

EXECUTIVE SUMMARY

1. PREAMBLE

M/s Shakambari Mines & Minerals is a proprietorship firm and engaged in production of Manganese Oxide and trading of minerals for more than 10 years. The concern is proposed to have mining activity of Manganese at Village Gowari-Wadona, Tehsil- Sausar, and District Chindwara in the state of Madhya Pradesh.

The project envisages forward mining activity for Manganese ore at mine area of 6.607 hectare at Village Gowari-Wadona at district Chindwara, MP for the anticipated production of ore by 2100 tonnes per annum.

In order to assess the likely impacts on environment due to ongoing mining activity and to have a tool of environment management, M/s Shakambari Mines & Minerals has submitted the Rapid Environment Impact Assessment study report for mining project.

2. LOCATION

The mining area is located in village Gowari-Wadona at district Chindwara, Madhya Pradesh located on toposheet no. 55 K/14 (Scale 1:50,000) by the following coordinates:

Latitude 21°32'N

Longitude 78°44' E

3. TRANSPORT

The area can be approached from Nagpur up to Khairi by Nagpur-Chhindwara State Highway which is 55 km from Khairi. There is diversion towards proposed site which is around 2 km and connected by fair weather and kuchha road.

The nearest railway station is Lodhikedha (N.G.) situated at a distance of about 8 kms from the applied area.

4. ENVIRONMENTAL SETTING

Topographically the area is slightly undulating towards west. This area has varying elevations between 470 meters above MSL.

Details of Project Settings

S. No.	Particulars	Details
1	Latitude	21°32'
2	Longitude	78°44'
3	Height above mean sea level	470m
4	Nearest City	Sausar – 17km Savner- 15 km
5	Nearest Railway Station	Lodhikhera NG - 08 Km
6	Nearest Airport	Nagpur located at about 57 km from the mines by road.
7	Nearest Highway	Chhindwara-Nagpur State Highway at about - 2 km
8	Nearest Village	Gowari-wadona-1.5 km - EES
9	Hills/Valley	No
10	Ecological Sensitive Zone	No national parks and sanctuary
11	Reserve Forest	No
12	Historical Place	No
13	Nearest River/ Nalla	Kanhan River – E– 4 km Dantpali Nalla – W- 9.0
14	Annual Climatic Conditions	Max. Temperature – 46°C Min ^m Temperature – 10 °C Average Rainfall–600 -800 mm Max. RH (%) – 100% Min. RH (%) – 7%

5. 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 proposed additional mining area.

6. PROJECT DESCRIPTION

6.1 RESERVES

The reserves of manganese ore in the area for Primary Bedded deposit are worked out for:

Summary of Reserves is as below:

	M. Tonnes
Proved Category:	41,250.00
Probable Category:	19,250.00
Possible Category:	19,250.00
Total	<u>83,750.00</u>

6.2 Anticipated Life of the Mine

Anticipated life of the mine will be obtained by computing the life of the mine by considering the proposed rate of production when the mine is fully developed and production for next years. It is estimated that 2100 tonnes per annum production will be taken after complete development of mine. Considering the above factors anticipated life of the mine would be around

25 years for extracting mineable reserve in proved & probable category reserves as per the present information available.

6.3 Mining Method

Opencast manual method of mining will be adopted. All operations of opencast mining will be done by manual means using hand tools like crowbars, spades, chisels and hammers. Due to earlier mining operation a large pit is already developed in the proposed area. All future mining activities will be concentrating in this old pit. Haul road will be extended upto the bottom of the pit. The height of the bench will be 1.5m and width will follow the quarry floor. Sorting and sizing will be done manually. Loading of overburden and mineral into the trucks will also be done manually.

The development and production will be done side by side simultaneously. The development and production has been proposed at one place for better supervision, control and conservation of mineral.

