Eskom	Matimba power station bi-annual air quality report	Matimba Power Station

Title: **Air quality bi-annual report April to September 2021**

Document Identifier:	**RP/247/013**
Plant Location:	**N/A**
Area of Applicability:	**Matimba Power Station**
Functional Area Applicability:	**Environment**
Revision:	**1**
Total Pages:	**21**
Report Date:	**October 2021**
Disclosure Classification:	**Controlled**

Compiled by	Functional Responsibility	Authorized by
WC Mocke	**MC Mamabolo**	**JL Janse van Rensburg**
Environmental Officer	**Environmental Manager**	**General Manager**
Date: 2021/12/20	Date: 22/12/2021	Date: 2021-12-22

Content

1. Report Summary

Eskom Matimba Power Station is a coal fired power station located in Lephalale, Limpopo Province. The power station has a generating base load capacity of 3990MW across its six units. Hydrological conditions of Lephalale influenced the design of Matimba Power Station to become one of the direct dry cooling power stations within Eskom fleet of power plants.

The station obtains its coal, which is stockpiled within the power plant premises, from the nearby coal mine, Exxaro's Grootegeluk Colliery. During the burning of coal, in a process to produce steam for electricity generators, various emissions are released. These emissions are coarse and fly ash, noxious and toxic gases that require effective management practices to contain, control and manage.

Matimba Power Station was issued with an Atmospheric Emission License (License No. 12/4/12L-W4/A4) by the Department of Economic Development, Environment and Tourism, Limpopo Province. The license requires the license holder to prepare and submit a bi-annual emission report as per, condition 7.7.2 "The License Holder must complete and submit to the Licensing Authority a Bi-annual Report no later than thirty (30) days after the end of each reporting period".

This report covers the period of April 2021 to September 2021.

2. Report Content

2.1 Compliance to atmospheric emission license

1) Overall compliance to license conditions

Matimba Power Station's compliance status to the overall license conditions is at 98%. In the reporting period. Three (3) of the 142 conditions were not complied with. Please refer to Appendix 1 for the full details on the conditions not complied to.

2) Compliance in terms of Raw materials and Products

The license provides allowances in terms of the consumption of raw materials which could directly influence atmospheric emissions during the production of electricity from fossil fuel power plant. The consumption figures for coal and fuel oil during the six month period was 7 115 087 Tons and 4 928 Tons respectively. Figure 1 and Figure 2 below indicate the total consumption of the raw materials and products for the reporting period per month.

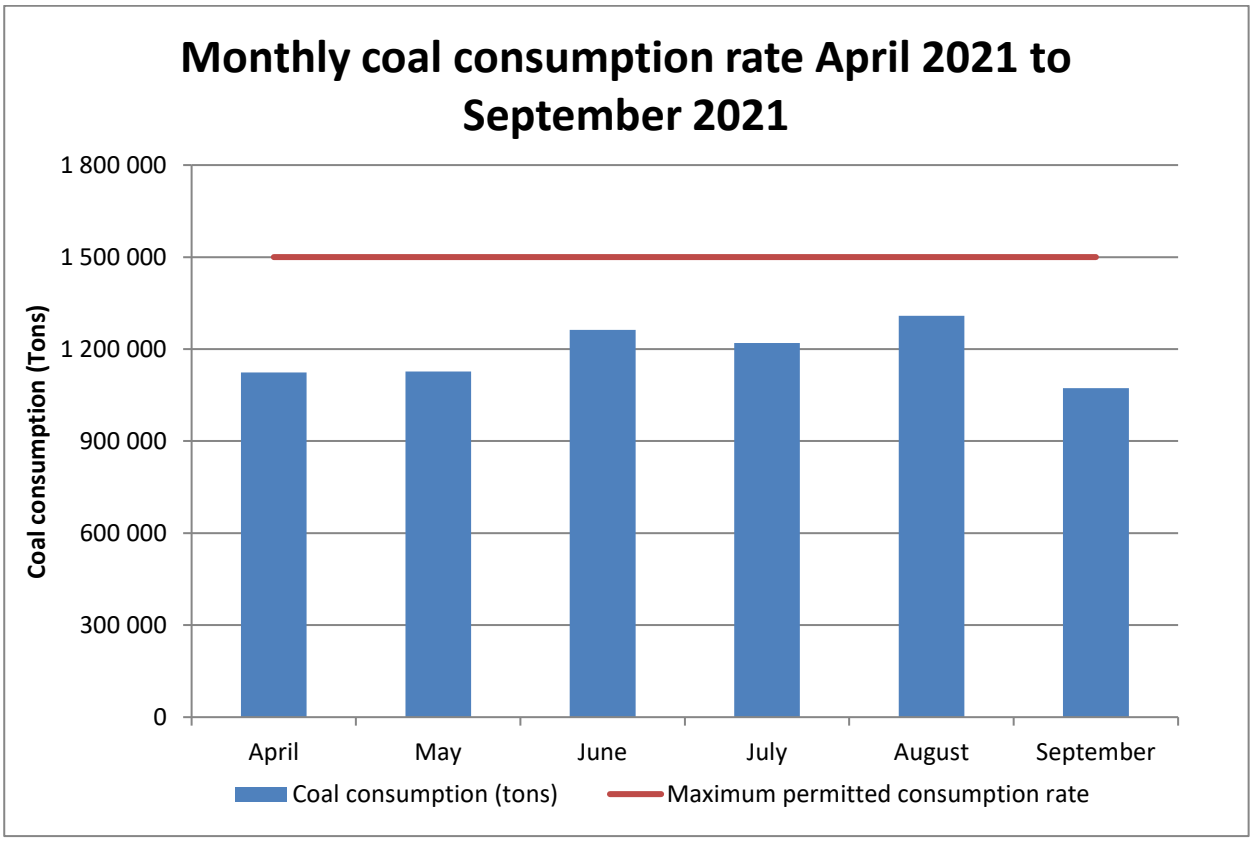

Figure 1: Monthly coal consumption rate April 2021 to September 2021

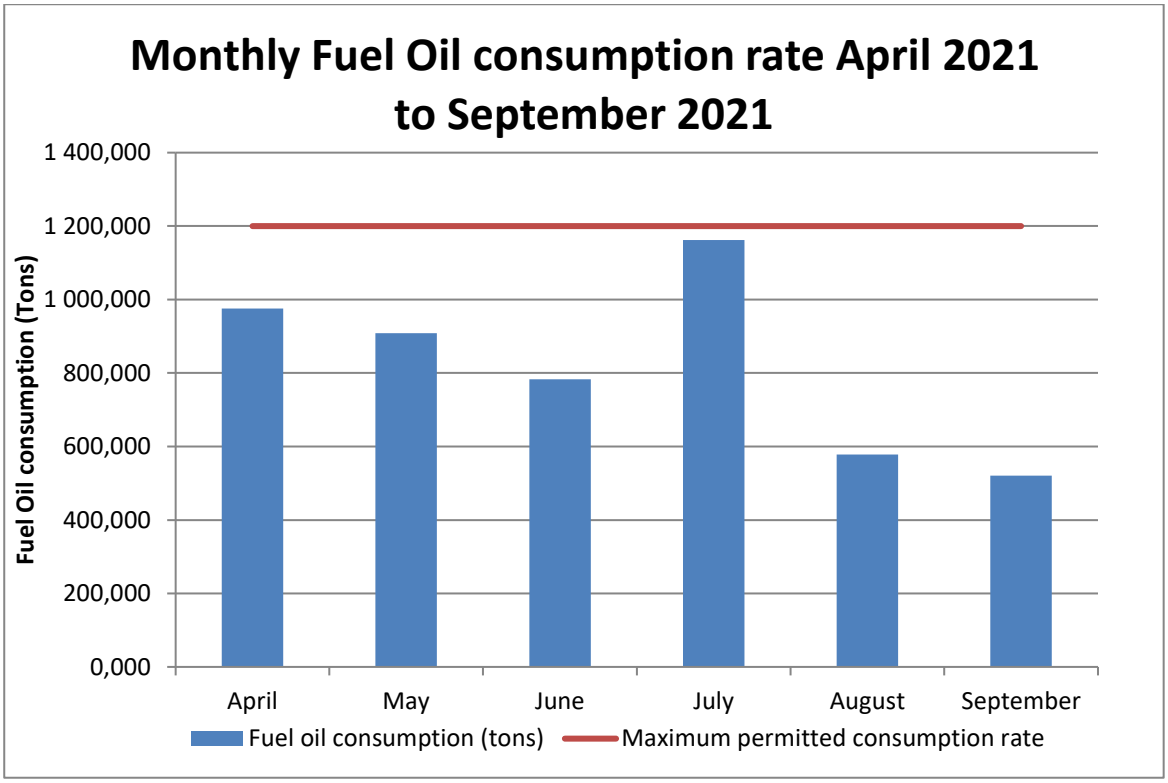

Figure 2: Monthly Fuel Oil Consumption rate April 2021 to September 2021

It must be noted that for fuel oil consumption there will be disparity on month to month consumption as this is dependent on the unit start-ups during planned or unplanned outage. An increased amount of fuel oil was used during July 2021 due to multiple unit start-ups. Matimba's coal and fuel oil consumption rates remained within the maximum permitted rates during the monitoring period.

