Eskom

Ms Mpho Nembilwi
Nkangala District Municipality
PO BOX 437
MIDDLEBURG
1050

Date:
01 March 2022

Enquiries:
Livhuwani Tshilate
017 615 2317

Ref*:* 17/4/AEL/MP312/11/09

Dear Ms Nembilwi

KRIEL POWER STATION'S MONTHLY STACK EMISSIONS REPORT FOR THE MONTH OF JANUARY 2021

This serves as the monthly report required in terms of Section 7.4 in Kriel Power Station's Atmospheric Emission License 17/4/AEL/MP312/11/09. The emissions are for the month of January 2022. Verified emissions of particulates matter, SO_2 and NO_x (as NO_2) are also included.

Raw Materials and Products

Table 1: Quantity of Raw Materials and Products used/produced for the month of January 2022

Raw Materials and Products used	**Raw Material Type**	**Units**	**Maximum Permitted Consumption / Rate (Quantity)**	**Consumption / Rate in Month of January 2022**
	Coal	Tons/month	1 227 600	723 705.00
	Fuel Oil	Tons/month	5 000	2 822.9
Production Rates	**Product/ By-Product Name**	**Unit**	**Maximum Production Capacity Permitted (Quantity)**	**Production Rate in Month of January 2022**
	Ash	Tons/month	not specified	211.4
	RE PM	kg/MWh	not specified	0.17

1/…

Abatement Technology

Table 2: Abatement Equipment Control Technology for January 2022.

Associated Unit/Stack	Technology Type	January 2022	
		Actual Efficiency (%)	Utilisation (%)
Unit 1	ESP	99.80%	98.4%
Unit 2	ESP	99.85%	86.0%
Unit 3	ESP	99.83%	70.2%
Unit 4	ESP	100%	76.3%
Unit 5	ESP	100%	84.9%
Unit 6	ESP	99.64%	85.6%

Energy Source Characteristics

Table 3: Energy Source Material Characteristics for the month of January 2022

Characteristic	Stipulated Range (Unit)	Monthly Average Content
Sulphur Content	0.6-1.2 (%)	0.83
Ash Content	21-36 (%)	24.48

Monthly Monitor Reliability

Associated Unit/Stack	PM (%)	SOx (%)	NOx (%)
North	*97.31*	*99.46*	*99.19*
South	*95.38*	*100*	*100*