The mining machinery & equipment required for development consists of few tractors with pneumatic trailers, compressors, and drill machines etc, water pump. (Three/Four numbers of tractor trolleys, one number of compressor & Two Jack hammers & two pumps). All excavations will be done manually with hand tools like crowbars, Spades, chisels and hammer. Sorting will be done manually. Development i.e. removal of overburden will also be done manually.

6.4 Proposed Rate of Production

It will be about 2100 tonnes per year of saleable ore for full year after complete development of the mines.

6.5 Loading

Loading of ore will be done manually to the trolley/trucks and will be sending to the end users. The overburden will be removed and stacked in a place in the surface. Subsequently it will be manually loaded to the tipper for onward dumping to the predetermined space in the lease boundary.

6.6 Hauling/Transport

The ore will be transported to the sorting yards by means of tubs on tracks.

6.7 Mine Drainage

That area water table starts beyond 30m (440m RL) from the surface level and surface level is 470mRL and mining will be done upto 435 m RL hence it is expected that ground water seepage will be there when mining cross the ground water table. The accumulated water in the developed pit during the rainy season will be used for green belt development.

6.8 Solid Waste Management

Proposed mining is being carried out by open cast manual method using explosive in the mining lease area. The area proposed to be excavated in at the end of lease period is about 3.2 Ha. Presently the area covered by pits and queries is 2.24 ha While, the Area covered by the top soil and waste dumps are about 1.28ha. Considering the rate of production, it has been estimated that almost 128 cum of overburden will be generated average on monthly basis. The O.B. and mine waste will be dumped in the Northern and Southern boundary side of the lease area during 1st five years. At about 1,20,000 cum of solid waste has been generated till date and it is expected that at about 1,50,800 cum of waste will be generated in the conceptual period. The soil will be dumped towards NW boundary of the lease area. No reclamation has been proposed during next five year in

view of insufficient space at pit bottom which will hamper the extension of haul road to bottom as mineralization is still continue in depth.

It is expected that out of excavated area of 3.2 ha at the end of lease period, 1.2 ha area will be left as pond for water holding and 3.4 ha area will rehabilitated though plantation.

The dumps will be stablised with fast growing grasses and various mulches and bark. The sides will be slopped to 36⁰. Garland drain will be provided along the sloping side to protect wash off and run off.

Excavated area, where backfilling is not feasible, that area will be left as it is for collection of rainwater. Proposed activity is carried out at shallow depth. Post mining land use envisaged for following purposes:

- a) Pond : 1.2 Ha
- b) plantation in reclaim area + boundary : 3.4 Ha

Backfilling is expected to start from 15th year onward in future and a clear distance will be maintained between the working face and edge of the backfilling area. The OB and waste will be shifted manually by cane baskets to the backfilling site. Mine waste with coarser material will be backfilled first and finer material above it. The top soil to the thickness of about 0.5 m will be spread and leveled. The leveling & grading of the ground will be done and converted into agriculture land. An effective land reclamation plan of this mining lease area will again restore the aesthetic beauty. Thus, impact on land environment is low.

6.9 Resource Requirement

The present proposal is to carry out mining for Manganese at Village Gowari-Wadona, Tehsil Sausar, Dist Chindwara, (MP) for efficient

operation of the Mines all necessary utilities will be made available, a brief description of the same is given below.

6.9.1 Storage facility

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

6.9.2 Project Cost

Project	Estimated Cost in Lac of Rupees
Mining of Manganese ore	Rs. 10 Lacs

5.9.2 Electric System

The power requirement for the project has been met by M P State Electricity Board, which is available at village Gowari-wadoan.