3) Emission abatement technology

Matimba Power station utilizes Electrostatic precipitators to minimize the amount of particulate matter released to the atmosphere through stack emissions. In addition to this Matimba has implemented a Sulphur plant for each unit in order to increase the conductivity of the dust particles to lessen particulate emissions even further. Table 1 and Table 2 below show the actual utilization in percentage for these technologies per unit per reporting month.

Table 1: Precipitator availability for reporting period

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
April	99,9%	99,9%	99,9%	99,9%	99,9%	99,9%
May	99,9%	99,9%	99,9%	99,9%	99,9%	99,9%
June	99,9%	99,9%	99,9%	99,9%	99,9%	99,9%
July	99,9%	99,9%	99,9%	99,9%	99,9%	99,9%
August	99,9%	99,9%	99,9%	99,9%	99,9%	99,9%
September	99,9%	99,9%	99,9%	99,9%	99,9%	99,9%

The Electrostatic Precipitators, for the reporting period, has been running above 90% for all units without any defects that affect their efficacy.

Table 2: Sulphur plant availability for reporting period

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
April	100%	100%	100%	100%	100%	87%
May	97%	97%	97%	100%	100%	97%
June	97%	97%	100%	100%	100%	90%
July	100%	100%	97%	100%	100%	90%
August	100%	100%	77%	100%	93%	100%
September	97%	93%	93%	100%	93%	100%

4) Energy source characteristics

The below trends of sulphur content and ash content in coal burned indicate that material characteristics of the coal burnt remained within the ranges stipulated in the license. Though on monthly averages there is compliance to the ranges as required by the license, on daily averages there are sporadic indications of high sulphur content. Figure 3 and Figure 4 below indicate the trends over the six month period.

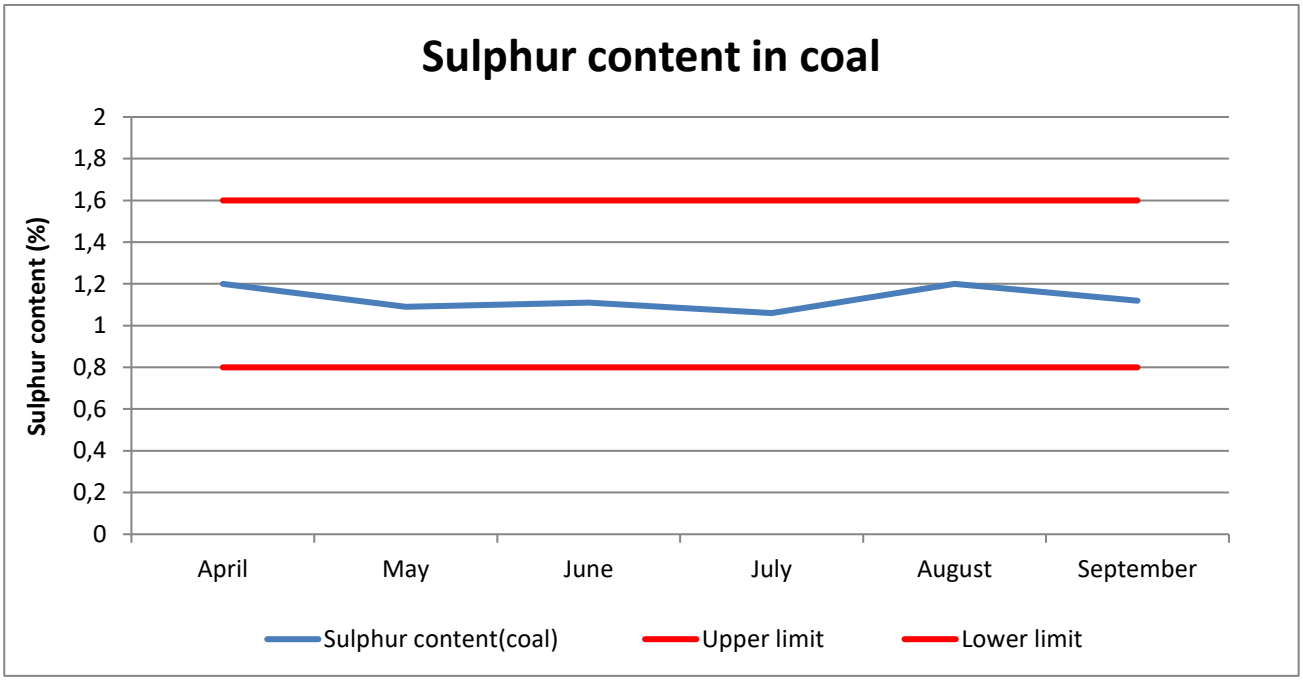

Figure 3: Monthly averages of sulphur content in coal

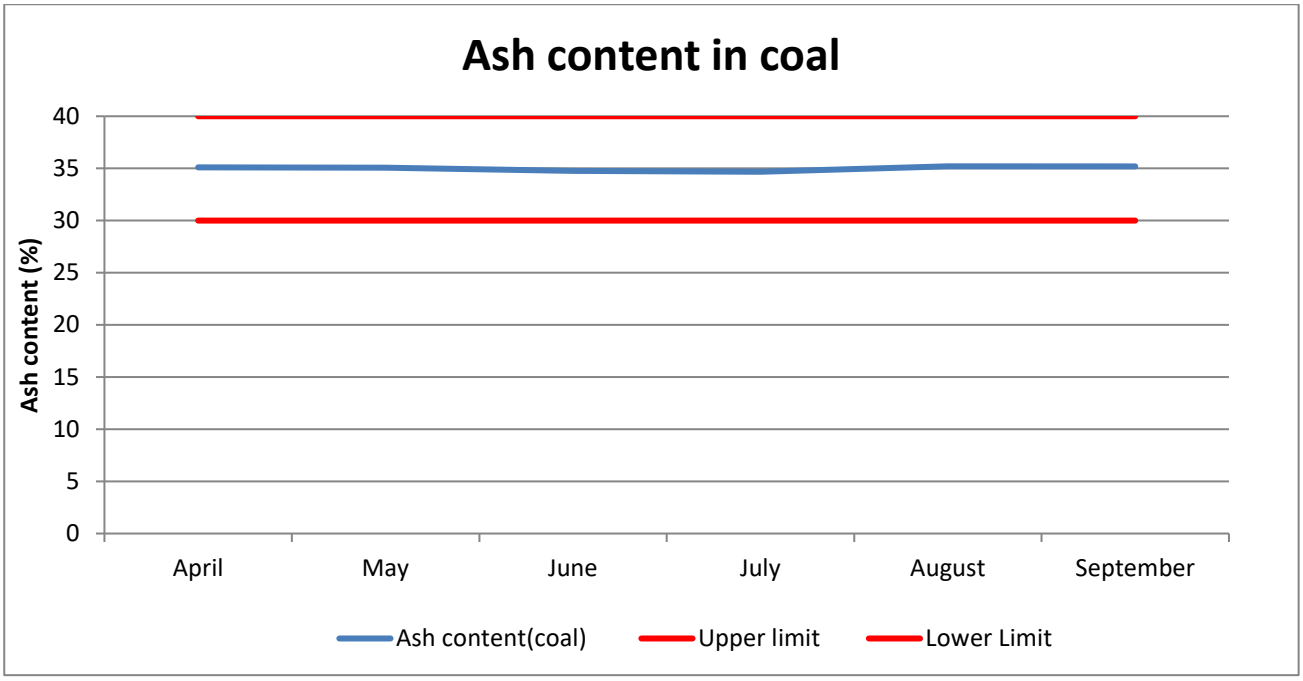

Figure 4: Monthly averages of ash content in coal

The below trends of sulphur content in fuel oil indicate that material characteristics of the fuel oil used remained within the ranges stipulated in the license. Fuel oil analyses was not conducted in May and July 2021 due challenges experienced with the transport of the samples. Figure 5 below indicate the sulphur content in fuel oil for the reporting period.

