as NO in PPM. Final NOx value is expressed as total NO_2

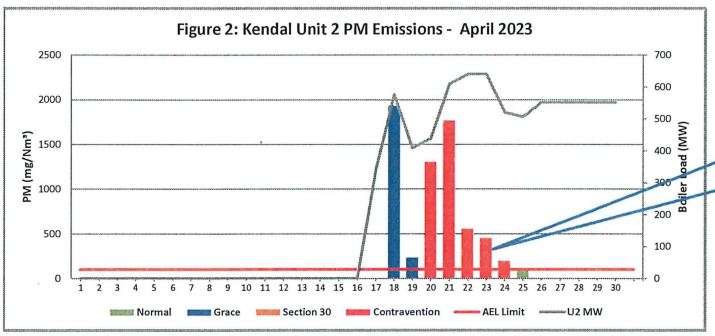
Table 6.5: Legend Description

Condition	Colour	Description
Normal		Emissions below Emission Limit Value (ELV)
Grace		Emissions above the ELV during grace period
Section 30		Emissions above ELV during a NEMA S30 incident
Contravention		Emissions above ELV but outside grace or S30 incident conditions



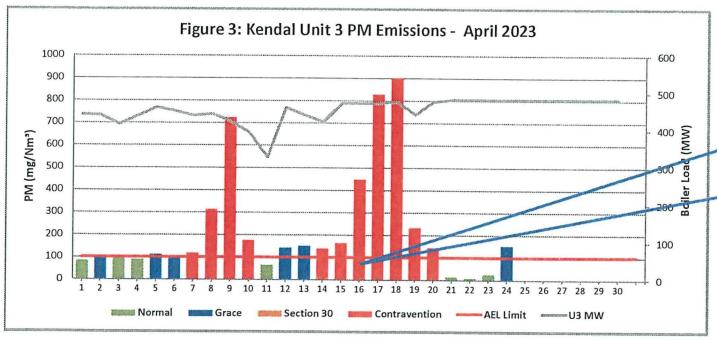
High emissions can be attributed to Primary conveyor 12 chocked, SO3 plant off due to low converter cooling temperature low, Apron conv tripped,SO3 shut down for repairs, Bucket elevator stream 1 faulty, Sulphur plant unavailable due to steam supply being isolated. Precip chain conveyor 13 chocked.

Unit 1 monitor maxed out on the 06th - 10th and the 14th



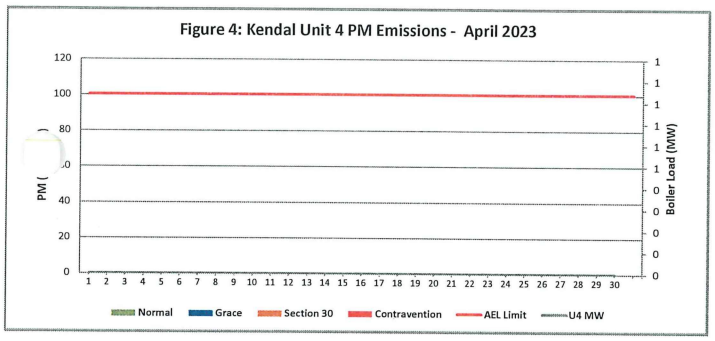
High emissions can be attributed to light up condition, SO3 on hold mode due to burner outlet Temp high, DHP off due to backet elevator fails to start up.

