

Environmental Status Report
For
Tatijharia Bauxite Mine
at
Post & Teh.: Samri, (Kusmi)
Dist: Balrampur-Ramanujganj(C.G.)

Duration: July-August-September-2018

Name of Industry:-



Ranpamonth
Agent of Mines
Samri Mines Division
Hindalco Industries Ltd

M/s. Hindalco Industries Limited,

Name of Laboratory:-



Recognised by MoEF (GOI) Notifn. No. D.L.33004/99 Dt.24.10.2007
NABL T-1550 (Chemical), T-1826 (Biological), T-2344 (Mechanical) dt.04/10/2016 valid up to 03.10.2018
Accredited under the QCI-NABET Scheme for EIA Consultant
BIS vide No.CL/CQAPD/OSL (7124116) dt.16.12.2011
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Foreword

The protection of environment plays a crucial role in maintaining the local environment quality for any mining industry. Hence compliance of the statutory requirements becomes very important to conserve the ecological balance within and surrounding the mine area. Therefore, environment protection is becoming a pre requisite for sustainable development. In line with this requirement, the management of **M/s Hindalco Industries Ltd.** has adopted a corporate responsibility of environment protection.

In order to comply with the Environment protection act, to fulfill statutory requirement and to be in tune with Environmental Preservation and sustainable development, **M/s Hindalco Industries Ltd.** has retained **ANACON LABORATORIES PVT. LTD.,** Nagpur as Environment Consultants and for various Environmental issues related to their mines.

This report presents the Environmental Status for the period **July-2018 to September-2018** as compliance to the statutory requirements.

The co-operation extended by the Staff and Management of **M/s Hindalco Industries Ltd.** during the work execution period is gratefully acknowledged.

for **ANACON LABORATORIES PVT. LTD.**

Place : Nagpur

Date : September, 2018



A handwritten signature in blue ink, appearing to read "Shawel".

Authorized Signatory

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|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
|  | <p align="center">Hindalco Industries Limited Tatijharia Mining Environmental Status Report for July-2018 To September-2018</p> | <p align="center">Introduction</p> |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|

1.1 Introduction

Hindalco Industries Limited (Hindalco) is one among the flagship companies of the Aditya Birla Group of Industries and is one of the largest corporate groups in India. This group is a leading manufacturer of Aluminum in India, having integrated facilities encompassing bauxite, mining, refining and smelting to achieve Aluminum.

Various processing units of Hindalco are strategically located in different parts of the nation to achieve optimum benefits. Over the past few decades the group has grown multifold in its production capacities, product mix and diversification in mining. The Chhattisgarh Environment Conservation Board (CECB) granted permission for establishing the Bauxite mine to Hindalco at block Tatijharia, Kudag and Samri mines in Balrampur District of Chhattisgarh State.

HINDALCO INDUSTRIES LTD. awarded the work to M/s ANACON LABORATORIES PVT. LTD. NAGPUR (ALPL) for carrying out monitoring of parameters for assessing pollution levels and preparation of monthly report (July-August-September-2018) as per the requirement of Chhattisgarh Environment Conservation Board (CECB) and Ministry of Environment Forest and climate change (MoEFCC) for Tatijharia mining lease in Balrampur District, Chhattisgarh State.

1.2 Background Information of Tatijharia Mine

Hindalco was granted Tatijharia Bauxite mining lease over an area of 1218.762hec.inTatijharia, Post Jamira, Tehsil Samri of Balrampur district, Chhattisgarh on 25/06/1998 for a period of **50** years. The mining operations were started on 01/04/2004. The production capacity of bauxite is 4.0 Lakh Tonnes Per Annum (LTPA).

1.3 Salient Features of Tatijharia Bauxite Mine

The deposits occur in Tatijharia block, Post JamiraTehsil Samri of Balrampur district. This deposit has been identified as one of the resources to cater the raw material requirements of the Hindalco Alumina refinery at Renukoot, Uttar Pradesh. The salient features of the project are presented below:

(**Table-1**)



1.5 Air Environment

1.5.1 Ambient Air Quality Monitoring

Ambient Air Quality monitored at 8 locations in the core zone and buffer zone with reference to Tatijharia mine lease area shown in (Fig. 1).

Table 2

Locations of Ambient Air Quality Monitoring (AAQM) & Fugitive Emission (1218.762 hec.)

| S.No. | Fugitive Emission (Core Zone) | S.No. | Buffer Zone |
|-------|------------------------------------|-------|-----------------------------|
| 1 | Piprapat/Nr.Mining Area | 5 | Kutku Village/Nr.V.T.Center |
| 2 | Betpani | 6 | Sairaidh Campus |
| 3 | Virhorepat | 7 | Rajendrapur/Nr.Mining Area |
| 4 | Tatijharia Village/Nr.Weigh Bridge | 8 | Dumerkholi/Nr.Mining Area |

The sampling stations are selected at the above mentioned locations, in downwind and upwind directions of the mining site in the core zone and buffer zone. ALPL is carrying out regular monitoring for $PM_{2.5}$, RPM(PM_{10}), SO_2 , NO_x and SPM, RSPM, SO_2 , NO_x , Pb, Hg, As and Cr above Ambient Air Quality Monitoring (AAQM) locations. The dust fall rate was measured in the mining area (BKB campus) and Tatijharia village during July-2018 to September-2018. The AAQM sampling sites are selected considering seasonal variation in wind speed and wind direction.

1.5.2 Sampling Duration and Frequency

Ambient air quality monitoring was carried out for the parameters $PM_{2.5}$, RPM(PM_{10}), SO_2 , NO_x and SPM, RSPM, SO_2 , NO_x , Pb, Hg, As and Cr from July-2018 to September-2018 as per CPCB norms. Sampling Frequency is given in **Table-3**.

Data is compared with the present revised standards mentioned in the latest Gazette Notification of the Central Pollution Control Board (CPCB) (August-20, 1994), and as per consent conditions mentioned in consent letter.

Table 4.0
Measurement Techniques for various pollutants

| Sr. No. | Parameter | Technique | Technical Protocol | Minimum Reportabl Value($\mu\text{g}/\text{m}^3$) |
|---------|-------------------------------|----------------------------------------------|---------------------|-----------------------------------------------------|
| 1. | Suspended Particulate Matter | Respirable Dust Sampler (Gravimetric Method) | IS-5182 (Part - 23) | 5 |
| 2. | Respirable Particulate Matter | Respirable Dust Sampler (Gravimetric Method) | IS-5182 (Part-23) | 5 |
| 3. | Particulate Matter 2.5 | Respirable Dust Sampler (Gravimetric Method) | Gravimetric Method | 5 |
| 4. | Sulphur Dioxide | Modified West and Gaeke | IS-5182 (Part - II) | 4 |
| 5. | Oxide of Nitrogen | Jacob & Hochheiser Method | IS-5182 (Part - VI) | 4 |
| 6. | Pb, As, Hg, Cr | Acid Digestion Method | EPA Method | 0.1 |
| 7. | Dust Full | Gravimetric | IS-5182 (Part-I) | - |

1.6 Fugitive Emission Monitoring (Core Zone)

The summary of Fugitive Emission monitoring results for the month of July-2018 to September-2018 are presented in detail in **Table 3.0**. 98th percentile; maximum and minimum values etc. have been computed from the collected raw data for all the Fugitive monitoring station. The data has been compared with the standards prescribed by Central Pollution Control Board (CPCB)/NAAQS for residential and rural zone.

1.6.1 Presentation of Results

Suspended Particulate Matter-SPM

The minimum and maximum concentrations for Suspended Particulate Matter-SPM were recorded as $192\mu\text{g}/\text{m}^3$ and $329\mu\text{g}/\text{m}^3$ respectively. The average concentrations were ranged between 212 to $306\mu\text{g}/\text{m}^3$ and 98th percentile values ranged between 230 to $328\mu\text{g}/\text{m}^3$ in the study area (**Table 6**).

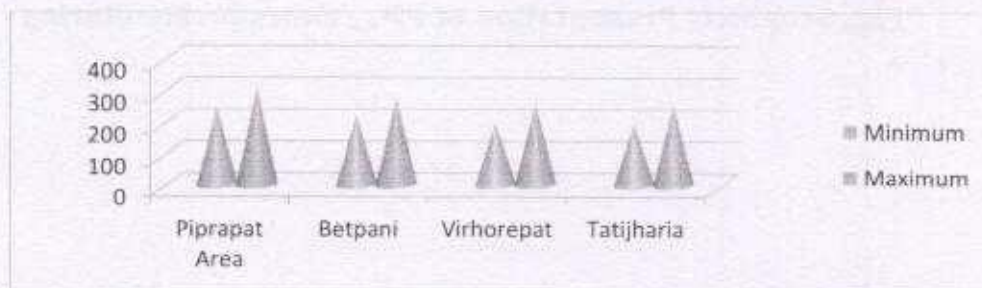


Fig. Graphical Presentation of SPM Fugitive Emission Monitoring

Sulphur Dioxide (SO₂)

The minimum and maximum SO₂ concentrations were recorded as 7µg/m³ and 17µg/m³ respectively. The average values were observed to be in the range of 9 to 14µg/m³ and 98th percentile values varied between 11 to 17µg/m³ (Table 9).



