

Executive Summary

1.0 Introduction

M/s R.B. Shreeram & Co Pvt Ltd, Tumsar, Village Chikmara, Manganese Ore Mining Project is located village – Chikmara, Tehsil Katangi, District Balaghat (M.P.). This 6.71 Ha mining lease area is being operated by the Rai Bahadur Shreeram & Company Private Limited. The lessee has his office at registered office: Shreeram Bhavan, Tumsar- Maharashtra.

The proposed capacity of the mining is 12500 MTPA for minerals Manganese Ore on the sectioned lease area of 8.16 Ha. In the mining activity no beneficiation is proposed at present.

In order to assess the likely impacts on environment due to the mining activities M/s R.B. Shreeram & Co Pvt Ltd, Tumsar has entrusted this task to M/s Green Environmental Technology, Bhopal to carry out the Rapid Environmental Impact Assessment Study of the mining lease area and based on the same to suggest an Environment Management Plan (EMP) and a Disaster Management Plan.

Location of the Project

District/State	Taluka	Village	Khasara No.	Area
Balaghat (MP)	Katangi	Chikmara	205,213,216,218,220,221	8.16
			Total	8.16 ha

1.1 Brief Description of Nature, Size, Location of the Project and its Importance to the Country/Region

The lease area is located 54 km South East direction of the Balaghat. Approach from Balaghat to lease area is as follows; Balaghat to Katangi distance is 44 km on Katangi to lease area distance is 1.5 km north connected by pukka road.

The general details of the mining lease area are given below

M/s R.B. Shreeram & Co Pvt Ltd, Tumsar (M.H.).

Status of Mining Lease

Village : Chikmara
 Tehsil : Katangi
 District : Balaghat
 Area : 8.16 ha.
 Date of grant: 08.01.1996

Date of Expiry: 07.01.2016
 Category of Mine: 'B' Class
 Shedual of Mine: Govt. revenue land (Non forest)

Table 1.0
Details of Mining Lease Area
Mining Lease Area

Sr. No.	Particulars	Details
1.	Pit and Quarries	0.85 ha.
2.	Dumps	0.50 ha.
3.	Infrastructure/Road	0.06 ha
4.	Hutments	Nil
5.	Area covered by proposed Road	0.04 Ha
6.	Agriculture Land	Nil
7.	Left area, covered by seasonal shrubs, bushes	1.0 ha
8.	Existing Plantation	0.70 ha
8.	Open Area	5.01 ha

1.2 Geology and Reserve

The Dharwarian system covers large connector areas within Madhya Pradesh and Bihar, spreading over Balaghar, Nagpur, Bhandara, Chhindwara and over hazaribagh and Rewah. In these areas it possesses a highly characteristic metalliferous facies of deposits. The Dharwarian rock of the Nagpur, Chhindwara and Bhandara District of Madhya Pradesh has been named as Sausar series. These rock types carry important economic deposits of Manganese Ore. The Sausar series have been sub-divided into stages which have a wide geographical extent in Madhya Pradesh and can therefore be correlated in distant outcrops of the series.

Named gondite from the Gond of Madhya Pradesh by de. L. permor these are a series of metamorphosed rock belonging to the Archaean and Dharwar system and largely composed of quartz, spessartite, rhodonite and other Manganese silicates. These rocks are supposed to be the product of the dynamic metamorphism of manganiferous clays and sands deposits during Dharwar times.

Crops of the Gondite series are typically developed in Balaghat, Chhindwara Dist of M.P. and Nagpur & Bhandara Dist of Maharashtra State and also in Panch Mahals of Gujrat & Banswara area of Rajasthan.

Manganese Ore and Gondite Horizon is assigned to Mansar stage and Lohangi Stage of Sausar series. In this case it is Mansar Stage.

1.2.1 Geology

Regional Geology

The idea of lithological formation can be had only from three old pits. Other area is covered with the soil and alluvium. There is no Top Soil in the area.