Emissions Reporting

Table 6.5: Graph 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

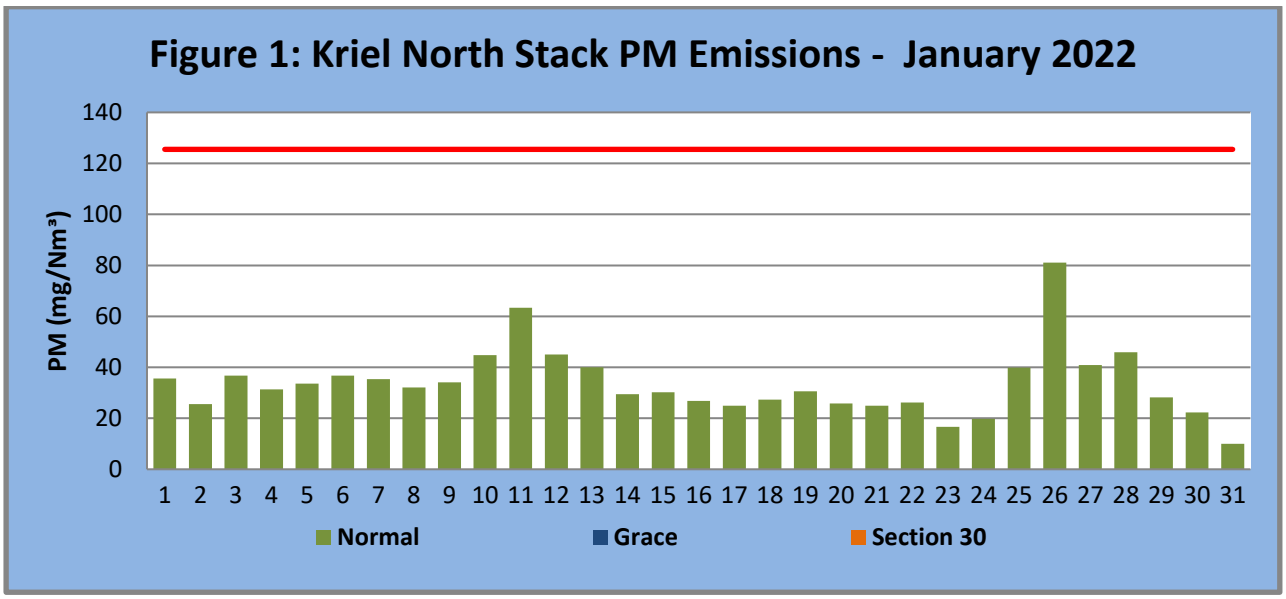

Figure 1: PM emissions for the month of January 2022 against emission limit for the North Stack. Monthly average was 33.7 mg/Nm3

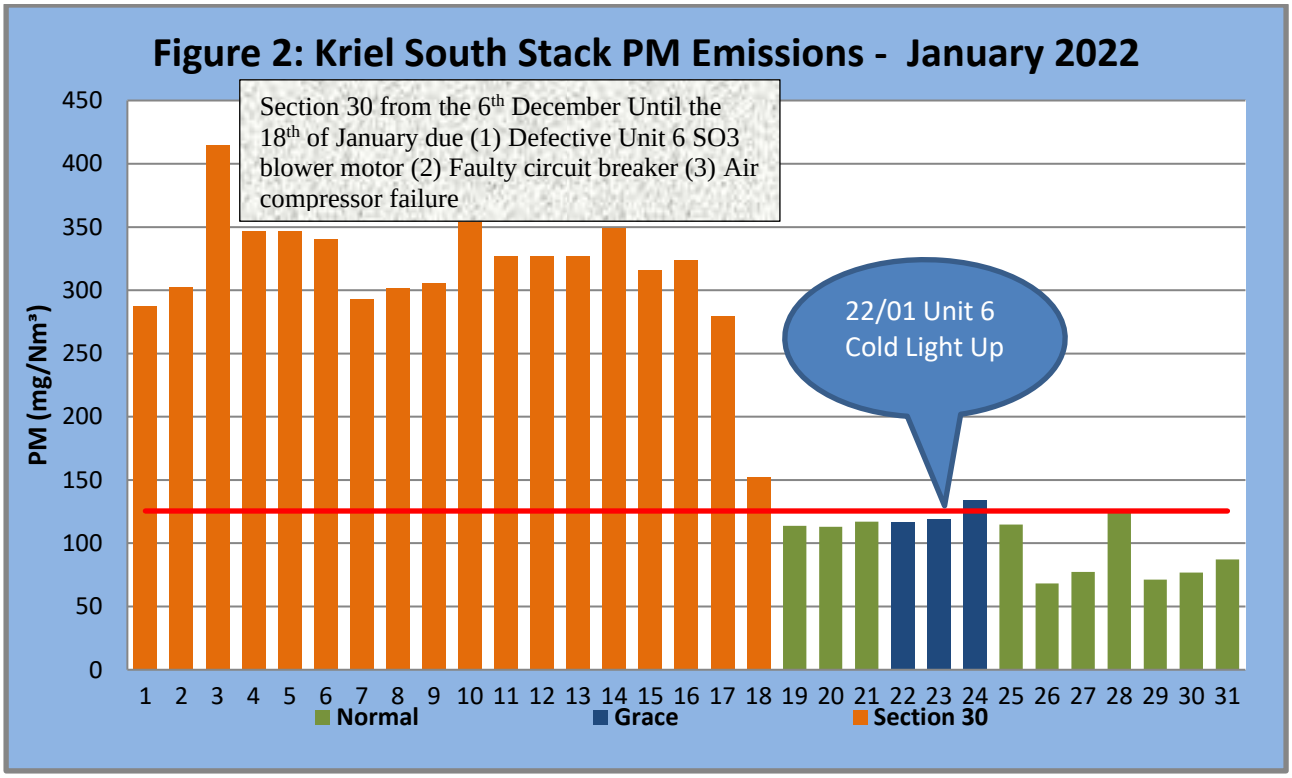

Figure 2: PM emissions for the month of January 2022 against emission limit for the South Stack. Monthly average was 227.3 mg/Nm3