Fig. Graphical Presentation of SO₂ Fugitive Emission Monitoring

Nitrogen Oxide (NO_x)

The minimum and maximum NO_x concentrations were recorded as 16µg/m³ and 31µg/m³. The average concentrations were ranged between 19 to 28µg/m³ and 98th percentile values varied between 21 to 31µg/m³ (Table 10).

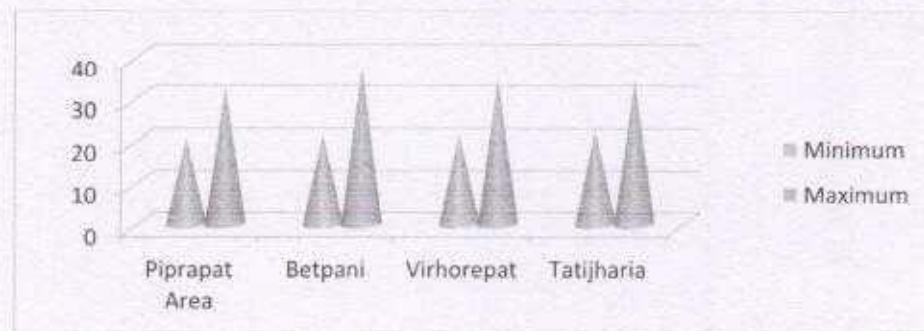


Fig. Graphical Presentation of NO_x Fugitive Emission Monitoring

1.7 Ambient Air Quality (Buffer Zone)

The background levels of SPM, RPM (PM_{10}), $PM_{2.5}$, SO_2 , NO_x , Pb, Hg, As and Cr measured are required to compute Ambient Air Quality. The sampling locations are selected at the above mentioned locations in downwind and upwind directions of the mine. The Minimum, Maximum concentration, Arithmetic mean (AM), Geometric mean (GM) and 98 Percentile are presented in tabular form (**Table 6**).

1.7.1 Presentation of Results.

The summary of Ambient Air Quality monitoring results for the month of July-2018 to September-2018 are presented in detail in **Table 3**. 98th percentile; maximum and minimum values etc. have been computed from the collected raw data for all the AAQ monitoring station. The data has been compared with the standards prescribed by Central Pollution Control Board (CPCB)/NAAQ for residential and rural zone.

Suspended Particulate Matter-SPM

The statistical analysis of SPM is presented in **Table 6** for the mining area. The minimum and maximum values varied between 132 to 216 $\mu g/m^3$ respectively during study period at all the 4 locations. The average values ranged between 143 to 210 $\mu g/m^3$ and 98th percentile values ranged between 152 to 216 $\mu g/m^3$ in the study area.

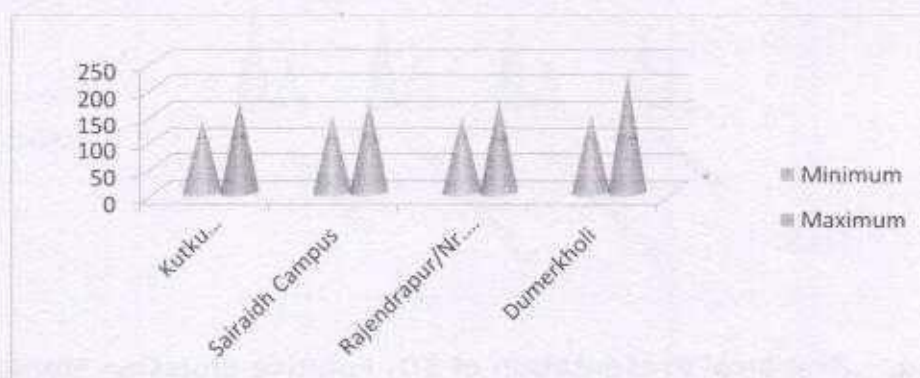


Fig. Graphical Presentation of SPM Fugitive Emission Monitoring

Nitrogen Oxide (NO_x)

The minimum and maximum values of NO_x concentrations varied between 9 to 24µg/m³ respectively. The average values range between 11 to 20µg/m³ and 98th percentile values varied between 13 to 24µg/m³ (**Table 10**).

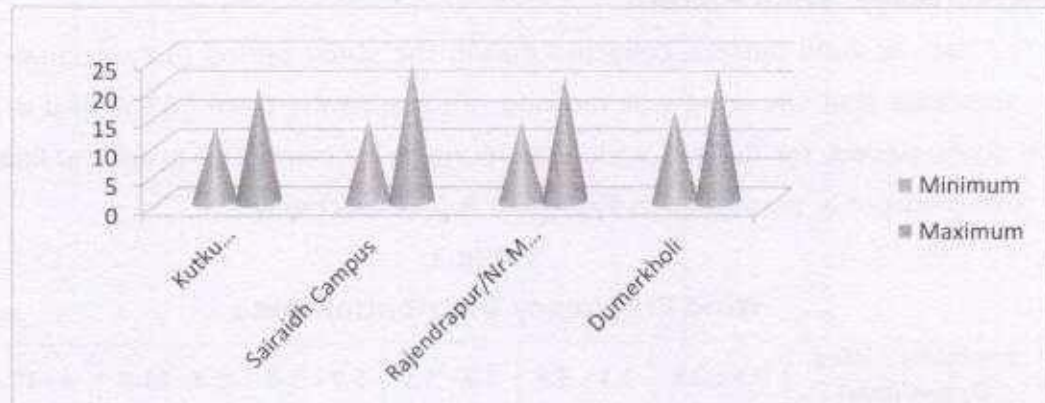


Fig. Graphical Presentation of NO_x Fugitive Emission Monitoring

Lead (Pb)

Lead (Pb) was not detected at any of the locations in SPM samples as well as RSPM Samples (**Table 11**).

Mercury (Hg)

Mercury (Hg) was not detected at any of the locations in SPM samples as well as RSPM Samples (**Table 12**).

Arsenic (As)

Arsenic (As) was not detected at any of the locations in SPM samples as well as RSPM Samples (**Table 13**).

Chromium (Cr)

Chromium was not detected at any of the locations in SPM samples as well as RSPM Samples.

The Dust fall rate during the month of July-2018 to September-2018 was observed 24.1 and 18.4 month MT/km²/month in the Piprapat/Near Mining Area and Tatijharia Village respectively. (**Table14**).

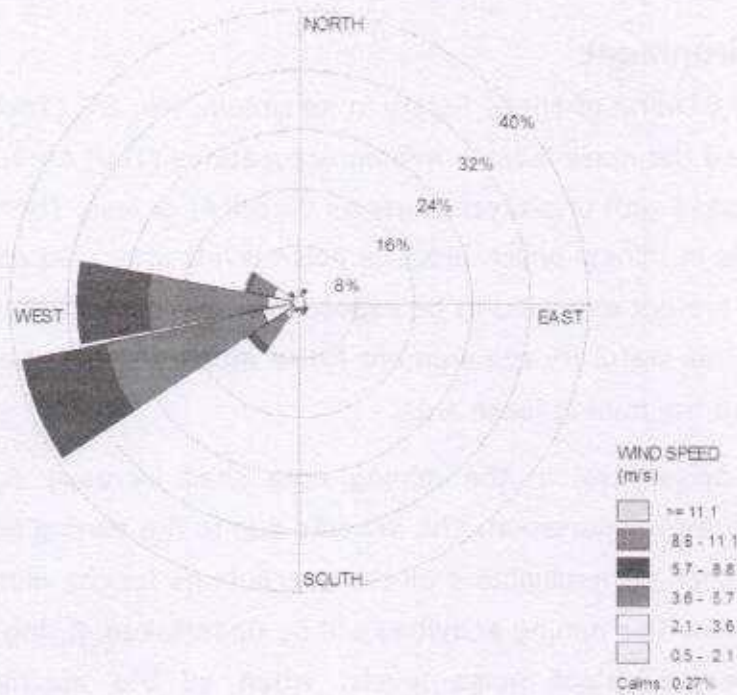


Figure.01: Wind Class Frequency Distribution (July-Aug-Sept-2018).