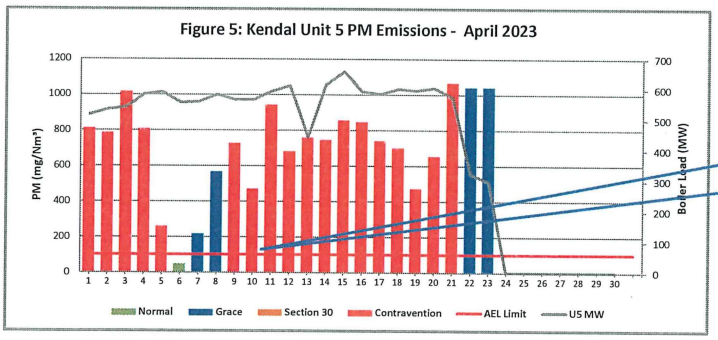
Unit 2 monitor maxed out on the 18th & 21st



High PM emissions can be attributed to SO3 plant tripped to hold mode due to aux steam press low.So3 plant tripped to off mode - Processes blower motor not runningStream 2 - 1st collecting conveyor tripped on overload ,So3 plant tripped to hold mode - Supply pressure low, so3 process air blowers faulty, so3 on hold mode converter out temp, precip fileds out of service, Precip 22,23 AND 24 tripped and chocked. SO3 plant trip on converter outlet temp high.

Unit 3 monitor maxed out on the 08th -10th and the 16th -19th





High PM emissions can be attributed toDHP Stream 1 trip due to compartment full, CONV 24 stopped, chock absorbers broken, knife gates closed. SO3 plant on hold mode due to Aux steam temp low.DHP tripped due to full compartments , knife gates closed.

