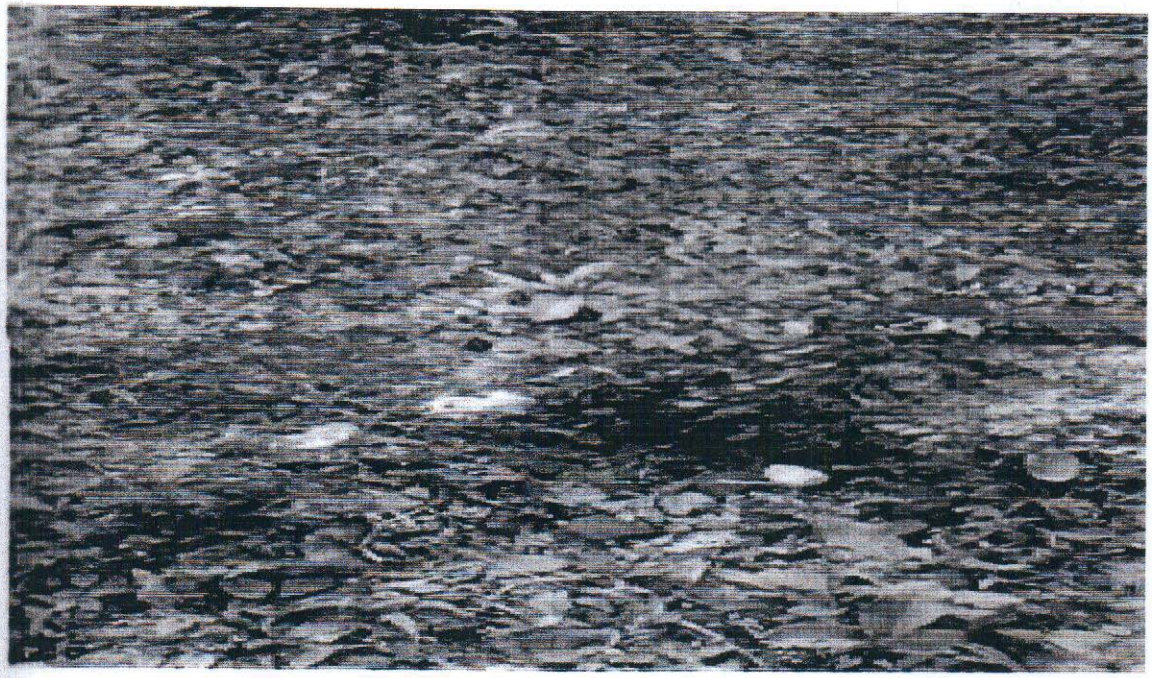
FIELD PHOTOGRAPHS

अनुमोदित
APPROVED

PHOTOGRAPHS OF THE APPLIED AREA

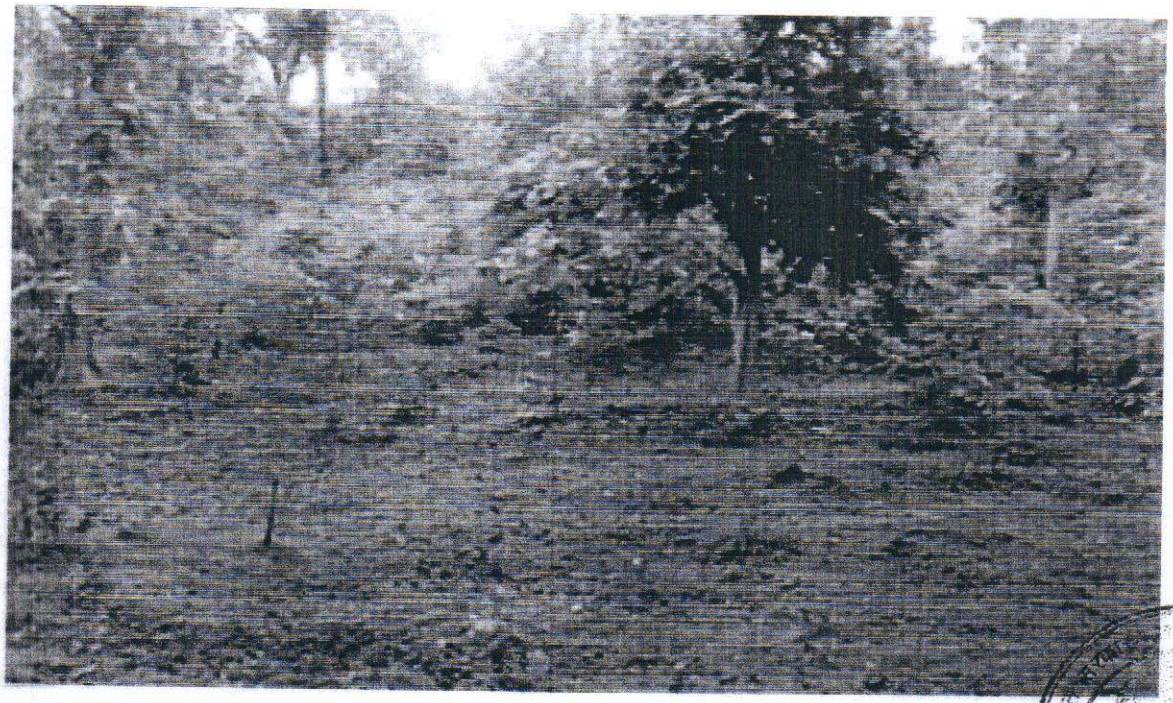
PHOTOGRAPH:-1. IRON ORE BODY SEEN IN THE SMALL CUTTING SECTION ON SMALL HILL SLOPE:

PHOTOGRAPH:-2. FLOAT ORE ON THE SOUTHERN SLOPE OF THE HILL:



अनुमोदित
APPROVED

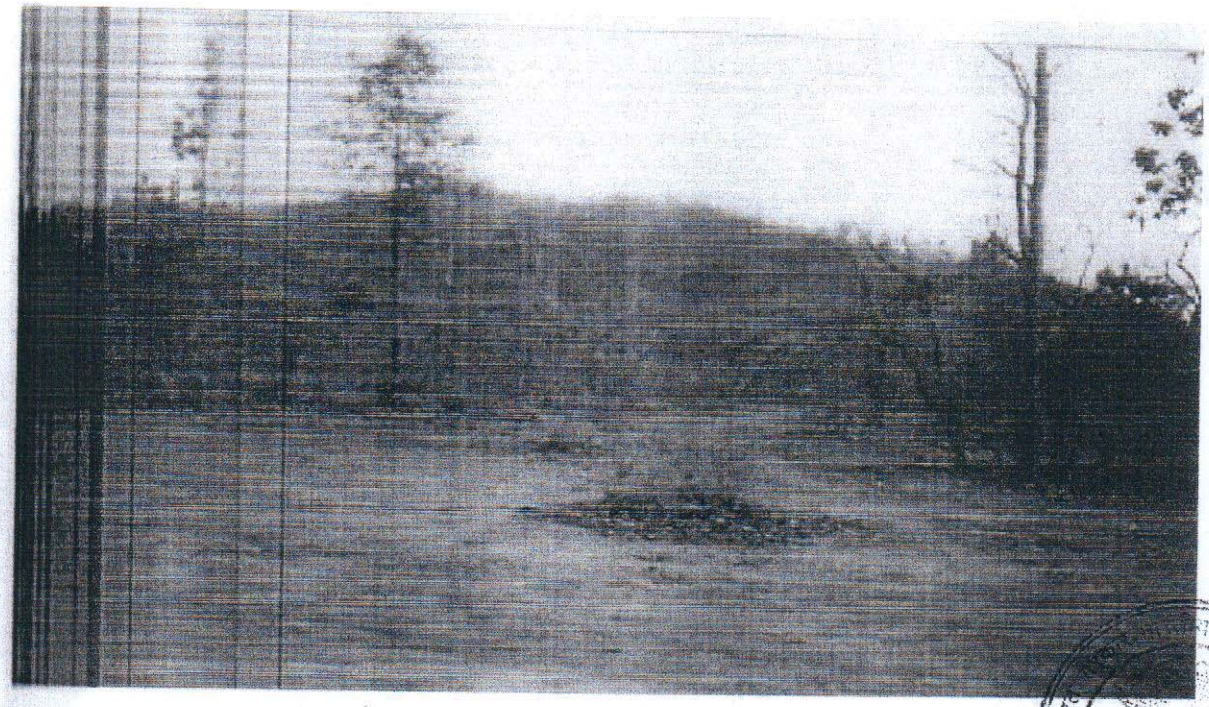
PHOTOGRAPH:-3. TOP OF THE SURFACE AREA SHOWS LATARITIC CAPPING WITH SMALL OUTCROP OF IRON ORE:



PHOTOGRAPH:-4. TOP OF THE SURFACE AREA SHOWS SMALL OUTCROP OF IRON ORE:

APPROVED

PHOTOGRAPH:-5. HILL SLOPE SHOWS LATARITIC SOIL CAPPING:



PHOTOGRAPH:-6. THE SURFACE AREA SHOWS SMALL OUTCROP OF IRON ORE:

PHOTOGRAPH:-7. HILL SLOPE SHOWS FLOAT ORE:

PHOTOGRAPH:-8. HILL SLOPE SHOWS FLOAT ORE:

APPROVED

ANNEXURES

अनुमोदित
APPROVED

Annexure-I

CERTIFICATE OF RECOGNITION AS QUALIFIED PERSON TO PREPARE MINING PLANS

(Under Rule 22C of Mineral Concession Rules, 1960)

Shri **SHALABH SAHA** *resident of* H.I.G.- 21, HUDCO COLONY, BHILAI, DURG (C.G), *son of Shri* **R. P. SAHA,**

having given satisfactory evidence of his qualifications & experience is hereby granted recognition under Rule 22 C of the Mineral Concession Rules, 1960 as a Qualified Person to prepare Mining Plans.

His registration number is RQP/NGP/302/2003/A

This recognition is valid for a period of ten yeas ending 3rd June 2013.

4/6/03

Regional Controller of Mines
Indian Bureau of Mines
Nagpur Region
क्षेत्रीय खान नियंत्रक (ना. क्ष.)
Regional Controller of Mine (N R
भारतीय खान ब्यूरो, नागपुर
Indian Bureau Of Mines, Nagpur

Place : Nagpur
Date : 4th June 2003

Annexure – I

भारत सरकार–कॉर्पोरेट कार्य मंत्रालय
कम्पनी रजिस्ट्रार कार्यालय, महाराष्ट्र, मुंबई

नाम परिवर्तन के पश्चात नया निगमन प्रमाण–पत्र

कॉर्पोरेट पहचान संख्या : L28920MH1972PLC016154

मैसर्स JAYASWALS NECO LIMITED

जे नामतः मे. मैं एतद्द्वारा सत्यापित करता हूँ कि मैसर्स
JAYASWALS NECO LIMITED

जो मूल रुप में दिनांक अठाईस नवम्बर उन्नीस सौ बहत्तर को कम्पनी अधिनियम, 1956 (1956 का 1) के अंतर्गत मैसर्स
JAYASWALS NECO LIMITED

के रुप मे निगमित की गई थी, ने कम्पनी अधिनियम, 1956 की धारा 21 की शर्तों के अनुसार विधिवत आवश्यक विनिश्चय पारित करके तथा लिखित रुप में यह सूचित करके की उसे भारत का अनुमोदन, कम्पनी अधिनियम, 1956 की धारा 21 के साथ पठित, भारत सरकार, कम्पनी कार्य विभाग, नई दिल्ली की अधिसूचना सं. सा.का.नि 507 (अ) दिनांक 24.6.1985 एस.आर.एन A24157992 दिनांक 05/11/2007 के द्वारा प्राप्त हो गया है, उक्त कम्पनी का नाम आज परिवर्तित रुप में मैसर्स
JAYASWAL NECO INDUSTRIES LIMITED

हो गया है और यह प्रमाण–पत्र, कथित अधिनियम की धारा 23(1) के अनुसरण में जारी किया जाता है।

यह प्रमाण–पत्र, मेरे हस्ताक्षर द्वारा मुंबई में आज दिनांक पांच नवम्बर दो हजार सात को जारी किया जाता है।

GOVERNMENT OF INDIA - MINISTRY OF CORPORATE AFFAIRS
Registrar of Companies, Maharashtra, Mumbai

Fresh Certificate of Incorporation Consequent upon Change of Name

Corporate Identity Number : L28920MH1972PLC016154

In the matter of M/s JAYASWALS NECO LIMITED

I hereby certify that JAYASWALS NECO LIMITED which was originally incorporated on Twenty Eighth day of November Nineteen Hundred Seventy Two under the Companies Act, 1956 (No. 1 of 1956) as JAYASWALS NECO LIMITED having duly passed the necessary resolution in terms of Section 21 of the Companies Act, 1956 and the approval of the Central Government signified in writing having been accorded thereto under Section 21 of the Companies Act, 1956, read with Government of India, Department of Company Affairs, New Delhi, Notification No G.S.R 507 (E) dated 24/06/1985 vide SRN A24157992 dated 05/11/2007 the name of the said company is this day changed to JAYASWAL NECO INDUSTRIES LIMITED and this Certificate is issued pursuant to Section 23(1) of the said Act.

Given under my hand at Mumbai this Fifth day of November Two Thousand Seven.

(MILIND VITTHALRAO CHAKRANARAYAN)

उप कम्पनी रजिस्ट्रार / Deputy Registrar of Companies

महाराष्ट्र, मुंबई

Maharashtra, Mumbai

कम्पनी रजिस्ट्रार के कार्यालय अभिलेख में उपलब्ध पत्राचार का पता :

Mailing Address as per record available in Registrar of Companies office:

JAYASWAL NECO INDUSTRIES LIMITED
F-8M I D C INDUSTRIAL AREA, HINGNA ROAD,
NAGPUR - 440016,
Maharashtra, INDIA

अनुमोदित
APPROVED

Annexure - III

AYASWAL NECO INDUSTRIES LIMITED

(FORMERLY JAYASWALS NECO LIMITED)

OFFICE : F-8, MIDC INDUSTRIAL AREA, HINGNA ROAD, NAGPUR - 440 016 (INDIA)
-91-7104-237276, 237471, 237472, 236251, FAX +91-7104-237583, 236255
nact@necoindia.com Website : www.necoindia.com

LIST OF DIRECTORS AS ON 20th JANUARY, 2011.

Name	Designation	Address	Age	Contact No.
Shri Basant Lall Shaw	Chairman	"Usha Sadan", 246, Pt. R.S.S Marg, Civil Lines, Nagpur – 440 001.	77	0712 -2540298 09373116650
Shri B K Jaiswal	Director	51, New Colony, Byramji Town. Nagpur – 440 013.	61	0712 – 2595959 09325111932
Shri N M Vyas	Director	K-53, Maker Tower, Cuffe Parade, Mumbai – 400 005.	68	022 – 22832381 09323466004
Sanjiv Kumar Sachdev	Director (IDBI Nominee)	H-53, Maker Kundan Garden, Juhu Tara Road, Santacruz (W), Mumbai – 400 049.	51	09969327982
Shri Nirmit Ved	Director (EXIM Nominee)	Export Import Bank of India, Maker Chambers IV, 8th Floor, Nariman Point, Mumbai – 400 021	34	09820350179
Shri M P Singh	Director	Block A, Flat – 1, Fourth Floor, Arihant Heights, Bhairav Society, Pachpedinaka, Raipur – 492 001.	52	09302839309
Shri Ramesh Jayaswal	Joint Managing Director	"Usha Sadan", 246, Pt. R.S.S. Marg, Civil Lines, Nagpur – 440 001.	50	0712 – 2540298 09325450000
Shri Arbind Jayaswal	Managing Director	"Usha Sadan", 246, Pt. R.S.S. Marg, Civil Lines, Nagpur – 440 001.	56	0712 – 2540298 09373116760

JAYASWAL NECO INDUSTRIES LIMITED

RAJGAONKAR,
COMPANY SECRETARY.