There are three types of formation in the area:

1. Soil
2. Micaceous schists
3. Manganese Ore

Manganese Ore band is found to occur in all the three pits in this portion of the village and also on the South Western contineouatio after the village. The general strike of ore body is North-East-South-West with minor local variations. The dip is towards South Easrt at angles varying from 40 to 45 degrees, in old pits the exact angle of the dip could not be measure situated on the other side of the village Chikmara and the same angle of dip is considered for Manganese Ore occurring in this area. The aversge thickness of ore body, as reported is considered to be 2.5 along with Gondite formation.

1.2.2 Reserves

According to the latest geological investigation in the Year 2007, updated geological reserve of limestone as calculated in a approved mining plan is given below:-

1.3 Summary of Reserves

Total Geological Reserve – 139664 MT

Year wise production – 12500 MTPA

1.4 Chemical Composition of the Ore

The mineral of the lease area has following chemical constituents

S. No.	Constituent	Symbol	Manganese Ore
1.	Loss on Ignition	LoI	10.78
2.	Silica	SiO ₂	8.48
3.	Iron Oxide	Fe ₂ O ₃	17.40
4.	Alumina	Al ₂ O ₃	8.80
5.	Titanium Oxide	TiO ₂	-
6.	Undermined	UD	0.38

7.	Manganese Oxide	MnO ₂	54.16
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1.5 MINING

In the approved mining plan opencast mining method is proposed using explosive. Thus present mining operations being carried out manually by open cast mining method. Though the use of explosive is proposed but after removing capping of Sometime excavator with tipper combination is being used for excavation and loading of mineral in to truck dumper. Loading of mineral in to truck dumper is being done manually, some time using machinery (excavator with tipper combination) hand tools such as spades, hammer, crowbar, and chisels etc. are also being used for mining purpose.

Necessary machinery which may be required for proposed mining is given below:

- 1) Jack hammer 1 no.
- 2) Portable compressor 1 no.
- 3) Excavator with tipper Combination 1 No.

The Mining activity consists of. :

1. Removal of overburden and soil waste rocks to dump sites.
2. Mining of Manganese Ore bed.
3. Removal of mined ROM to surface yard for proper breaking, sizing, sorting, stacking and zinging etc.
4. Preparing grade wise stack of ore for delivery.

1.6 Mining Method

The activities involved in the mining are:

- 1) Ground preparation
- 2) Drilling
- 3) Blasting
- 4) Loading and unloading of mineral / overburden
- 5) Crushing
- 6) Transportation

Mining will be done by manually using hand tools like crowbars, spades, chisels and hammer adopted for sorting, sizing & loading. Drilling & blasting will be done only for removing the capping of Manganese Loading and un-loading is done manually.

Loading O.M.S.	=	10t
Max load	=	10m
Max lift	=	5m

Sharpening and tempering of tools clearing the area of loose boulders, maintaining the quarry road, plantation and watering the sapling for afforestation will be done by casual labour under mate /foreman supervision. Haulage of O.B. and murrum up to the stacking site will be done by head using cane baskets. Loading will be done manually by head load using cane baskets.

1.7 Drilling & Blasting

Broad Blasting Parameters are given below:

Burden	:	1.0m
Spacing	:	1.20m
Depth of drill hole	:	1.65m
Diameter of blast holes	:	32-34mm
No. of holes in row	:	10nos
Qty of explosive	:	750g

1.8 Storage of Explosive

Explosive will be purchased as and when required, from the authorized agency holding the license from the Controller of Explosive, Agra or Nagpur. At present no storage facility will be provided at site.

1.8.1 Blasting Parameters

Storage, handling of explosive & blasting is strictly carried out as per the guidelines of Explosive Act and provision of MMR 1961 and special permissions obtained from DGMS which also ensure safety of workers and material along with control of noise and ground vibration.

Single row blasting of maximum 10 holes of total charge of 3.5 Kg. Blasting is proposed for loosening purpose only. To achieve 6 m bench height drilling and blasting will be done in 4 stages. In view of flaky nature of minerals, no regular holes are required to be given. Instead random holes will be given where hard rock will be encountered.