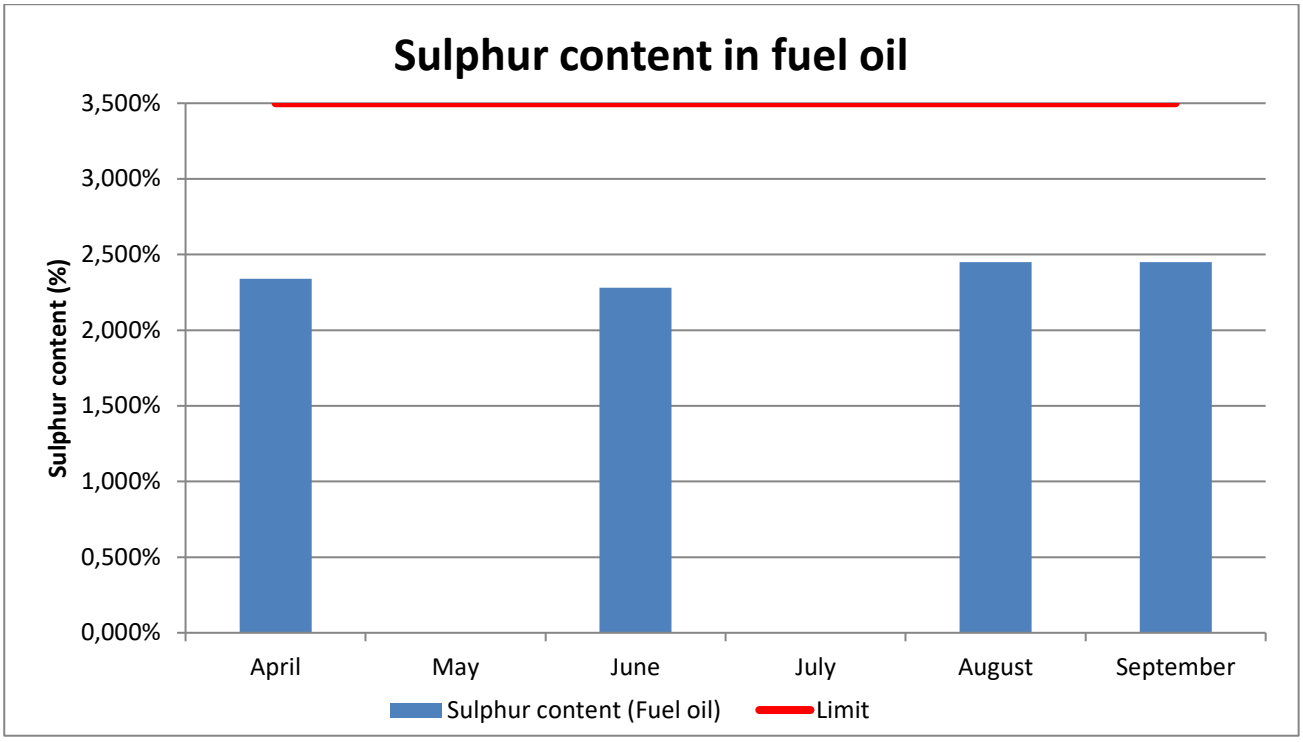

Figure 5: Monthly averages of sulphur content in fuel oil

2.2 Interpretation of data on plant performance and impacts on the environment

1) Particulate matter emissions

The manner in which Matimba monitors particulate emissions is twofold. Fly ash emissions are monitored via the in situ continuous emission monitors and fugitive dust emissions are monitored through means of dust fallout monitoring by bucket exposure for period of 30 days.

i) In stack particulate matter continuous emission monitoring.

Particulate emissions are monitored continuously on all six units. The determination of the particulate concentrations is carried out in accordance with ISO 9096 and VDI 2066, the process for the determination is articulated in the Eskom Emission Monitoring and Reporting Standard 240-56242363. The monitors are being calibrated and isokinetic tests are conducted as per the Eskom Emission Monitoring Standard which is aligned with both National and international standards and practices.

Condition 7.2 of the Matimba AEL provides limits for particulate emissions which are capped at a daily average limit of 50mg/Nm^3.