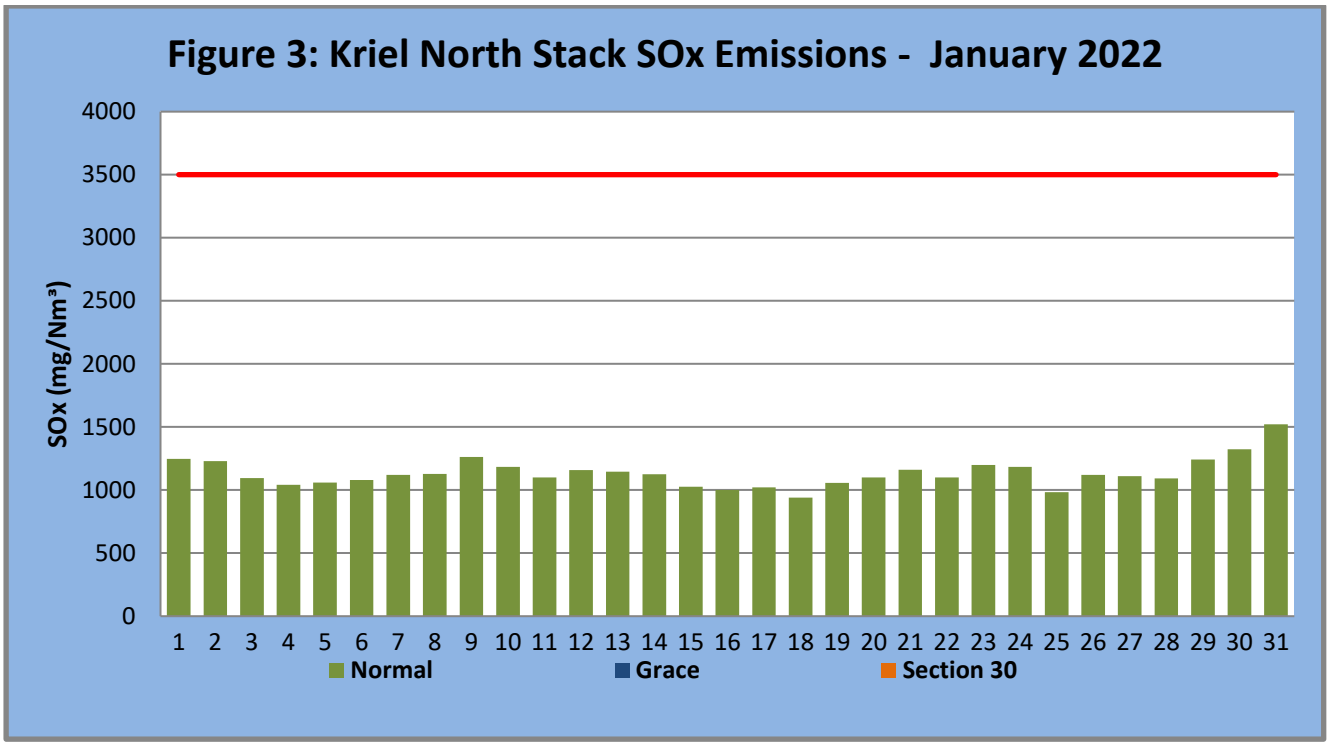

Figure 3. SO_2 emissions for the month of January 2022 against emission limit for the North Stack. The SOx Limit is 3500mg/Nm3.