5.9.4 Water Supply

The total fresh water needs to be pumped is about 6 KL per day for consumption of domestic and mining purpose. This quantity of water will be taken from the ground water. The details of water balance of existing /proposed mining project are given below:

WATER BALANCE OF MINING PROJECT

Process		Total
a) Mine Site		
Dust suppression	4000 lit	4000 lit
Green Belt	1000 lit	1000 lit
b) Domestic		
Drinking & Washing	1000 lit	1000 lit
Total (A + B)	6000 lit	6000

7. EXISTING ENVIRONMENT SCENARIO

7.1 Climate

The climate of the region is characteristically dry except in the monsoon season. All the three seasons are distinct. The summer season extends from February to June, till the onset of Monsoon. Rains are received from mid June to Mid September and winter season extends from October to January. The area receives an average annual rainfall of 600-800 mm. The maximum rainfall is received through the southwest monsoon during June to September.

The brief discussion over the meteorological condition of the area is as below:

- **Temperature:** The winter season starts from December and continues till the end of February. January is the coolest month with the mean daily maximum temperature at 29°C and the mean daily minimum temperature at 10°C. Both the night and day temperatures increase rapidly during the onset of the pre-monsoon season from March to May. During pre-monsoon season, the mean maximum temperature (May) was observed to be 46°C with the mean minimum temperature (March) at 20°C. The mean maximum temperature in the monsoon season (Sep.) observed to be 37°C whereas the mean minimum temperature was observed to be 19°C. By the end of September with the onset of post-monsoon, the day temperatures increase slightly, with the mean maximum temperature at 34°C and the mean minimum temperature at 17.3°C.
- **Relative Humidity:** The air is generally humid in this region during the monsoon when the average relative humidity at 0830 hr. was observed to be with a maximum of 96% and a minimum of 65%. Similarly, at 1730 hr., the average value was observed to be with a maximum of 98% and a minimum of 64%. Generally, the weather during Post monsoon seasons was observed to be with a maximum of 83% and a minimum of 48%.

- **Rainfall:** Monsoon in the area comes from south-westerly winds. The average annual rainfall based on the last 10-year IMD data, was observed to be 600-800 mm. The monsoon sets in the month of June and continues till mid observed in the evenings, with clear mornings. During the monsoon season, both in the mornings and evenings, the skies were found to be clouded.
- **Cloud:** 30 years average data reveal that maximum cloud cover was observed around 6.8 oktas in the month of July, august. Whereas cloud cover was observed around 2 (in oktas) in the month of November, December, January, February and March.
- **Wind Pattern**

Generally light to moderate winds prevails throughout the year. Winds were light and moderate particularly during the morning hours. While during the afternoon hours the winds were stronger. A review of the wind rose diagram shows that predominant winds are mostly from NNW, SW and NW directions followed by NW direction.
- **Wind Patterns during study period**

The predominant directions of wind were observed from NNW, N and NW.

7.2 AIR QUALITY

To establish the ambient air quality, sampling and testing were conducted. Air sampling stations were established at eight (8) locations around the proposed mining area to assess the background air pollution levels.

COMPARISON OF AIR SAMPLING RESULTS WITH CPCB NORMS

	A1	A2	A3	A4	A5	A6	A7	A8	CPCB Norms	
									Indl. & Mixed used area	idential & Rural Area
March-May 2007										
SPM Concentration										
Minimum	96	102	108	116	100	96	108	88	500	200
Maximum	132	136	158	180	138	140	132	119		
Average	114.1	113.7	126.5	148.5	118.7	115.8	119.5	103.4		
RPM Concentration										
Minimum	46	50	46	52	38	36	60	48	150	100
Maximum	72	72	78	86	68	58	68	53		
Average	58.5	58.2	57.3	64.6	52.7	44.2	63.4	50.4		
SO2 Concentration										
Minimum	7.6	8.8	10	10.2	9.4	9.5	12.2	7.1	120	80
Maximum	8.9	10.2	12.6	12.7	11.5	10.8	13.6	8.4		
Average	8.32	9.44	11.3	11.4	10.4	10.1	12.8	7.8		
NOX Concentration										
Minimum	10	10	12.1	12.3	12.0	11.5	12.3	8.1	120	80
Maximum	11.6	12	14.6	14.8	14.8	13.9	1.37	9.3		
Average	10.7	10.8	13.2	13.4	13.5	12.8	12.8	8.6		

7.3 NOISE LEVEL

Ambient noise levels were measured at different locations (same as ambient air monitoring locations for two days on hourly basis) to establish present scenario which shall be described as follows.