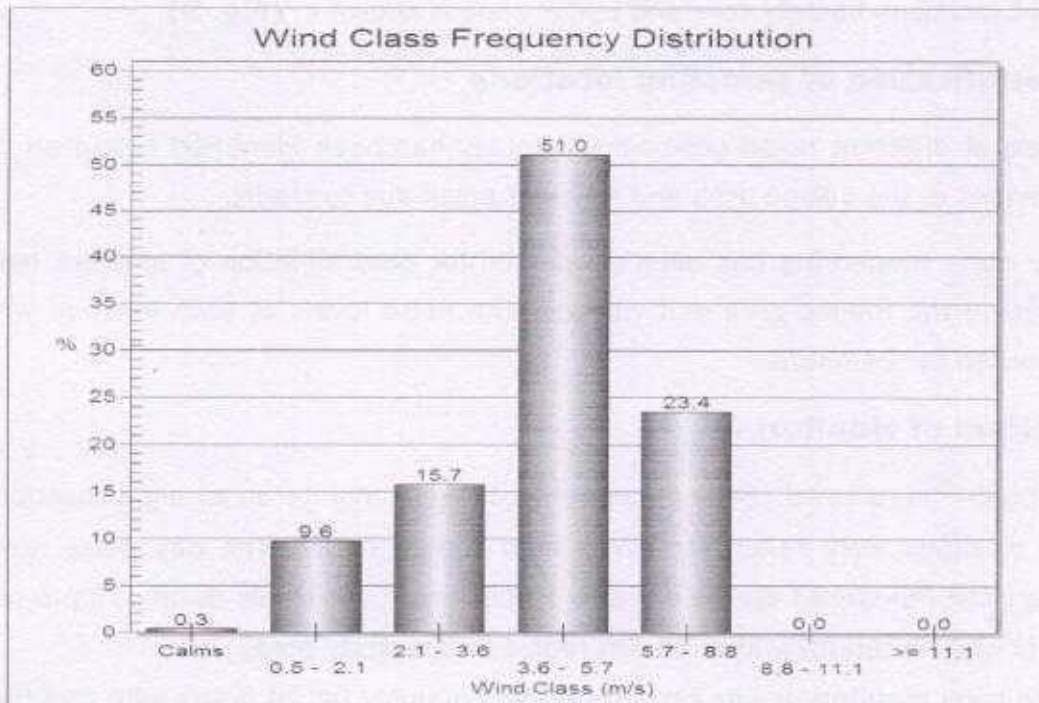


Figure.02: Wind Rose Diagram (July-Aug-Sept-2018)



Noise levels monitored during day and night at 8 locations are found to be below the stipulated standard of CPCB as for Industrial area as 75 dB(A) and 70dB(A) for day and night respectively as given in **(Table 15)**.

Instrument used for monitoring

Noise levels were measured using integrated sound level meter manufactured by Envirotech made in India (Model no. SLM-100). This instrument is capable of measuring the Sound Pressure Level (SPL), Leq.

1.7 Water Quality

The existing status of water quality for groundwater and surface water was assessed by collecting the water samples from underground wells from the piprapat/Nr.mining area and surface water sample from nallahs nearby mining area. The physico-chemical analysis of ground and surface water samples collected during study period reported as average of three month given in (Table 16 & 17). The overall water quality found to be below the stipulated standards of IS 10500-2012 for ground water and found to be fit for drinking purpose for tested parameters. Surface water quality is satisfactory as per IS 10500-2012 for surface water. Thus the impacts due to mining activities in each month have been found to be insignificant.

Month-wise Summary of Statistical Analysis of SPM

1.8 Fugitive Emission (Core Zone):-

1.8.1 Presentation of Results.

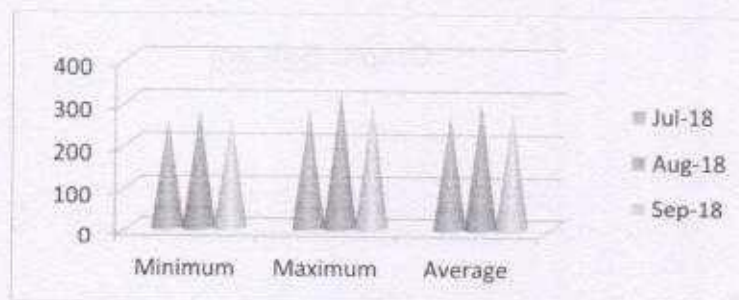
The summary of Statistical Analysis of SPM results for the month of July to September-2018 are presented in detail in **Table 6**. 98th percentile; maximum, minimum and average values etc. have been computed from the collected raw data for all the Fugitive emission monitoring station.

Piprapat / Nr.Mining Area

For the Month of July-2018 the minimum and maximum concentrations for SPM were recorded as 257 $\mu\text{g}/\text{m}^3$ and 286 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 272 $\mu\text{g}/\text{m}^3$.

For the Month of August-2018 the minimum and maximum concentrations for SPM were recorded as 282 $\mu\text{g}/\text{m}^3$ and 329 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 306 $\mu\text{g}/\text{m}^3$.

For the Month of September-2018 the minimum and maximum concentrations for SPM were recorded as 264 $\mu\text{g}/\text{m}^3$ and 304 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 284 $\mu\text{g}/\text{m}^3$.



Graph :- Piprapat / Nr.Mining Area

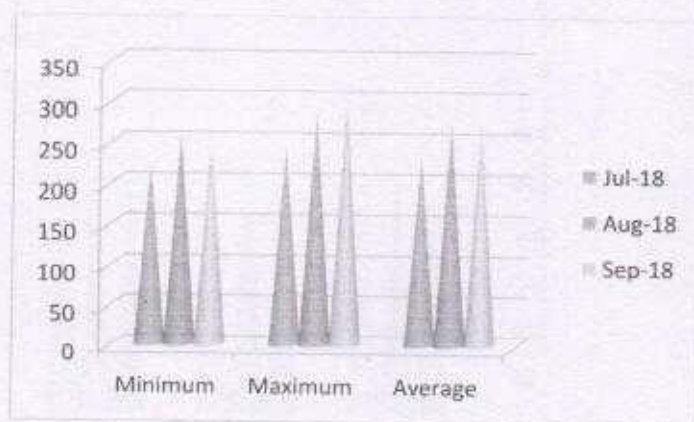


Virhorepat

For the Month of July-2018 the minimum and maximum concentrations for SPM were recorded as $225\mu\text{g}/\text{m}^3$ and $247\mu\text{g}/\text{m}^3$ respectively and average concentration of $236\mu\text{g}/\text{m}^3$.

For the Month of August-2018 the minimum and maximum concentrations for SPM were recorded as $261\mu\text{g}/\text{m}^3$ and $291\mu\text{g}/\text{m}^3$ respectively and average concentration of $276\mu\text{g}/\text{m}^3$.

For the Month of September-2018 the minimum and maximum concentrations for SPM were recorded as $252\mu\text{g}/\text{m}^3$ and $304\mu\text{g}/\text{m}^3$ respectively and average concentration of $278\mu\text{g}/\text{m}^3$.



Graph: - Virhorepat

1.9 Fugitive Emission (Buffer Zone):-

1.9.1 Presentation of Results.

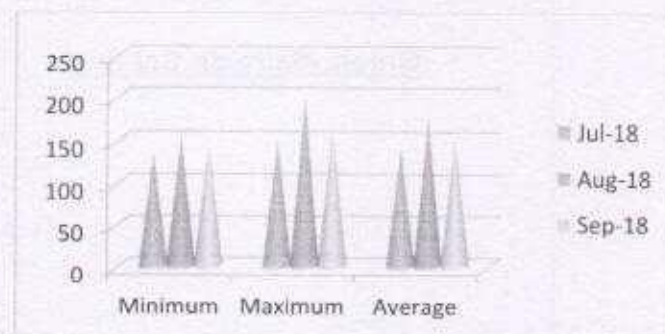
The summary of Statistical Analysis of SPM results for the month of July to September-2018 are presented in detail in **Table 6**. 98th percentile; maximum, minimum and average values etc. have been computed from the collected raw data for all the Fugitive emission monitoring station.

Kutku Village / Nr.V.T.Center

For the Month of July-2018 the minimum and maximum concentrations for SPM were recorded as 138 $\mu\text{g}/\text{m}^3$ and 152 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 145 $\mu\text{g}/\text{m}^3$.

For the Month of August-2018 the minimum and maximum concentrations for SPM were recorded as 156 $\mu\text{g}/\text{m}^3$ and 204 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 180 $\mu\text{g}/\text{m}^3$.

For the Month of September-2018 the minimum and maximum concentrations for SPM were recorded as 149 $\mu\text{g}/\text{m}^3$ and 168 $\mu\text{g}/\text{m}^3$ respectively and average concentration of 159 $\mu\text{g}/\text{m}^3$.



Graph:-Kutku Village / Nr.V.T.Center

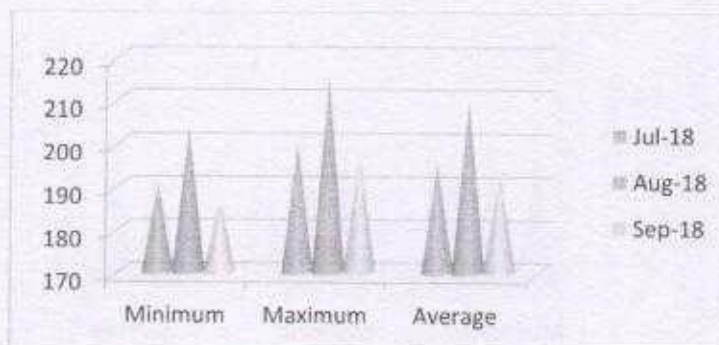


Rajendrapur / Nr.Mining Area

For the Month of July-2018 the minimum and maximum concentrations for SPM were recorded as $191\mu\text{g}/\text{m}^3$ and $201\mu\text{g}/\text{m}^3$ respectively and average concentration of $196\mu\text{g}/\text{m}^3$.