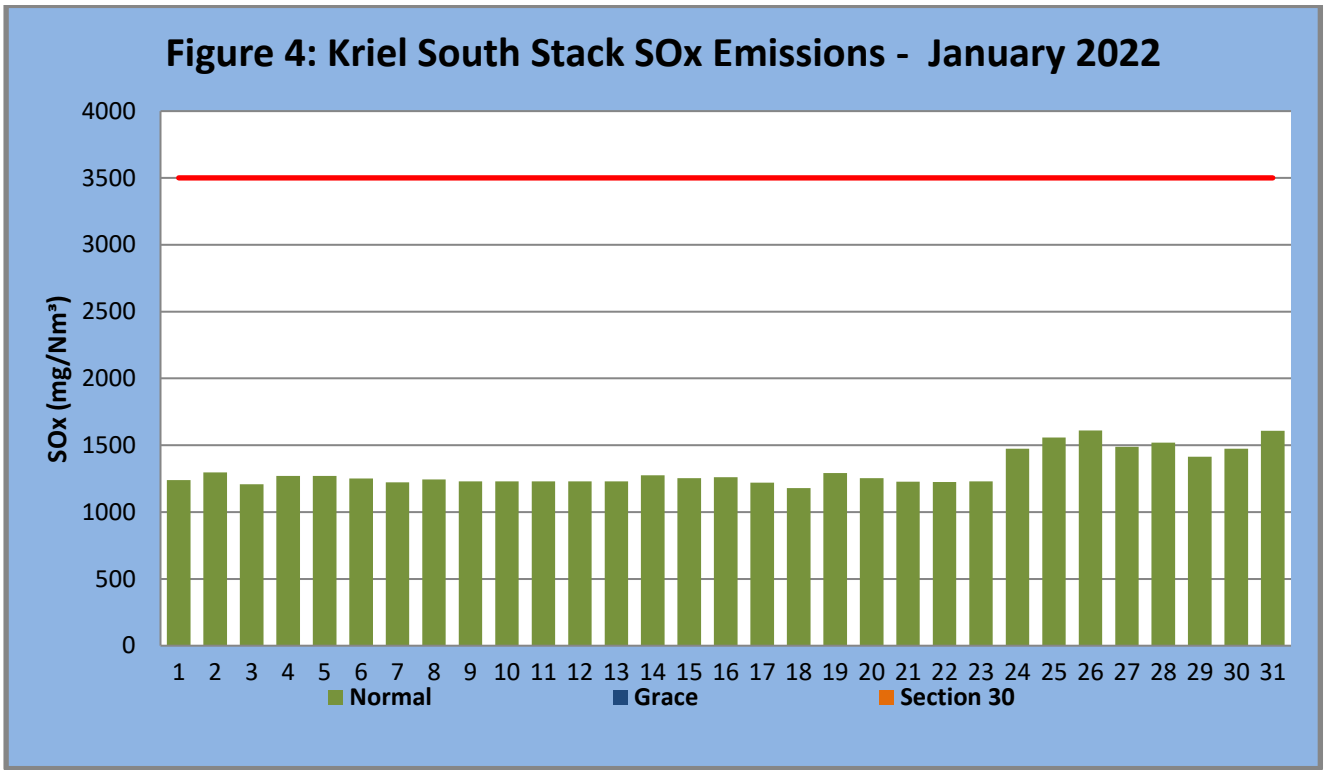

Figure 4. SO_2 emissions for the month of January 2022 against emission limit for the South Stack. The SOx Limit is 3500mg/Nm3.