अनुमोदित
APPROVED

Annexure - IV

JAYASWAL NECO INDUSTRIES LIMITED

(FORMERLY JAYASWALS NECO LIMITED)

OFFICE : F-8, MIDC INDUSTRIAL AREA, HINGNA ROAD, NAGPUR - 440 016 (INDIA)
+91-7104-237276, 237471, 237472, 236251, FAX +91-7104-237583, 236255
contact@necoindia.com Website : www.necoindia.com

CERTIFIED TRUE COPY OF THE RESOLUTION PASSED BY THE COMMITTEE OF DIRECTORS OF JAYASWAL NECO INDUSTRIES LIMITED AT ITS MEETING HELD ON 10TH MARCH, 2011 AT REGISTERED OFFICE OF THE COMPANY.

ITEM:- APPOINTMENT OF SHRI DEGREE LAL CHOUDHARY (PRESIDENT, METAL MINES) AS "NOMINATED OWNER" OF THE SANCTIONED / TO BE SANCTIONED MINES FOR VARIOUS MINERALS.

The Chairman informed that the Company has been allotted / is being allotted Iron Ore, Lime Stone, Ti-Ferrous Iron Ore & Manganese Ore Mines in Chhattisgarh, Maharashtra and other states for captive consumption. The Company is required to notify a "Nominated Owner" of the Company to the competent authorities who shall be entitled to exercise the powers of the Company in connection with the operations at the above Mines. He shall also be responsible for ensuring compliance of the applicable rules and regulations in that behalf. The Committee unanimously approved the appointment of Shri Degree Lal Choudhary (President, Metal Mines), as Nominated Owner for the Mines allotted / to be allotted to the Company as above said. The following resolution was passed.

"RESOLVED THAT the Company does hereby appoint Shri Degree Lal Choudhary (President, Metal Mines), of the Company as the " Nominated Owner " for the various Metal Mines in Chhattisgarh, Maharashtra and other states allotted / being allotted to the Company".

"RESOLVED FURTHER THAT the above named Shri Degree Lal Choudhary (President, Metal Mines), in his capacity of Nominated Owner shall in pursuance of the applicable statutes in that behalf, be entitled to exercise all the powers exercisable by the nominated owner, for and on behalf of the Company and shall be responsible for ensuring the compliance under the said legislative provisions and directions issued by the competent authorities having jurisdiction".

"RESOLVED FURTHER THAT the above named Shri Degree Lal Choudhary (President, Metal Mines), be and is hereby authorized to make and sign on behalf of the Company all such papers, and documents in connection with the allotment of mines, commencement of operations in the above said Mines as are necessary and submit the same to the competent authorities in that regard and further that the Company does hereby undertake to ratify all such things deeds and matters lawfully done and actions lawfully taken by him on behalf of the Company, if and as and when so required in that behalf".

"RESOLVED FURTHER THAT Certified True Copy of the foregoing be submitted to the concerned for their records and they be requested to act thereon."

अनुमोदित
APPROVED

CERTIFIED TRUE COPY
For JAYASWAL NECO INDUSTRIES LIMITED

JAYASWAL NECO INDUSTRIES LIMITED NAGPUR

A D KARAJGAONKAR,
COMPANY SECRETARY.

6/12/11
D. L. Choudhary
President (Mines)
Jayaswal Neco Industries Ltd

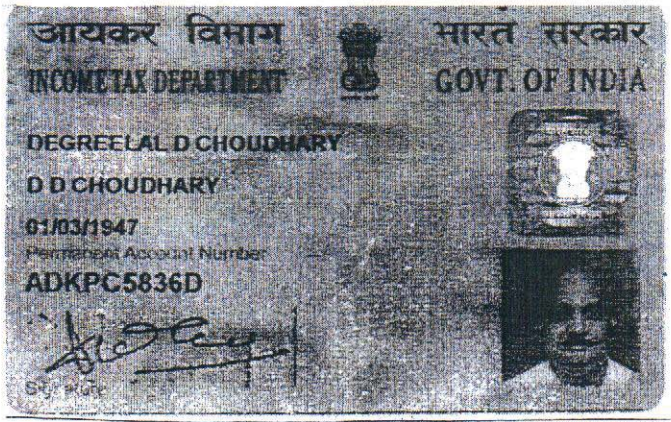
Defence Colony, 110 024. (INDIA) 24641579 24642190

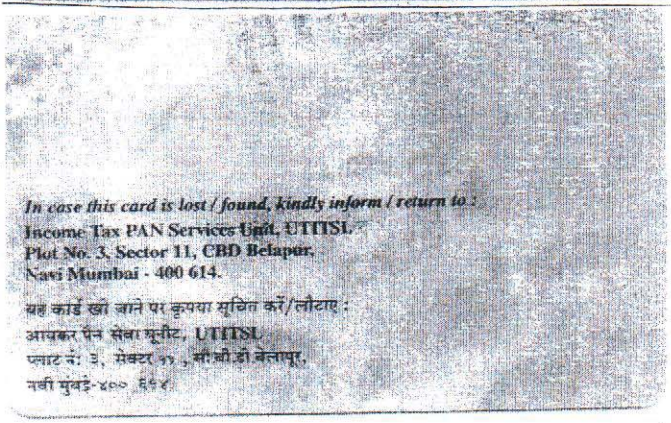
301, TULSIANI CHAMBERS NARIMAN POINT, MUMBAI 400 021 (INDIA) PH. : (022) 2282-0967, (022) 2282-3273 (022) : 22832381 FAX : (022) 22832367

TRUST HOUSE, 5th FLOOR, 32-A CHITTARANJAN AVENUE, KOLKATTA-700012 INDIA FAX : 033-22122560 PHONES : 033-22122368, 22120502

178-A, LIGHT INDUSTRIAL AREA, BHILAI - 490026 CHHATISGARH, INDIA PHONES : 0788-2381858, 2381859, 60, 61, 62 FAX : 0788 - 2286679

Annexure – V





D. D. Choudhary
President (Mines)
Jayaswal Neco Industries Ltd

SEEN
APPROVED

27.10.08

Airtel

dia Services

r Airtel Bill

HARY
TANKI B16/7,
NDRA NAGAR AMLEE DHE,
VP 08

Telephone Number: Multiple
Account No : 11717799
Bill No : 264242538
Bill Date : 18/Oct/2008
Billing Period : 17/Sep/2008 to 16/Oct/2008
DUE DATE देय तिथि : 06/Nov/2008
Tariff Plan: Multiple

7992642425 38

Switch to eBill. Save Paper, Save Trees.

ount Summary

Balance		Payments		Adjustments		This Month Charges		Amount Payable By 06/Nov/2008	Amount Payable After 06/Nov/2008
00	-	2,933.00	-	0.00	+	2,534.91	=	2,535.00	2,611.05
		भुगतान		समायोजन		इस महीने की देय राशि		राशि देय, तिथि	राशि देय, तिथि उपरान्त

nth's Charges (इस महीने की देय राशि)

Charges	मासिक शुल्क	840.00
VAS Charges	कॉल एवं वी ए एस शुल्क	1,632.45
Charges	डी एस एल इस्तेमाल शुल्क	0.00
harges	अन्य शुल्क	0.00
level charges	खाते दर शुल्क	1,036.99
harges	शुल्क	3,509.44
Discounts	कुल छूट	-1,243.70
	कुल शुल्क	2,265.74
	कर	269.17
ent Charges	इस महीने की कुल देय राशि	2,534.91

Sr. GM(F&A)

Terms & conditions apply. For more details, kindly visit www.airtel.in

D. L. Choudhary
President (Mines)
Jayaswal Neco Industries Ltd.

on No: AAACB2894GST027/Telephone and Leased Circuit

and return with payment

Multiple
11717799
264242538

11717799264242538181020080000253500

Bill Date : 18/Oct/200
Amount Payable : 2,535.0
DUE DATE : 06/Nov/200

Mode	Amount	Date	Cheque Number	Bank / Branch
	☐ Diners ☐ Master ☐ Visa ☐ Amex			

Against Card No. Card Expiry Date /

Card Holder's Name

Cheque/DD/Pay Order in favour of Airtel (A/c 11717799)

Bharti Airtel Limited

Bharti Airtel Limited, Interface, Bldg No-7, 5th Floor,Link Road, Near Goregaon Sport Club,Malad-West,Mumbai-400064.Fax No-022-40034195
Local City Office: Bharti Airtel Ltd, 1, Malviya nagar,Near Titan Showroom, Bhopal - 462003. Fax No - 0755-4223223
inquiries:Pl. dial 121 from your Airtel telephone no. or dial 4444121. from a non-Airtel Telephone no. or email at: wecare.mp@airtel.in
Airtel we are committed to your complete satisfaction. You can highlight any matter related to our services to our Nodal Officer:
Deepak Sethi, email:nodal.central@airtel.in, Tel no. 0755-4200460, Fax no. 0755-4223231
In case you do not get any satisfactory response you can highlight the matter to our Appellate Authority:
Pankaj Sootha, email:appellate.central@airtel.in , Tel no. 0755-4221100, Fax no. 0755-4223223

Annexure - VI

SUMMARY RECORD OF THE 8TH MEETING OF EXPERT APPRAISAL COMMITTEE FOR ENVIRONMENTAL APPRAISAL OF MINING PROJECTS CONSTITUTED UNDER EIA NOTIFICATION, 2006

2.3 Metabodeli Iron Ore Mining Project of M/s Jayaswal Neco Industries Ltd. located at Pakhanjur, District Kanker, Chhattisgarh (Consultant: Srushti Sewa, Nagpur)

The proposal was considered by the Committee and the proponent made a presentation on the same. The proposal is for opening of a new mine for production of 0.2 million TPA of iron ore. The mine lease area is 50 ha, which is a forestland. The TOR for this project for prescribed on 25th February, 2009. Public hearing was held on 26.4.2010. Mine working will be opencast involving drilling and blasting. Life of the mine is 20 years. Ultimate working depth will be 9 m from 550 m AMSL. The depth of water table is below 20 m from the ground level. The mine working will not intersect the groundwater table.

Based on the presentation made and discussions held, the Committee made the following observations:-

(i) The BHQ area should not be used for dumping and accordingly the mine plan should be revised.

(ii) The Mine planning/life of the mine does not appear to be supported by adequate exploration/reserve estimates. This should be rectified by carrying out further exploration / prospecting in the leasehold and if no further resources are established, by suitably adjusting the mine life to conform to the proven reserves.

(iii) The EIA should be for the lease period / conceptual period.

(iv) Detailed biological study should be carried out. Baseline data on flora and fauna should be provided.

(v) As the area constitutes a large proportion of tribal population, a plan for their welfare should be provided.

(vi) Wildlife Conservation Plan incorporating plan for its execution, monitoring and funding should be provided.

(vii) As there will be common facilities with the adjoining mine, details in this regard should be provided and suitably integrated in the approved mine plan of both the mines.

(viii) As there is a river in the southern direction and reservoir in north-north east direction, the impact of the mining on the same should be provided.

अनुमोदित
APPROVED

(ix) (ix) As the entire lease area is forestland, necessary prior forestry clearance should be obtained before submitting the proposal for environmental clearance.

In the light of the above observations, it was concluded that the proposal is pre-mature. The proposal may be submitted after complying with the above observations. Till such time, the proposal may be closed and delisted.

अनुमोदित
APPROVED

Annexure – VII 160

REGISTERED

GOVERNMENT OF INDIA
MINISTRY OF COAL & MINES
DEPARTMENT OF MINES

No.5/6/2004-M.IV

New Delhi, the 6th Oct.,2004

To

The Secretary to the Govt. of Chhattisgarh,
Department of Mineral Resources,
Mantralaya, RAIPUR (Chhattisgarh)

Sub: Grant of ML for Iron Ore over an area of 50.00 hects. in Forest Compartment No. 426 & 427 in village Metabodli, Tah. Pankhanjur, Distt Kanker (Chhattisgarh) in favour of M/s Jayaswal NECO Ltd. for a period of 30 (thirty) years.

Sir,

I am directed to refer to your letter No. 3-94/2003/M dated 25.11.2003 and letter No. 3-94/2003/Minerals dated 26.3.2004 on the above mentioned subject and to convey the approval of the Central Govt. under Section 5(1) of the Mines and Mineral (Development and Regulation) Act, 1957 to the grant of ML for Iron Ore over an area of 50.00 hects. in Forest Compartment No. 426 & 427 in village Metabodli, Tah. Pankhanjur, Distt. Kanker (Chhattisgarh) in favour of M/s. Jayaswal NECO Ltd. for a period of 30 years.

2. Before allowing grant of ML the State Govt. may kindly ensure the compliance of the amended provisions of the Act and Rules, and other applicable Acts and Rules including Forest (Conservation) Act, 1980.

3. A copy of the order passed by the State Govt. in the matter may kindly be furnished to this Department for record.

Yours faithfully,

6/X/04

(O.P. KATHURIA)
UNDER SECRETARY TO THE GOVT. OF INDIA
Ph.23388061

Encl./Copy to :

1. The Controller General, Indian Bureau of Mines, Indira Bhawan, Civil Lines, NAGPUR-440001.
2. The Chairman-cum-Managing Director, Mineral Exploration Corporation Ltd., High Land Drive Road, Seminary Hills, NAGPUR-440006.
3. PS to Minister (C & M)
4. Copy for Guard file.

6/X/04

(O.P. KATHURIA)

UNDERSECRETARY

अनुमोदित
APPROVED

6/10/11

D. L. Choudhary
President (Mines)
Jayaswal Neco Industries Ltd

Annexure - VIII

छत्तीसगढ़ शासन
खनिज साधन विभाग,
मंत्रालय,
दाऊ कल्याण सिंह भवन, रायपुर

कमांक एफ–3–94 / 2003 / 12(1) रायपुर, दिनांक 28 JUL 2008 जुलाई 2008

प्रति,

प्रबंध निदेशक,
मेसर्स जायवाल्स निको लिमिटेड,
एफ–8 एम0आई0डी0सी0,
इण्डस्ट्रीयल ऐरिया हिंगना रोड़,नागपुर
महाराष्ट्र–4400016।

विषयः–जिला उत्तर बस्तर कांकेर तह0 पखांजूर के ग्राम मेटाबोदली पश्चिम भानुप्रतापपुर के वन कंपार्टमेंट कमांक 426 एवं 427 के रकबा 50.00 हेक्टर क्षेत्र पर खनिज लौह अयस्क के खनिपट्टा स्वीकृति हेतु मायनिंग प्लान प्रस्तुत करने बाबत्।

जिला उत्तर बस्तर कांकेर, तहसील पखांजूर के ग्राम मेटाबोदली वनमंडल पश्चिम भानुप्रतापपुर के वन रेंज कोयलीबेडा के वन कंपार्टमेंट कमांक 426 एवं 427 के रकबा 50.00 हेक्टर क्षेत्र जिसके अक्षांश एवं देशांस नीचे की तालिका में दर्शित है, पर 30 वर्ष की अवधि के लिए खनिज लौह अयस्क की खनिपट्टा स्वीकृति हेतु भारत सरकार, खान मंत्रालय के पत्र कमांक 5/6/2004–M-IV दिनांक 06.10. 2004 द्वारा खान एवं खनिज (विकास एवं विनियमन) अधिनियम, 1957 की धारा 5(1) के तहत पूर्वानुमोदन दिया गया है :–