For the Month of August-2018 the minimum and maximum concentrations for SPM were recorded as $204\mu\text{g}/\text{m}^3$ and $216\mu\text{g}/\text{m}^3$ respectively and average concentration of $210\mu\text{g}/\text{m}^3$.

For the Month of September-2018 the minimum and maximum concentrations for SPM were recorded as $187\mu\text{g}/\text{m}^3$ and $198\mu\text{g}/\text{m}^3$ respectively and average concentration of $193\mu\text{g}/\text{m}^3$.



Graph:-Rajendrapur / Nr.Mining Area



Table 7

Statistical analysis of RSPM

Unit: $\mu\text{g}/\text{m}^3$

| Location | Month & Year | Min. | Max. | A.M. | G.M. | 98% |
|-------------------------------------------|----------------|---------------------------------------------------------|------|------|------|-----|
| Fugitive Emission (Core Zone):- | | | | | | |
| Piprapat/Nr.Mining Area | July-2018 | 58 | 61 | 60 | 60 | 61 |
| | August-2018 | 64 | 72 | 68 | 68 | 72 |
| | September-2018 | 63 | 68 | 66 | 66 | 68 |
| Betpani | July-2018 | 62 | 65 | 64 | 64 | 65 |
| | August-2018 | 74 | 82 | 78 | 78 | 82 |
| | September-2018 | 73 | 78 | 76 | 76 | 78 |
| Virhorepat | July-2018 | 56 | 59 | 58 | 58 | 59 |
| | August-2018 | 71 | 79 | 75 | 75 | 79 |
| | September-2018 | 61 | 66 | 64 | 64 | 66 |
| Tatijharia Village/Nr.Weigh Bridge | July-2018 | 62 | 65 | 64 | 64 | 65 |
| | August-2018 | 67 | 75 | 71 | 71 | 75 |
| | September-2018 | 60 | 65 | 63 | 63 | 65 |
| | | 100 $\mu\text{g}/\text{m}^3$ (24 hrs) | | | | |

| Location | Month & Year | Min. | Max. | A.M. | G.M. | 98% |
|-------------------------------------|----------------|---------------------------------------------------------|------|------|------|-----|
| Buffer Zone :- | | | | | | |
| Kutku Village/ Nr.V.T.Center | July-2018 | 48 | 53 | 51 | 51 | 53 |
| | August-2018 | 51 | 58 | 55 | 55 | 58 |
| | September-2018 | 46 | 49 | 48 | 48 | 49 |
| Sairaidh Campus | July-2018 | 42 | 51 | 47 | 47 | 51 |
| | August-2018 | 46 | 57 | 52 | 52 | 57 |
| | September-2018 | 43 | 49 | 46 | 46 | 49 |
| Rajendrapur/ Nr.Mining Area | July-2018 | 53 | 62 | 58 | 58 | 62 |
| | August-2018 | 56 | 71 | 64 | 64 | 71 |
| | September-2018 | 48 | 59 | 54 | 54 | 59 |
| Dumerkholi/ Nr.Mining Area | July-2018 | 47 | 56 | 52 | 52 | 56 |
| | August-2018 | 51 | 62 | 57 | 57 | 62 |
| | September-2018 | 49 | 58 | 54 | 54 | 58 |
| CPCB Standard | | 100 $\mu\text{g}/\text{m}^3$ (24 hrs) | | | | |

Conclusion (A):-

- 5) **Piprapat/Nr.Mining Lease Area Core Zone:** For the Months of July-Aug-Sept-2018 Average of RSPM is $65\mu\text{g}/\text{m}^3$.
- 6) **Betpani Lease Area Core Zone:-** For the Months of July-Aug-Sept-2018 Average of RSPM is $73\mu\text{g}/\text{m}^3$.
- 7) **Virhorepat Lease Area Core Zone:-** For the Months of July-Aug-Sept-2018 Average of RSPM is $66\mu\text{g}/\text{m}^3$.
- 8) **Tatijharia Village/Nr.Weigh Bridge Lease Area Core Zone:-**For the Months of July-Aug-Sept-2018 Avg of RSPM is $66\mu\text{g}/\text{m}^3$.
 - The Average Concentration of RSPM within the Core Zone of Tatijharia Lease is $67\mu\text{g}/\text{m}^3$.

Conclusion (B):-

- 5) **Kutku Village/ Nr.V.T.CenterLease Area Buffer Zone:-** For the Months July-Aug-Sept-2018 Average of RSPM is $51\mu\text{g}/\text{m}^3$.
- 6) **Sairaidh Campus Lease Area Buffer Zone:-** For the Months of July-Aug-Sept-2018 Average of RSPM is $48\mu\text{g}/\text{m}^3$.
- 7) **Rajendrapur/ Nr.Mining Lease Area Buffer Zone:-**For the Months of July-Aug-Sept-2018 Average of RSPM is $59\mu\text{g}/\text{m}^3$.
- 8) **Dumerkholi/ Nr.Mining Lease Area Buffer Zone:-**For the Months of July-Aug-Sept-2018 Average of RSPM is $54\mu\text{g}/\text{m}^3$.
 - The Average Concentration of RSPM within the Buffer Zone of Tatijharia Lease is $53\mu\text{g}/\text{m}^3$.

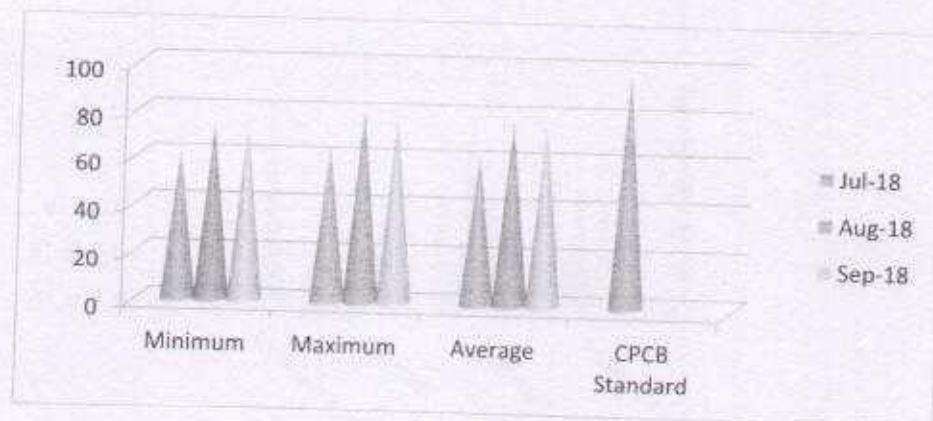


Betpani

For the Month of July-2018 the minimum and maximum concentrations for RSPM were recorded as $62\mu\text{g}/\text{m}^3$ and $65\mu\text{g}/\text{m}^3$ respectively and average concentration of $64\mu\text{g}/\text{m}^3$.

For the Month of August-2018 the minimum and maximum concentrations for RSPM were recorded as $74\mu\text{g}/\text{m}^3$ and $82\mu\text{g}/\text{m}^3$ respectively and average concentration of $78\mu\text{g}/\text{m}^3$.

For the Month of September-2018 the minimum and maximum concentrations for RSPM were recorded as $73\mu\text{g}/\text{m}^3$ and $78\mu\text{g}/\text{m}^3$ respectively and average concentration of $76\mu\text{g}/\text{m}^3$.



Graph:-Betpani

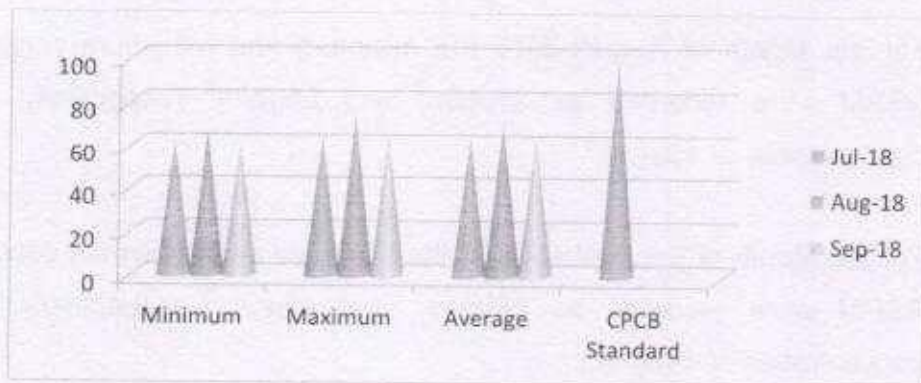


Tatijharia Village/Nr.Weigh Bridge

For the Month of July-2018 the minimum and maximum concentrations for RSPM were recorded as $62\mu\text{g}/\text{m}^3$ and $65\mu\text{g}/\text{m}^3$ respectively and average concentration of $64\mu\text{g}/\text{m}^3$.