1.9 Disposal of Mine Waste

No subgrade mineral was generated in the past mining. Hence it is anticipated that no sub grade will be there during the proposed mining hence disposal of sub grade is not estimated.

During the proposed mining the waste produced consists of some quantity of soil & country rocks. The waste shall be dumped in the non minerlization area and shall be used for reclamation of exits pits then and there.

1.10 Use of Mineral

The Manganese ore shall be used in ferro alloys industries. A list of Manganese Ore buyers is as follows:

1. M/s Ferro Alloys Corporation Ltd, Garivdi (A.P.)
2. M/s Jain Carbides & chemical Pvt Ltd, Raipur (C.G.)
3. M/s union Carbides India Ltd, Bombay
4. M/s Bhilai Steel Plant (C.G.)

1.11 Reason For Environmental Impact Assessment (EIA)

The impact of mine on the environment depends to a large extent on its location with respect to Human settlements, meteorological conditions, ambient air quality, water bodies, agricultural and forest land etc.

Most of the adverse impacts of mines are amenable to technological control by providing necessary preventive and control measures and finally through effective environmental management of the operating mines. Keeping in view the likely impacts of mines on environment, this Rapid Environment Impact Assessment Report has been prepared for submission to State Pollution Control Board and Ministry for Environment and Forests (MoEF) for clearance of the mining area in operation.

1.12 Resource Requirement

The present proposal is of proposed mining activity at mining lease area of 6.71 ha at village Chikmara, Tehsil Katangi Dist Balaghat (M. P.). For efficient operation of the mines all necessary utilities will be made available, a brief description of the same is given below.

a) Storage Facility

It is proposed to provide adequate storage facilities for the excavated mineral, and waste, which is generated/ used during mining process. Proposed excavated minerals will be kept in the existing mining lease area and the waste will be utilized for reclamation purpose.

b) Water Supply

The total fresh water need is about 7.0 kilo liters per day for domestic and mining purpose. This water will be taken from out side village bore wall as well as accumulated rain water from existing mine pits. The details of water balance of existing / proposed mining project are given below:

Table 1.1
Water Balance of Mining Project

Process	Total
a) Mine site	
Dust Suppression	5.0 kld
Green Belt	1.5 kld
b) Domestic	
Drinking & Washing	1.5 kld
Total (A+B)	8.0 kld

1.13 ENVIRONMENT MANAGEMENT PLAN

The mining development in the study area need to be intertwined with judicious utilization of non renewable resource of the study area and within the limit of permissible assimilative capacity. The assimilative capacity of the study area is the maximum amount of pollution load that can be discharge into the environment without effecting the designated use and governed by dilution dispersion and removal due to the physio - chemical and biological process. The EMP list out all these measures for the mining

activities. Many of the areas in environmental Management planning are of multidisciplinary dimension. Therefore the measures envisaged in the report are to be regarded as a guide and depending upon the continuing advice from various experts of relevant fields like forestry, soil chemistry, hydrology etc. The suggested scheme is to be detailed, if necessary modified. The EMP is prepared keeping in view all possible strategies oriented towards impact minimization.

- Solid Waste Disposal
- Air Pollution Control
- Land Use Plan pattern after mining activity
- Forestation and Land Use planning
- Water Pollution Control
- Noise Control
- Measures Against Ground Vibration, Fly Rocks And Air Blast
- Occupational Safety And Health
- Socio Economic Measures

1.13.1 EMP DURING OPERATIONAL PHASE

a. Air Environment

The major pollutant emitted from mining activity is suspended particulate matter and major sources of pollutants are excavation, blasting and vehicular movement as well as various materials loading points.

- As the open cast of mining is proposed, during the ambient air quality monitoring it is observed the baseline concentration of pollutants are well below the prescribed norms. And it can be concluded that mining activity will not cause any adverse effect of existing baseline status. As per the fugitive emission is concern the following measures is recommended:
- Use of water sprinkling system for the mine road for dust suppression. Green development along the road side and in the mining area.
- Over charging shall be avoided during the process of blasting.