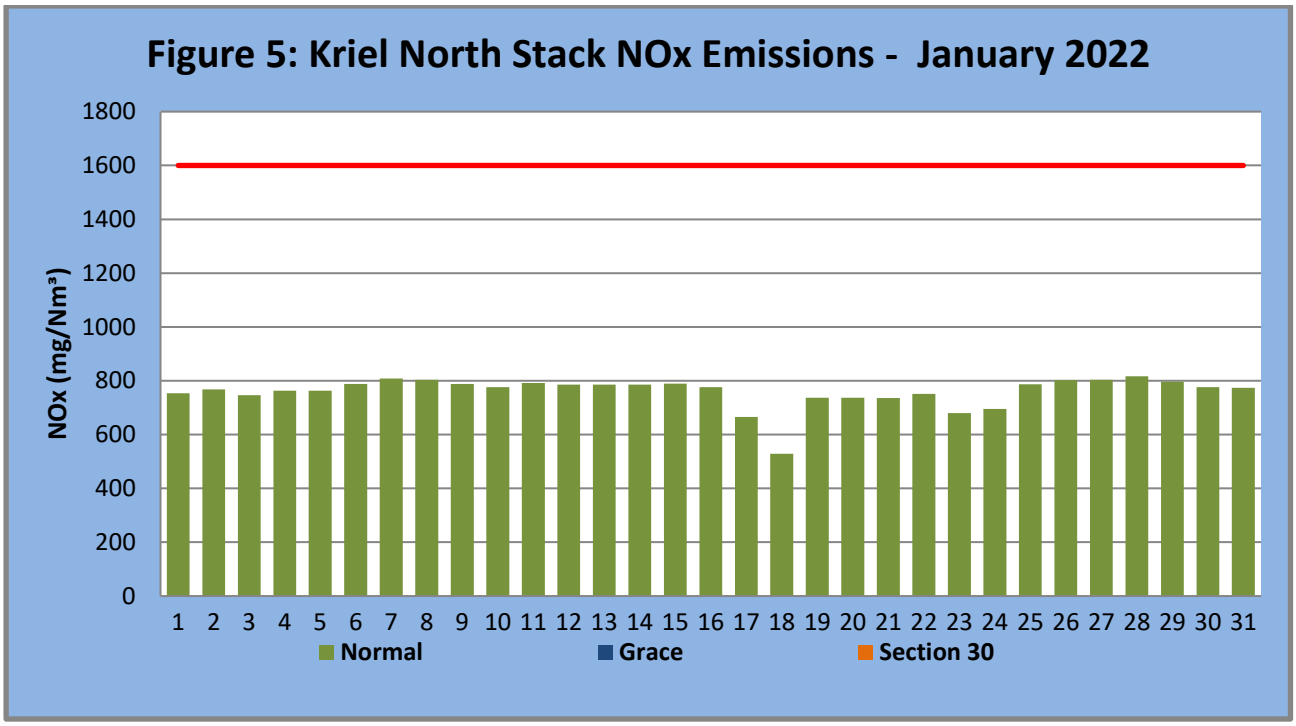

Figure 5. NO_2 emissions for the month of January 2022 against emission limit for the North Stack. The NOx Limit is 1600mg/Nm3.