वन मंडल एवं वन रेंज	वन कंपार्टमेंट		रकबा (हेक्टर में)	Point	देशांश	अक्षांश	रकबा (हेक्टर में)
	पुराना	नया					
पश्चिम भानुप्रतापपुर वन मंडल के वन रेंज कोयलीबेडा	पी –426	पी –1305	45.00	A	80° 58' 40.18"	20° 2' 20.34"	50.00 हेक्टर (कोआर्डिनेट के मध्य आने वाला क्षेत्र)
	पी –426	पी –1306	05.00	B	80° 59'16.07"	20° 2'54.32"	
			——	C	80° 59'18.48"	20° 2'52.00"	
			50.00	D	80° 59'19.75"	20° 2'41.65"	
				E	80° 58'49.75"	20° 2'12.40"	

2/ उपर्युक्त आवेदित क्षेत्र आरक्षित/संरक्षित वन भूमि होने से इसके लिए भारत सरकार, पर्यावरण एवं वन मंत्रालय से वन संरक्षण अधिनियम, 1980 के तहत अनुमति प्राप्त की जानी होगी। उक्त अनुमति प्राप्त करने के लिए वन विभाग में प्रस्तुत किये जाने वाले आवेदन के साथ अनुमोदित मायनिंग प्लान भी संलग्न किया जाना होगा। अतएव आपको उक्त अनुमति प्राप्त करने हेतु उपर्युक्त क्षेत्र बाबत् मायनिंग प्लान आई.बी.एम से अनुमोदित कराने हेतु निम्नलिखित शर्तो के तहत अनुमति प्रदान की जाती है :–

2.1 वन संरक्षण अधिनियम, 1980 के तहत मायनिंग प्लान तैयार कराये जाने के लिए जारी की जा रही इस अनुमति से आपको उपर्युक्त आवेदित क्षेत्र पर प्रवेश करने या खनन कार्य करने का कोई अधिकार प्राप्त नहीं होगा।

.....2

D.L. Choudhary
President (Mines)
Jayaswal Neco Industries Ltd

2.2 आवेदित क्षेत्र हेतु वन संरक्षण अधिनियम, 1980 के तहत वन विभाग से आवश्यक अनुमति प्राप्त करने में असफल रहने के फलस्वरूप यदि कंपनी द्वारा तैयार कराया गया मायनिंग प्लान निष्फल हो जाता है तो इसका कोई उत्तरदायित्व राज्य शासन पर नही होगा एवं इस संबंध में कंपनी द्वारा राज्य शासन के विरूद्ध कोई दावा (क्लेम) मान्य नही किया जाएगा।

3/ यदि आपको उपर्युक्त शर्ते मान्य हो तो 6 माह की अवधि के भीतर इडियन ब्यूरो ऑफ माईन्स से माइनिंग प्लान अनुमोदित कराकर इस विभाग को प्रस्तुत करें एवं साथ ही वन संरक्षण अधिनियम, 1980 के तहत अनुमति प्राप्त करने हेतु अग्रिम कार्यवाही करे।

23/7/08

(संजय कनकने)
अवर सचिव
छत्तीसगढ़ शासन
खनिज साधन विभाग
रायपुर, दिनांक जुलाई

पृ0 क0 एफ–3–94/2003/12,

प्रतिलिपि–

1. कन्ट्रोलर जनरल, भारतीय खान ब्यूरों सेकेण्ड फ्लोर ए ब्लाक, इदिरा भवन, सिविल लाईन्स, नागपुर (महाराष्ट्र)।
2. संचालक, भौमिकी तथा खनिकर्म, छत्तीसगढ़ ,सोनाखान भवन, रायपुर।
3. कलेक्टर जिला उत्तर बस्तर कांकेर, छत्तीसगढ़।
4. नोडल आफिसर, मुख्य वन संरक्षक (भू–प्रबंध) वन संरक्षण अधिनियम, 1980 भवन, जेल रोड़ रायपुर छत्तीसगढ़।
5. क्षेत्रीय खान नियत्रक, भारतीय खान ब्यूरों, सेकेण्ड फ्लोर, ए ब्लाक, इदिरा सिविल लाईन्स, नागपुर (महाराष्ट्र)।
7. गार्ड फाईल।

अवर सचिव
छत्तीसगढ़ शासन
खनिज साधन विभाग

METABODELI IRON ORE DEPOSIT

RANGE-KOILIBEDA, DIVISION-BHANUPRATAPPUR(WEST)
DISTT-KANKER, CHHATTISGARH

CO-ORDINATES	INDEX	
58:40.18, 20:02:20.34	ML AREA	
59:16.07 20:02:54.32	PF BOUNDARY	
59:18.48, 20:02:52.00	VILLAGE	
59:19.75 20:02:41.65	ROAD	
58:49.75, 20:02:12.40	P-426	45.00 HA
	P-427	05.00 HA
	TOTAL AREA	50.00 HA

SCALE- 1:50,000

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Divisional Forest Officer
West Bhanupratappur Divi
Bhanupratappur

AUTHORISED SIGNATORY
M/S JAYASWALS NECO LTD.

Range Officer
Kolibeda

उप-वन मण्डलाधिकारी.
(पूर्व) कापसी उप वन मण्डल.

Range Officer

CHAPTER 3
DESCRIPTION OF ENVIRONMENT

3.0 INTRODUCTION

This chapter incorporates the description of the existing environmental setting the area encompassed by a circle of 5 km radius around the proposed iron ore mine.

3.1 AIR ENVIRONMENT

3.1.1 AIR ENVIRONMENT: BASELINE STATUS

3.1.1(a) Climate & Meteorology : Micro-Meteorological data within the study area during the air quality survey period is an indispensable part of air pollution studies. The meteorological data recorded during the monitoring period is very useful for proper interpretation of the baseline information as well as for input to the predictive models for air quality dispersion. Historical data on meteorological parameters will also play an important role in identifying the general meteorological status of the region. The climate of the study area and the surrounding area is generally dry except in the south-west monsoon season. The year may broadly be divided into four seasons.

- Winter Season : December to February
- Pre Monsoon Season : March to May
- Monsoon Season : June to September
- Post Monsoon Season : October and November

The methodology adopted for monitoring surface observations is as per the standard norms laid down by Bureau of Indian Standards (BIS) and the Indian Meteorology Department (IMD).

i) Temperature : The winter season starts from end of November and continues to February. December is the coldest month with mean monthly maximum temperature at 32.50°C and the mean monthly minimum at 10.9°C. The mean monthly temperature in December month is observed to be 23.0°C. Both the day and night temperatures increase rapidly from March to May. During summer the mean monthly maximum temperature is 47.10°C observed during May and the mean monthly minimum temperature is 11.7°C observed during March. It is observed that during March through May the maximum temperatures exceed 40°C marginally. During monsoon the average maximum temperatures range between 35.7°C to 46.50°C and the average minimum temperatures observed are in the range of 15.10°C to 19.40°C. There is an appreciable drop in minimum temperatures with the retreat of south-west monsoon i.e. the end of September/October.

ii) Relative Humidity

The air is generally dry except in the south-west monsoon season. During summer months, the relative humidities are very low.

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RH at 0830 hrs : The mean humidity ranges between 54.0% to 86.00%. Dur... summer the maximum humidity ranged between 93.0% to 95.0% while ... minimum is ranged between 14.0% to20.0%. The monthly mean variati... (Between 1978-87) are presented in Table-3.6 .

RH at 1730 hrs : The mean humidity ranges between 24.00% to 76.00%. Dur... summer the maximum humidity ranged between 73.0% to 96.0% while ... minimum ranged between 7% to 9.0%. The summary of monthly mea... variations (Between 1978-870 are presented in Table-3.6 .

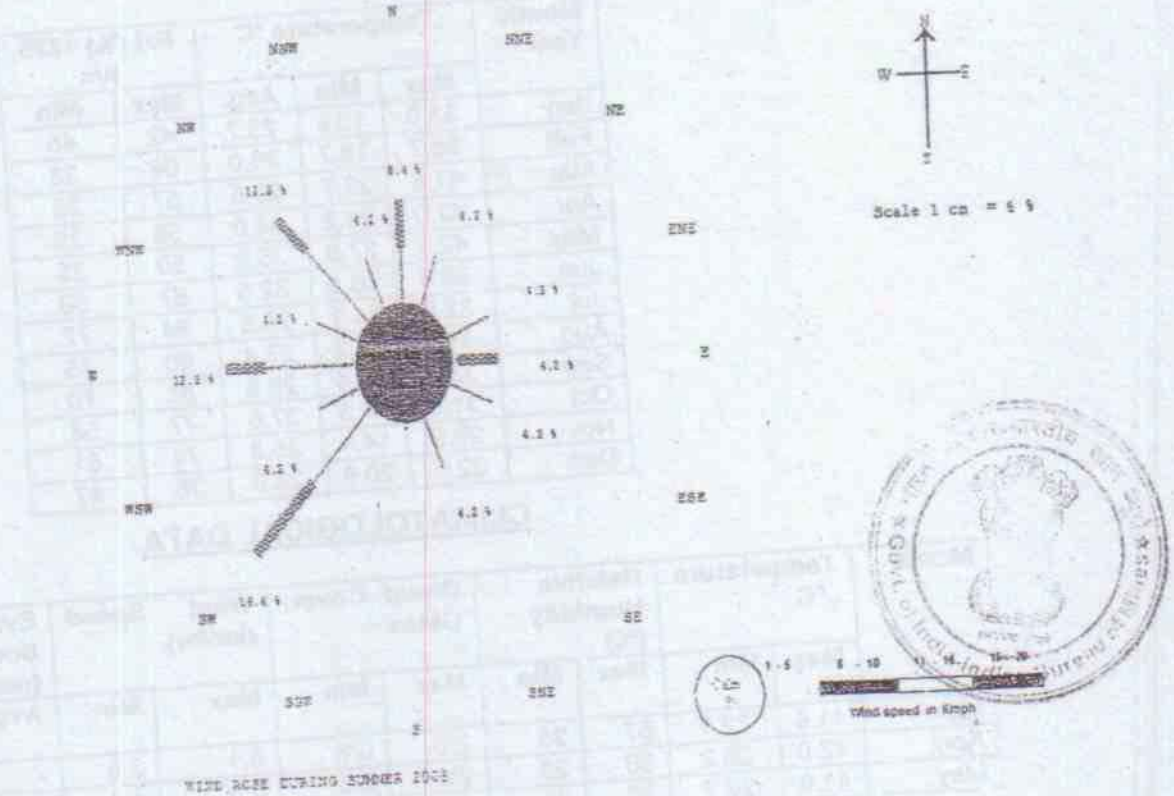
iii) **Atmospheric Pressure**

The maximum atmospheric pressure is recorded in winter season. The press... in all other months is found to be varying.

At 0830 Hrs : The mean pressure ranges between 988.7 mb to 1002.7 mb ... maximum atmospheric pressure during the winter season was observed to l... the range of 1006.8 mb to 1013.8 mb while the minimum is observed in the r... of 993.0 mb to 996.6 mb. The summary of monthly mean variations (Betwe... 1978-87) are presented in Table-3.6.

At 1730 Hrs : The mean pressure ranges between 984.6 mb to 998.7 mb ... mean maximum atmospheric pressure during the winter season was observe... be in range of 1002.8 mb to 1008.0 mb while the minimum of 988.9 mb to 99... mb. The summary of monthly mean variations (Between 1978-87) are prese... in Table-3.6.

iv) **Wind Speed/Direction :** The wind speed and wind direction data recorde... IMD, has been procured and the same is presented in the annual wind ros... Figure below:



WIND ROSE DURING SUMMER 2013

v) **Rainfall :** Subject to a typical Monsoon climate, Kanker District receives average 1492 mm rainfall. The maximum rainfall is observed during South-west monsoon. About 70% of the annual rainfall is received during the monsoon season. Pre-monsoon rains are also observed in the are

TABLE-3.1

SUMMARY OF METEOROLOGICAL DATA

Month/ Year	Temperature °C			RH (%) 1730 hrs	
	Max	Min	Avg.	Max	Min
Jan	33.9	15.5	23.7	42	45
Feb	38.7	18.7	26.0	68	33
Mar	41.8	22.7	29.6	57	25
Apr	42.0	26.2	34.0	56	25
May	42.1	27.6	35.2	50	25
Jun	38.5	26.8	32.5	67	50
Jul	32.5	24.1	28.5	84	72
Aug	31.7	24.2	27.4	86	75
Sep	32.3	20.4	28.3	82	70
Oct	31.8	17.3	27.6	77	58
Nov	29.9	14.4	25.3	74	51
Dec	32.5	20.9	23.0	76	47

CLIMATOLOGICAL DATA

Month	Temperature, °C		Relative Humidity (%)		Cloud Cover, Oktas		Wind Speed (km/hr)		Evapora-tion rates (mm/day)	Rainfall
	Max	Min	Max	Min	Max	Min	Max	Min	Avg	Total (mm/month)
March	41.8	22.7	57	25	2/8	0/8	5.1	3.6	-	NIL
April	42.0	26.2	56	25	2/8	0/8	6.5	4.4	5.9	NIL
May	41.8	22.7	50	25	3/8	0/8	7.2	2.9	-	21.9

LOCATION OF AIR MONITORING STATIONS

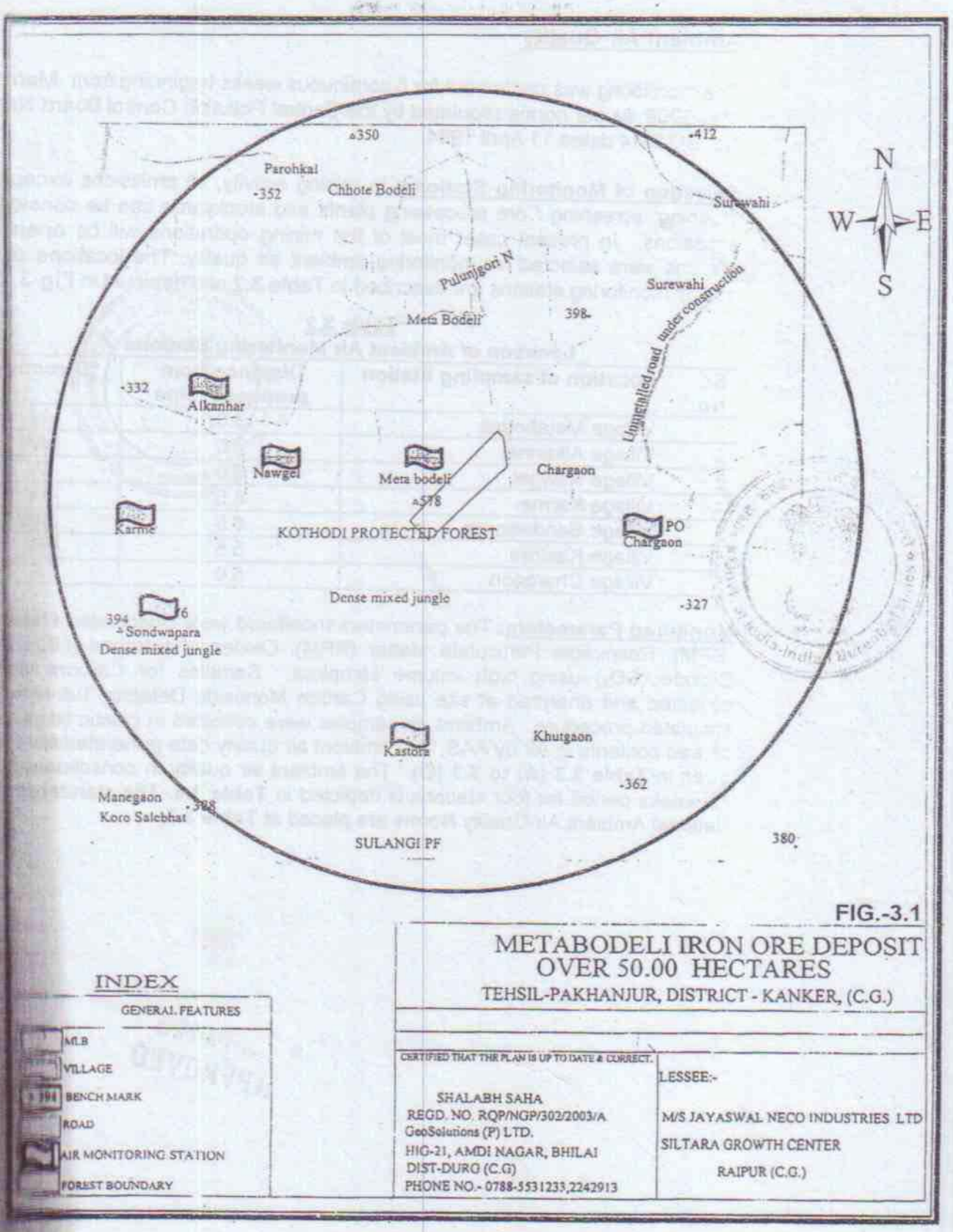


FIG.-3.1

METABODELI IRON ORE DEPOSIT OVER 50.00 HECTARES

TEHSIL-PAKHANJUR, DISTRICT - KANKER, (C.G.)