- All the values are well within the norms prescribed by CPCB for industrial and commercial area.
- Main source of noise are traffic movements.

7.4 WATER QUALITY

Surface Water

The Surface water bodies in the study area mainly located E direction at about 4km Kanhan River. The water from Kanhan River is used for domestic as well as drinking purpose. The water from abandoned mine is a collection of run off water and used for domestic purpose. The data conform to the water quality standards for most of the parameters. The dissolved oxygen levels range between 6.1 to 6.2 mg/l, Total Hardness

ranges from 242 to 300 mg/l, BOD levels are as low as 2.1 to 2.4 mg/l. The heavy metal content has been observed within the limit. The analysis of the sample indicates that the organic pollution of River is insignificant. The physico-chemical and biological analysis revealed that all the parameters are well within the prescribed limits of IS: 2296.

Ground Water

Water supply in the most of the villages depends on ground water resources. Well water is used for domestic as well as irrigation purposes. Ground Water quality analysis was carried out at 4 locations and the frequency of sampling was once /month/station. Ground water samples were examined for physico-chemical, heavy metals and bacteriological parameters in order to assess the effect of industrial and other activities on ground water. The samples were collected and analysed as per the procedures specified in “standard Methods for the examination of water & Wastewater” published by American Public Health association (APHA). pH in ground water sample was observed to be in the range 7.45 to 7.8 while conductivity was observed in the range of 240-280 umhos/cm. The value of alkalinity and hardness were observed in the range of 105-134mg/l and 120 to 142 mg/l respectively. Whereas heavy metal was found to be within the limit.

The physico-chemical and biological analysis revealed that all the parameters were well within the prescribed limits of IS: 10500.

7.5 SOIL QUALITY

Five locations within 10 km radius of the project site were selected for soil sampling. At each location, soil samples were collected from three different depths viz. 30 cm, 60 cm and 90 cm below the surface and homogenized. The homogenized samples were analyzed for physical and chemical characteristics. For general characterisation of soil a few random samples from the study area to the depth of about 15 cm were

collected. Soil samples so collected were brought to the laboratory for analysis. It has been observed that the texture of the soil was observed to be sandy and clay. The organic carbon was found to be in the range of 1.2% to 1.5% The nitrogen and phosphorus were observed to be in the ranges of 572 to 604Kg/ha and 52.2 to 68.2kg/ha respectively the pH range at the soil vary in between 8.12 to 8.57.

7.6 FLORA AND FAUNA

The district of extensive forests spread over in an area of the 4336.13 sq.km consulting 36.7 percent of the total geographical area of the district. The forests of the district are divided into two divisions viz. east Chhindwara and West Chhindwara Division. The forests of the districts are of the tropical dry deciduous type with predomance of teak.

The species, which are commonly found in the district, are tak sagon (*Tectena grandis*), Khair (*Acacia Catechu*), Sal (*Shereo rebusta*), Bija (*Pterocarpus marsuplum*), Dhaura (*Angoissus Latifelia*), Tendu (*Dispyresres Menalexilan*), Jamun (*Eugeniejambe Lana*). Palas (*Butea monosperma*) is the main tree growing gregariously on heavy soil. The common species on the trap covered hills are Bharrati (*Gymnosperma spinosa*), Banrahar (*Flemingia semialata*), jamrasi (*Elaeodendron glaucum*) and harsingar (*Nyctanthes arbortristis*). On moist slopes indarjata(*Petalidium barleriodes*) grows thickly covering large areas. Rocky exposed ground is covered with Dhawai (Wood – *fordia druticosa*) and makor (*Zizyphus oenoplia*). The undergrowth is thicker along watercourses and in sheltered valleys. Karonda (*Carissa spp.*) form dense undergrowth on alluvium and eroded bank of nallahs.