- Proper maintenance of haulage roads which are being used for transportation of material.
- Adopt wet drilling practices, which is used very rarely as the nature of the soil strata is soft.

In addition to the above following additional measures are also being adopted. :

1. Dust mask are provided to all workers working in dusty atmosphere.
2. Spread of dust from blasting will some what checked by use of suitable explosive i.e. ANFO. Overcharging of blast holes should also be avoided.
3. To prevent spillage of materials by avoiding Overloading of trucks.
4. Plantation shall carried out at the periphery of mining lease.
5. Utmost care and regular inspection schedule shall be made to prevent any fugitive emission of dust during transportation of material from one place to another.

1.14 Air Quality Modelling and Predictions using Industrial Source Complex – Short Term (ISCST) Model

The air quality impact of a source or group of sources is evaluated by the use of mathematical models. The models simulate the relationships between air pollutant emissions and the resulting impact on air quality. The inputs to the model include data relating to emissions, meteorology and atmospheric details like ambient temperature, wind speed and wind direction all of which are determined by formulating impact scenarios.

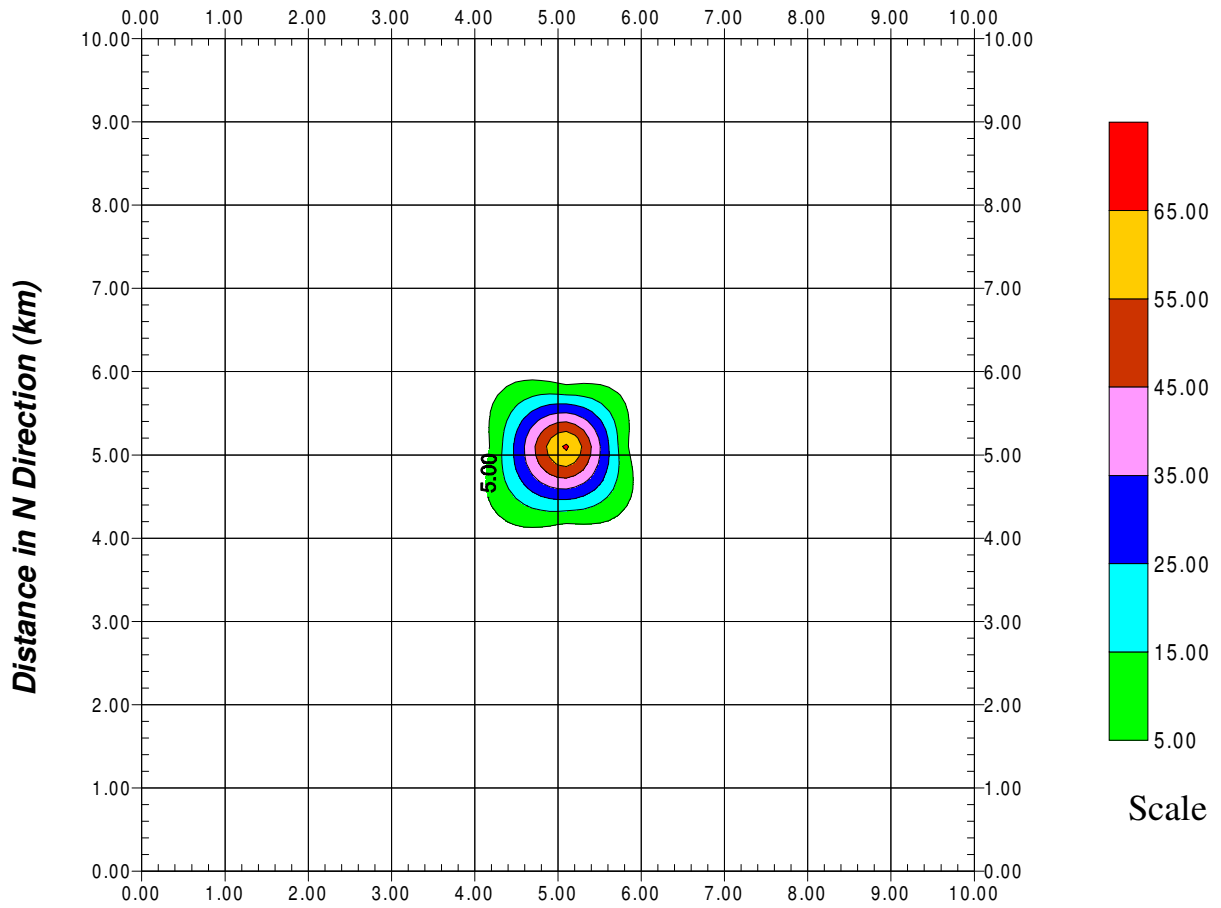
The estimation and evaluation of dust generation from mining activities is an immensely complicated procedure. Dust generated during mining activities will be from various sources like drilling, cutting and blasting operations which generate fugitive dust harmful to the human health and environment. Apart from this, vehicular movement within and around the mining activity will also generate dust. The mining equipments and machineries like Jack hammer,