INDEX

GENERAL FEATURES

- M.B
- VILLAGE
- 394 BENCH MARK
- ROAD
- AIR MONITORING STATION
- FOREST BOUNDARY

CERTIFIED THAT THE PLAN IS UP TO DATE & CORRECT.

SHALABH SAHA
REGD. NO. RQP/NGP/302/2003/A
GeoSolutions (P) LTD.
HIG-21, AMDI NAGAR, BHILAI
DIST-DURG (C.G)
PHONE NO.- 0788-5531233,2242913

LESSEE:-

M/S JAYASWAL NECO INDUSTRIES LTD
SILTARA GROWTH CENTER
RAIPUR (C.G.)

Ambient Air Quality

The monitoring was carried out for 5 continuous weeks beginning from March 2009 to May, 2009, as per norms stipulated by the Central Pollution Control Board Notification No. B-33014 dated 11 April 1994.

Selection of Monitoring Stations: In mining activity, all emissions except those from crushing, screening / ore processing plants and stockyards can be considered fugitive emissions. In present case, most of the mining operations will be opencast. several stations were selected for monitoring ambient air quality, The locations of the four air quality monitoring stations are described in **Table 3.2** and depicted in **Fig-3.1.**

Table 3.2
Location of Ambient Air Monitoring Stations

Sr. No.	Location of sampling Station	Distance from proposed mine	Direction
1	Village Metabodeli	3.0	N
2	Village Alkanhar	5.5	NW
3	Village Nawgel	3.0	W
4	Village Karme	6.5	W
5	Village Sondwapara	6.5	SW
6	Village Kastora	5.5	S
7	Village Chargaon	5.0	E

Monitored Parameters: The parameters monitored were Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Oxides of Nitrogen (NOx) and Sulphur Dioxide (SO_2) using high volume samplers. Samples for Carbon Monoxide were collected and analyzed at site using Carbon Monoxide Detector Tubes as per Drager stipulated procedure. Ambient air samples were collected in plastic bags for estimation of lead contents in Air by AAS. The ambient air quality data generated for four stations is given in **Table 3.3 (A) to 3.3 (G)**. The ambient air quality in consolidated summary for 13 weeks period for four stations is depicted in **Table 3.4**. The standards prescribed in National Ambient Air Quality Norms are placed at **Table 3.5**.

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TABLE 3.3 (A)
AMBIENT AIR QUALITY
SAMPLING STATION : A1

Week	SPM $\mu g/m^3$	RPM $\mu g/m^3$	SO_2 $\mu g/m^3$	NOx $\mu g/m^3$
W1	63.4	34.8	6.3	5.2
	89.7	48.3	6.5	5.7
W2	67.8	39.4	6.3	5.3
	81.2	46.2	6.4	5.5
W3	58.8	37.2	6.2	4.9
	75.3	43.1	6.6	5.9
W4	86.5	47.4	6.7	5.9
	88.4	47.8	6.7	5.9
W5	70.7	41.5	6.5	5.2
	58.9	37.6	6.2	4.7
W6	91.7	48.9	6.8	5.5
	87.4	47.5	6.6	5.1
W7	71.1	42.6	6.3	4.6
	89.7	48.3	6.5	5.3
W8	75.8	43.3	6.2	4.7
	90.3	48.5	6.7	4.7
W9	85.7	46.8	6.4	5.2
	80.7	44.1	6.3	5.1
W10	75.1	42.3	6.3	4.9
	84.4	46.4	6.5	5.3
W11	67.9	39.6	6.3	4.8
	81.6	45.4	6.6	5.9
W12	69.4	37.8	6.2	5.1
	78.4	44.2	6.5	5.3
W13	90.6	48.6	6.8	5.9
	74.7	42.7	6.5	5.5
Max	**91.7**	**48.9**	**6.8**	**5.9**
Min	**58.8**	**34.8**	**6.2**	**4.6**
98th %tile	**78.28**	**43.86**	**6.46**	**5.27**

TABLE 3.3 (B)
AMBIENT AIR QUALITY
SAMPLING STATION : A2

Week	SPM µg/m³	RPM µg/m³	SO_2 µg/m³	NOx µg/m³
W1	81.3	50.4	6.2	4.7
	88.6	53.6	6.2	4.5
W2	84.9	52.1	6.2	4.7
	76.4	48.2	6.1	4.1
W3	79.6	49.7	6.1	4.4
	94.4	56.2	6.3	5.2
W4	68.5	44.3	6.1	4.1
	88.7	53.7	6.2	4.7
W5	93.4	55.4	6.3	5.5
	89.3	53.9	6.2	4.8
W6	72.8	49.8	6.1	4.2
	83.7	51.5	6.2	4.5
W7	74.1	47.3	6.1	4.3
	71.3	46.4	6.1	4.3
W8	79.8	49.7	6.2	5.1
	74.2	47.5	6.1	4.7
W9	78.9	49.3	6.2	4.9
	76.4	48.2	6.1	4.5
W10	79.3	49.4	6.2	5.1
	91.1	54.7	6.3	6.1
W11	69.7	45.1	6.1	4.3
	70.9	45.8	6.1	4.9
W12	74.4	46.6	6.2	5.1
	76.3	48.1	6.1	5.3
W13	83.7	51.5	6.3	5.7
	78.5	49.4	6.2	4.8
Max	**94.4**	**56.2**	**6.3**	**6.1**
Min	**68.5**	**44.3**	**6.1**	**4.1**
98th %tile	**80.0**	**49.9**	**6.2**	**4.8**

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TABLE 3.3 (C)
AMBIENT AIR QUALITY
SAMPLING STATION: A3

Week	SPM µg/m³	RPM µg/m³	SO_2 µg/m³	NOx µg/m³
W1	92.4	53.8	6.3	4.8
	88.5	51.5	6.1	4.2
W2	91.4	53.2	6.2	5.1
	97.3	56.6	6.4	5.3
W3	85.7	49.9	6.1	4.4
	87.9	51.2	6.1	4.5
W4	91.3	53.1	6.3	5.4
	97.1	56.5	6.4	5.7
W5	86.4	50.3	6.2	4.3
	73.8	43.0	6.1	5.1
W6	92.2	53.7	6.3	5.5
	89.6	52.1	6.3	5.2
W7	81.8	47.6	6.2	4.7
	73.6	42.8	6.1	4.1
W8	84.3	49.1	6.1	4.8
	96.5	56.2	6.4	5.7
W9	83.1	48.4	6.2	4.5
	92.7	54.0	6.3	5.3
W10	89.4	52.0	6.2	4.4
	78.6	45.7	6.1	4.2
W11	102.3	59.5	6.5	5.7
	93.8	54.6	6.3	5.2
W12	87.5	50.9	6.2	4.6
	91.9	53.5	6.2	5.1
W13	101.6	59.1	6.5	5.5
	90.7	52.8	6.3	4.9
Max	**102.3**	**59.5**	**6.5**	**5.7**
Min	**73.6**	**42.8**	**6.1**	**4.1**
98th %tile	**89.3**	**52.0**	**6.2**	**4.9**

TABLE 3.3 (D)
AMBIENT AIR QUALITY
SAMPLING STATION : A 4

Week	SPM $\mu g/m^3$	RPM $\mu g/m^3$	SO_2 $\mu g/m^3$	NOx $\mu g/m^3$
W1	74.5	43.7	6.2	4.2
	68.3	41.1	6.1	3.5
W2	73.9	42.3	6.2	4.1
	79.2	46.4	6.3	4.5
W3	67.8	39.7	6.1	3.6
	76.4	44.8	6.2	4.4
W4	72.3	42.4	6.2	4.1
	79.1	45.9	6.3	4.5
W5	68.4	39.6	6.1	3.6
	54.8	33.2	6.1	3.2
W6	74.2	43.5	6.1	4.3
	76.5	44.8	6.2	4.5
W7	68.3	40.4	6.1	3.7
	56.8	34.3	6.1	3.3
W8	66.2	38.7	6.1	3.7
	78.4	45.9	6.2	4.6
W9	61.9	36.3	6.1	4.2
	74.7	43.4	6.2	4.4
W10	71.6	42.2	6.2	4.2
	63.5	36.8	6.1	3.8
W11	84.3	49.4	6.4	4.7
	75.8	45.6	6.3	4.3
W12	68.4	40.7	6.1	3.6
	73.7	43.1	6.2	4.2
W13	83.6	49.3	6.4	4.8
	77.2	45.6	6.3	4.5
Max	**84.3**	**49.4**	**6.4**	**4.8**
Min	**54.8**	**33.2**	**6.1**	**3.2**
98th %tile	**71.9**	**42.3**	**6.2**	**4.1**

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TABLE 3.3(E)
AMBIENT AIR QUALITY
SAMPLING STATION : A 5

Week	SPM µg/m³	RPM µg/m³	SO_2 µg/m³	NOx µg/m³
W1	96.3	52.6	6.2	5.1
	103.6	57.4	6.3	5.7
W2	99.7	53.7	6.2	5.5
	91.4	50.8	6.1	5.1
W3	94.6	5.4	6.2	5.4
	101.8	56.4	6.3	5.8
W4	95.3	51.2	6.2	4.9
	103.7	57.6	6.4	5.7
W5	104.8	58.7	6.4	5.9
	101.2	55.3	6.4	5.6
W6	95.1	51.4	6.2	4.9
	98.7	52.9	6.3	5.3
W7	88.9	48.6	6.1	4.6
	83.6	44.5	6.1	4.5
W8	94.8	52.1	6.2	5.3
	89.2	48.7	6.1	4.7
W9	78.9	42.3	6.1	4.5
	91.4	49.9	6.2	5.2
W10	89.3	47.6	6.1	4.9
	101.6	56.4	6.4	5.8
W11	94.7	51.7	6.2	5.2
	85.9	46.8	6.1	4.8
W12	79.5	44.3	6.1	4.5
	91.3	49.5	6.2	5.1
W13	98.7	53.7	6.3	5.3
	94.6	51.2	6.3	5.1
Max	**104.8**	**58.7**	**6.4**	**5.9**
Min	**78.9**	**5.4**	**6.1**	**4.5**
98th %tile	**94.2**	**49.6**	**6.2**	**5.2**

TABLE 3.3 (F)
AMBIENT AIR QUALITY
SAMPLING STATION : A 6

Week	SPM $\mu g/m^3$	RPM $\mu g/m^3$	SO_2 $\mu g/m^3$	NOx $\mu g/m^3$
W1	65.7	41.4	6.1	3.6
	72.4	45.6	6.3	4.1
W2	53.6	33.8	6.1	3.5
	55.4	34.9	6.1	3.7
W3	59.8	37.7	6.2	3.5
	66.6	42.2	6.2	3.7
W4	62.3	39.2	6.2	3.5
	53.7	33.8	6.1	3.2
W5	70.5	44.5	6.3	4.4
	66.4	41.8	6.2	4.1
W6	72.9	35.2	6.1	4.5
	67.4	32.6	6.1	4.2
W7	56.7	41.7	6.2	3.8
	63.9	45.9	6.3	4.1
W8	49.6	42.5	6.2	3.7
	55.8	35.7	6.1	3.5
W9	62.6	40.3	6.2	4.2
	71.1	31.2	6.1	4.5
W10	54.5	35.5	6.1	3.9
	64.3	39.4	6.2	4.4
W11	61.7	44.8	6.3	4.1
	56.2	34.3	6.1	3.7
W12	61.4	49.7	6.2	3.5
	51.7	38.7	6.1	3.5
W13	56.8	34.6	6.1	3.7
	63.2	39.1	6.2	3.9
Max	**72.9**	**49.7**	**6.3**	**4.5**
Min	**49.6**	**31.2**	**6.1**	**3.2**
98th %tile	**61.4**	**39.1**	**6.2**	**3.9**

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TABLE 3.3 (G)
AMBIENT AIR QUALITY
SAMPLING STATION : A 7

Week	SPM µg/m³	RPM µg/m³	SO_2 µg/m³	NOx µg/m³
W1	101.6	50.0	6.2	5.3
	114.2	56.2	6.2	5.8
W2	95.3	46.9	6.1	4.1
	108.3	53.3	6.3	5.9
W3	103.7	51.7	6.2	6.6
	94.9	46.7	6.1	5.4
W4	112.6	55.4	6.4	5.9
	93.6	46.1	6.1	4.9
W5	108.5	53.4	6.4	6.3
	114.6	56.4	6.5	5.5
W6	105.6	52.0	6.6	4.8
	91.3	44.9	6.1	5.9
W7	97.5	48.0	6.3	5.5
	113.8	56.0	6.5	5.1
W8	107.4	52.8	6.1	5.5
	94.2	46.3	6.2	4.9
W9	105.7	52.0	6.3	6.8
	97.1	47.8	6.1	6.4
W10	104.9	51.6	6.4	5.6
	107.4	52.8	6.3	6.8
W11	98.3	48.7	6.2	5.3
	106.3	52.3	6.3	6.4
W12	97.4	47.9	6.2	4.1
	103.3	50.8	6.4	5.9
W13	109.2	53.7	6.2	6.2
	98.4	48.4	6.2	6.7
Max	**114.6**	**56.4**	**6.6**	**6.8**
Min	**91.3**	**44.9**	**6.1**	**4.1**
98th %tile	**103.3**	**50.9**	**6.3**	**5.7**

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3.1.4 Findings:

a. **Suspended Particulate Matter (SPM) :** The average SPM concentration at the seven Stations A_1, A_2, A_3, A_4, A_4, A_5, A_7 were 78.3, 80.0, 89.3, 79.3, 94.2, 61.4 and 103.3 µg/m^3 respectively. Thus, the position regarding SPM concentration in ambient air is quite satisfactory for all monitoring stations.

b. **Respirable Particulate Matter (RPM):** The position regarding RPM, is quite satisfactory for the all seven stations A_1, A_2, A_3, A_4, A_5, A_6 and A_7. All the 24 hourly max values of RPM are 48.9, 56.2, 59.5, 49.4, 58.7, 49.7, and 56.4 µg/m^3 well below the prescribed limit of 100 µg/m^3 for rural / residential areas.

c. **Sulphur-Di-Oxide (SO_2):** The values recorded for all stations are below 15 µg/m^3, the limit of annual average prescribed for sensitive areas. The average values for all seven stations are 6.5, 6.2, 6.2, 6.2, 6.2, 6.2, and 6.3 µg/m^3, respectively. The expected annual average for 52 weeks will be lower, as values during summer season will be even lower. Thus, the position of SO_2 concentration is satisfactory. The percentile analysis is of little consequence for these low values.

d. **Oxides of Nitrogen:** The position is very highly satisfactory. The highest recorded value of oxides of Nitrogen for A_7 Station is 6.8 µg/m^3 and for the other these were 5.9, 6.1, 5.7, 4.8, 5.9 and 4.5 µg / m^3

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TABLE 3.4

Summary of Ambient Air Quality Monitoring

Values in ($\mu g/m^3$)