For the Month of August-2018 the minimum and maximum concentrations for RSPM were recorded as $67\mu\text{g}/\text{m}^3$ and $75\mu\text{g}/\text{m}^3$ respectively and average concentration of $71\mu\text{g}/\text{m}^3$.

For the Month of September-2018 the minimum and maximum concentrations for RSPM were recorded as $60\mu\text{g}/\text{m}^3$ and $65\mu\text{g}/\text{m}^3$ respectively and average concentration of $63\mu\text{g}/\text{m}^3$.



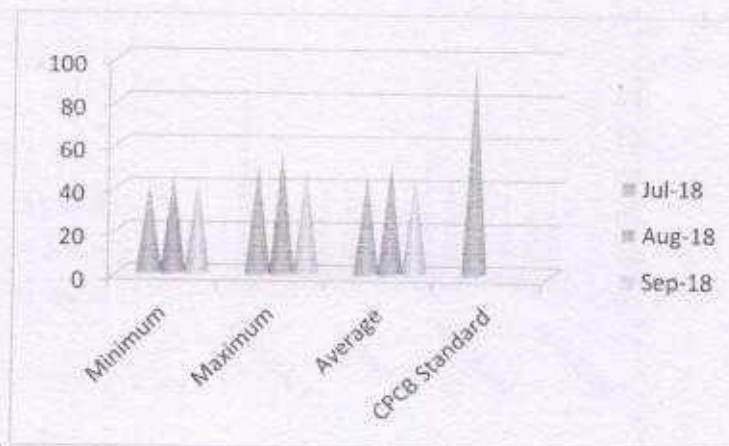
Graph:-Tatijharia Village/Nr.Weigh Bridge

Sairaidh Campus

For the Month of July-2018 the minimum and maximum concentrations for RSPM were recorded as $42\mu\text{g}/\text{m}^3$ and $51\mu\text{g}/\text{m}^3$ respectively and average concentration of $47\mu\text{g}/\text{m}^3$.

For the Month of August-2018 the minimum and maximum concentrations for RSPM were recorded as $46\mu\text{g}/\text{m}^3$ and $57\mu\text{g}/\text{m}^3$ respectively and average concentration of $52\mu\text{g}/\text{m}^3$.

For the Month of September-2018 the minimum and maximum concentrations for RSPM were recorded as $43\mu\text{g}/\text{m}^3$ and $49\mu\text{g}/\text{m}^3$ respectively and average concentration of $46\mu\text{g}/\text{m}^3$.



Graph:-Sairaidh Campus

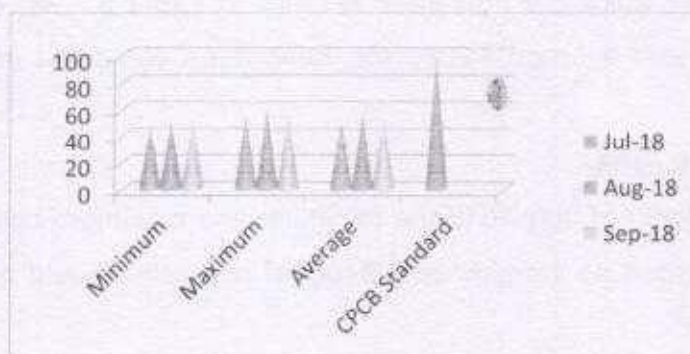


Dumerkholi / Nr.Mining Area

For the Month of July-2018 the minimum and maximum concentrations for RSPM were recorded as $47\mu\text{g}/\text{m}^3$ and $56\mu\text{g}/\text{m}^3$ respectively and average concentration of $52\mu\text{g}/\text{m}^3$.

For the Month of August-2018 the minimum and maximum concentrations for RSPM were recorded as $51\mu\text{g}/\text{m}^3$ and $62\mu\text{g}/\text{m}^3$ respectively and average concentration of $57\mu\text{g}/\text{m}^3$.

For the Month of September-2018 the minimum and maximum concentrations for RSPM were recorded as $49\mu\text{g}/\text{m}^3$ and $58\mu\text{g}/\text{m}^3$ respectively and average concentration of $54\mu\text{g}/\text{m}^3$.



Graph:- Dumerkholi / Nr.Mining Area



Table 9
Statistical Analysis of SO₂

Unit: µg/m³

| Location | Month & Year | Min. | Max. | A.M. | G.M. | 98% |
|---------------------------------------------------|----------------|-------------------------------------|------|------|------|-----|
| Fugitive Emission (Core Zone):- | | | | | | |
| Piprapat/Nr.Minin g Area | July-2018 | 8 | 14 | 11 | 11 | 14 |
| | August-2018 | 11 | 17 | 14 | 14 | 17 |
| | September-2018 | 9 | 14 | 12 | 12 | 14 |
| Betpani | July-2018 | 7 | 11 | 9 | 9 | 11 |
| | August-2018 | 12 | 16 | 14 | 14 | 16 |
| | September-2018 | 9 | 14 | 12 | 12 | 14 |
| Virhorepat | July-2018 | 6 | 12 | 9 | 9 | 12 |
| | August-2018 | 9 | 16 | 13 | 13 | 16 |
| | September-2018 | 7 | 11 | 9 | 9 | 11 |
| Tatijharia Village/Nr.Weigh Bridge | July-2018 | 8 | 13 | 11 | 11 | 13 |
| | August-2018 | 11 | 16 | 14 | 14 | 16 |
| | September-2018 | 9 | 14 | 12 | 12 | 14 |
| Buffer Zone :- | | | | | | |
| Kutku Village/ Nr.V.T.Center | July-2018 | 6 | 9 | 8 | 8 | 9 |
| | August-2018 | 7 | 11 | 9 | 9 | 11 |
| | September-2018 | 7 | 12 | 10 | 10 | 12 |
| Sairaidh Campus | July-2018 | 6 | 8 | 7 | 7 | 8 |
| | August-2018 | 8 | 12 | 10 | 10 | 12 |
| | September-2018 | 7 | 9 | 8 | 8 | 9 |
| Rajendrapur/ Nr.Mining Area | July-2018 | 6 | 9 | 8 | 8 | 9 |
| | August-2018 | 7 | 12 | 10 | 10 | 12 |
| | September-2018 | 6 | 8 | 7 | 7 | 8 |
| Dumerkholi/ Nr.Mining Area | July-2018 | 7 | 11 | 9 | 9 | 11 |
| | August-2018 | 9 | 14 | 12 | 12 | 14 |
| | September-2018 | 7 | 12 | 10 | 10 | 12 |
| CPCB Standard | | 80 µg/m³ (24 hrs) | | | | |

Conclusion: (A)

- 1) **Piprapat /Nr.Mining Lease Area Core Zone:** For the Months of July-Aug-Sept-2018 Average of SO₂ is 12 µg/m³.
- 2) **Betpani Lease Area Core Zone:** For the Months of July-Aug-Sept-2018 Average of SO₂ is 12 µg/m³.
- 3) **Virhorepat Lease Area Core Zone:** For the Months of July-Aug-Sept-2018 Average of SO₂ is 10 µg/m³.
- 4) **Tatijharia Village/Nr.Weigh Bridge Lease Area Core Zone:** For the Months of July-Aug-Sept-2018 Average of SO₂ is 12 µg/m³.
 The Average Concentration of SO₂ within the Core Zone of Tatijharia Lease during this period (July-Aug-Sept-2018) is 12µg/m³ and it is within permissible limits as per CPCB Standard.

Conclusion: (B)

1. **Kutku Village/ Nr.V.T.Center Lease Area Buffer Zone:-** For the Months of July-Aug-Sept-2018 Average of SO₂ is 9 µg/m³.
2. **Sairaidh Campus Lease Area Buffer Zone:-** For the Months of July-Aug-Sept-2018 Average of SO₂ is 8µg/m³.
3. **Rajendrapur/ Nr.Mining Lease Area Buffer Zone:-** For the Months of July-Aug-Sept-2018 Average of SO₂ is 10µg/m³. SO₂ is 8µg/m³.
4. **Dumerkholi/ Nr.Mining Area :** For the Months of July-Aug-Sept-2018 Average of SO₂ is 10µg/m³.