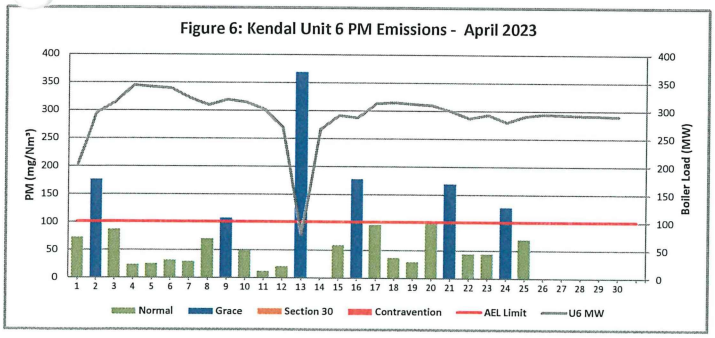


Figure 7: Kendal Unit 1 SO_2 Emissions - April 2023

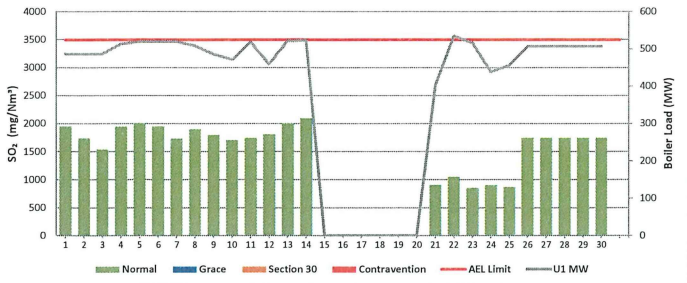


Figure 8: Kendal Unit 2 SO_2 Emissions - April 2023

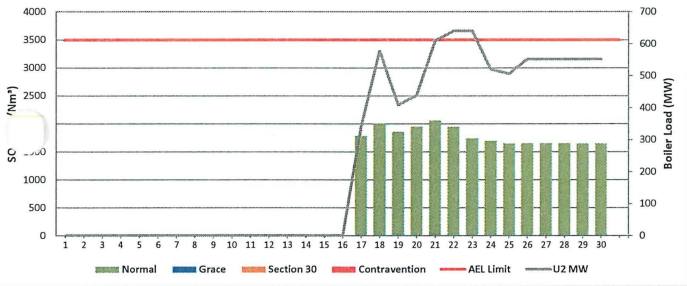


Figure 9: Kendal Unit 3 SO_2 Emissions - April 2023

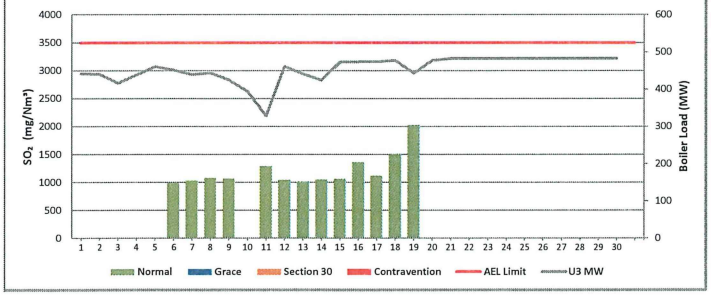


Figure 10: Kendal Unit 4 SO_2 Emissions - April 2023

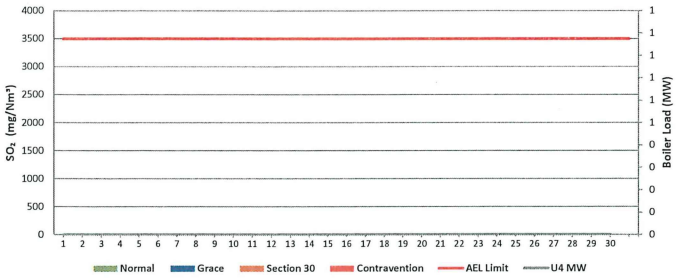


Figure 11: Kendal Unit 5 SO_2 Emissions - April 2023

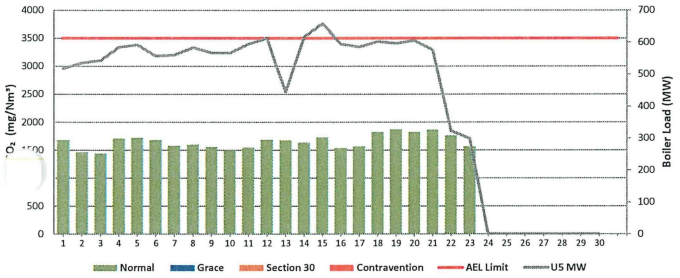


Figure 12: Kendal Unit 6 SO_2 Emissions - April 2023

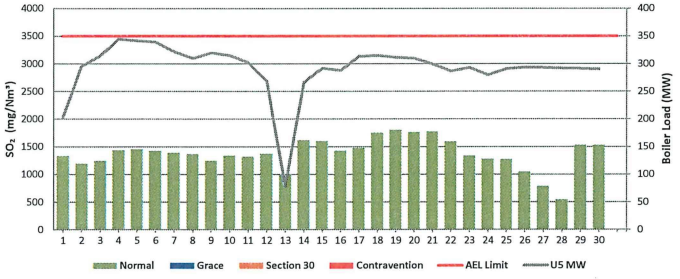


Figure 13: Kendal Unit 1 NOx Emissions - April 2023

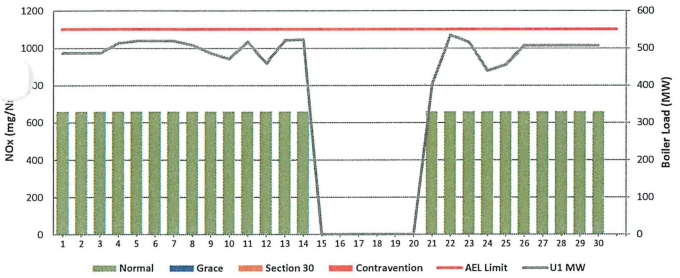


Figure 14: Kendal Unit 2 NOx Emissions - April 2023

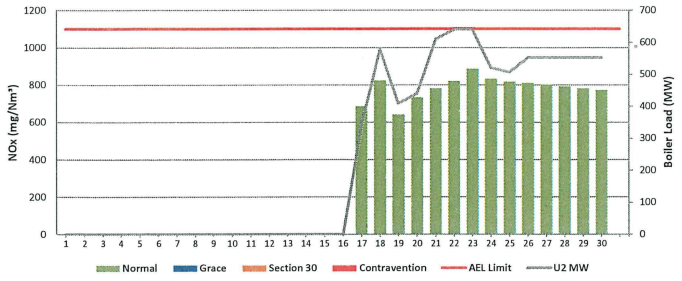
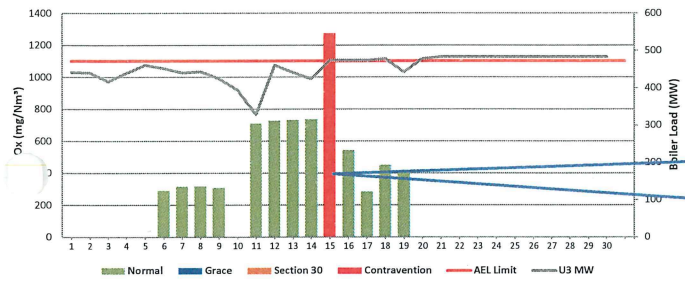


Figure 15: Kendal Unit 3 NOx Emissions - April 2023