Reunjha (*Acacia leucophloea*)

Kohu (*Terminalia arjuna*)

Karanji (*Pongamia pinnata*)

Sisham (*Dalbergia sissoo*)

Babul (*Acacia arabica*)

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Neem (*Azadirachta indica*)
Kachnar (*Bauhinia variegata*)
Akasneem (*Millingtonia hertonsia*)
Bargad (*Ficus bengalensis*)
Gular (*Ficus glomerata*)
Jamun (*Syzygium cumini*)
Aam (*Mangifera indica*)

The species, which occur naturally in these areas:

Palas (*Butea monosperma*)
Mahua (*Madhuca latifolia*)
Ber (*Zizyphus mauritiana*)
Bel (*Aegle marmelos*)
Saj (*Terminalia tomentosa*)
Kanker (*Flacorita indica*)
Tendu (*Diospyros melanoxylon*)

Cultivated trees growing in the villages are:

Bargad (*Ficus bengalensis*)
Gular (*Ficus glomerata*)
Pipal (*Ficus religiosa*)
Imli (*Tamarindus indica*)
Aam (*Mangifera indica*)
Jamun (*Syzygium cumini*)
Munga (*Moringa olderfera*)
Ber (*Zizyphus mauritiana*)
Bel (*Aegle marmelos*)
Lasora (*Cordia dichotoma*)
Neem (*Azadirachta indica*)
Mahua (*Madhuca latifolia*)
Sitaphal (*Anona squamosa*)

The district contains various wild species like Tiger, Leopard and Jungal Cat, Lomri, Sloth Bear, Wild Bear etc. The study area does not host natural wild life because no forest has been found within the 10 Km radius of the plant. There are also no zoos or bird sanctuaries in the study area. Rodents, monkeys, jackals and large birds constitute the fauna in the study area. Pheasants, pigeon, peacock can be sighted occasionally along with the birds of common occurrence in the study area. Even forestland has only sparse row of trees and is not able to sustain much natural fauna.

7.7 LAND USE PATTERN

The study area covers about 28560 ha. For computation of the land use pattern in the study area based on the village-wise land-use data given in the census records, the geographical area of all settlements covered within the study area, though many villages in the peripheries of the circular study area are partially covered. Perfect delineation and quantification of land uses for the partially covered parts of villages of the study area is not possible, hence the entire village area is considered for the study, irrespective of its coverage within the village boundary.

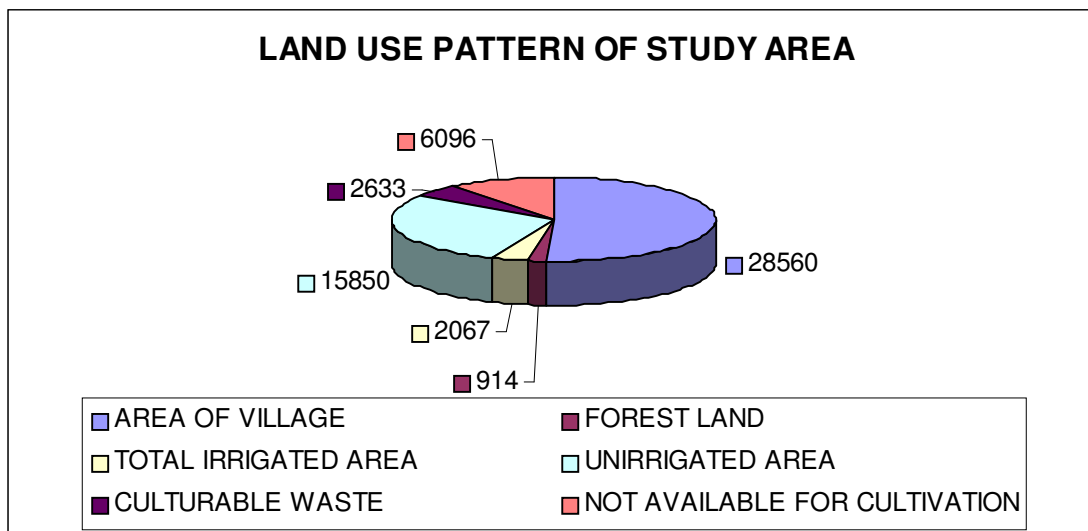
The land use is classified into four types – viz. forests, area under cultivation, culturable waste and the area not available for cultivation. The land under cultivation is further sub-divided into two types viz. irrigated and un-irrigated.