Portable compressor, Excavator with topper Combination, Dumpers, Tippers and Blast hole drills etc. which will act as sources generating dust pollution along with movement of vehicles within the mining area acting as line sources.

For Chikmara mine Three line sources of 200m each were selected. The silt content of the mine area is taken as 8%, the velocity of the vehicle moving inside the line sources is taken as around 13 - 15 kmph, whereas the mass of the vehicle moving with the material is considered around 10 tonnes and number of trips for material transportation is taken as 3 Trips per day. The details of emissions expected from vehicular movement during mining activity at Chikmara mine site is has been monitored

The maximum SPM ground level concentration (GLC) observed is found to be $12 \mu\text{g} / \text{m}^3$ at the receptor (5km,5 km) which is center of the (10 km X 10 km) grid and occurs at the mine activity itself . The different GLC of SPM concentration contours were plotted using SURFER package and shown in **Figure** It is observed the predicted SPM concentration is located within the mine boundary lease of Chikmara mine and will not disperse to the surrounding region of the mine site. The observed ambient SPM levels during AAQ monitoring near the mine site is in the range of 89to 176 $\mu\text{g}/\text{m}^3$,during the winter season. The predicted GLC is 12 $\mu\text{g}/\text{m}^3$, thus the total incremental rise of SPM due to the proposed activity will be in the range of 101to 188 $\mu\text{g}/\text{m}^3$,which is much less than the stipulated by CPCB guidelines of national ambient air quality standards for different areas.

Isopleths showing the Incremental GLCs of SPM during winter season



Distance in E Direction (km)

**Mine Location
(X, Y : 5km, 5km)**

Table 1.3

Micro - Meteorological Data used for Prediction of Impacts

Time (hrs)	Flow Vector (degree)	Wind Speed (m/s)	Stability Class	Mixing Height (m)	Temper ature (K)
1.	185.0	2.22	6	1	284.0
2.	190.0	2.77	6	1	283.2
3.	203.0	3.00	6	1	283.0
4.	225.0	3.33	6	1	282.0
5.	226.0	3.50	5	1	281.0
6.	245.0	3.88	5	1	280.0
7.	247.0	3.88	4	200	283.5
8.	202.0	3.88	4	400	284.8
9.	204.0	4.00	4	400	288.4
10.	112.0	4.22	3	600	291.8
11.	158.0	4.44	3	700	293.0
12.	090.0	5.00	3	700	297.0
13.	092.0	5.22	2	800	299.2
14.	247.0	5.55	2	800	308.4
15.	022.5	5.22	2	700	303.0
16.	342.0	4.44	2	600	301.2
17.	227.0	3.88	3	500	299.0
18.	273.0	3.33	3	300	297.9
19.	315.0	3.33	4	200	295.0
20.	225.0	3.00	4	100	294.7
21.	226.0	2.77	6	1	292.2
22.	203.0	2.22	6	1	290.0
23.	202.0	2.00	6	1	287.0
24.	194.0	1.66	6	1	286.0

Noise Environment

In the open cast mining, there will no mechanical source of noise as its seen in the mining area, the ambient noise level are well within the standards of Occupational Safety and Health Administration (OSHA) and Central Pollution Control Board. Mining equipment will also generate significant noise, however, noise levels will be less than 90 dBA and exposure to the workers for 8 hrs will also be less than stipulated standard of 90 dBA. The major source of noise will be the vehicular movement, and it's a short time activity.