Percentile	A1				A2				A3			
	SPM	RPM	SO_2	NOx	SPM	RPM	SO_2	NOx	SPM	RPM	SO_2	NOx
10	65.6	37.7	6.2	4.7	71.1	46.1	6.1	4.3	80.2	46.7	6.1	4.3
20	69.4	39.6	6.3	4.9	74.1	47.3	6.1	4.3	84.3	49.1	6.1	4.4
30	72.9	42.3	6.3	5.1	75.4	48.1	6.1	4.5	87.0	50.4	6.2	4.5
40	75.3	43.1	6.4	5.2	76.4	49.3	6.1	4.7	88.5	51.5	6.2	4.8
50	79.6	44.2	6.5	5.3	79.1	49.6	6.2	4.7	90.2	52.5	6.2	5.0
60	81.6	46.2	6.5	5.3	79.8	49.8	6.2	4.8	91.4	53.2	6.3	5.1
70	86.1	47.1	6.6	5.5	83.7	51.5	6.2	5.0	92.3	53.8	6.3	5.3
80	88.4	47.8	6.6	5.7	88.6	53.6	6.2	5.1	93.8	54.6	6.3	5.4
90	90.0	48.4	6.7	5.9	90.2	54.3	6.3	5.4	97.2	56.6	6.4	5.6
95	90.5	48.6	6.8	5.9	92.8	55.2	6.3	5.7	100.5	58.5	6.5	5.7
98	91.2	48.8	6.8	5.9	93.9	55.8	6.3	5.9	102.0	59.3	6.5	5.7

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(Values IN µg/m³)

Percentile	A4				A5			
	SPM	RPM	SO_2	NOx	SPM	RPM	SO_2	NOx
10	62.7	36.6	6.1	3.6	84.8	44.4	6.1	4.6
20	67.8	39.6	6.1	3.6	89.2	47.6	6.1	4.8
30	68.4	40.4	6.1	3.7	91.4	48.8	6.1	4.9
40	71.6	42.2	6.1	4.1	94.6	50.8	6.2	5.1
50	73.8	42.8	6.2	4.2	94.8	51.3	6.2	5.2
60	74.5	43.5	6.2	4.3	95.3	52.1	6.2	5.3
70	76.1	44.8	6.2	4.4	98.7	53.3	6.3	5.4
80	77.2	45.6	6.3	4.5	101.2	55.3	6.3	5.6
90	79.2	46.2	6.3	4.6	102.7	56.9	6.4	5.8
95	82.5	48.6	6.4	4.7	103.7	57.6	6.4	5.8
98	84.0	49.4	6.4	4.8	104.3	58.2	6.4	5.9

Percentile	A6				A7			
	SPM	RPM	SO_2	NOx	SPM	RPM	SO_2	NOx
10	53.7	33.8	6.1	3.5	94.6	46.5	6.1	4.9
20	55.4	34.6	6.1	3.5	97.1	47.8	6.1	5.1
30	56.5	35.2	6.1	3.6	97.9	48.0	6.2	5.3
40	59.8	37.7	6.1	3.7	101.6	50.0	6.2	5.5
50	62.0	39.2	6.2	3.8	104.3	51.7	6.2	5.7
60	63.2	40.3	6.2	3.9	105.7	52.0	6.3	5.9
70	65.0	41.8	6.2	4.1	107.4	52.8	6.3	6.1
80	66.6	42.5	6.2	4.2	108.5	53.4	6.4	6.4
90	70.8	45.2	6.3	4.4	113.2	55.7	6.5	6.7
95	72.1	45.8	6.3	4.5	114.1	56.2	6.5	6.8
98	72.7	47.8	6.3	4.5	114.4	56.3	6.6	6.8

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TABLE-3.5

AMBIENT AIR QUALITY PERMISSIBLE LIMITS SPECIFIED BY CENTRAL POLLUTION CONTROL BOARD

Sr. No.	Zone Station	SPM ($\mu g/m^3$)	RPM ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (ppm)
1.	Industrial and Mixed use zone	500	150	120	120	5000
2.	Residential and Rural Zone	200	100	80	80	2000

3.1.2 AIR ENVIRONMENT: ANTICIPATED IMPACTS

Impact on Ambient Air Quality: Mining operations contribute towards air pollution in two ways addition of gaseous pollutants to the atmosphere and emission dust particles. The proposed mine with it's capacity of 0.078 million TPA, is likely to generate dust, NOx and SO2. Hard strata will be ripped and dozed. Tippers of 10 tons capacity will be deployed for transporting ore and waste within the mining lease area. The number of working days has been taken at 300 days per year with 8 hours of operation/ day, hence the concentration predicted is considered to be the worst case. With control measures, the emissions have been taken at 30% of uncontrolled emissions for handling and 10% of uncontrolled emissions for transportation.

Major consequences of mining related activities i.e. drilling, blasting and transportation will be contributors of particulate matter (PM) to ambient air. It is possible that PM will be dispersed as per meteorological conditions. Quantification of PM during top soil removal, drilling, blasting etc. was carried out by using USEPA (United States Environmental Protection Agency) equations. These emission factors are statistical averages of the rate at which PM is released into the atmosphere as a result of specified activity. These factors multiplied by the level of activities (drilling, blasting, loading etc.) per day will give the emission rate. These factors are given below along with projected quantum of activities.

Table 3.6
Emission Factors for various mining activities

Sr. No.	Activity	Unit	Emission Factor	Probable intensity at Manpur per day	Emission rate
1.	Drilling	lb/hole	1.5	3 holes/day	4.5 lb/d
2.	Blasting	lb/blast	49.8	5 times/month	49.8 lb/d
3.	Truck loading of soil	lb/ton	0.037	5.2 Ton/day	0.19 lb/d
4.	Truck loading of LS & D	lb/ton	0.037	260 Ton/day	9.62 lb/d
5.	Transportation on asphalted/ macadamized road	lb/veh. mile	7.0	13 vehicles of 20 T capacity per day. Equal number will return. Therefore total vehicles will be 26 & will travel 1 km each. Hence 26 km (16 miles)	182 lb/d

All activities excepting blasting (2) in the above table will be routine activities. Blasting will be five times a month or once a week. Major emissions from routine activities will be of PM. Total emissions from all these activities will be 1.76.1 lb/day or 0.66 g/sec. On the day of blasting emissions would be176.1 lb/day or 0.92 g/sec. These predicted emissions will be from the mining lease which has a total area of 1,21,450 m^2. Therefore "area source"-emission-rate will be 0.0000076 g/sec/m^2 on the day of blasting (once a week) and will be 0.0000064 g/sec./m^2 on other days. Air borne PM will be upto 20 μ size and is likely to be air borne during dispersion. Dispersion pattern is governed by (i) Gaussian dispersion, (ii) wind pattern, (iii) solar intensity, in other words as per prevailing meteorological conditions. Mining will be only in one shift i.e. during the day

Climatically three atmospheric conditions can predominate at the site. They are moderately unstable, neutral and slightly stable. These conditions are specified as under :

Table 3.7
Atmospheric Classes

Wind speed (m/sec.)	Day Solar radiations			Night	
	Strong	Moderate	Slight	Overcast	Clear
<2	A	A-B	B		
2	A-B	B	C	E	F
4	B	B-C	C	D	E
6	C	C-D	D	D	D
>6	C	D	D	D	D

NB : A – Extremely unstable, B- Moderately unstable, C- Slightly unstable D – Neutral, E- Slightly stable & F- Moderately unstable.

In other words dust/PM from mine lease will cause or contribute to SPM in ambient air. Concentration of SPM will depend on emission rate, wind conditions, topography in area and location of the receptor/s. These are known as ground level concentrations (GLCs) in the downwind direction. Normally meteorological data is available for shorter periods (1 hour). Therefore averaging time was converted to 24 hours (required by CPCB) by using the relation.

$$\frac{C_2}{C_1} = \left\{ \frac{T_2}{T_1} \right\}^r \quad \text{where } r = -0.51$$

Where, C_1 – GLC at 1 hour interval T_1

C_2 - GLC at 24 hour interval T_2

Calculated GLCs in the down wind direction are valid for critical wind speed conditions. Critical wind speed is the one at which concentration is highest. These wind conditions are momentary. As mining activities will be only during the day time, the prevailing stability conditions will be mostly moderately unstable. The predicted 24 hrs short term GLCs in μg/m^3 are given Table 3.8 below:

unstable. The predicted 24 hrs short term GLCs in µg/m^3 are given **Table 3.8** below:

Table 3.8
Estimated GLC

Distance m.	On day of blasting Moderately unstable	On other days Moderately unstable
1	33	25
100	37	26
200	40	28
300	24	17
400	14	10
500	10	7
1000	3	2
1500	2	1
2000	1	<1
2500	<1	<1
3000	<1	<1
3500	<1	<1
4000	<1	<1
4500	<1	<1
5000	<1	<1

Quantification : It will depend mostly on two emission rates of PM from mine area. First is for routine activities without blasting and on the day of blasting. GLCs of PM in the down wind direction were calculated using a computer program for distance between 100-2000 m at intervals of 500 m. These were converted to 24 hrs-short term values and are given in **Table 3.9** for routine activities and for the day on which blasting take place.

Table 3.9
Particulate Matter GLCs (µg/m^3) from Mining Lease Area During Routine Mining Activities & Blasting + Mining Activities

Distance m)	Stability Class					
	Moderately unstable		Neutral		Slightly stable	
100	32	46	65	91	81	114
500	8	11	24	34	35	49
1000	3	4	12	17	18	25
1500	1	2	8	11	13	19
2000	1	2	5	8	10	13

N.B. : - * During blasting & routine activities
- Values rounded to nearest decimal.
- Critical wind conditions i.e. the speed at which concentration is max.

Distances of maximum concentration are given below:

Atmospheric class	Maximum concentration (µg/m^3)		Distance (m)
Moderately unstable	32	46	100
Neutral	65	91	100
Slightly stable	81	114	100

NB : * Neutral class prevails during overcast skies and at surface wind speed at about 14 kmph & beyond ; slightly stable conditions during clear skies at this speed.

Therefore maximum contribution of PM to SPM in ambient air will be 114.0 $\mu g/m^3$ at a distance of 100 m in the down wind direction (There is no habitation within this distance) Average SPM in the area is 128.4 $\mu g/m^3$. Locations of villages and the wind roses are given below in order to depict the zone of influence as per the wind conditions. Cumulative SPM after mining will be total of background SPM values plus that predicted above are given in **Table 3.10**

Table 3.10
Incremental Increase in SPM ($\mu g/m^3$)

Atmospheric class	Back ground values	Contribution by mining		Total	
Moderately unstable	128	28	40	156	168
Neutral	128	57	79	185	207
Slightly stable	128	71	99	199	227

* Blasting + routine activities
NB. : Critical wind conditions only.

It can be concluded that there would be only temporary alteration in AAQ for a momentary period. Net maximum increase will be by 40 $\mu g/m^3$ during day at a distance of about 200 m from ML area in down wind direction under moderately unstable condition.. It may be noted that mining activities will be stopped during the night and hence emission rates would be lower.

3.1.3 AIR ENVIRONMENT: PROPOSED MITIGATIVE MEASURES

- Haulage roads will be frequently sprinkled with water for which truck mounted water tankers with sprinkler arrangement have been provided in the scheme.
- Ore will be covered by tarpaulins to prevent spread of dust from it during transportation. Road surfaces will be black tapped to prevent generation of dust by truck movement.
- Regular maintenance of vehicles and machineries will be carried out in order to control emissions. An equipped workshop has been proposed for timely and proper maintenance of all machinery. This proper maintenance will ensure that gaseous exhaust form these ate minimum.
- Dust generated due to traffic on haul roads would be reduced by water spraying at regular intervals;
- Green belt development would be taken up all along the haul roads and overburden dumps.

3.2 NOISE ENVIRONMENT

3.2.1 NOISE ENVIRONMENT : BASELINE STATUS

Introduction : The physical description of sound concerns its loudness as a function of frequency. Noise in general is sound which is composed of many frequency components of various loudness distributed over the audible frequency range. Various noise scales have been introduced to describe, in a single number, the response of an average human sto a complex sound made up of various frequencies at different loudness levels. The most common and universally accepted scale is the 'A'. Weighted scale which is measured as DB(A). This is more suitable for audible range of 20 to 20,000 Hz. The scale has been designed to weigh various components of noise according to the response of a human ear. The impact of noise sources on surrounding community depends on :

- Characteristics of noise sources (instantaneous, intermittent or continuous in nature). It can be observed that steady noise is not as annoying as one which is continuously varying in loudness;
- The time of day at which noise occurs, for example high noise levels at night in residential areas are not acceptable because of sleep disturbance; and
- The location of the noise source, with respect to noise sensitive landuse, which determines the loudness and period of exposure.

The environmental impact of noise can have several effects varying from Noise Induced Hearing Loss (NIHL) to annoyance depending on loudness of noise levels./ The environmental impact assessment of noise from the industrial activity, vehicular traffic can be undertaken by taking into consideration various factors like potential damage to hearing, physiological responses, annoyance and general community responses.

The study area of 10 km radius with reference to the proposed mine site has been covered for noise environment. The entire mine lease area is under reserve forest. The remaining study area also does not harbor any industries. Most of the study area is under forest cover. The four zones viz., Residential, Commercial, Industrial and Silence zones have been considered for noise monitoring. Noise monitoring has been undertaken for 24 hr at each location.

The main objective of noise pollution impact assessment in the study area is to assess the impact of the total noise generated by the existing domestic activities and vehicular traffic on the human settlements within 10 km radius.

Types of Sound Fields

- **Free Field** : Free progressive sound waves have been described as sound waves that propagate without obstruction from source to the receiver. In the case of spherical waves, the inverse square law holds good so tht the sound pressure level decreases by 6 dB as the distance is doubled. Such a field is known as free field.
- **Near Field** : The near field is defined as that region close to the source where the inverse square law does not apply. Usually this region is located within a few wavelengths of the source and it is also controlled by the dimensions of the source.

- **Far Field:** The far field consists of two parts, the free part and the reverberation part. In the free part of the far field, the sound pressure level obeys the inverse square law. The reverberant part of the field exists for enclosed situation where the reflected sound waves are superimposed on the incident sound waves. If there are many reflected waves from all possible direction, a diffuse sound field exists.

Parameters Measured During Monitoring : A noise rating developed by the EPA for specification of community noise from all the sources is the Day-Night Sound Level (L_{dn}). It is similar to a 24 hr equivalent sound level except that during the night time period , which extends from 9 p.m. to 6 a.m., a 10 dB(A) weighting penalty is added to the instantaneous sound level before computing the 24 hr average. This night time penalty is added to account for the fact that noise during night when people usually sleep is judged more annoying than the same noise during the day time. For Noise levels measured over a given period of time interval, it is possible to describe important features of noise using statistical quantities. This is calculated using the percent of the time certain noise levels exceeding during the time interval. The notation for the statistical quantities of noise levels are described below :

- L_{10} is the noise level exceeded 10 percent of other time.
- L_{50} is the noise level exceeded 50 percent of the time and
- L_{90} is the noise level exceeded 90 percent of the time and
- L_{day} is defined as the equivalent noise level measured over a period of time during day (6 am to 9 pm)
- L_{night} is defined as the equivalent noise level measured over a period of time during night (9 pm to 6 am).

Equivalent Sound Pressure Level (L_{eq}) : This Leq is the equivalent continuous sound level which is equivalent to othe same sound energy as the actual fluctuating sound measured in the same period. This is necessary because sound from noise source often fluctuates widely during a given period of time. This is calculated from the following equation :

$$L_{eq} = L_{50} + \frac{(L_{10} - L_{90})^2}{60}$$

L_{dn} : The noise rating developed for community noise from all sources is the Day-Night Sound Level (L_{dn}). It is similar to a 24 hr equivalent sound level except that during night time period (9 pm to 6 am) a 10 dB(A) weighing penalty is added to the instantaneous sound level before computing the 24 hr average. The L_{dn} for a given location in a community may be calculated from the hourly Leq's, by the following equation.