Land-use Pattern in the Study Area

S. N.	Particulars	Study Area (ha)	Percentage Coverage
1.	Forest Land	914	3.2
2.	Land under Cultivation		
	a) Irrigated Land	2067	7.24
	b) Un irrigated Land	15850	55.5

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3.	Culturable Waste Land	3633	12.72
4.	Area not available for cultivation	6096	21.34
	Total Area	28560	100



7.8 SOCIO-ECONOMIC CONDITIONS

The study area falls in Sausar Block of Chindwara district. The district is dominated by rural population (about 80% of the total population).

Scheduled cast account for about 14.26% of the total population. Scheduled tribes account for about 13.33% of the total population. Total work force of study area is reported to be about 49% of the total population. An examination of the occupational pattern reveals that about 46% of the total main workers are engaged in farming or in associated activities either as cultivators or as agricultural laborers. Thus, it can be inferred that a major portion of the population derives their livelihood from agricultural sector.

ESTIMATED BASIC STATISTICS OF THE STUDY AREA

1. Households	12049
2. Population	53721
Male	28013
Female	25708

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3. Schedule Tribe	7163
4. Schedule Cast	7665
5. Literacy Rate	62.4%
6. Occupational Pattern :	
(A) Main workers	49%
(% of total population)	
i) Cultivators (% of main worker)	46.66%
ii) Agricultural Labors (% of main worker)	38.35%
iii) Other Workers (% of main worker)	15.99%
(B) Marginal Workers	19.04%
(% of total population)	

DIFFERENT AMENITIES IN SAUSAR BLOCK

1.	Total No. of villages	54
2.	<u>EDUCATION</u>	
	Primary Schools	50
	Middle Schools	7
	Higher Secondary Schools	3
	Sr Secondary School	3
	Degree College	0
3.	<u>HEALTH FACILITIES</u>	
	Hospitals	1
	P.H.Cs & Adl. P.H.Cs	33
4.	<u>POLICE STATIONS</u>	2
5.	<u>POSTAL FACILITIES</u>	
	Post Offices	18
	Telegraph Offices	0

8. IMPACT ASSESSMENT

Mining activities is bound to have an adverse impact on existent environment. An understanding of the nature and extent of various impacts is essential in devising the methods and advance planning to mitigate the impacts and ultimately restore the land to useful conditions.

9. IMPACT EVALUATION

An attempt has been made to evaluate the impact of project in terms of both quality and quantity by using modified matrix method for crucial environmental parameters. The environmental impact evaluation of possible effects as a result of proposed mining area is primarily based on study of objectives, process, surrounding environment etc. The aspects such as water, air, land and related issues have been assessed on the basis of mining operations for similar activity. The environmental impacts identify the possible relationship of proposed mining operations with respect to environmental parameters. Their relationship can be beneficial or adverse and can be further classified as short term, long term, reversible, irreversible, local or regional. The evaluation of the impact of proposed activity are presented in Table below

Parameters	Weight PIU	Baseline EIU (a)	Without EMP EIU (b)	With EMP EIU (c)	Change EIU (c-b)	Change EIU (c-a)
Biological Environment	300	195	185	201	16	6
Environmental Pollution	450	343	321	348	27	5
Aesthetic	100	77	65	75	10	-2
Human Interest	150	115	112	128	16	13
Grand Total	1000	730	683	752	69	22

10. ENVIRONMENT MANAGEMENT PLAN

10.1 Reclamation of Land

The land reclamation of the worked out area will be done by the backfilling of the overburden. The Overburden will be dumped properly and it will be levelled in a fashion that the dump height remains be uniform in all sides and subsequently it will be used for back filling the degraded land as far as possible.