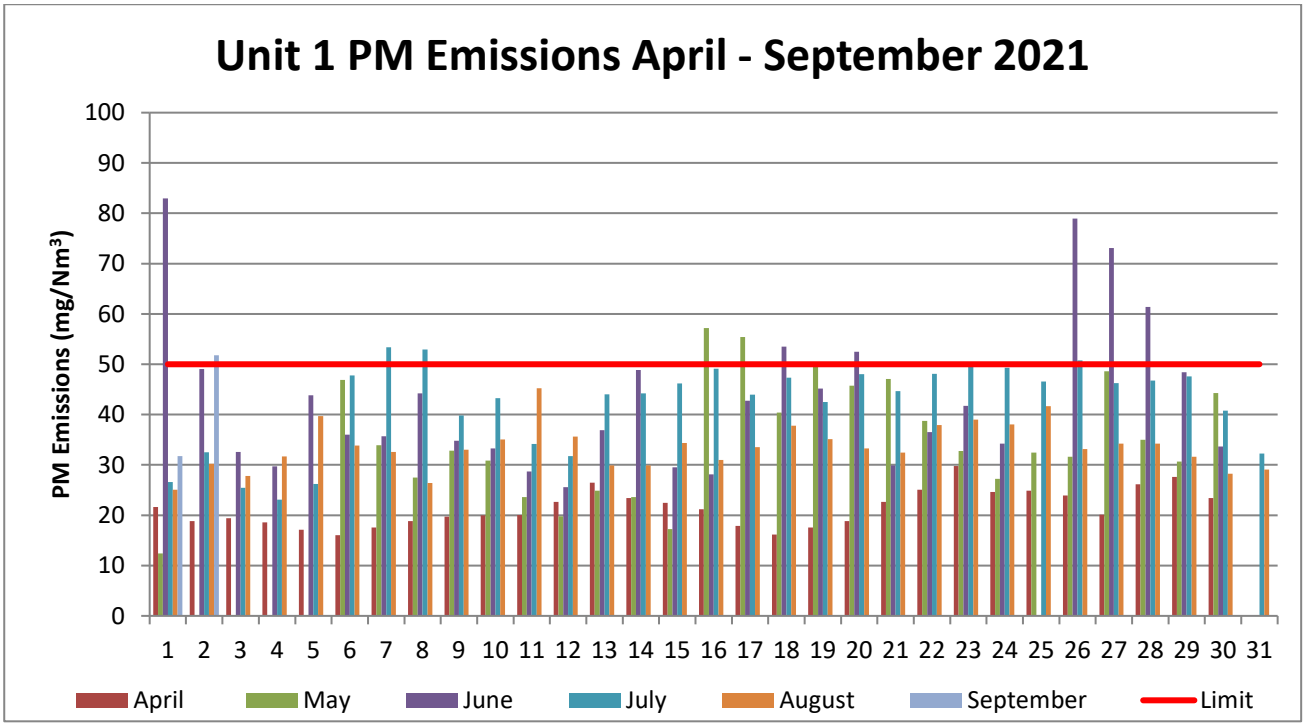

Figure 6: Unit 1 particulate matter emission trends for reporting period

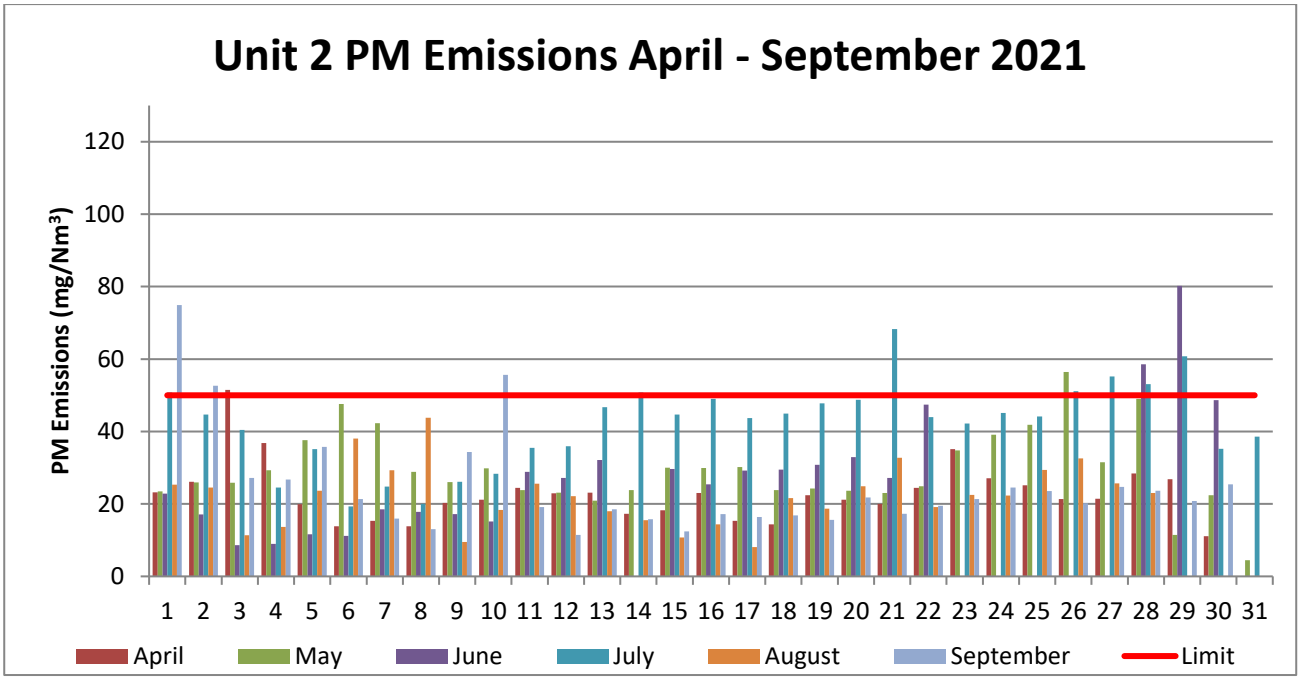

Figure 7: Unit 2 particulate matter emission trends for reporting period

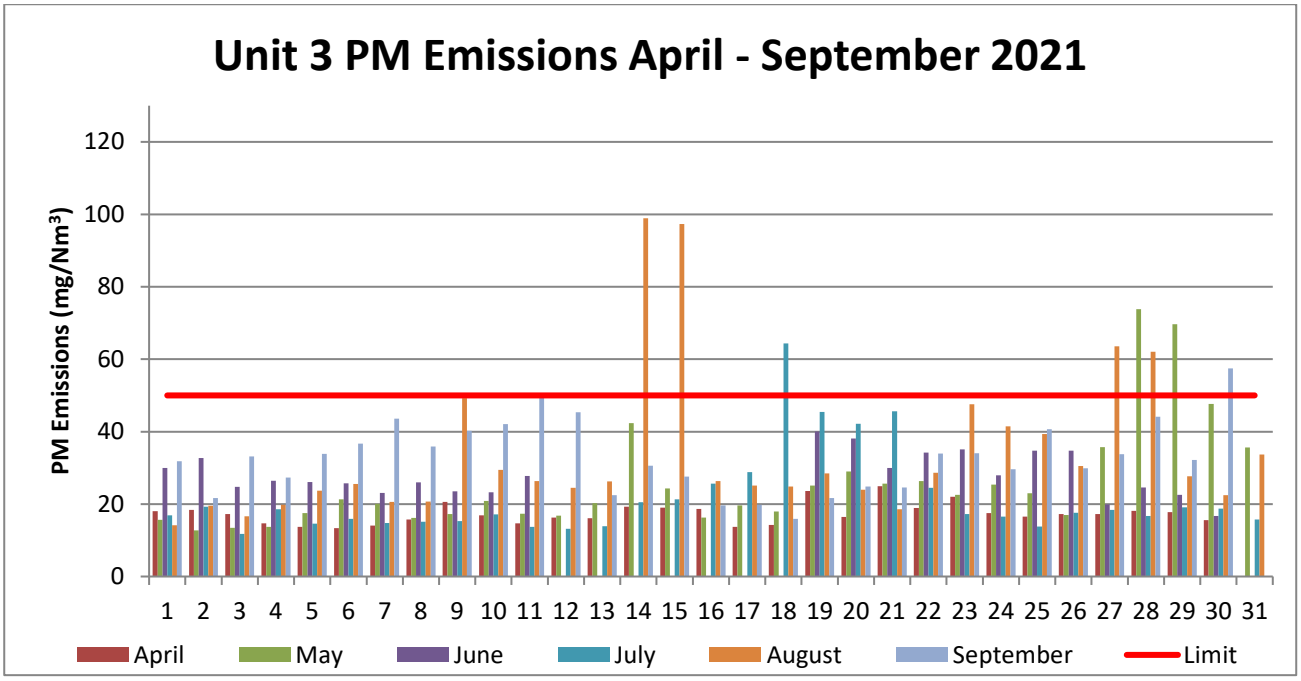

Figure 8: Unit 3 particulate matter emission trends for reporting period

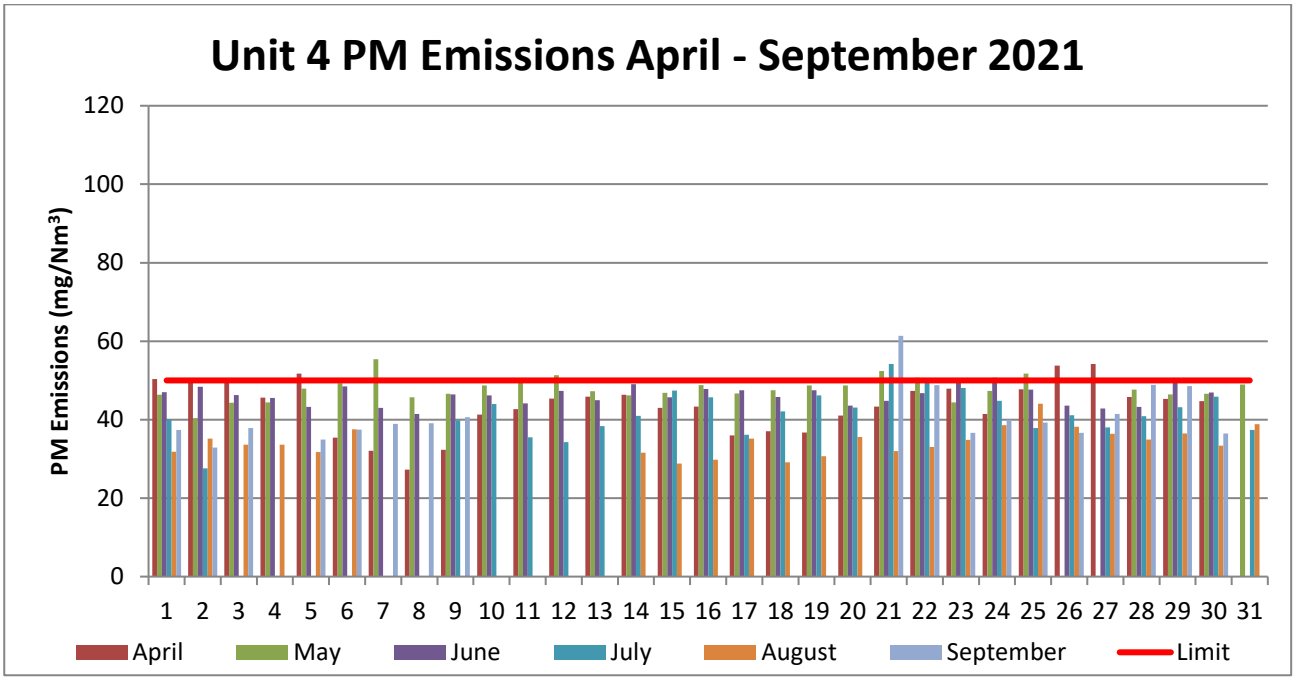

Figure 9: Unit 4 particulate matter emission trends for reporting period

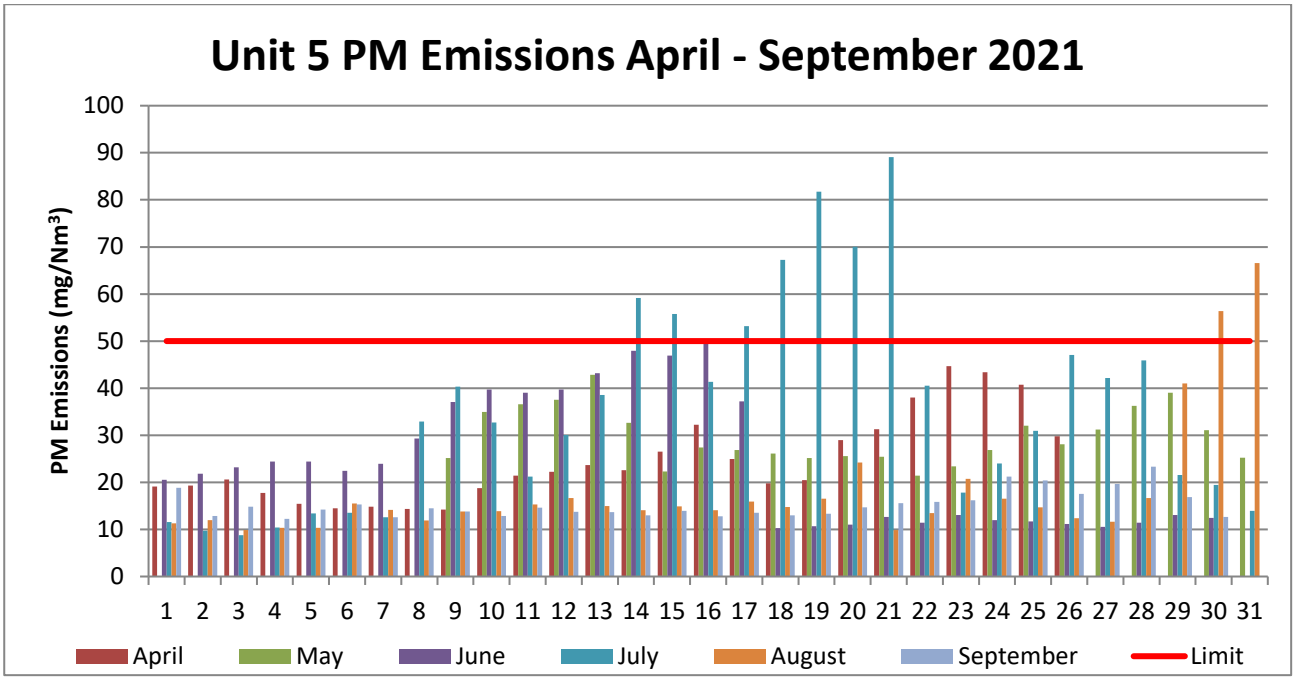

Figure 10: Unit 5 particulate matter emission trends for reporting period

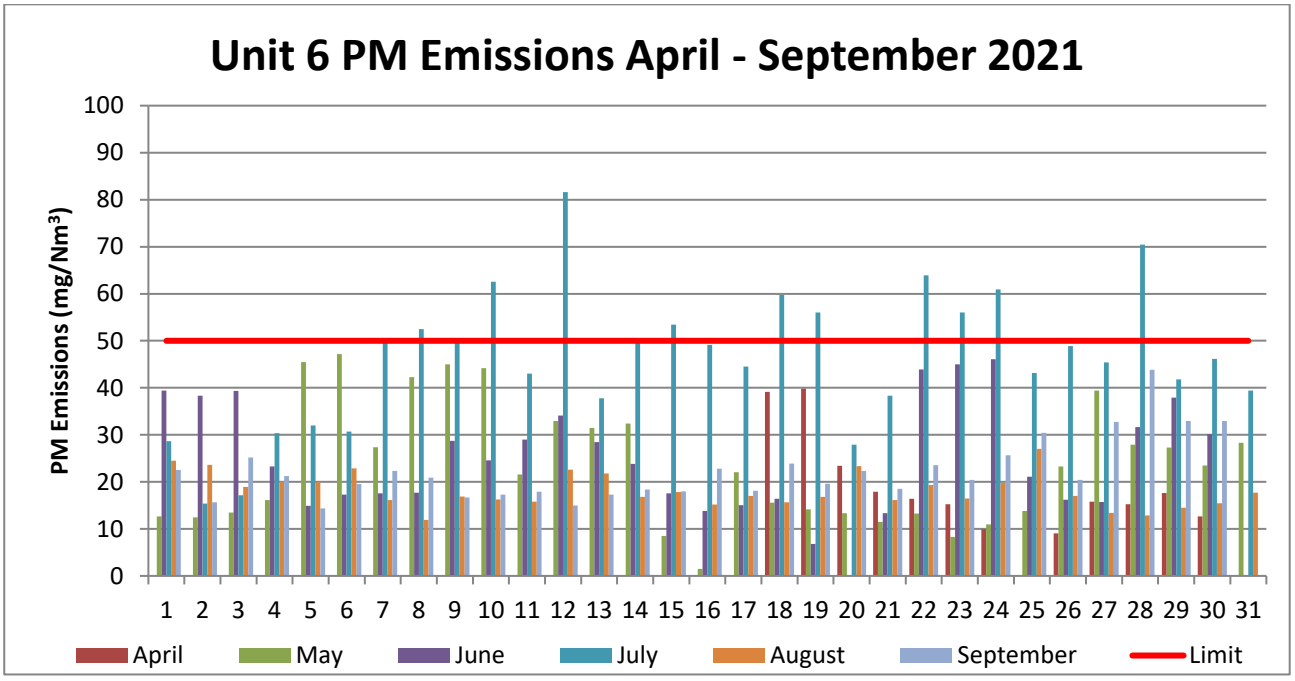

Figure 11: Unit 6 particulate matter emission trends for reporting period

Matimba have experienced multiple exceedances of the 50mg/Nm^3 limit with most exceedances occurring during between May 2021 – July 2021. The exceedances were mainly due to recurring failures on the system transporting ash out of the units. These failures resulted in ash build-up within the flue gas path which affected the efficiency of the electrostatic precipitator fields. Furthermore the build-up of ash damaged some components of the flue gas cleaning system which affected the efficiency of the abatement equipment. The failures were investigated and actions were put in place to address the root cause of the failures. Plans were also put in place to repair the damaged components. Five (5) exceedances exceeded the 48 hour grace period and these were reported as Section 30 incidents to the department. Specific information regarding exceedances on individual units is provided in the monthly emission reports submitted to your office.

Table 3: Status of plant operating under NEMA S30

Unit	Days operating under normal operation	Days operating in grace period	Days operating under NEMA S30
1	136	13	0
2	159	12	2
3	167	8	0
4	142	13	0
5	161	6	3
6	153	8	2