****The Average Concentration of SO₂ within the Buffer Zone of Tatijharia Lease during this period (July-Aug-Sept-2018) is 9µg/m³ and it is within permissible limits as per CPCB Standard.**

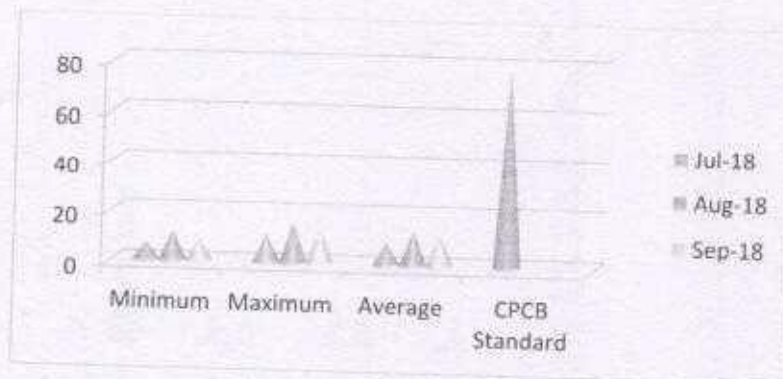


Betpani

For the Month of July-2018 the minimum and maximum concentrations for SO₂ were recorded as 7µg/m³ and 11µg/m³ respectively and average concentration of 9µg/m³.

For the Month of August-2018 the minimum and maximum concentrations for SO₂ were recorded as 12µg/m³ and 16µg/m³ respectively and average concentration of 14µg/m³.

For the Month of September-2018 the minimum and maximum concentrations for SO₂ were recorded as 9µg/m³ and 14µg/m³ respectively and average concentration of 12µg/m³.



Graph:-Betpani

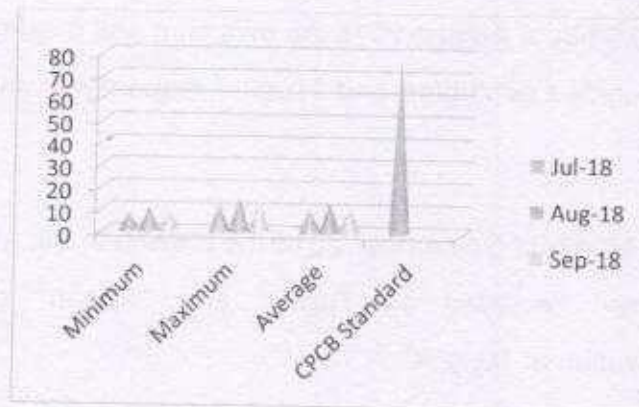


Tatijharia Village/Nr.Weigh Bridge

For the Month of July-2018 the minimum and maximum concentrations for SO₂ were recorded as 8µg/m³ and 13µg/m³ respectively and average concentration of 11µg/m³.

For the Month of August-2018 the minimum and maximum concentrations for SO₂ were recorded as 11µg/m³ and 16µg/m³ respectively and average concentration of 14µg/m³.

For the Month of September-2018 the minimum and maximum concentrations for SO₂ were recorded as 9µg/m³ and 14µg/m³ respectively and average concentration of 12µg/m³.



Graph:-Tatijharia Village/Nr.Weigh Bridge

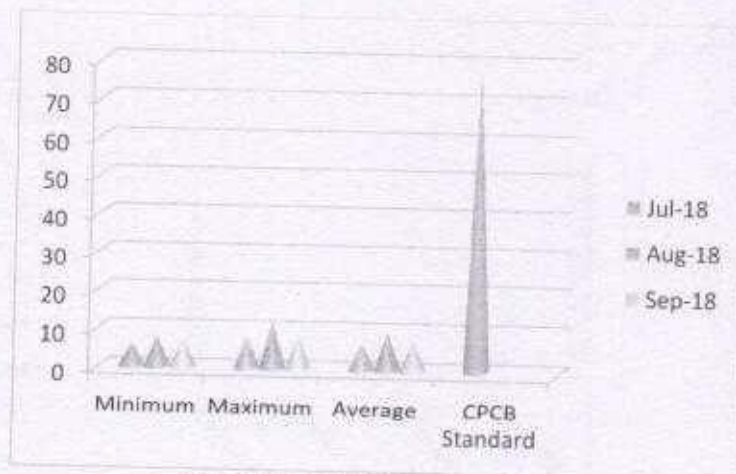


Sairaidh Campus

For the Month of July-2018 the minimum and maximum concentrations for SO₂ were recorded as 6µg/m³ and 8µg/m³ respectively and average concentration of 7µg/m³.

For the Month of August-2018 the minimum and maximum concentrations for SO₂ were recorded as 8µg/m³ and 12µg/m³ respectively and average concentration of 10µg/m³.

For the Month of September-2018 the minimum and maximum concentrations for SO₂ were recorded as 7µg/m³ and 9µg/m³ respectively and average concentration of 8µg/m³.



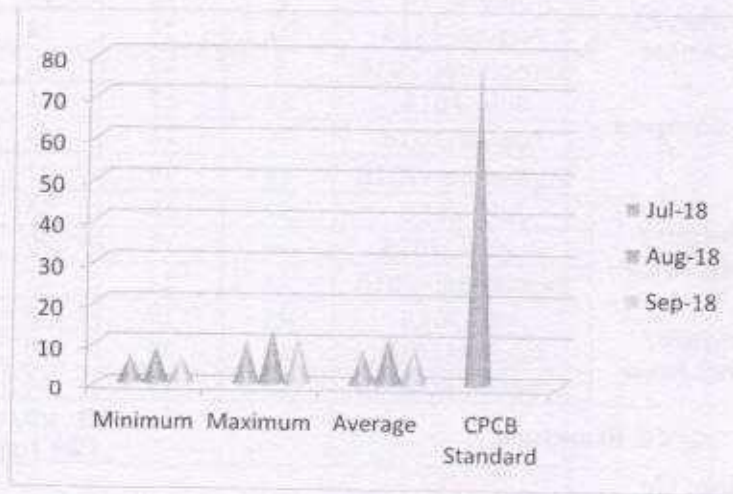
Graph:-Sairaidh Campus

Dumerkholi / Nr.Mining Area

For the Month of July-2018 the minimum and maximum concentrations for SO₂ were recorded as 7µg/m³ and 11µg/m³ respectively and average concentration of 9µg/m³.

For the Month of August-2018 the minimum and maximum concentrations for SO₂ were recorded as 9µg/m³ and 14µg/m³ respectively and average concentration of 12µg/m³.

For the Month of September-2018 the minimum and maximum concentrations for SO₂ were recorded as 7µg/m³ and 12µg/m³ respectively and average concentration of 10µg/m³.



Graph:-Dumerkholi / Nr.Mining Area



Month-wise Summary of Statistical Analysis of NO_x

2.5 Fugitive Emission (Core Zone):-

2.5.1 Presentation of Results.

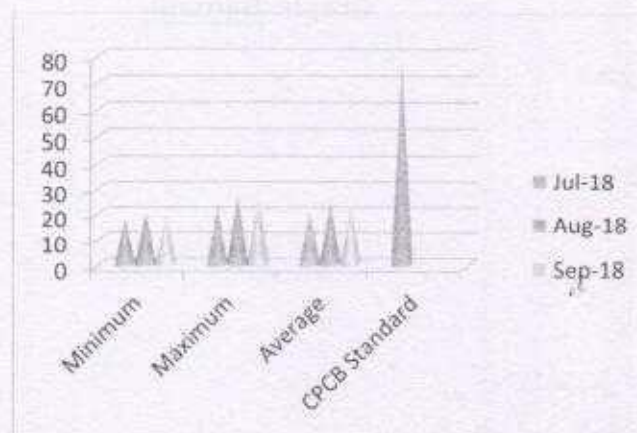
The summary of Statistical Analysis of NO_x results for the month of July-August-September-2018 are presented in detail in **Table 10**. 98th percentile; maximum, minimum and average values etc. have been computed from the collected raw data for all the Fugitive emission monitoring station.

Piprapat / Nr.Mining Area

For the Month of July-2018 the minimum and maximum concentrations for NO_x were recorded as 18µg/m³ and 24µg/m³ respectively and average concentration of 21µg/m³.

For the Month of August-2018 the minimum and maximum concentrations for NO_x were recorded as 21µg/m³ and 28µg/m³ respectively and average concentration of 25µg/m³.

For the Month of September-2018 the minimum and maximum concentrations for NO_x were recorded as 19µg/m³ and 27µg/m³ respectively and average concentration of 23µg/m³.



Graph :- Piprapat / Nr.Mining Area

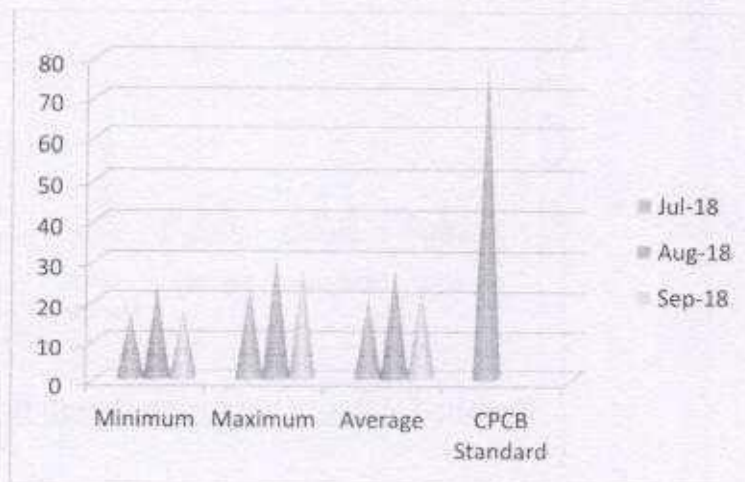


Virhorepat

For the Month of July-2018 the minimum and maximum concentrations for NO_x were recorded as $17\mu\text{g}/\text{m}^3$ and $24\mu\text{g}/\text{m}^3$ respectively and average concentration of $21\mu\text{g}/\text{m}^3$.