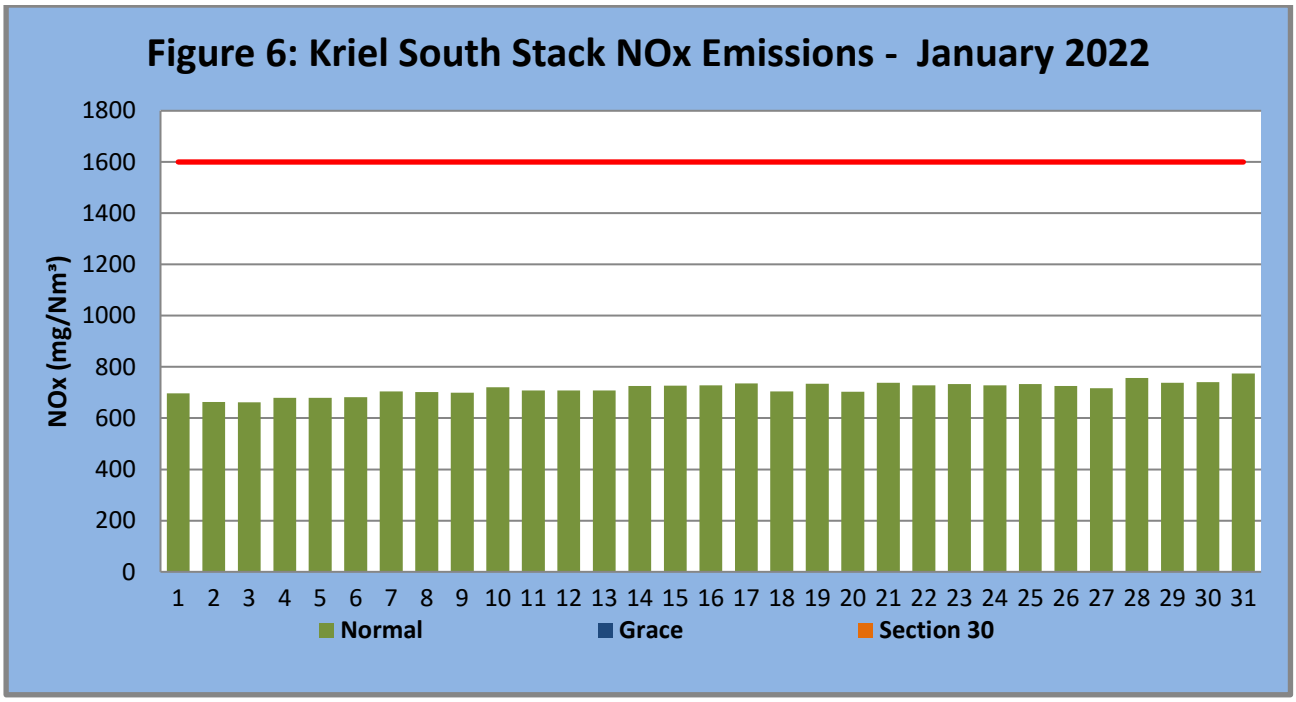

Figure 6. NO_2 emissions for the month of January 2022 against emission limit for the South Stack. The NOx Limit is 1600mg/Nm3.

Table 4: Monthly tonnages for the month January 2022

Unit	PM (tons)	SO_2 (tons)	NO_2 (tons)
SUM	211.4	4 749.6	3 143.7

Table 5: Each unit and respective days operating under normal operation and section 30 days respectively

Table 5.1: Operating days in compliance to PM AEL Limit – January 2022

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Monthly Limit Exceedance	Average PM (mg/Nm³)
North	31	0	0	0	0	33.7
South	10	3	18	0	21	227.3

Table 5.2: Operating days in compliance to SOx AEL Limit - January 2022

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average SOx (mg/Nm³)
North	31	0	0	0	0	1 134.0
South	31	0	0	0	0	1 313.3

Table 5.3: Operating days in compliance to NOx AEL Limit – January 2022

Associated Unit/Stack	Normal	Grace	Section 30	Contravention	Total Exceedance	Average NOx (mg/Nm³)
North	31	0	0	0	0	760.0
South	31	0	0	0	0	715.6

Light up information

Table 6: PM Start-up information for the month of January 2022

North Stack	*Event 1*		*Event 2*		*Event 3*	
Unit No.	*Unit 2*		*Unit 1*		*Unit 3*	
Breaker Open (BO)			*11:35 AM*	*2022/01/23*	*10:25 AM*	*2022/01/18*
Draught Group (DG) Shut Down (SD)			*2:10 PM*	*2022/01/23*	*8:35 PM*	*2022/01/18*
BO to DG SD (duration)		DD:HH:MM	*00:02:35*	DD:HH:MM	*00:10:10*	DD:HH:MM
Fires in time	*10:10 PM*	*2022/01/04*	*7:00 PM*	*2022/01/23*	*7:45 AM*	*2022/01/27*
Synch. to Grid (or BC)	*8:00 AM*	*2022/01/05*	*11:05 PM*	*2022/01/23*	*4:15 PM*	*2022/01/27*
Fires in to BC (duration)	*00:09:50*	DD:HH:MM	*00:04:05*	DD:HH:MM	*00:08:30*	DD:HH:MM
Emissions below limit from BC (end date)	*not > limit*	*not > limit*	*not > limit*	*not > limit*	*not > limit*	*not > limit*
Emissions below limit from BC (duration)	*n/a*	DD:HH:MM	*n/a*	DD:HH:MM	*n/a*	DD:HH:MM