Water Environment

There are no surface or ground water bodies available in the lease area .there is no potential of acid mine drainage. Course exists in the area therefore there will be no effect of mining on the water regime. Water available in open well and bore-well in village Chikmara near the area is potable and it is pure and clean. The question of treatment and disposal of water from mine does not arise as there are no chemical beneficiation processes involved.

Surface rain water will be examined for its physic-chemical and bacteriological parameters in order to assess the effect of mining and related activities on ambient quality of water. Water will be analyses by as per procedures laid down in the standard method for examination water.

The rain water may also get accumulated in the working pit. Dewatering of the accumulated water in to working pit will be done using 5 HP pump having capacity to lift 2500 liters of water per hour. Rain water will be used for agriculture purpose in the surroundings. Thus there are no negative impacts envisaged over water environment due to proposed mining activity. The following measures shall be taken to minimize the negative impact of mining on water environment.

- The mine site will be well equipped with basic sanitary facilities like well designed latrine followed by septic tanks to avoid open defecation.
- Garland drain shall be provided to all overburden and topsoil dumps.
- Drain water will be passed to a settling tank thus heavy particles will settle before discharge of drain water, thus siltation of agriculture fields will be avoided up to some extent.

1.15 Overall Impact Evaluation

The net environmental impact of the existing plant for biological category is beneficial. The beneficial value obtained is the result of increased natural vegetation and proper land use as envisaged in the EMP.

The net impact under environmental pollution category is insignificant. The impacts are due to emissions of Particulate Matters from the vehicular movement and natural causes. Overall positive impacts are observed in both aquatic and land environmental components after implementation of measures suggested in EMP.

The aesthetic category marks positive impacts due to better appearance of water, increased diversity of vegetation, marginal increase in visual quality and a favorable composite effect.

The human interest parameters show encouraging positive impacts. The plant having a tremendous export potential will be economically of immense help to the local residents as well as to the nation itself. The total impact is, therefore, positive for the existing plant.

Evaluation of impacts for 4 categories based on the above allocations is presented in EIA report. Summary of environmental evaluation is given in **Table**

Table 1.4
Summary of Environmental Evaluation of ongoing Mining Activity

Parameters	Weight PIU	Baseline EIU (a)	Without EMP EIU (b)	With EMP EIU ©	Change EIU (c-b)	Change EIU (c-a)
Biological Environment	300	221	206	227	21	6
Environmental Pollution	450	394	360	395	35	1
Aesthetic	1030	80	65	79	14	-1
Human Interest	150	120	1039	129	20	9
Grand Total	1000	815	740	830	90	15

1.16 Health And Safety

The Health and Safety of the employees shall be given first priority during the mining operation.

- Extensive publicity and propaganda related to safety
- Provision of rest shelters for mine workers with amenities like drinking water, fans etc.
- First aid facility shall be provided at mine site.
- Training programme organized for First aid.
- Periodical medical check up camps shall be organized for worker and staff.

1.17 Implementation Of EMP and Monitoring

A large part of the sampling and measurement activities will be concerned with long term monitoring aimed at providing an early warning of any undesirable changes or trends in the natural environment that could be associated with mining and associated activities. This is essential to determine whether the changes are a response to a cycle of climatic conditions or are due to the mining and associated activities.

In particular, monitoring strategy is required to ensure that all environmental resources, which may be subjected to contamination, are kept under review. Monitoring of the individual elements of the environment are necessary.