ii) Fugitive dust monitoring

Matimba Power Station is required in terms of its policy obligations, the emission license and the National Dust Control Regulations (GNR827/2013) as well as the SANS 1929:2011 to control and manage dust from its operations as well as to monitor and report monitoring results to the relevant authorities. The dust fallout monitoring is conducted using the bucket fallout method, where a bucket filled with distilled water is exposed for period of 30 days. The monitoring and sample analysis is done using the American Society for testing and methods, ASTM D1739-98, gravimetric method for settle-able dust. Figure 12 below provides the fugitive dust fallout monitoring results for the reporting period.

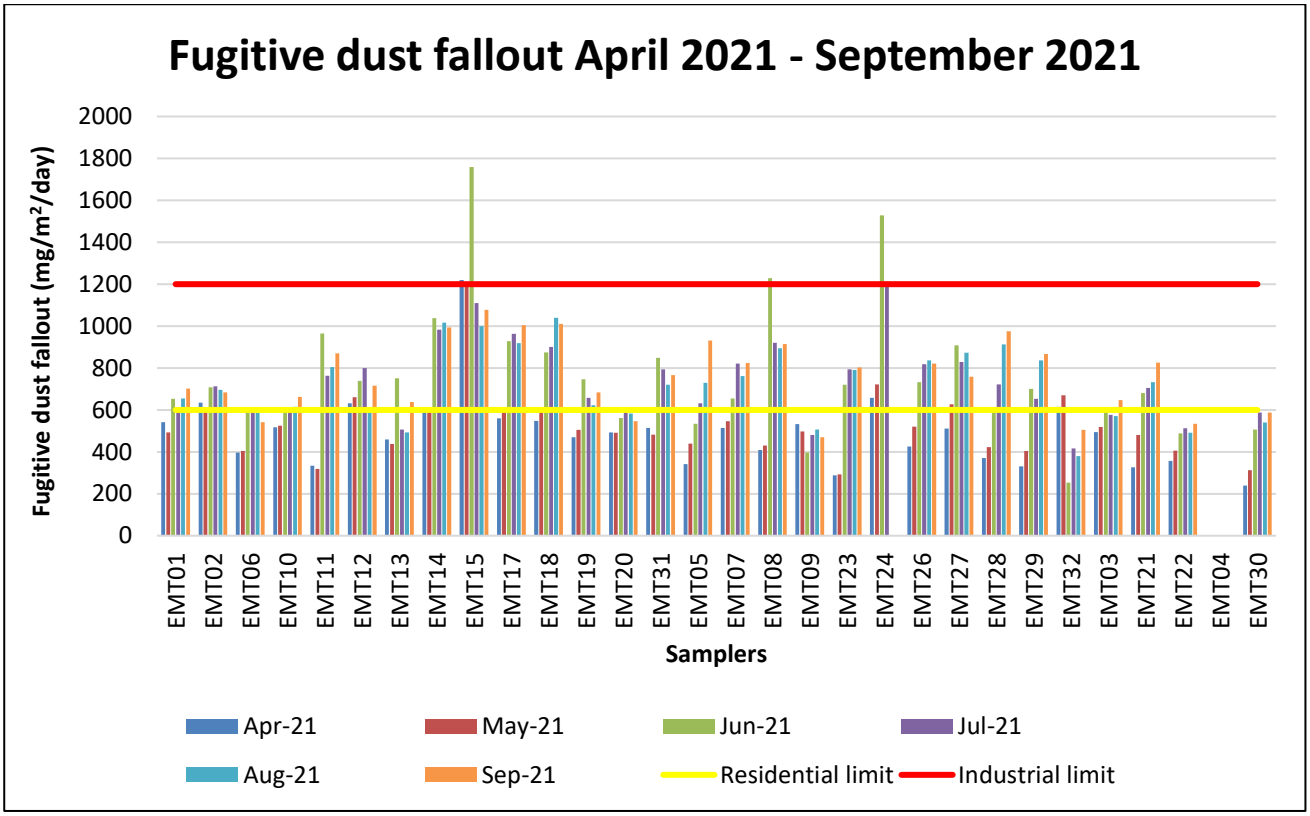

Figure 12: Fugitive dust fallout results April 2021 – September 2021

Fugitive dust mitigation was conducted throughout the time period and an investigation was initiated and actions raised to address the root cause of exceedances.

Matimba strives to put in further efforts to protect the environment and the well-being of its employees and its surrounding communities.

2) Gaseous emission monitoring

Matimba Power Station monitors gaseous emissions by use of an automatic measurement system installed in the stacks. The monitoring systems have been installed and calibrated according to VDI 3960 and manufacturer's user manual. The monitors are inspected, serviced and calibrated every fortnight through a service contract. The service involves zero and span calibration with known gas for collaborative reasons with the recorded data. If there is any drifting that occurs, the disparity is investigated and corrected. This verification of data is conducted in accordance with BS EN 14181:2004.

Matimba gaseous emissions performance per unit is depicted in Figure 12 below:

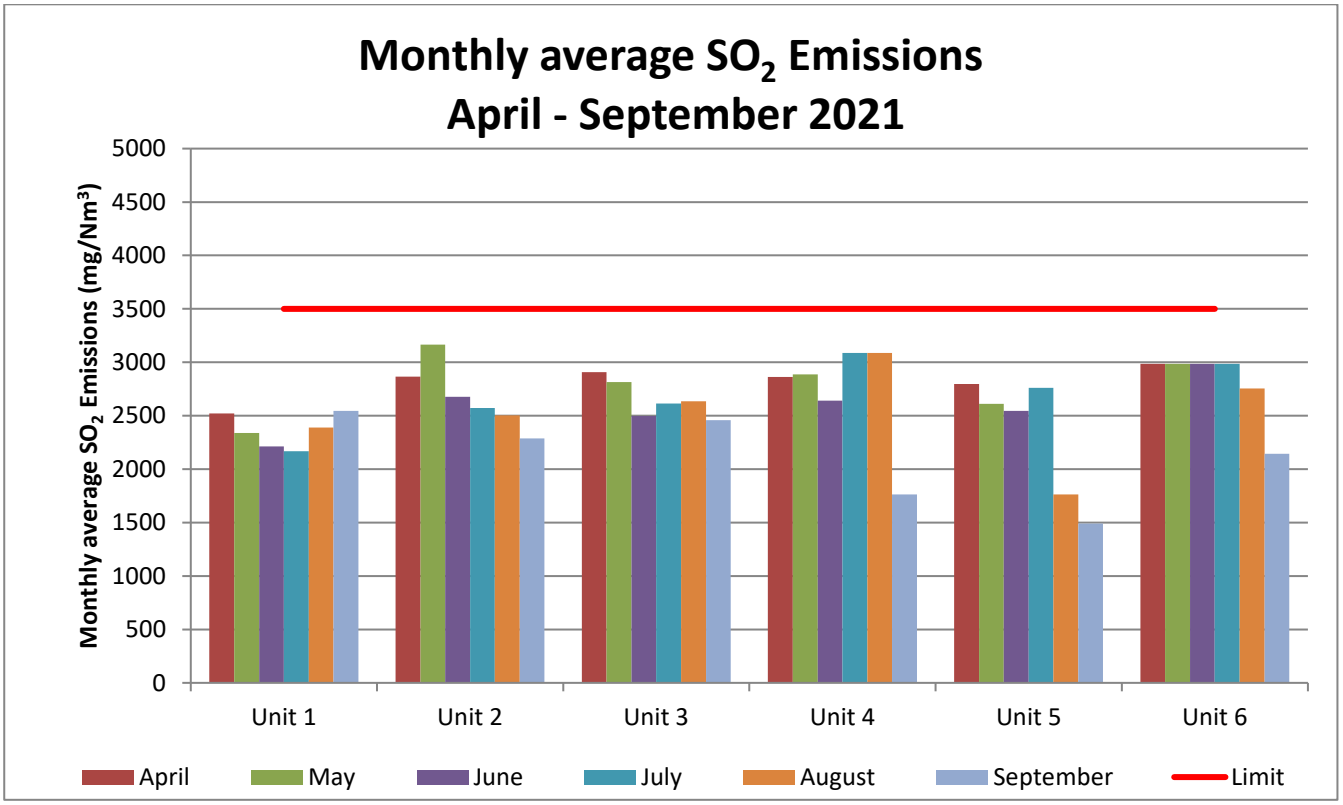

Figure 13: Monthly SO_2 averages for reporting period

SO_x emissions have significantly improved since September 2020, no exceedances of the monthly limit have been experienced. However, occasional increases of sulphur content in the coal burnt have been occurring on a day to day basis. These increases are closely monitored and appropriate actions are taken to reduce the SO_x emissions during such times. Averaged values from Quality Assurance Level 2 reports were used for SO_x emission reporting in cases where gaseous emission monitors were not available or were producing unreliable data. An example of where this method was implemented can be seen at unit 6 April 2021 to July 2021 and at unit 4 July 2021 and August 2021. Full details of where averaged data was used is provided in the monthly reports submitted to your office.