For the Month of August-2018 the minimum and maximum concentrations for NO_x were recorded as $24\mu\text{g}/\text{m}^3$ and $31\mu\text{g}/\text{m}^3$ respectively and average concentration of $28\mu\text{g}/\text{m}^3$.

For the Month of September-2018 the minimum and maximum concentrations for NO_x were recorded as $18\mu\text{g}/\text{m}^3$ and $28\mu\text{g}/\text{m}^3$ respectively and average concentration of $23\mu\text{g}/\text{m}^3$.



Graph:-Virhorepat

2.6 Fugitive Emission (Buffer Zone):-

2.6.1 Presentation of Results.

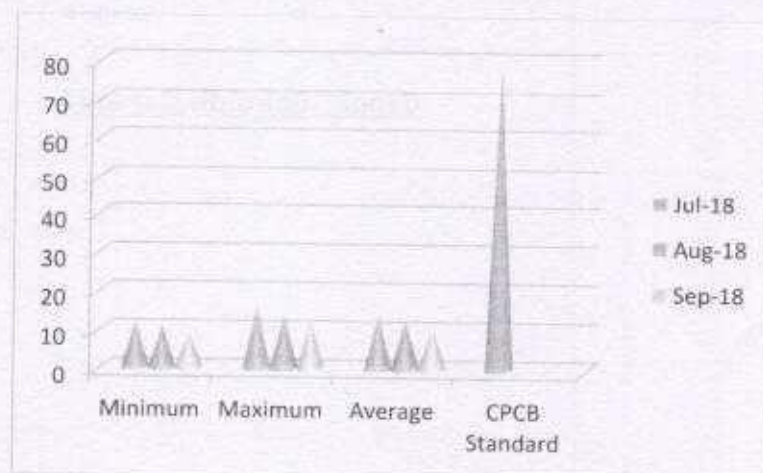
The summary of Statistical Analysis of NO_x results for the month of July-August-September-2018 are presented in detail in **Table 10**. 98th percentile; maximum, minimum and average values etc. have been computed from the collected raw data for all the Fugitive emission monitoring station.

Kutku Village / Nr.V.T.Center

For the Month of July-2018 the minimum and maximum concentrations for NO_x were recorded as 12µg/m³ and 16µg/m³ respectively and average concentration of 14µg/m³.

For the Month of August-2018 the minimum and maximum concentrations for NO_x were recorded as 11µg/m³ and 14µg/m³ respectively and average concentration of 13µg/m³.

For the Month of September-2018 the minimum and maximum concentrations for NO_x were recorded as 9µg/m³ and 13µg/m³ respectively and average concentration of 11µg/m³.



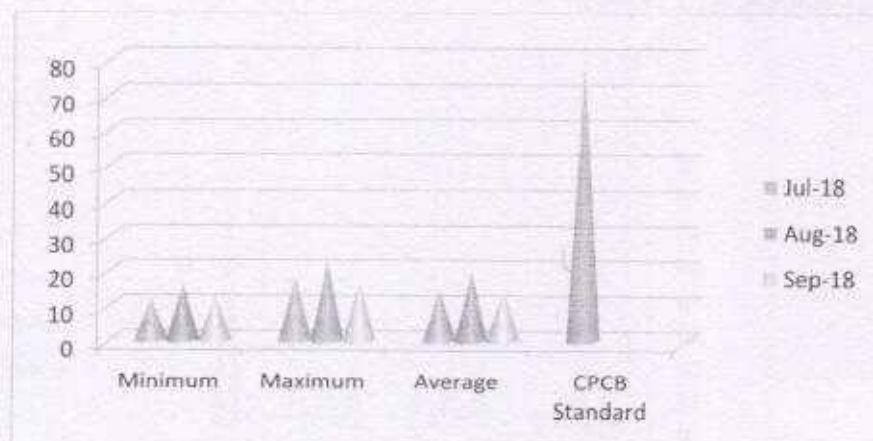
Graph:-Kutku Village / Nr.V.T.Center

Rajendrapur / Nr.Mining Area

For the Month of July-2018 the minimum and maximum concentrations for NO_x were recorded as 12µg/m³ and 18µg/m³ respectively and average concentration of 15µg/m³.

For the Month of August-2018 the minimum and maximum concentrations for NO_x were recorded as 16µg/m³ and 23µg/m³ respectively and average concentration of 20µg/m³.

For the Month of September-2018 the minimum and maximum concentrations for NO_x were recorded as 13µg/m³ and 17µg/m³ respectively and average concentration of 15µg/m³.



Graph:-Rajendrapur / Nr.Mining Area



Table 11

Statistical Analysis of Pb

Unit: $\mu\text{g}/\text{m}^3$

| Location | Month & Year | Min. | Max. | A.M. | G.M. | 98%ile |
|---------------------------------------------------|----------------|---------------------------------------------------------|-------|-------|-------|--------|
| Fugitive Emission (Core Zone):- | | | | | | |
| Piprapat/ Nr.Mining Area | July-2018 | 0.021 | 0.046 | 0.034 | 0.034 | 0.046 |
| | August-2018 | 0.027 | 0.052 | 0.040 | 0.040 | 0.052 |
| | September-2018 | 0.031 | 0.069 | 0.050 | 0.050 | 0.068 |
| Betpani | July-2018 | 0.017 | 0.038 | 0.028 | 0.028 | 0.038 |
| | August-2018 | 0.021 | 0.042 | 0.032 | 0.032 | 0.042 |
| | September-2018 | 0.019 | 0.037 | 0.028 | 0.028 | 0.037 |
| Virhorepat | July-2018 | 0.021 | 0.041 | 0.031 | 0.031 | 0.041 |
| | August-2018 | 0.027 | 0.056 | 0.042 | 0.042 | 0.055 |
| | September-2018 | 0.031 | 0.062 | 0.047 | 0.047 | 0.061 |
| Tatijharia Village/Nr.Weigh Bridge | July-2018 | 0.029 | 0.038 | 0.034 | 0.034 | 0.038 |
| | August-2018 | 0.037 | 0.064 | 0.051 | 0.051 | 0.063 |
| | September-2018 | 0.031 | 0.043 | 0.037 | 0.037 | 0.043 |
| CPCB Standard | | 1.0 $\mu\text{g}/\text{m}^3$ (24 hrs) | | | | |

| Location | Month & Year | Min. | Max. | A.M. | G.M. | 98%ile |
|-----------------------------------------|----------------|---------------------------------------------------------|------|------|------|--------|
| Buffer Zone :- | | | | | | |
| Kutku Village/ Nr.V.T.Center | July-2018 | ND | ND | ND | ND | ND |
| | August-2018 | ND | ND | ND | ND | ND |
| | September-2018 | ND | ND | ND | ND | ND |
| Sairaidh Campus | July-2018 | ND | ND | ND | ND | ND |
| | August-2018 | ND | ND | ND | ND | ND |
| | September-2018 | ND | ND | ND | ND | ND |
| Rajendrapur/ Nr.Mining Area | July-2018 | ND | ND | ND | ND | ND |
| | August-2018 | ND | ND | ND | ND | ND |
| | September-2018 | ND | ND | ND | ND | ND |
| Dumerkholi/ Nr.Mining Area | July-2018 | ND | ND | ND | ND | ND |
| | August-2018 | ND | ND | ND | ND | ND |
| | September-2018 | ND | ND | ND | ND | ND |
| CPCB Standard | | 1.0 $\mu\text{g}/\text{m}^3$ (24 hrs) | | | | |

Conclusion: (A)

The Average concentration of Pb within the Core Zone of Tatijharia Lease during this period (July-August-September-2018) is $0.060\mu\text{g}/\text{m}^3$ and it is within permissible limits as per CPCB Standards.

Conclusion: (B)

The Average Concentration of Pb within the Buffer Zone of Tatijharia Lease during this period (July-August-September-2018) is not detected and it is within permissible limits as per CPCB Standards.