High PM emissions can be attributed Three mills available and under produce, causing mill load under specification:
B mill - 89/92 under performance (3%)
D mill – 39/83 under performance (44%)
E mill - 88/84 under/ performance (4%)
2. Faulty burner tilts, wrong directions of flame at the furnace.
3. PF pipes block during the day, causing bad distribution of fuel, affecting air and coal ration.

Figure 16: Kendal Unit 4 NOx Emissions - April 2023

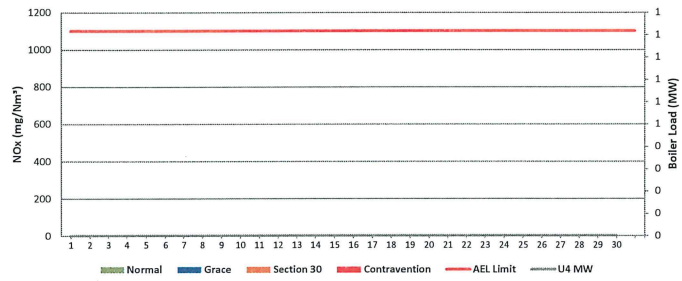


Figure 17: Kendal Unit 5 NOx Emissions - April 2023

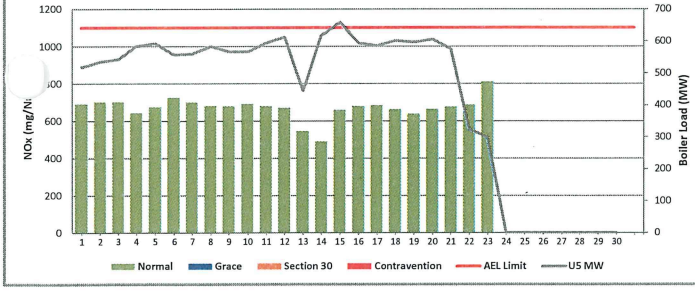
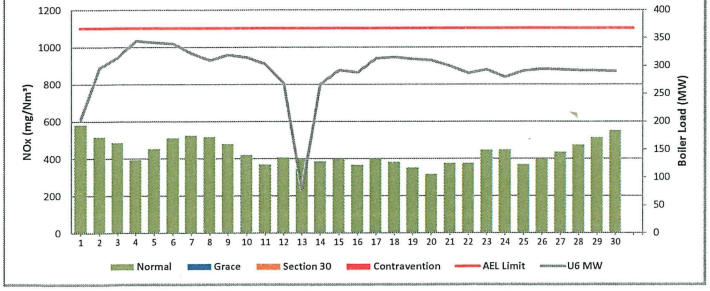


Figure 18: Kendal Unit 6 NOx Emissions - April 2023



7 COMPLAINTS

There were no complaints for this months

Source Code / Name	Root Cause Analysis	Calculation of Impacts / emissions associated	Dispersion modeling of pollutants where applicable	Measures implemented to prevent reoccurrence