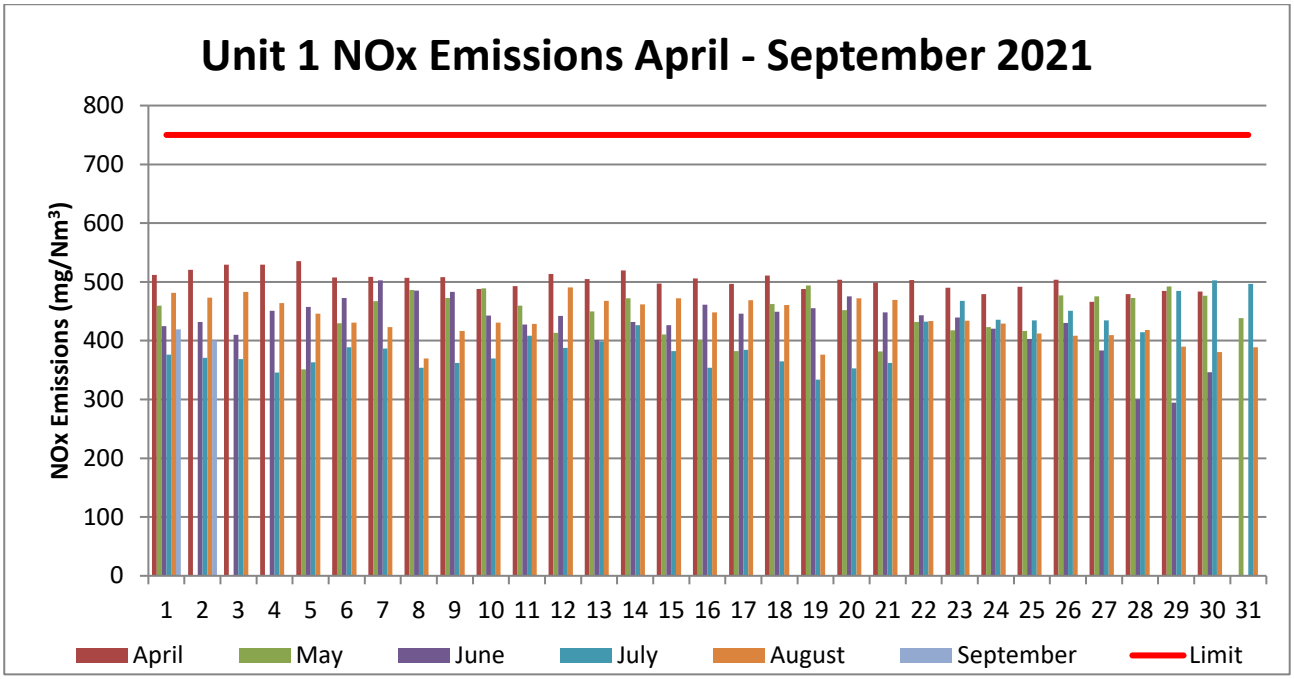

Figure 14: Unit 1 daily NO_x averages for reporting period

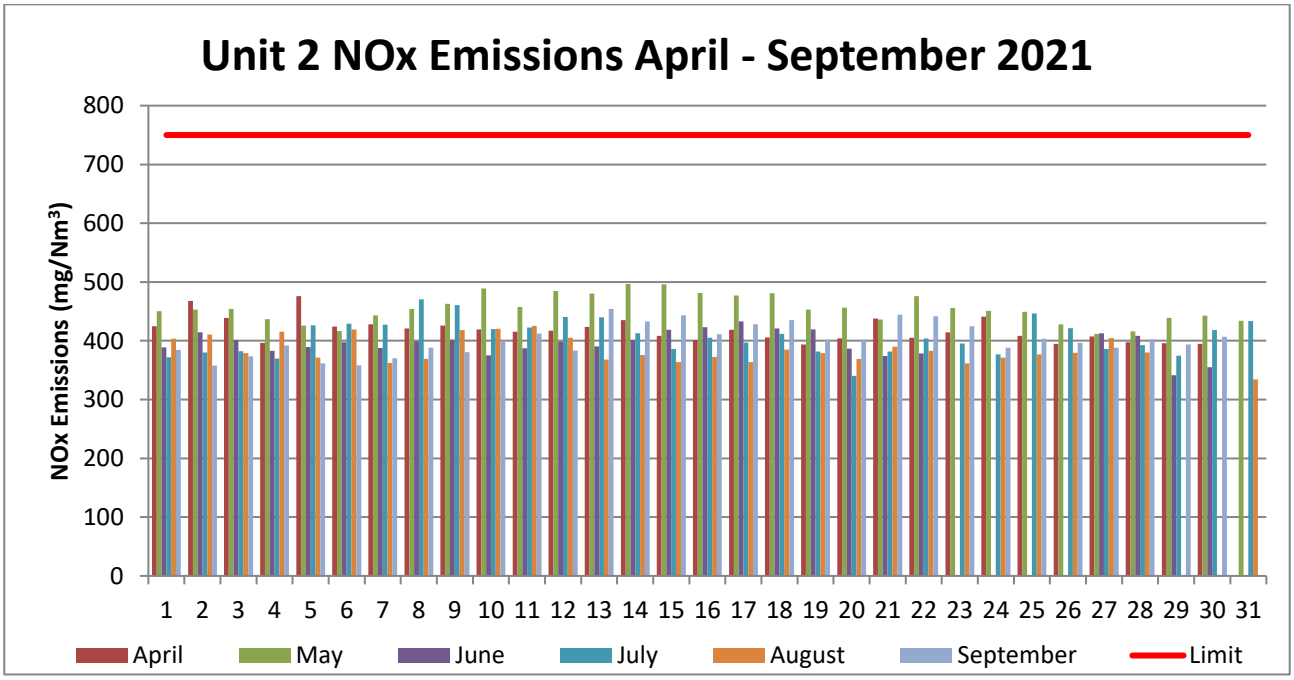

Figure 15: Unit 2 daily NO_x averages for reporting period

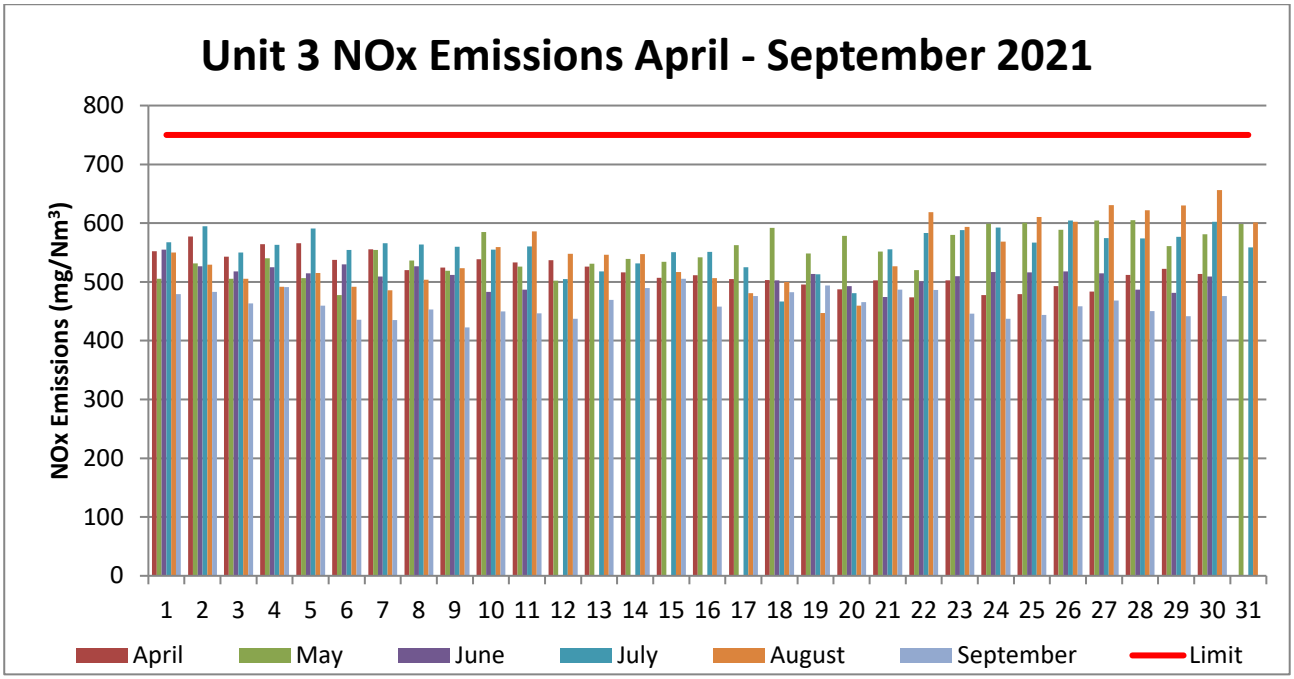

Figure 16: Unit 3 daily NO_x averages for reporting period

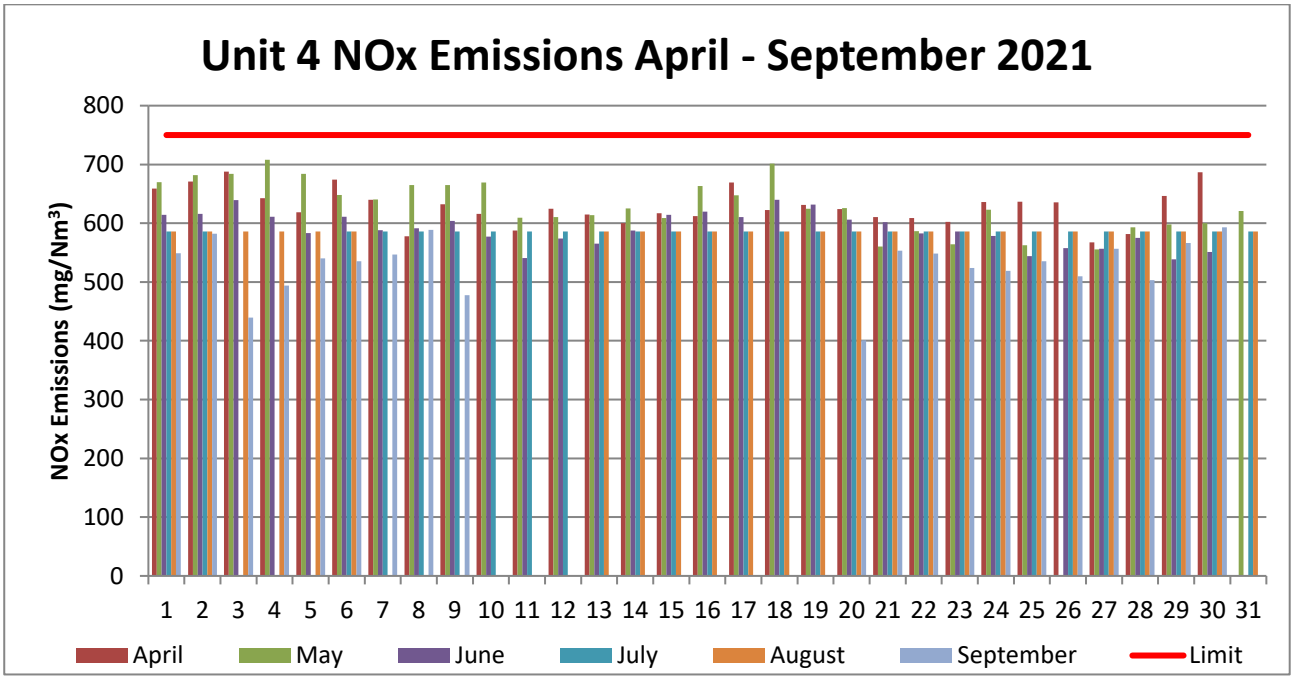

Figure 17: Unit 4 daily NO_x averages for reporting period

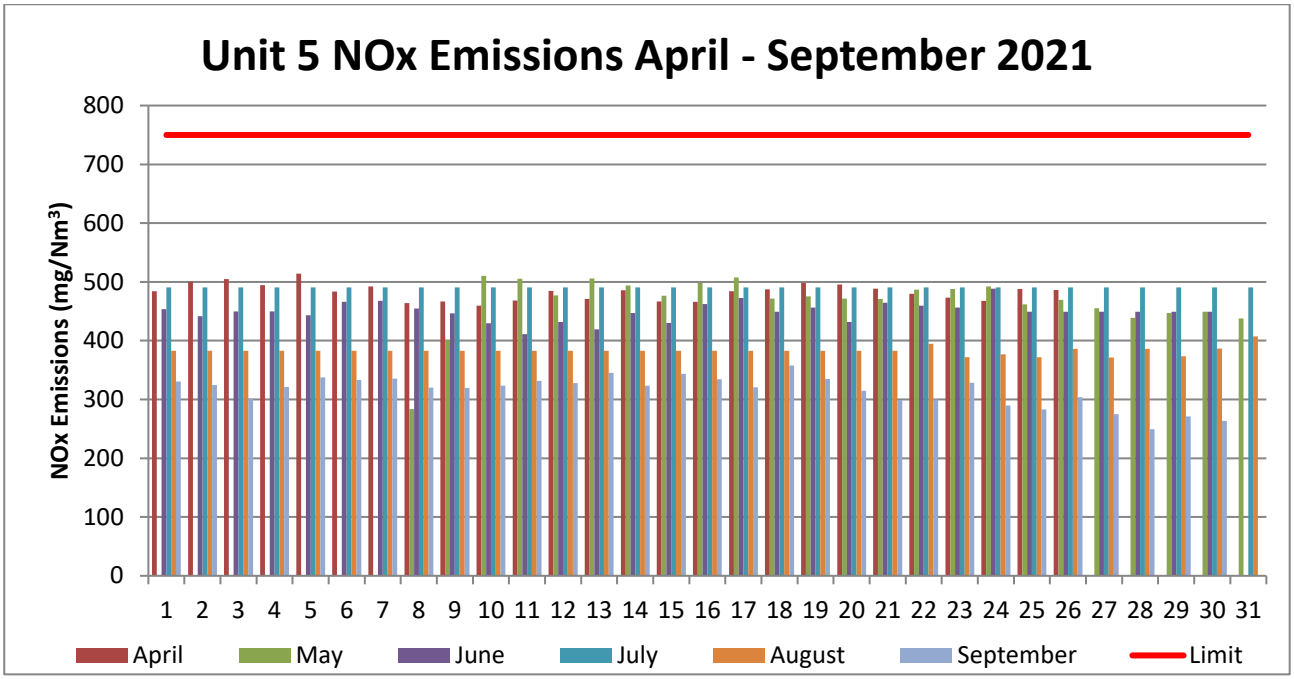

Figure 18: Unit 5 daily NO_x averages for reporting period

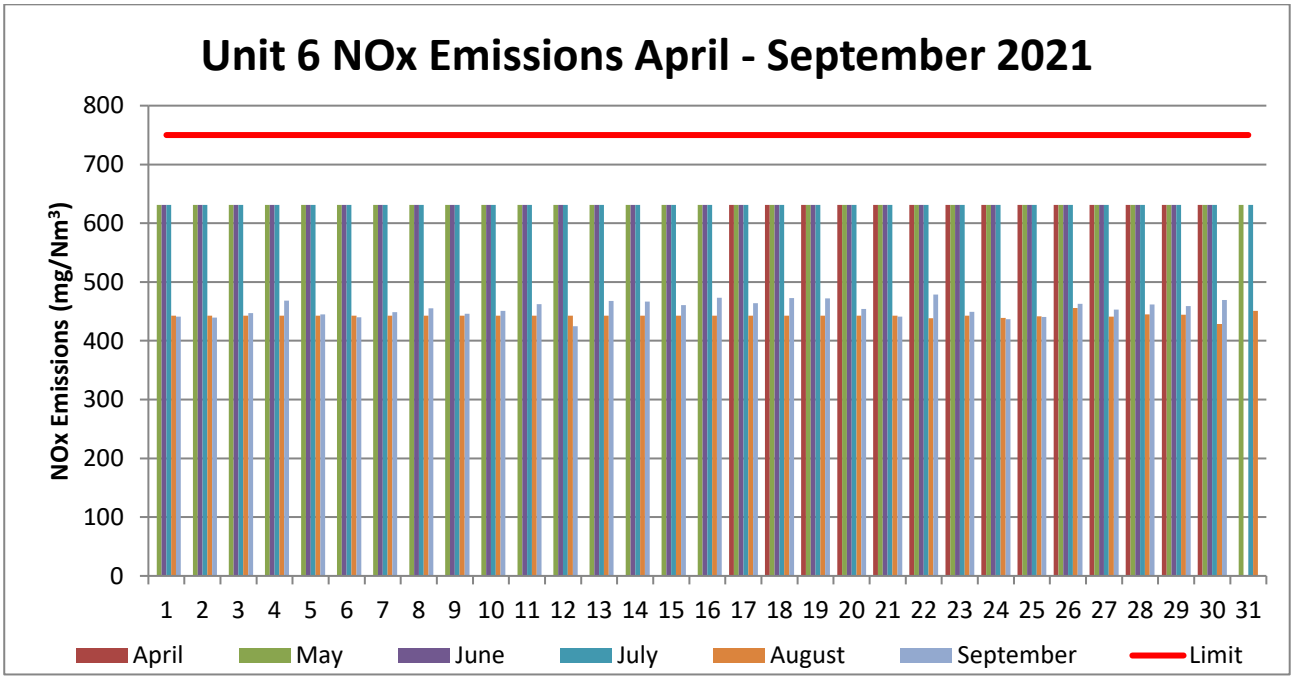

Figure 19: Unit 6 daily NO_x averages for reporting period

Matimba did not exceed the limit for Nitrogen oxides (NO_x) emissions in the reporting period. Averaged values from Quality Assurance Level 2 reports were used for NO_x emission reporting in cases where gaseous emission monitors were not available or were producing unreliable data. An example of where this method was implemented can be seen at unit 6 April 2021 to July 2021 and at unit 4 July 2021 and August 2021. Full details of where averaged data was used is provided in the monthly reports submitted to your office.

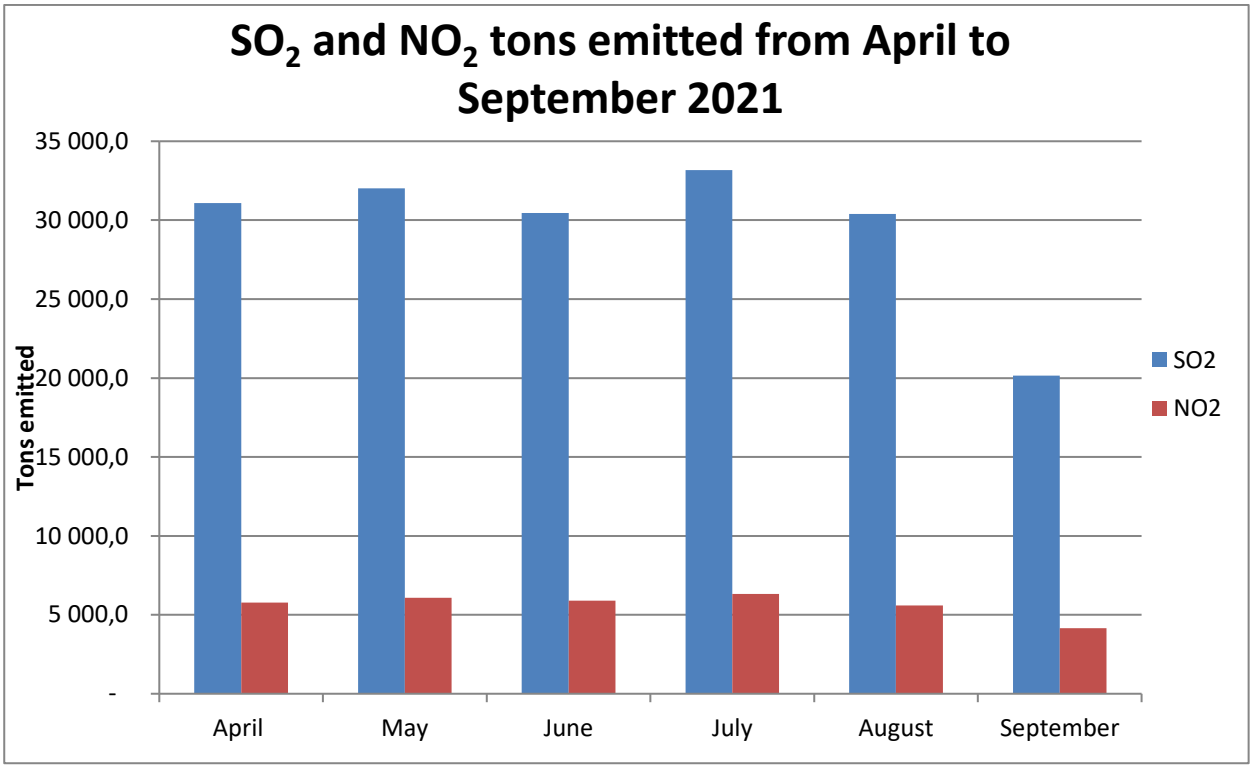

Figure 20: Six Monthly tonnages of SO_2 and NO_x (represented as NO_2)

Impacts of SO_2 emissions

Though pre-combustion activities such as washing of coal to remove 50% of sulphur which is not organically bound, coal blending (mixing of low S_{coal} and high S_{coal}), and pulverising of coal are conducted, this will not have any material change in the amount of sulphur emitted as there is still 50% of sulphur content which is organically bound.

SO_2 is a potent acid rain maker which results in damage to forests and crops, changes the makeup of soil, and makes natural water resources such as rivers acidic and becomes unsuitable for fish and other aquatic life to thrive. Continued exposure over a long time changes the natural variety of plants and animals in an ecosystem. In terms of the human health high exposure to SO_2 is associated with increased risk of respiratory diseases and asthma. Based on the dispersion models the sensitive receptors to Matimba are unlikely to be impacted on by the current emission rates which are within the set national standards.

Impacts of NO_x emissions

Oxides of Nitrogen (represented by NO_2), as an important air pollutant is being monitored in Matimba and reported as per requirement of the atmospheric emission license and also reported in tonnages.

NO_2 it's associated with various human health effects such as lungs, bronchitis, pneumonia, and lower resistance respiratory infections, the emitted concentrations from Matimba are too low to cause any of the mentioned health problems. Rationale being the dispersion of this pollutant will not be in the direction of the sensitive receptors.

Further looking into the environmental impacts, the consequence of NO_2 is in its ability to react with free radical hydroxide ion (OH^o) that is present in the atmosphere. This reaction results in nitric acid (HNO_3) which contributes to the formation of acid rain. It further causes damage terrestrial plants and it is a known cause of eutrophication in natural streams. At the current emission rate the impact of this to the environment is very minimal.

Impacts of CO_2 emissions