To meet the above objective an Environment Management Cell shall be formed under supervision of consultant and involve Pollution Control Board for their valuable suggestion and guidance. The following items will be considered under the monitoring schedule:

- Re- Vegetation & Green Belt development
- Land Erosion
- Drainage
- Blasting effects

- Air Quality Monitoring
- Water Quality Monitoring
- Occupational Health
- Socio-Economic Development

1.18 Conclusion

The Chikmara Mining project (Manganese Ore) will be environmental compatible to the surrounding due to the high standards of pollution control measures to be adopted during the operation activity. Considering the size and operating method of mining, it can be safely stated that the mining activity will not have any adverse effect on the surroundings, if the proper environmental management plan is adopted.

Ambient Air Quality Status –SPM

Season : Post Monsoon/Winter Frequency :				24 hourly, for three months					
Unit : $\mu\text{g}/\text{m}^3$				Period : Sept to Nov 08					
Sr. No	Sampling Location	Minimum Con.	Maximum Con.	Percentile				Arithmetic	
				25 th	50 th	80 th	98 th	Mean	SD
A1.	Chikmara mine gate	89	176	96	116	128	158	140	6.8
A2.	Khajari Village	114	185	121	132	145	174	152	8.2
A3.	Selwa Village	116	192	131	136	168	184	154	8.2
A4.	Choukhandi Village	105	189	121	143	167	181	150	11.5
A5.	Manegoan Village	101	183	109	125	141	172	135	7.2
A6.	Katedara Village	112	187	125	131	148	168	147	7.2

Ambient Air Quality Status –RPM

Season : Post Monsoon/Winter Season				Frequency : 24 hourly, for three months					
Unit : $\mu\text{g}/\text{m}^3$				Period : Sept to Nov 2008					
Sr. No	Sampling Location	Minimum Con.	Maximum Con.	Percentile				Arithmetic	
				25 th	50 th	80 th	98 th	Mean	SD
1	Chikmara Mine gate	28	76	35	42	61	71	50.8	4.4
2	Khajari Village	31	67	41	47	52.00	60	47	4.3
3	SelwaVillage	28	67	34	42	56	62	44.0	4.2
4	Choukhandi Village	27	87	32	45	52	72	52	6.3
5	Manegoan village	23	69	32.3	42.3	61.2	64.2	41.2	3.1
6	KatedaraVillage	24	68	35	42	56	63.3	40.0	4.2

Ambient Air Quality Status –SO₂

Season : Post Monsoon/Winter Season				Frequency : 24 hourly, for three months					
Unit : µg/m ³				Period : Sept to Nov 08					
Sr. No	Sampling Location	Min.	Max.	Percentile				Arithmetic	
				25 th	50 th	80 th	98 th	Mean	SD
1	Chikmara mine gate	9.2	18.5	11.2	13.3	16.3	17.2	18.1	2.9
2	Kosmi Village	8.9	16.6	13.3	13.9	14.5	16.1	15.2	2.15
3	Selwa Village	10.3	17.5	12.2	14.2	15.2	16.0	13.3	2.0
4	Choukhandi Village	8.9	19.8	10.2	13.2	14.2	17.1	14.2	2.9
5	Manegoan Village	8.9	15.8	9.2	12.2	13.2	14.2	13.0	2.1
6	Katedara Village	8.2	16.3	9.0	11.2	13.3	15.2	13.2	2.8

Ambeint Air Quality Status –NO_x

Season : Post Monsoon/Winter Season				Frequency : 24 hourly, for three months					
Unit : $\mu\text{g}/\text{m}^3$				Period : Sept to Nov 08					
Sr. No	Sampling Location	Min.	Max.	Percentile				Arithmetic	
				25 th	50 th	80 th	98 th	Mean	SD
1	Chikmara Mine Gate	11.3	24.4	14.5	16.2	18.1	22.4	17.6	2.8
2	Khajari Village	12.3	24.5	10.3	16.30	21.22	23.61	18.2	3.99
3	SelwaVillage	11.9	24.5	10.3	13.2	18.2	21.5	16.12	2.44
4	Choukhandi Village	10.7	23.9	12.3	17.6	19.6	20.9	17.0	3.1
5	Manegoan Village	10.3	24.3	10.9	13.3	19.2	22.2	17.2	3.61
6	KatedaraVillage	10.7	23.9	14.2	17.40	22.60	23.41	19.2	3.80