$L_{dn} = 10 \log (1/24 [15(10^{Ld/10}) + 9 (10^{(Ln + 10)})]]$

Where L_d is the equivalent sound level during the day time (6 am to 9 pm) and L_n is the equivalent sound level during the night time (9 pm to 6 am).

Method of Monitoring: A detailed noise survey was undertaken to study the levels of noise as the high noise levels may cause adverse effect on human beings and the associated environment. Noise level was recorded at each hour in the following manner. To obtain noise level at 8 AM, noise readings, with setting at 'A' response - slow mode, were recorded at 7.56, 7.57, 7.58, 7.59, 8.0, 8.01, 8.02, 8.03, 8.04 and 8.05 hours. This gives 10 readings in 1 hr. Hence period of 24 hours gives 240 readings. These 240 readings were tabulated to get frequency table with different class intervals.

Identification of Sampling Locations : A preliminary reconnaissance survey has been undertaken to identify the major noise generating sources in the area. Noise generating sources have been identified with respect to the activities viz, industrial noise, ambient noise due to industries & traffic noise impact on sensitive areas (Ref. **Figure-3.2**).

Ambient Noise Monitoring Locations: The noise survey involved determination of noise levels in decibels at 7 locations in the study area. Noise levels are measured once for twenty four hours at the selected locations. Noise levels were recorded for 10 minutes in every clock hour for a continuous 24 hour period.

Presentation of Results : The ambient noise levels measured are presented in **Table-3.6**. The table indicates equivalent noise levels viz. L_{10}, L_{50}, L_{90}, L_{eq}, L_{day}, L_{night}, and L_{dn} at different places located within in the study area.

LOCATION OF NOISE MONITORING STATIONS

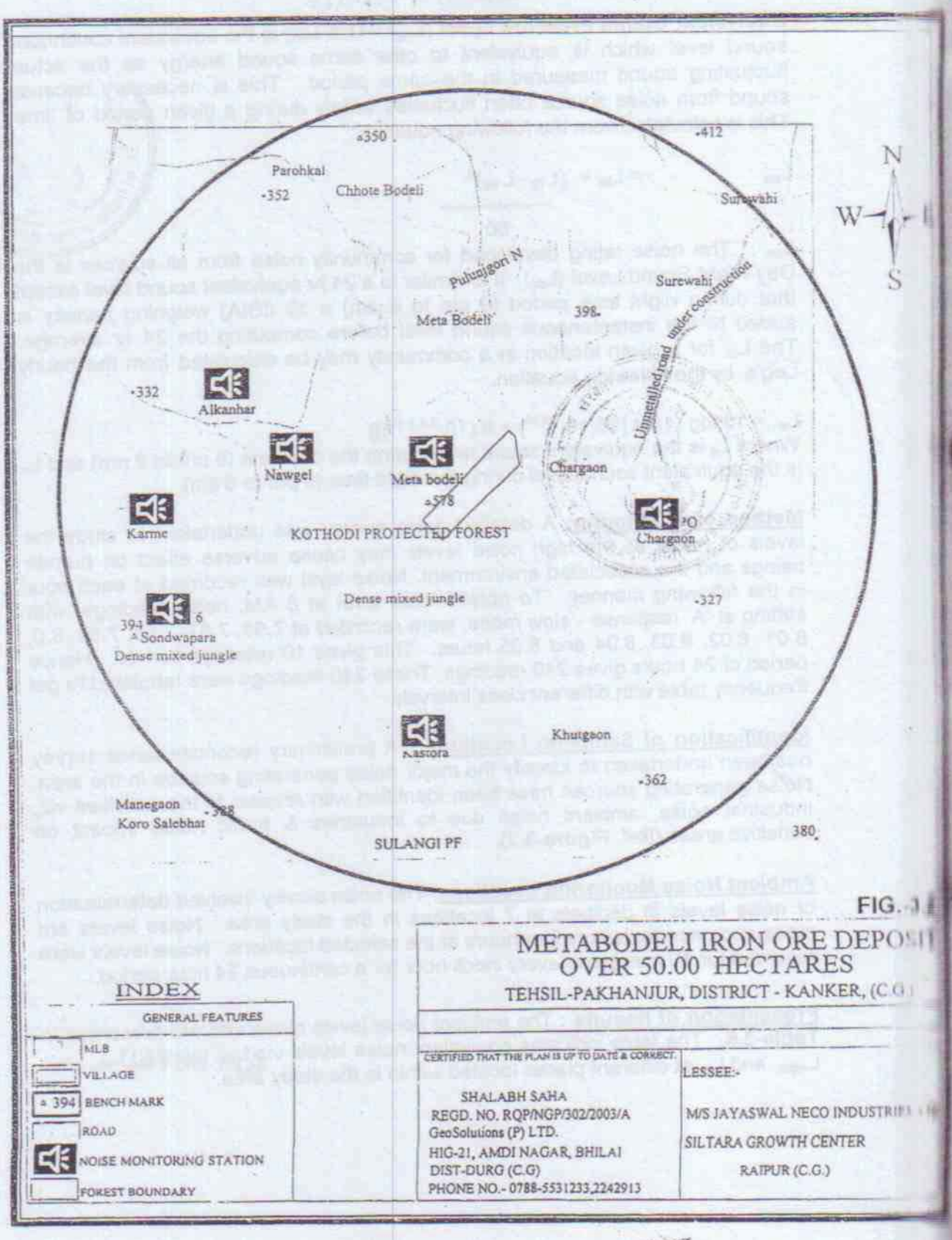

FIG.-1

METABODELI IRON ORE DEPOSIT OVER 50.00 HECTARES

TEHSIL-PAKHANJUR, DISTRICT - KANKER, (C.G.)

INDEX

GENERAL FEATURES
MLB
VILLAGE
394 BENCH MARK
ROAD
NOISE MONITORING STATION
FOREST BOUNDARY

CERTIFIED THAT THE PLAN IS UP TO DATE & CORRECT.

SHALABH SAHA
REGD. NO. RQP/NGP/302/2003/A
GeoSolutions (P) LTD.
HIG-21, AMDI NAGAR, BHILAI
DIST-DURG (C.G)
PHONE NO.- 0788-5531233,2242913

LESSEE:-

M/S JAYASWAL NECO INDUSTRIES LTD.
SILTARA GROWTH CENTER
RAIPUR (C.G.)

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Table-3.6
Ambient noise levels

Time (hr)	N - 1	N - 2	N - 3	N - 4	N - 5	N - 6	N - 7
0600	39.9	40.1	41.5	40.2	43.6	40.7	40.1
0700	40.6	40.2	46.5	41.6	41.6	46.8	43.7
0800	41.5	40.7	43.8	43.8	40.5	43.8	41.5
0900	43.8	42.5	46.5	40.6	46.9	41.5	46.5
1000	46.5	45.7	50.3	55.8	48.5	46.8	41.8
1100	51.6	46.0	51.6	53.2	40.0	47.5	43.5
1200	53.8	41.8	53.8	51.6	49.8	48.9	46.5
1300	51.5	46.3	56.7	53.8	53.6	53.8	49.8
1400	54.2	44.4	56.8	55.0	55.8	55.0	51.7
1500	55.0	46.8	53.8	56.8	56.5	56.8	51.0
1600	51.5	52.1	61.5	55.4	57.5	57.9	56.8
1700	46.8	51.7	63.8	54.7	60.1	55.0	55.0
1800	42.2	54.5	61.7	53.8	53.8	56.8	53.0
1900	41.0	53.8	63.8	54.7	61.7	55.7	53.0
2000	41.3	48.5	61.5	46.8	58.4	58.9	51.6
2100	49.8	47.3	55.7	43.8	53.5	60.3	56.0
2200	41.0	46.0	53.8	44.0	58.6	61.5	51.7
2300	39.9	41.8	51.7	43.8	59.8	53.7	53.8
2400	40.7	49.6	55.4	41.5	51.5	51.0	51.7
0100	41.8	46.8	53.1	43.8	44.1	51.7	46.8
0200	43.5	41.1	52.5	40.1	46.8	48.9	51.7
0300	40.0	41.7	41.6	40.6	43.8	46.5	40.0
0400	41.0	40.7	42.5	40.8	40.1	43.8	41.7
0500	41.7	42.1	41.8	40.0	40.7	41.5	41.8

Ambient Noise Level Standards : Ambient Air quality standards in respect of noise have been notified by the Ministry of Environment & Forests vide Gazette Notification Dated 26th December 1989. It is based on the A weighted equivalent noise level (Leq). The standards are given in **Table-3.7.**

Table-3.7
Ambient noise level standards

Area Code	Category of Area	Limits in dB(A) Leq	
		Day time	Night time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone**	50	40

** Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions and courts. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones.

3.2.2 NOISE ENVIRONMENT: ANTICIPATED IMPACTS

There are three major categories of noise sources in mining process viz. fixed plant installations, mobile plant units and external transport movements. Heavy Earth Moving Machinery (HEMM), drills, dumpers, material handling, crushing and cleaning equipment are the prominent noise sources in the proposoed opencast mining.

3.2.3 NOISE ENVIRONMENT: MITIGATION MEASURES:

Mitigation measures for noise and ground vibrations are of following types :

- Prevention at source;
- Attenuation in transmission path; and
- Protective measures in work environment.

Preventive at source: Noise should be best abated at source by choosing machinery and equipment suitably, by proper mounting of equipment & ventilation systems and by providing noise insulating enclosures or padding where practicable. The equipments to be procured should be new and as such as the noise emission will be optimal for their design/operation. Proper maintenance/working should be done which keeps the noise levels within limits.

Attenuation in transmission path:

- Boundary walls (Baffle walls), waste banks and dense belt of trees should be erected as acoustic barriers.
- Planting of bushy trees of rich canopy in and around the mine area to intercept noise transmission. A 50 m wide belt of trees of different heights should be useful to act as noise attenuater in the mining areas. The plant species which are more suitable for noise attenuation are given in Table-3.8.
- Location of the residential colony should be away from the mining premises.

Table-3.8

Trees with good canopy for noise attenuation

Sr. No.	Vernacular Name	Scientific Name	Growth	Height (m)
1.	Ashoka	Saraca Indica	Medium	10-12
2.	Nagamali	Millingtonia	Medium	15-20
3.	Sunari	Cassia Fistula	Medium	8-12
4.	Jacaranda	Jaceranda misosaefolia	Medium	8-12
5.	Kanchan	Bauhinia variegata	Medium	6-10
6.	Kanchan	Bauhinia accuminata	Medium	6-10
7.	Neem	Azadirachta indica	Fast	8-12
8.	Mahudo	Madhuca indica	Slow	0-12
9.	Paladhua	Erythrina indica	Slow	8-12
10.	Pink cassia	Cassia nodasa	Slow	6-10
11.	Pink cassia	Cassia javanica	Slow	8-10

Sr. No.	Vernacular Name	Scientific Name	Growth	Height (m)
12.	Pipal	Ficus religiosa	Fast	15-25
13.	Shimli	Bombax malabaricum	Fast	15-20
14.	Patali	Lagerstroe-mia	Fast	6-10
15.	Bahada	Ficus glomerata	Fast	8-10

Preventive measures in the work environment : Noise helmets, protective earmuffs and earplugs should be provided for those exposed to high noise levels as per statutory requirements; The noise level exposure should be maintained within the prescribed limits under mine rules/bye laws there under;

- Blasting parameters should be suitably set to minimize ground vibration within safety limit;
- Provision of insulating caps and aids on the machinery should be made;
- Shock absorbing techniques should be adopted to reduce impact energy;
- Efficient flow techniques for noise associated with high fluid velocities and turbulence should be used (like reduction in noise generated by control leaves in both gas and liquid systems achieved by reducing system pressure to as low as possible);
- All the openings like covers, partitions should be acousticaly sealed. Inlet and outlet mufflers should be provided and these have been easy to design and construct; effective equipment maintenance like periodic lubrication, replacement of gears and deducting should be done.

3.3 WATER ENVIRONMENT

3.3.1 WATER ENVIRONMENT : BASELINE STATUS

3.3.1(a) **Water Quality** : Selected water quality parameters of ground and surface water resources within 10-km radius of the study area have been studied for assessing the water environment and evaluate anticipated impact of the integrated coal complex. Understanding the water quality is essential in preparation of Environmental Impact Assessment and to identify critical issues with a view to suggest appropriate mitigation measures for implementation. The purpose of this study is to:

- Assess the water quality characteristics for critical parameters;
- Evaluate the impacts on agricultural productivity, habitat conditions, recreational resources and aesthetics in the vicinity; and
- Prediction of impact on water quality by this project and related activities.

The information required was collected through primary surveys and secondary sources.

Methodology

Reconnaissance survey was undertaken and monitoring locations were finalized based on:

- Drainage pattern,
- Location of residential areas representing different activities/likely impact areas; and
- Likely areas, which can represent baseline conditions.

Water sources covering 10-km radial distance from integrated coal complex boundary were examined for physico-chemical, heavy metals and bacteriological parameters in order to assess the effect of industrial and other activities on water. The samples were collected and analyzed as per the procedures specified in 'Standard Methods for the Examination of Water and wastewater' published by American Public Health Association (APHA).

Water Sampling Locations

Water samples were collected from ***nine*** sampling locations consisting of 5 ground water samples and 4 surface water samples. These samples were analyzed for various parameters to compare with the standards for drinking water as per IS: 10500 for ground water sources and standard for inland waters as per IS: 2296 for surface water sources. The details of water sampling locations are given in **Table 3.9** and **Figure-3.3.**

TABLE-3.9
DETAILS OF WATER SAMPLING LOCATIONS

Code	Locations/Village	Distance from Boundary (km)	Direction w.r.t ML Area	Source of Water
Ground Water				
GW1	Village Metabodeli	3.0	N	Hand pump
GW2	Village Alkanhar	5.5	NW	Open well
GW3	Village Nawgel	3.0	W	Hand pump
GW4	Village Karma	6.5	W	Hand pump
GW5	Village Sondwapara	6.5	SW	Hand pump
Surface Water				
SW1	Chargaon Nadi, Near village Chargaon	3.5	E	Upstream flow
SW2	Chargaon Nadi,	3.0	S	Downstream flow
SW3	Stream near village Nawagel	3.0	W	Water bodies near river
SW4	Village Metabodeli	3.0	N	Water bodies near river

Presentation of Results

The results of the parameters analyzed for the 5 ground water and 4 surface water samples are presented in **Table-3.10** and **Table-3.11** respectively and are compared with the standards for drinking water as per IS: 10500-2003 "Specifications for Drinking Water" and standard for inland water as per IS: 2296 for surface water sources.