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It is expected that out of excavated area of 3.2 ha at the end of lease period 1.2 ha Area will be left as pond for water holding and 3.4 ha area will rehabilitated though plantation & agriculture.

The dumps will be stablised with fast growing grasses and various mulches and bark. The sides will be slopped to 36⁰. Garland drain will be provided along the sloping side to protect wash off and run off.

Excavated area, where backfilling is not feasible, that area will be left as it is for collection of rainwater. Mining activity/ proposed activity is carried out at shallow depth. Post mining land use envisaged for following purposes:

- a) Pond : 1.2Ha
- b) Plantation in reclaim area : 2.0Ha

Backfilling is expected to start from 15th year onward in future and a clear distance will be maintained between the working face and edge of the backfilling area. The OB and waste will be shifted manually by cane

baskets to the backfilling site. Mine waste with coarser material will be backfilled first and finer material above it. The top soil to the thickness of about 0.5 m will be spread and leveled. The leveling & grading of the ground will be done and converted into agriculture land. An effective land reclamation plan of this mining lease area will again restore the aesthetic beauty.

10.2 Green Belt Development

The massive afforestation planned for the project shall generate a forest having greater tree density (about 40 trees for first two year per 400m²). The proposed extensive will enhance the vegetation quality as well as aesthetic quality of the area. Thus there is no adverse impact is envisaged over biological environment due to proposed mining activity.

Below is showing 5 yearly stage wise forest land development In order to show the backfilling rate and afforestation rate (on backfilled land) cumulative available broken land, back filled area generation and Overall, the project will have a very strong positive effect on flora.

Year	No. of Trees	Area Covered in m²	Survival rate
1 st	20	400	80%
2 nd	20	400	80%
3 rd	20	400	80%
4 th	20	400	80%
5 th	20	400	80%

Further to that total 2 ha area will be reclaimed out of 3.2 ha (Mineable area). At the end of the lease period, at about 2.0 ha area with approx. 3500no. of trees of reclaimed portion will be planted and at the same time peripheral portion of the lease area, non mineralized portion of the lease area shall also be planted, which will enhance the vegetation quality.

10.3 Measures to Improve Socio-Economic Conditions

The impacts of the project would be felt in an integrated manner on the socio-economic environment in the study area. There is no village in core zone and further no displacement is required for the proposed project and therefore impact will be positive side rather negative. The impacts on the different components viz employment, housing, educational, and medical and transport facilities, fuel availability, economics, status, health agriculture is not significant because size of project is very **small**. However, it would definitely increase the employment opportunity (primary as well as secondary) in the project area. Some of these impacts would be beneficial.

- i) The project will have a strong positive employment and income effect, both direct as well as indirect.
- ii) Migrant-Non migrant ratio shall shift towards migrant side. This will happen because of (i) better employment opportunities due to this project and (ii) relatively low agricultural yield through traditional agricultural practice with monocrops.
- iii) The project shall speed up the growing view on importance of education among people in study area.
- iv) The project is going to bring about changes in the pattern of demand from food to non-food items if sufficient income is generated.
- v) The project is not going to influence the existing traditional agricultural situation significantly. It may help to improve agricultural production by way of providing additional income to the farms from supplementary sources.

People perceive that the project will bring handful gains by way of creating significant job opportunities along with development of social infrastructure.