Abatement Technology-Table 4

In order to achieve the required operational dust removal efficiency based on measured values, several assumptions such as
- Coal ash content (%) and burnt rate mass
- Fly : Coarse ash ratio of 80:20 - 80% of fly-ash mass obtained from burnt coal goes to ESP
- Measurement of dust emission by Dust Monitor over a period of time (monthly)

Operational Dust Removal Efficiency

$\eta = (1 - (Output/Input)) \times 100$

$$\eta = 1 - \frac{(DustEmissionFromAQR\ ReportDustMonitor(tons)}{(CoalBurnt(tons) * \%AshContent * 80\%)} \times 100$$

Monitor Reliability-Table 5

In terms of the minimum emissions standard, the requirement is that a monitor should be 80% reliable on a monthly average.
The **monitor reliability** refers to **data reliability** because the assumed value of 99.325% reliability is compared to the dust concentration signal. If the dust concentration signal is above 99.325% opacity,the data information is no longer reliable because the monitor reading is out of its maximum reading range. The data reliability looks at how many times did the dust concentration signal go above 98% over a period of time e.g 24hours
The formula is as follows:
= (1 – (count hours above 99.325%/24hours))x 100

Emissions Performance:

- Average velocity values from the latest correlation report were used on the gaseous emissions on Unit 1, 2,4,5 &6 due to defective CEMS monitors and velocity correction factors were set M=1 and C=0
- Unit 5 Monitor still using the old monitor correlation. After new correlations are done, new correlation factors will be implemeted and backfitted to the date of monitor installation.
- From the 25th to the 3rd of May the was no data due to failure on OT network impacting core OT functions and services including PI systems and all PI.
- U1 and 3 monitors maxed out, meaning the emission were higher than what the monitor was correlated for. In which case we use surrogate values. This is attributted to abnormal plant conditions including.
- Please note the reported figures in tonnage calculation are an under estimate since the station did not use the Maxing out PM monitor quantification exercise which is the use of "surrogate values" on days when the monitor maxed out. The following are the days when the monitor was maxing out: Unit 1 from the 06th - 10th and the 14th,U2 on the 18th & 21st, Unit 3 form the 08th -10th and the 16th -19th. Figures will be restated based on updated upset testing and surrogate value determination as soon as the station is done with the tests.
- Unit 1 NOx Monitor for the entire month was defective.

- Unit 1
- Findings: The high emissions can be attributed to High emissions can be attributed to Primary conveyor 12 chocked, SO3 plant off due to low converter cooling temperature low, Apron conv tripped,SO3 shut down for repairs, Bucket elevator stream 1 faulty, Sulphur plant unavailable due to steam supply being isolated. Precip chain conveyor 13 chocked.
- Resolution: Plant repaired

- Unit 2
- Findings: The high emissions can be attributed to light up condition, SO3 on hold mode due to burner outlet Temp high, DHP off due to backet elevator fails to start up.
- Resolution: Plant repaired.

- Unit 3
- Findings: The high PM emissions can be attributed to SO3 plant tripped to hold mode due to aux steam press low.So3 plant tripped to off mode - Processes blower motor not runningStream 2 - 1st collecting conveyor tripped on overload ,So3 plant tripped to hold mode - Supply pressure low, so3 process air blowers faulty, so3 on hold mode converter out temp, precip fileds out of service, Precip 22,23 and 24 tripped and chocked. SO3 plant trip on converter outlet temp high.
- Resolution: Palnt repaired.

- Unit 4 is Off on Outage

- Unit 5
- Findings: High PM emissions can be attributed to SO3 plant that kept on tripping due to heaters temps that are high causing the burner outlet temp to be high and trip the SO3 plant. Resolution: Plant repaired. DHP Stream 1 tripped due to compartment full, CONV 24 stopped, chock absorbers broken, knife gates closed. SO3 plant on hold mode due to Aux steam temp low.DHP tripped due to full compartments , knife gates closed.
- Resolution: Plant repaired