- ***Ground Water***

LOCATION OF WATER SAMPLE STATIONS

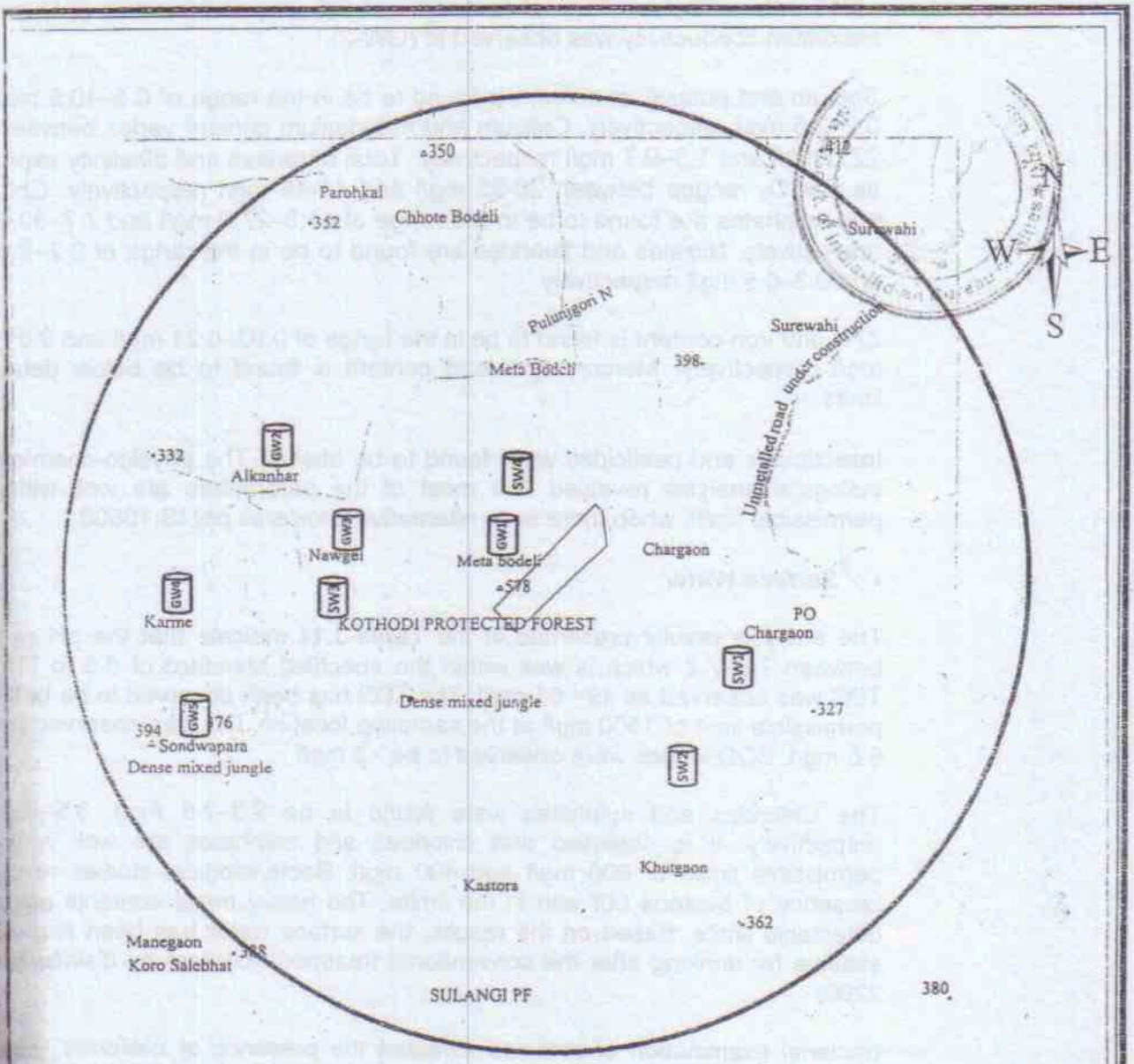

FIG.-3.3

METABODELI IRON ORE DEPOSIT OVER 50.00 HECTARES

TEHSIL-PAKHANJUR, DISTRICT - KANKER, (C.G.)

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GENERAL FEATURES

- MLB
- VILLAGE
- 394 BENCH MARK
- ROAD
- WATER SAMPLE STATION
- FOREST BOUNDARY

CERTIFIED THAT THE PLAN IS UP TO DATE & CORRECT.

SHALABH SAHA
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SILTARA GROWTH CENTER
RAIPUR (C.G.)

As seen from the **Table-3.10**, the pH and conductivity varies from 5.2–6.9 and 90 - 243 micromhos/cm. The maximum pH of 6.9 was observed at (G5) and the maximum conductivity was observed at (GW-2).

Sodium and potassium content is found to be in the range of 0.5–10.5 mg/l and 0.2–2.5 mg/l respectively. Calcium and magnesium content varies between 7.0 - 22.0 mg/l and 1.3–9.7 mg/l respectively. Total hardness and alkalinity expressed as $CaCO_3$ ranges between 20-95 mg/l and 11-48 mg/l respectively. Chlorides and sulphates are found to be in the range of 11.3–27.0 mg/l and 7.7–30.0 mg/l respectively. Nitrates and fluorides are found to be in the range of 0.2–2.6 mg/l and 0.3–0.5 mg/l respectively.

Zinc and iron content is found to be in the range of 0.03–0.21 mg/l and 0.01–0.08 mg/l respectively. Mercury and lead content is found to be below detactable limits.

Insecticides and pesticides were found to be absent. The physico-chemical and biological analysis revealed that most of the parameters are well within the permissible limits when there is no alternative choice as per IS:10500.

- ***Surface Water***

The analysis results presented in the **Table-3.11** indicate that the pH range is between 7.0–7.2 which is well within the specified standard of 6.5 to 8.5. The TDS was observed as 49 - 61 mg/l. The TDS has been observed to be below the permissible limit of 1500 mg/l at the sampling location. DO was observed as 5.1 - 6.6 mg/l. BOD values were observed to be <3 mg/l.

The Chlorides and sulphates were found to be 2.3–2.8 mg/l, 3.5–4.2 mg/l respectively. It is observed that chlorides and sulphates are well within the permissible limits of 600 mg/l and 400 mg/l. Bacteriological studies reveal the presence of bacteria but with in the limits. The heavy metal contents are below detectable limits. Based on the results, the surface water has been found to be suitable for drinking after the conventional treatment followed by disinfection (IS: 2296).

Bacterial examination of samples revealed the presence of coliforms. The total coliform count in the samples ranged from 2 MPN/100 ml to 4 MPN/100 ml within the limit of 5000 mg/l. The physico-chemical and biological analysis revealed that all the parameters are well within the prescribed limits of IS: 2296 Class 'C' limits.

TABLE-3.10
GROUND WATER QUALITY

Parameter	UOM	IS: 10500 Standards	(GW1)	(GW2)	(GW3)	(GW4)	(GW5)
pH	-	6.8 – 8.5	6.6	6.5	6.2	5.2	6.9
Colour	Hazen	5 [25]	1	2	1	2	1
Odour	-	UO	UO	UO	UO	UO	UO
Conductivity	µS/cm	$	135	243	90	210	98
Taste	-	Ag	Ag	Ag	Ag	Ag	Ag
Turbidity	NTU	5 [10]	2	4	3	2	3
Total Hardness as $CaCO_3$	mg/l	300 [600]	85	95	20	75	45
Total Dissolved Solids	mg/l	500 [2000]	110	193	165	184	173
Chlorides as Cl	mg/l	250 [1000]	11.3	24.0	15.6	27.0	12.8
Residual free Chlorine	mg/l	0.2 Min	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoride as F	mg/l	1.0 [1.5]	0.3	0.4	0.3	0.5	0.4
Calcium as Ca	mg/l	75 [200]	18.0	22.0	7.0	21.8	7.5
Magnesium as Mg	mg/l	30 [100]	5.3	9.7	1.3	7.0	1.9
Sulphates as SO_4	mg/l	200 [400]	10.2	30.0	7.7	30.0	7.5
Nitrates as NO_3	mg/l	45	1.1	1.1	2.6	0.5	0.2
Phenolics as C_6H_5OH	mg/l	0.001 [0.002]	<0.001	<0.001	<0.001	<0.001	<0.001
Cyanide as CN	mg/l	0.05	<0.02	<0.02	<0.02	<0.02	<0.02
Alkalinity as $CaCO_3$	mg/l	200 [600]	38	48	11	35	20
Boron	mg/l	1 [5]	0.01	0.02	0.01	0.07	0.03
Sodium as Na	mg/l	$	0.5	10.5	10.5	10.2	10.4
Potassium as K	mg/l	$	0.5	2.5	0.2	2.1	0.3
Iron as Fe	mg/l	0.3 [1.0]	0.02	0.01	0.04	0.08	0.02
Copper as Cu	mg/l	0.05 [1.5]	<0.01	<0.01	<0.01	<0.01	<0.01
Manganese as Mn	mg/l	0.1 [0.3]	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminium as Al	mg/l	0.03 [0.2]	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium as Cr^{6+}	mg/l	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium as Cd	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium as Se	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic as As	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead as Pb	mg/l	0.05	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc as Zn	mg/l	5 [15]	0.21	0.11	0.06	0.05	0.03
Mercury as Hg	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Anionic detergents	mg/l	0.2 [1.0]	<0.1	<0.1	<0.1	<0.1	<0.1
Mineral Oil	mg/l	0.01 [0.03]	<0.01	<0.01	<0.01	<0.01	<0.01
Pesticides	mg/l	Absent	Absent	Absent	Absent	Absent	Absent
E.Coli	-	Absent	Absent	Absent	Absent	Absent	Absent

$: Limits not specified, UO: Un-Objectionable, Ag-Agreeable

Note : The limits given in paranthesis indicate permissible limit in the absence of alternate source.

TABLE-3.11
SURFACE WATER QUALITY

Sr. No.	Parameters	Units	Class C of IS: 2296 Limits	(SW1)	(SW2)	(SW3)	(SW4)
1	pH	-	6.5 to 8.5	7.0	7.2	7.1	7.0
2	Colour	Hazen	300	12	11	10.6	13
3	Conductivity	µS/cm	$	73	64	68	74
4	Dissolved oxygen	mg/l	4 Min.	5.3	6.2	5.1	6.6
5	BOD, 3day @ 27°C	mg/l	3	<3	<3	<3	<3
6	Total dissolved solids	mg/l	1500	55	58	61	49
7	Total hardness as $CaCO_3$	mg/l	$	35	28	22	31
8	Chlorides as Cl	mg/l	600	2.8	2.3	2.8	2.6
9	Fluorides as F	mg/l	1.5	0.2	0.3	0.4	0.2
10	Sulphates as SO_4	mg/l	400	4.0	3.8	4.2	3.5
11	Alkalinity	mg/l	$	24.0	28	31	33
12	Nitrates as NO_3	mg/l	50	0.2	0.19	0.26	0.0
13	Cyanides as CN	mg/l	0.05	<0.02	<0.02	<0.02	<0.0
14	Calcium as Ca	mg/l	$	5.0	5.8	4.7	5
15	Magnesium as Mg	mg/l	$	1.2	1.6	1.4	1
16	Sodium as Na	mg/l	$	8.5	7.9	8.2	9
17	Potassium as K	mg/l	$	0.4	0.42	0.39	0.4
18	Iron as Fe	mg/l	50	0.04	0.02	0.04	0.0
19	Chromium as Cr	mg/l	0.05	<0.05	<0.05	<0.05	<0
20	Cadmium as Cd	mg/l	0.01	<0.01	<0.01	<0.01	<0.0
21	Lead as Pb	mg/l	0.1	<0.01	<0.01	<0.01	<0.0
22	Copper as Cu	mg/l	1.5	<0.01	<0.01	<0.01	<0.0
23	Arsenic as As	mg/l	0.2	<0.01	<0.01	<0.01	<0.0
24	Selenium as Se	mg/l	0.05	<0.01	<0.01	<0.01	<0.0
25	Phenolics as C_6H_5OH	mg/l	0.005	<0.01	<0.01	<0.01	<0.0
26	Zinc as Zn	mg/l	15	0.01	0.01	0.01	0.0
27	Mercury as Hg	mg/l	$	<0.001	<0.001	<0.001	<0.00
28	Anionic detergents as MBAS	mg/l	1	<0.1	<0.1	<0.1	<0.1
29	Oil and grease	mg/l	0.1	<0.1	<0.1	<0.1	<0.1
30	Insecticides	mg/l	Absent	Absent	Absent	Absent	Absent
31	Total Coliforms	MPN/ 100ml	5000	3	2	4	2

3.3.2 WATER ENVIRONMENT : ANTICIPATED IMPACTS

Impact on Water Quality : The proposed excavations are not going to touch the ground water table as it observed to be 12 m. Thus there will not be any contamination of the underground water because of the proposed mining. The water requirement for the proposed mine will be met from the bore well / dug well. There will be no discharge of waste water from the mine. Thus, it can be assumed that there will be minimum pollution as far water quality is concerned.

3.3.3 WATER ENVIRONMENT : PROPOSED MITIGATIVE MEASURES

The mining project will require continuous supply of water for various purposes during mining, vegetation etc. apart from drinking water supply. The main source of water pollution in opencast mining is the surface run-off due to rainfall. There will not be any mine discharge during dry weather seasons as the proposed mining will be on the escarpment of the hill. There may be small quantity of mine discharge during monsoon season, which contains fine silt. This will be treated in settling tanks followed by desilting tanks and the treated water will be let into the natural nallahs. Another source of pollution will be from domestic sewage from canteen and toilets which will be treated in septic tanks and soak pits.

Mine water: During monsoon there will be accumulation of water in the excavated pits which is proposed to be dewatered into a sump and will be pumped into desilting tanks of 2 x 2 x 3 m each. This after adequate, settling of solids will be reused for sprinkling of water and plantation. No overburden or loose sediments will be kept on working benches. Check dam will be constructed around the dump prevent washing off of loose sediments. Samples collected from the northern side nala will be analyzed for their pollutant levels. This will help to decide treatment and the type of treatment needed.

Rainwater Harvesting : Check dams with settling ponds should be provided to arrest the silt & suspended solids from surface run-offs along the nallahs.

- Brief description on check dams : Gullies and drainage lines are formed on the overburden dumps due to constant flow of run-off water. One of the alternatives available for sediment and water control has been the use of check dams. Check dams are small pervious obstructions across gullies and streams to check the velocity of water and thus reduce soil erosion; also due to reduction of velocity, the soil particles are arrested and get deposited on upstream side of check dams and thus wash off solids from dumps are prevented from entering into the streams. Check dams range from relatively simple structures built with stones, gravel and clay to fairly elaborate and sophisticated rockfill dams with concrete spillway. These dams require very minor changes in the local topography and can be constructed relatively quickly with low financial investment as well as limited labor input. Construction of a series of check dams on a gully or stream can significantly reduce the overall rate of soil erosion. Brief description of various types of check dams is given below :

- Brushwood check dams: The brushwood check dams are proposed in gullies on gentle bed slopes. It is necessary to have some strong check dams having overall height of at least 40 cm. This can be achieved by piling of wood posts or bamboo in staggered manner. An apron of at least 3.5 m on downstream and upstream side stuffed with jungle bush for effective retention of silt and establishment of vegetation should be provided.

- Stone Masonry check dam : This type of check dam is constructed in random rubble masonry with cement mortar (1:6). This type of stone masonry check dam can be constructed over gullies streams. The height of the check dam varies from 2 m to 3 m with top width of 0.60 m to 1 m and bottom width 1.20 m over cement concrete (1:3:6) foundation of 1.40 m wide and 300 mm thick. The length of check dam will depend on actual site conditions. During execution proper care should be taken to keep the sufficient depth of foundation.

- Dry Stone Masonry Check Dams: These are suggested for gullies where small earthern check dams are of limited use. These dams can be built at lower reaches of gullies which can finally check the surplus silt carried by the run-off water through other control structures at the upstream side. Depth of foundation of at least 0.5 m and hangers on both sides have to be provided to withstand against high water currents. The banks can be provided with necessary stone pitching to avoid bank erosions. However, while execution of the work, the side slopes may be modified as per actual site conditions.

- Earthern Check Dams: This type of check dam is easy to construct and it is cheap also, provided impermeable soil is available for it's construction. During execution, ground should be prepared properly free from vegetation and sufficient stepping has to be provided at both banks.

- Loose Boulder Check Dam: This type of check dam is useful at locations where gully formation takes place due to poor vegetation and poor soil conditions resulting in high erosion rates. During heavy rainfall, large quantity of silt is carried away and effective check over these gullies, loose boulder check dams with boulder sausage at every 50-60 m interval have to be provided.