10.4 Air Pollution Control Measures

Following measures shall be taken to mitigate the effect of mining operation over ambient air environment:

1. Regular spraying of water by water sprinkling system over haulage roads.
2. To reduce dust generation during loading operation water shall be sprayed over the muck pile to the loaded;
3. To reduce dust generation during plying of dumpers on the haul road. Water sprinkling is done at frequent intervals. Water sprinklers shall be installed at the mine haulage road;
4. To reduce spread of dust, plantation along the mining lease boundary and plantation shall be also done along haul roads.
5. Periodic maintenance of haulage roads.
6. All over burden dumps shall be stabilized with legumes and grass to prevent the erosion of soil and arrest the dust emission during windy days.

In addition to the above following additional mitigation measures shall be adopted and it is expected to continue in future also:

1. Dust due to drilling shall be minimised by using wet drilling method like water injection system.
2. Dust mask shall be provided to all workers working in dusty atmosphere.
3. Tree Saplings shall be planted at the periphery of mining lease
4. Regular maintenance of vehicles and machinery's shall be carried out in order to control emissions;
5. A good house keeping and proper maintenance shall be practiced which will help in controlling pollution.

10.5 Noise Pollution Control Measures

The main sources of noise in mining activity are drilling, blasting, material handling machinery, loading equipment, etc. Following mitigation measures should be taken to control noise pollution:

1. Wherever the noise levels exceed 85 dBA, workers should be provided with earmuffs, ear plugs etc.

2. Hydraulic drills shall be used for drilling;
3. All moving parts of machine shall be properly lubricated;
4. Non-moving parts of machine shall be properly fastened;
5. Blasting shall be well designed and arranged in such a way that only one or two holes are blasted at a time with the use of short delay detonators in combination with sequential blasting machine;
6. No trunk like of detonating fuse shall be used on surface (Even if detonating fuse is used as trunk line with cord relays, then it shall be covered with clay properly);
7. No blasting shall be done when the sky is cloudy because cloud cover can cause reflection of pressure wave block to the ground at some distance from blast
8. Electric detonators shall be used instead of the detonating fuse as trunk line.
9. Blast shall be designed in such a way that fragmentation will be proper and over size boulder generation will be minimum. So secondary blasting is avoided;
10. Blasting shall be done between 12 noon to 4 pm when temperature inversions are not likely to be there and air density is less;
11. A barrier of overburden at mine boundaries shall be made and three rows of trees are proposed to be planted to reduce propagation of noise;
12. Secondary blasting is not required and hydraulic rock breaker is used.
13. Noise barriers, silencers and enclosures shall be incorporated for equipments, which emit high noise levels.
14. All the basic equipments and various machinery shall be kept well maintained.
15. Thick green belt around the mining pit and along the haulage roads.
16. As far as possible heavy and noisy workers shall be avoided during nighttime.
17. Unnecessary use of horns by the drivers of the vehicles shall be avoided.

10.5 Water Pollution Control measures

Following measures have been taken to avoid accumulation of water:

1. Pump having required capacity shall be installed to lift accumulated rain water from working pit.
2. There shall not be no over flow on wash off from dumps nor is there any beneficiation plant. Only rainwater is pumped out of the mine;
3. There is no toxic constituent in water and soil so water collected in sump is free from any toxic substances.
4. A silt-settling tank shall be constructed in northern barrier zone area to settle heavy particle before discharging water into drain.
5. Quality of water accumulated in the working pit may be checked during monsoon.
6. It shall be ensured that silt content in the mines discharged is minimum.
7. It shall be ensured that quality of drinking water for the worker is hygienic and good sanitation system is available.

11.0 Conclusion

The Manganese mining project of M/s Shakambari Mines & Minerals, village – Gowari-Wadona, Tehsil Sausar, Chindwara District (MP) will be environmental compatible to the surrounding due to the high standards of pollution control measures to be adopted during the operation activity. Thus it can be safely stated that the mining activities will not have any adverse effect on the surroundings, if the proper environmental management plan is adopted.