Carbon dioxide as a greenhouse gas (GHG) and is emitted in large quantities from coal fired power station, for obvious reasons as high carbon intensity fossil fuels are used. The use of coal and fuel oil in the operation of the plant is unavoidable, especially since coal is more carbon intensive than oil; while oil will emit more carbon than the natural gas. CO_2 is an important GHG as it supports various forms of life; however high concentrations of this gas results in climate challenges such as global warming. In terms of the human health, CO_2 is classified as a non-toxic gas.

Eskom as a whole has a climate change policy which seeks to address the carbon footprint of its power producing fleet, and Matimba is part of the current and future interventions being employed to minimise the carbon footprint.

2.3 Air quality improvement and social responsibility

No awareness or education campaigns have been conducted in the reporting period, campaigns are currently in the planning phase and will be completed by March 2022.

2.4 Recommendations of non-compliance or potential non-compliance and implementation plan

The below table indicates the conditions which were not satisfied during the reporting period April 2021 to September 2021.

Table 4: Non-compliance to the station AEL

AEL condition	Current Measure	Impact	Planned Date:
7.1.4 The License Holder shall, continuously operate, and maintain SO_3 injection plant in all six units to improve the efficacy of the electrostatic precipitator.	Project is being implemented to install an additional Sulphur tank at the station to ensure that the plants can stay in operation when maintenance is being performed. Required spares for the SO_3 injection plant has been reviewed and the outstanding components were procured to ensure quick return times after breakdowns.	Air pollution	30 December 2022 Completed
7.3.2 CEMS availability – The CEMS must be maintained to yield a minimum of 90% availability valid hourly average values during the reporting period	Daily reports on availability and progress on repairs of emission monitors when needed. A five year maintenance contract has been put in place to increase the reliability and availability of monitors. A quality control plan was developed to ensure that maintenance and calibrations are performed to the required standard.	Possible under reporting or overstating of the emission figures and unavailability of emission figures.	Daily activity Completed Completed

	Refer to Appendix 8 – "CEMS availability April 2021 to September 2021" for monthly average availability		
7.2.2 PM10 emissions shall not exceed 50 mg/Nm3, NOX emissions shall not exceed 750 mg/Nm3, averaged daily under normal conditions of 273 K, 101.3 kPa and 10% oxygen (O2).and SO2 emissions shall not exceed 3500 mg/Nm3, averaged monthly under normal conditions of 273 K, 101.3 kPa and 10% oxygen (O2).	Recovery plans have been developed to address defects on emission reduction equipment.	Air pollution	30 December 2022

Refer to Appendix 2 to Appendix 7 for reference values for data.

3. Declaration

DECLARATION OF INFORMATION CONTAINED IN THE REPORT:

The information demonstrated in this report show compliance with the Atmospheric Emission License conditions and it is reflects the emission performance for the reporting period.

I hereby declare that the information in this report is correct.

Yours sincerely

Wikus Janse van Rensburg

GENERAL MANAGER: MATIMBA POWER STATION