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Table 13
Statistical Analysis of As

Unit: ng/m³

| Location | Month & Year | Min. | Max. | A.M. | G.M. | 98% |
|---------------------------------------------------|----------------|-----------------------------------------|------|------|------|-----|
| Fugitive Emission (Core Zone):- | | | | | | |
| Piprapat/ Nr.Mining Area | July-2018 | ND | ND | ND | ND | ND |
| | August-2018 | ND | ND | ND | ND | ND |
| | September-2018 | ND | ND | ND | ND | ND |
| Betpani | July-2018 | ND | ND | ND | ND | ND |
| | August-2018 | ND | ND | ND | ND | ND |
| | September-2018 | ND | ND | ND | ND | ND |
| Virhorepat | July-2018 | ND | ND | ND | ND | ND |
| | August-2018 | ND | ND | ND | ND | ND |
| | September-2018 | ND | ND | ND | ND | ND |
| Tatijharia Village/Nr.Weigh Bridge | July-2018 | ND | ND | ND | ND | ND |
| | August-2018 | ND | ND | ND | ND | ND |
| | September-2018 | ND | ND | ND | ND | ND |
| Buffer Zone :- | | | | | | |
| Kutku Village/ Nr.V.T.Center | July-2018 | ND | ND | ND | ND | ND |
| | August-2018 | ND | ND | ND | ND | ND |
| | September-2018 | ND | ND | ND | ND | ND |
| Sairaidh Campus | July-2018 | ND | ND | ND | ND | ND |
| | August-2018 | ND | ND | ND | ND | ND |
| | September-2018 | ND | ND | ND | ND | ND |
| Rajendrapur/ Nr.Mining Area | July-2018 | ND | ND | ND | ND | ND |
| | August-2018 | ND | ND | ND | ND | ND |
| | September-2018 | ND | ND | ND | ND | ND |
| Dumerkholi/ Nr.Mining Area | July-2018 | ND | ND | ND | ND | ND |
| | August-2018 | ND | ND | ND | ND | ND |
| | September-2018 | ND | ND | ND | ND | ND |
| CPCB Standard | | 06 ng/m³ (Annual) | | | | |

Conclusion:

The Average Concentration of As within the Core Zone and Buffer Zone of Tatijharia Lease during this period (July-August-September-2018) is not detected and it is within permissible limits as per CPCB Standard.



Table 15

Noise Level Monitoring

| Sl. No. | Location | Unit: dB(A) | | | | | |
|--------------------|----------------------------------------|-------------|-------|-------------|-------|----------------|-------|
| | | July 2018 | | August 2018 | | September 2018 | |
| | | Day | Night | Day | Night | Day | Night |
| Core Zone | | | | | | | |
| 1. | Piprapat/Nr.Mining Area | 56.1 | 42.9 | 62.8 | 54.3 | 58.3 | 41.6 |
| 2. | Betpani | 63.9 | 52.7 | 64.7 | 48.2 | 59.1 | 42.8 |
| 3. | Virhorepat | 68.1 | 56.2 | 71.3 | 62.9 | 56.2 | 47.2 |
| 4. | Tatijharia Village/ Nr.Weigh Bridge | 71.9 | 58.3 | 68.1 | 54.2 | 63.9 | 51.6 |
| Buffer Zone | | | | | | | |
| 5. | Kutku Village/Nr.V.T.Center | 51.6 | 41.9 | 48.2 | 38.1 | 52.7 | 39.2 |
| 6. | Sairaidh Campus | 48.3 | 38.2 | 51.7 | 41.6 | 53.9 | 41.6 |
| 7. | Rajendrapur/Nr.Mining Area | 53.7 | 42.8 | 52.8 | 42.7 | 48.3 | 37.1 |
| 8. | Dumerkholi/Nr.Mining Area | 49.2 | 37.3 | 51.4 | 42.1 | 51.8 | 42.7 |

CPCB Standards for Residential Area: 55 (Day time) 45 (Night time)
Industrial Area: 75 (Day time) 70 (Night time)

Table 15-A

HEMM Spot Noise Level Monitoring

| Sl. No. | Location | Unit: dB(A) | | | | | | | | |
|---------|-------------------------|-------------|------|-------------|-------------|------|-------------|----------------|------|-------------|
| | | July 2018 | | | August 2018 | | | September 2018 | | |
| | | Min. | Max. | Avg. | Min. | Max. | Avg. | Min. | Max. | Avg. |
| 1. | Piprapat/Nr.Mining Area | 63.9 | 72.8 | 68.4 | 72.8 | 84.6 | 78.7 | 76.3 | 86.2 | 81.3 |



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| | | | | | | |
|------------|----------------------------------------|------------|-------------------------|--------|---------------|--------|
| 40. | Anionic detergents, (as MBAS) | mg/l | IS 13428:2005 (Annex K) | 0.2 | 1.0 | < 0.01 |
| 41. | Polynuclear aromatic hydrocarbon (PAH) | µg/l | USEPA : 550 | 0.1 | No relaxation | < 0.03 |
| 42. | Total coliform | MPN/100 ml | IS 1622 | --- | --- | Absent |
| 43. | <i>Escherichia coli</i> | Per100 ml. | IS 1622 | Absent | Absent | Absent |
| 44. | Pesticides residues | | | | | |
| i. | Alpha-HCH | µg/l | USEPA 508 | | 0.01 | Absent |
| ii. | Beta HCH | µg/l | USEPA 508 | | 0.04 | Absent |
| iii. | Delta- HCH | µg/l | USEPA 508 | | 0.04 | Absent |
| iv. | Alachlor | µg/l | USEPA 508 | | 20 | Absent |
| v. | Aldrin / Dieldrin | µg/l | USEPA 508 | | 0.03 | Absent |
| vi. | Atrazine | µg/l | USEPA 1657 | | 2 | Absent |
| vii. | Butachlor | µg/l | USEPA 508 | | 125 | Absent |
| viii. | Chlorpyrifos | µg/l | USEPA 1657 | | 30 | Absent |
| ix. | DDT and its Isomers | µg/l | USEPA 508 | | 1 | Absent |
| x. | Gamma - HCH (Lindane) | µg/l | USEPA 508 | | 2 | Absent |
| xi. | 2,4 Dichloro-phenoxyacetic acid | µg/l | USEPA 1657 | | 30 | Absent |
| xii. | Endosulphan | µg/l | USEPA 508 | | 0.4 | Absent |
| xiii. | Ethion | µg/l | USEPA 1657 | | 3 | Absent |
| xiv. | Isoproturon | µg/l | USEPA 1657 | | 9 | Absent |
| xv. | Malathion | µg/l | USEPA 1657 | | 190 | Absent |
| xvi. | Methyl Parathion | µg/l | USEPA 1657 | | 0.3 | Absent |
| xvii. | Monocrotophos | µg/l | USEPA 1657 | | 1 | Absent |
| xviii. | Phorate | µg/l | USEPA 1657 | | 2 | Absent |

Note: 1. Results relate to tested sample only. 2. Test report should not be reproduced partially. 3. *Permissible limit in the absence of alternate source. 4. 'mg/l' is equivalent to 'ppm' 5. 'µg/l' is equivalent to 'ppb' 6. '<' indicates detection limit of the laboratory. 7. MPN-Most probable number. 8. Results for test no. 7 are not applicable.

REMARKS: Based upon request of the party, sample was tested for above mentioned parameters only. Sample complies with IS:10500:2012, for tests conducted, indicating that it is fit for drinking purpose with respect to tested parameters.



Table 18

Report on Soil Analysis, Tatijharia

Date of collection: Sept-2018.

Sample Location: Piprapat/Nr.Mining Area

| Sr. No. | Test Parameters | Measurement Unit | Results |
|---------|-------------------------------------------|------------------|--------------|
| 1 | pH | - | 7.29 at 25°C |
| 2 | Electrical Conductivity at 25°C | µs/cm | 152 |
| 3 | Texture | - | Clay Loam |
| 4 | Sand | % | 31.68 |
| 5 | Silt | % | 24.73 |
| 6 | Clay | % | 43.59 |
| 7 | Bulk Density | g/cc | 1.31 |
| 8 | Porosity | % | 11.68 |
| 9 | Water Holding Capacity | % | 27.94 |
| 10 | Exchangeable Calcium as Ca | mg/kg | 562 |
| 11 | Exchangeable Magnesium as Mg | mg/kg | 152 |
| 12 | Exchangeable Sodium as Na | mg/kg | 112.64 |
| 13 | Available Potassium as K | kg/hect. | 416.29 |
| 14 | Available Phosphorous as P | kg/hect. | 18.24 |
| 15 | Available Nitrogen as N | kg/hect. | 201 |
| 16 | Organic Matter | % | 1.17 |
| 17 | Organic Carbon | % | 0.68 |
| 18 | Water Soluble Chloride as Cl ⁺ | mg/kg | 12.1 |
| 19 | Water Soluble Sulphate as SO ₄ | mg/kg | 539.2 |
| 20 | Sodium Absorption Ratio | - | 6.47 |
| 21 | CEC | meq/100 gm | 12.48 |
| 22 | Total Iron | mg/kg | 1219 |
| 23 | Available Manganese | mg/kg | 118.54 |
| 24 | Available Zinc | mg/kg | 68.21 |
| 25 | Available Boron | mg/kg | ND |

Note: 1. Results relate to tested sample only. 2. Test report should not be reproduced partially. 3. 'mg/Kg' is equivalent to 'ppm'. 4. 'g/100g' is equivalent to '%w/w'. 5. All parameters are in 1:5 water extract.

REMARKS: Based upon request of party, sample was tested for above mentioned parameters only.