South Stack	Event 1		Event 2		Event 3	
Unit No.	Unit 4		Unit 5		no event	
Breaker Open (BO)	BO previously	BO previously	9:05 PM	2022/01/07	12:30 PM	2022/01/08
Draught Group (DG) Shut Down (SD)	n/a	n/a	7:45 AM	2022/01/08	11:35 AM	2022/01/10
BO to DG SD (duration)	n/a	DD:HH:MM	00:10:40	DD:HH:MM	01:23:05	DD:HH:MM
Fires in time	11:00 AM	2022/01/03	7:30 PM	2022/01/10		
Synch. to Grid (or BC)	5:40 PM	2022/01/05	6:30 AM	2022/01/13		
Fires in to BC (duration)	02:06:40	DD:HH:MM	02:11:00	DD:HH:MM		DD:HH:MM
Emissions below limit from BC (end date)	not > limit	not > limit	not > limit	not > limit		
Emissions below limit from BC (duration)	n/a	DD:HH:MM	n/a	DD:HH:MM		DD:HH:MM

South Stack …Cont.	Event 4		Event 5		Event 6		Event 7	
Unit No.	Unit 4		Unit 6		Unit 5		no event	
Breaker Open (BO)	12:15 PM	2022/01/11	6:25 PM	2022/01/17	10:40 PM	2022/01/21	9:25 AM	2022/01/27
Draught Group (DG) Shut Down (SD)	11:10 PM	2022/01/11	5:35 AM	2022/01/18	11:25 PM	2022/01/21	6:50 PM	2022/01/27
BO to DG SD (duration)	00:10:55	DD:HH:MM	00:11:10	DD:HH:MM	00:00:45	DD:HH:MM	00:09:25	DD:HH:MM
Fires in time	6:10 PM	2022/01/15	9:05 PM	2022/01/21	8:20 PM	2022/01/22		
Synch. to Grid (or BC)	3:35 AM	2022/01/16	5:20 AM	2022/01/22	5:15 AM	2022/01/23		
Fires in to BC (duration)	00:09:25	DD:HH:MM	00:08:15	DD:HH:MM	00:08:55	DD:HH:MM		DD:HH:MM
Emissions below limit from BC (end date)	not > limit	not > limit	not > limit	not > limit	not > limit	not > limit		
Emissions below limit from BC (duration)	n/a	DD:HH:MM	n/a	DD:HH:MM	n/a	DD:HH:MM		DD:HH:MM

Complaints Register

Table 9: Complaints for the month of January 2022.

Source Code/ Name	Root Cause Analysis	Calculation of Impacts/ emissions associated with the incident	Dispersion modeling of pollutants where applicable	Measures implemented to prevent reoccurrence	Date by which measure will be implemented
There was no complaint related to air quality received during the month of January 2022.					

General

The particulate matter (PM10) emissions on the North Common Stack were within the **monthly limit**; North stack recorded the monthly PM10 average emissions figure of **33.7 mg/Nm3** while south stack exceeded the **monthly limit** and recorded PM10 monthly average figure of **227.3 mg/Nm3**. The gaseous (NOx & SOx) emissions on the north and south common stacks were also within the **daily limit** during the month of January 2022; refer to graphs above.

Hereunder is the sequence of events resulting into south stack experiencing high emissions during the months of December 2021 and January 2022:

- On Monday the 6th of December 2021 (at around 20:20), Operating Department noted an increase on South stack's emissions performance resulting on emissions averaging above the 125mg/Nm3 licenced limit. The matter was immediately reported and investigated by maintenance team.
- On the 7th of December 2021, the incident investigation team discovered that the issue was Unit 06's SO_3 system which was malfunctioning, and therefore negatively impacting the dust trapping mechanism on the Electrostatic Precipitators (ESPs).
- Further online investigations were carried out to understand the cause of Unit 06's SO_3 plant malfunction. On the 9th of December 2021, the investigation team found that Unit 06's SO_3 plant blower motor was the underlying problem as it was defective.
- From the 9th to the 16th of December 2021, a three phased 24-points action plan to repair and restore the defective blower motor was established and implemented.
- On the 17th of December 2021, Unit 06's SO3 plant was still ineffective; and it was also further noted that the repair work done and the return to service for unit 06's SO3 plant was unsuccessful.
- On the 19th of December 2021, an environmental duty of care decision was taken to shut down Unit 06 to address SO_3 plant issues which could not be addressed while the unit was online.
- NB: It needs to be noted that a decision to shut down unit 06 was taken despite the system constraints on the national power supply grid at the time.
- The benefits of shutting down Unit 06 started to materialise on the 25th of December 2021 as the PM10 emissions started to trend downward from the 25th to the 27th of December 2021; although it remained above the limit.
- While PM10 emissions were showing signs of improvement and recovery, on the 28th of December 2021, South Stack's emissions increased above the limit again.
- On the 29th of December 2021, it was then discovered that South Stack was also affected by insufficient air pressure from the common air compressor system which services Unit 01 to Unit 06; the system was defective (another upset condition). This resulted into inadequate ash transportation, particularly on Unit 05 which ultimately caused high hopper levels.
- Consequently, Unit 05 high hopper levels led to ESP fields underperforming as the rapping system was clogged by dust. This further adversely affected the PM10 emissions performance from the 28th of December 2021 to the 7th of January 2022 as operating and maintenance teams were battling to clear the high hopper levels.
- During this period, maintenance team also hired three (3) rental diesel air compressors (emergency) to supplement the air pressure.
- As it was evident that efforts to reduce high hopper levels while unit 05 was online were not bearing desired outcome, Kriel Power Station's management then took a decision to shut down

unit 05 on the 7th of January 2022 as an environmental duty of care measure to mitigate against further high emissions.

- Just when there were hopes of South Stack's PM10 emissions recovery following unit 05 shut down, on the 8th of January 2022, South Stack's common SO_3 plant tripped. The matter was immediately reported and investigated by maintenance team.
- The investigation discovered that there was a loss of power supply to the SO_3 Board Programmable Logic Controller (PLC) due to a defective circuit breaker, thus resulting to the trip of the SO3 plant (another upset condition).
- This meant that the entire south side did not have any functioning SO_3 PLCs, and it further worsened the PM_{10} emissions performance on the South Common Stack.
- The defective circuit breaker was replaced and the SO3 plant was returned to service by the 12th of January 2022.
- On the 20th of January 2022, all the above-mentioned issues were resolved and South Stack's PM10 emissions were at around 78mg/Nm3.

NB: The rest of the information demonstrating compliance with the emissions license conditions is supplied in the annual emission reports sent to your office.

Kriel Power Station's List of NEMA Section 30 Incidents for 2021/2022 Financial Year

Month	Description of Section30 Incidents - including the reference number	Root Cause (s)	Status of S30 Incident with DEFF (open or closed)	Remarks
April– 2021	**North Stack:** Upset condition in Units 1,2 and 3 exceeded 48 hours Grace Period	1.Castlet Key System failure 2.Defective Pyrometers	Open	1 event reported
May – 2021	None			
June – 2021	None			
July – 2021	None			
Aug - 2021	None			
Sep – 2021	**South Stack:** Upset condition in Units 4,5 and 5 exceeded 48 hours grace period	Spark from loose electrical connection on the motor terminal at the South SO3 pump house resulting into flashover	Closed	1 event reported
Oct – 2021	None			
Nov – 2021	None			
Dec – 2021	**North Stack:** Upset condition in Units 1,2 and 3 exceeded 48 hours Grace Period **South Stack:** Upset condition in Units 4,5 and 6 exceeded 48 hours grace period	Air compressor failure resulting into inadequate air pressure Unit 6's defective SO_3 plant blower motor Air compressor failure resulting to inadequate air pressure -Defective circuit breaker resulting into loss of power supply to South Stack's SO3 PLC	Open Open	2 events reported
Jan – 2022	December South Stack Incident overlapped to January and affected January emissions			
Feb – 2022	None			
Mar - 2022	None			