- Outlet Check Dam: It is necessary to provide outlet check dam on downstream of other typed of check dams wherever the flow of water in a stream is more. This dam constructed in masonry, also serves the purpose of storing water which can be used for plantation during dry weather conditions :

The location of check dams shall be decided after the detailed survey;

a] Earthen bunds should be constructed all around the outer edges of abandoned benches before reclamation so as to prevent carry over of solid material by the surface run-off.

b] Drains should be provided at the intersection of successive bunds to channelize the water in loose soil areas to prevent erosion.

c] The storm water due to rainfall should be channelized to the natural water courses like gullies and depression through appropriate drainage system with check bunds.

d] The domestic sewage from the canteen and toilets should be routed to septic tanks followed by soak pits. These tanks after few years get choked with sludge and become ineffective for the purpose for which they are provided. Therefore, it is suggested that proper operation and maintenance of these systems should be done withdue attention or a centralized sewage treatment plant is recommended comprising aeration and settling tanks. The treated sewage should be used for growing plantation in and around the working area. The sludge from the treatment plant should be used as manure for plantation.

3. 4 SOIL ENVIRONMENT

Soil Characteristics : Most of the study area is under forest cover. In the remaining area, agriculture is the main occupation of people in the study area. Hence, it is essential to assess the potential of the soil of the study area for agriculture. Soil analysis has been carried out to assess the agricultural and afforestation potential of the soil. For studying soil profile of the region three locations were selected to assess the existing soil conditions in and around the project area representing various landuse conditions. The physical and chemical and properties of the soil were analyzed. The soil sampling was done during the summer season to represent dry season. Soil samples were collected by ramming core-cutter into the soil up to a depth of 60 cm.

Soil Sampling : Soil samples were collected at selected locations in the study area to assess the existing soil conditions in and around the proposed plant site. The environmental setting around the sampling locations is given in **Table-3.12**. The sampling locations are shown in **Figure-3.4.** Soil characteristics (for both seasons) are tabulated in **Table-3.13** and compared with standard classification given in **Table-3.14**.

TABLE-3.12
Details of Sampling Locations

Station Code	Sampling Location
(S1)	Agriculture land near Metabodeli village
(S2)	Barren land near Nawagel village
(S3)	Agriculture land near Chargaon village
(S3)	Forest land

अनुमोदित
APPROVED

LOCATION OF SOIL SAMPLE STATIONS

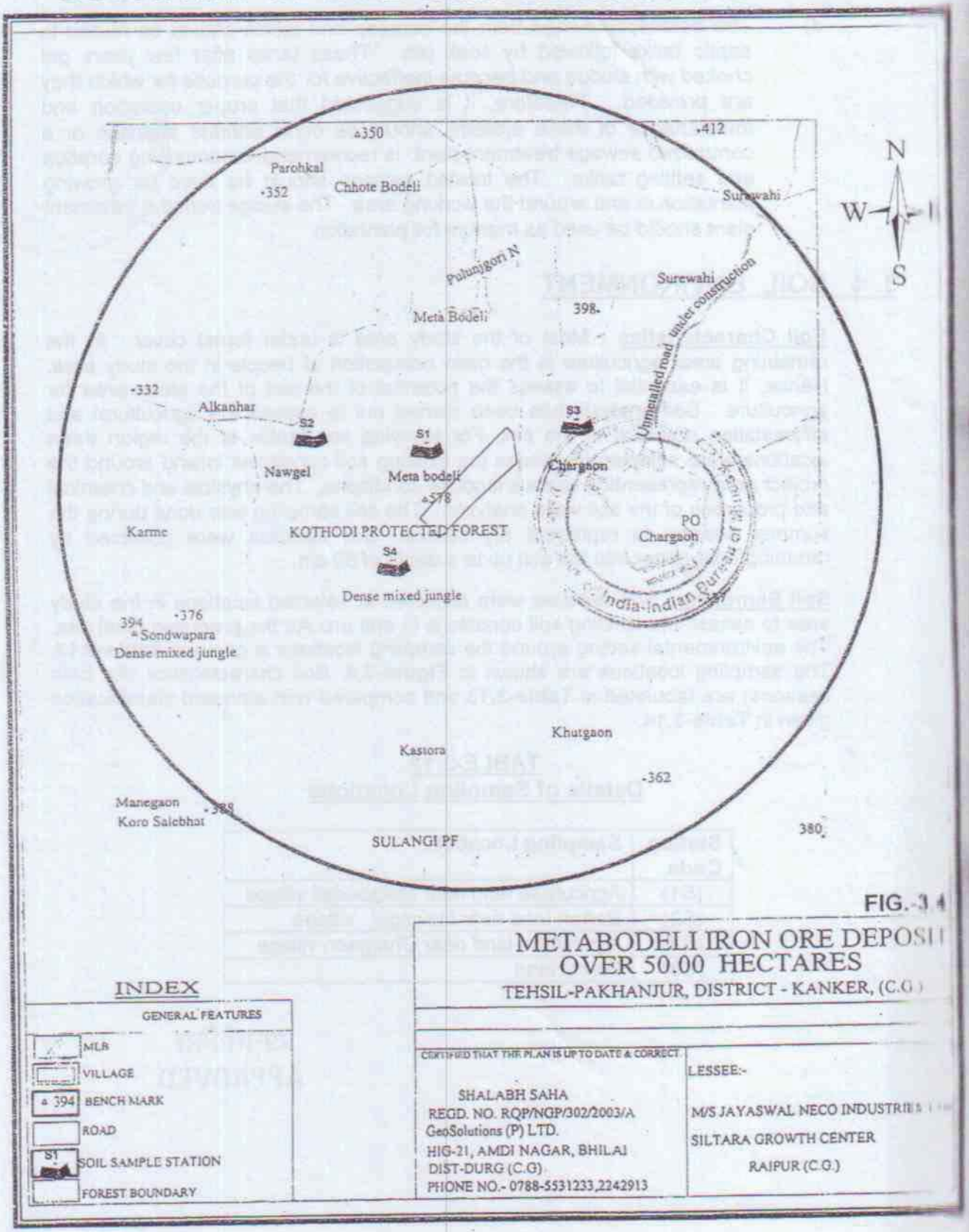

FIG.-3.4

METABODELI IRON ORE DEPOSIT OVER 50.00 HECTARES

TEHSIL-PAKHANJUR, DISTRICT - KANKER, (C.G.)

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CERTIFIED THAT THE PLAN IS UP TO DATE & CORRECT

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TABLE-3.13
Soil Analysis Results

Sr. No	Parameters	UOM	(S1)	(S2)	(S3)	(S4)
1	pH	--	4.5	6.4	6.9	6.0
2	Conductivity	µs/cm	30	25	40	60
3	Texture	--	Sandy clay	Sandy clay	Sandy clay	Sandy clay
4	Sand	%	48	45	50	45
5	Silt	%	14	15	13	14
6	Clay	%	38	40	37	41
7	Bulk Density	g/cc	1.2	1.1	1.2	1.1
8	Exchangeable Calcium as Ca	mg/kg	640	880	755	479
9	Exchangeable Magnesium as Mg	mg/kg	316	219	241	267
10	Exchangeable Sodium as Na	mg/kg	59.0	75.5	98.3	76.3
11	Available Potassium as K	Kg/ha	280.7	328.1	371.2	444.9
12	Available Phosphorous	Kg/ha	3.4	17.2	24.3	18.7
13	Available Nitrogen as N	Kg /ha	21.4	79.3	10.8	79.2
14	Organic Matter	%	0.18	0.74	0.09	0.74
15	Organic carbon	mg/kg	0.11	0.43	0.05	0.43

LANDUSE :

Study of landuse landcover has been carried out with the help of satellite image procured from NRSA refer **Figure3.5.**

TABLE-3.14
STANDARD SOIL CLASSIFICATION

Sr. No.	Soil Tests	Classification	
1.	pH	< 4.50 extremely acidic 4.50-5.00 very strongly acidic 5.00-5.50 strongly acidic 5.50-6.00 moderately acidic 6.00-6.50 slightly acidic	6.50-7.30 neutral 7.30-7.80 slightly alkaline 7.60-8.50 moderately alkaline 8.50-9.00 strongly akaline 9.00 very strongly alkaline (* tolerable to crops)
2.	Salinity Electrical Conductivity (mmhos/cm) (1mmho/cm = 640 ppm)	Upto 1.00 average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops sensitive to salts	
3.	Organic Carbon	Upto 0.3 : very less 0.21-0.4 : less 0.41-0.5 : medium	0.61-0.8 : On an average sufficient 0.81-1.0 : Sufficient >1.0 : more than sufficient
4.	Nitrogen (kg/ha)	Upto 50 very less 51-100 less 101-150 good	151-300 better Above 300 sufficient
5.	Phosphorous (kg/ha)	Upto 15 very less 16-30 less 31-50 medium	51-65 on an average sufficient 65-80 sufficient Above 80 more than sufficient
6.	Potash (kg/ha)	0 very less 120-180 less 181-240 medium	241-300 average 301-360 better Above 360 more than sufficient

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LANDUSE LANDCOVER – SATELLITE IMAGE

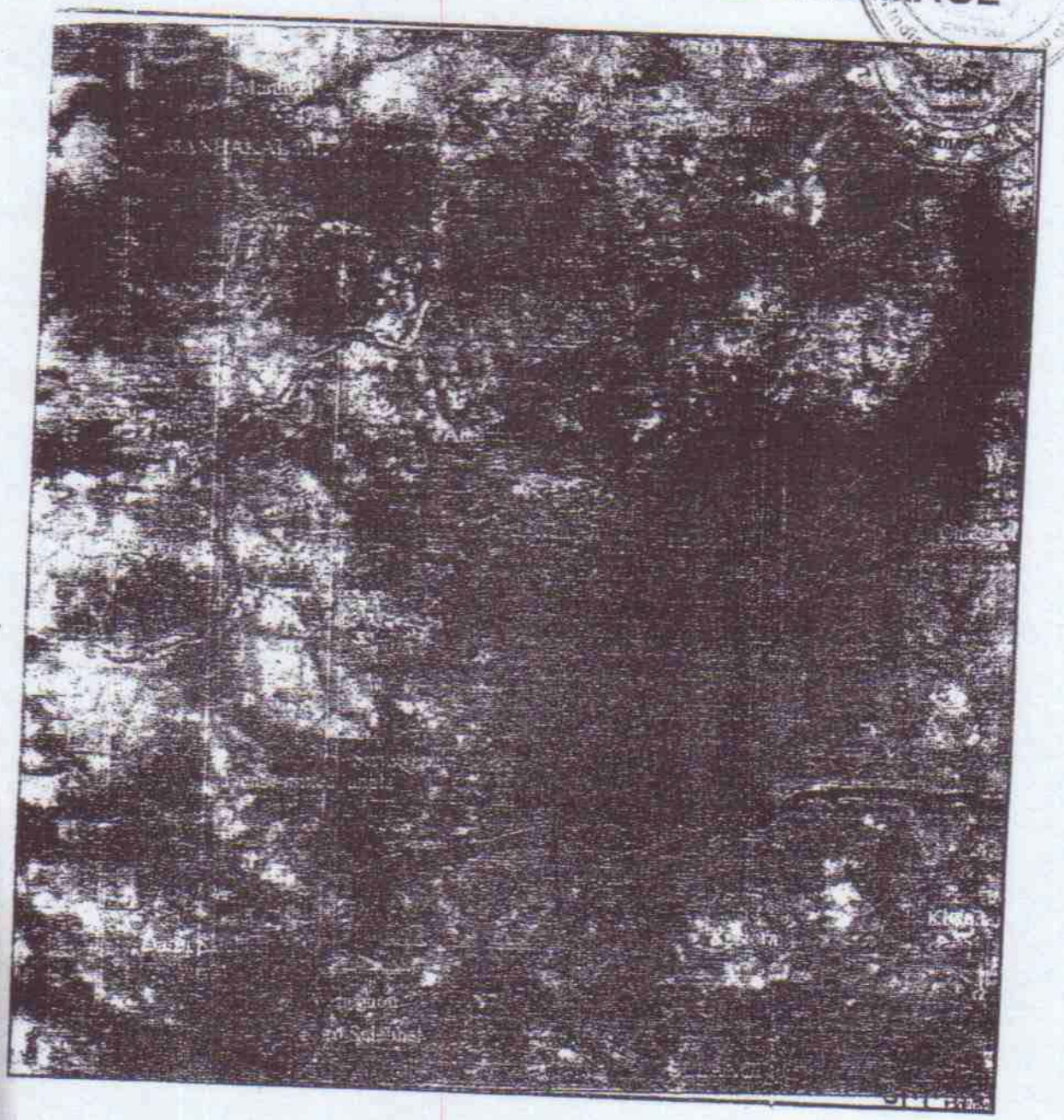

FIGURE-3.5

3.5 BIOLOGICAL ENVIRONMENT

3.5.1 BIOLOGICAL ENVIRONMENT: BASELINE STATUS

TERRESTRIAL FLORA : The forest vegetation in the study area is predominated by Shorea robusta, which had Madhuca indica, Diospyrus melanoxylon and Buchnania lanzan as the major companion species. The saplings of Shorea robusta is found highest in this forest, followed by Cordia macleodii and Diospyrus melanoxylon. Flacourtia indica is the major dominant shrub species. The ground flora is mainly dominated by Cassia fistula and Achyranthus aspera. Holarrhena antidysenterica is one of the important tree species in this forest used in the treatment of dysentery. The presence of Butea monosperma and Ipomoea carnea indicated the manmade disturbances in this forest as the Phatepur village is located in the fringes of this forest. The forest had either the high girth class mature tree species or the saplings of these tree species. The middle canopy or the middle girth class tree species had the low availability. The ground vegetation had also obtained poor diversity. The low vegetation cover and density is due to high anthropogenic pressures mainly in the form of heavy livestock grazing and collection of ethnobotanically important species.

There are different types of pressures on some plant species as destructing harvesting of Awala fruits is the major cause of concern. The entire fruit bearing twig of Awala is broken in most of the cases for gathering fruits. Underground plant parts such as tubers of Agitha are collected for trade and used as medicine. Though Agitha has a wide range of distributed but due to over-collection, there has been a continuous decline of this species in the wild.

Rurai Vegetation : The villages were seen spread over in all directions. The cultivation of the principal agriculture crop, paddy is confined to monsoon season, in the region. The main irrigation source at present appears to be rivers which, practically go dry during summer. The other agricultural crops include jowar, ulad and mung. The vegetable crops - brinjal, tomato and chillies are also often cultivated. Mangifera indica, Tamarindus indica, Cocos nucifera, Musa paradisiaca and Carica papaya are the fruit crops cultivated by villagers. Caryota urens, Azadirachta indica, Aegle marmelos and Melia azadirachta are the other cultivars around villages

IV] **Agriculture & Cropping Pattern**: The main agriculture crops in the district along with the cropping period and market area is given as follows;

Type of Crops	Name of Crops	Cropping Period
Major Crops (Irrigated)		
KHARIF	Paddy	June to Nove.
RABBI	Wheat Gram	Sept. to Febr. Sept. to Janu.
Major Crops (Non-Irrigated)		
KHARIF	Tur Mung Pulses Soyabean Sesamum Cotton	June to Nove. June to Janu. June to Octo. June to Octo. June to Octo. June to Janu.
RABBI	Wheat Gram	Sept. to Febr. Sept. to Janu.
Major Cash Crops KHARIF & RABBI	Soyabean Cotton Groundnut Sesamum	June to Octo. June to Janu. June to Octo. Sept to Nove.

TERRESTRIAL FAUNA : The authenticated list of Flora and Fauna enclosed as Annexure 4.

- **Mammals**: The project area is quite poor as far as the mammalian fauna is concerned. Very few evidences are found of mammals in the area Vocalization of Rhesus macaque (Macaca mullatta) and Common Indian langur (Presbytes Entellus) is heard from neighboring forested areas but there is no direct sighting or indirect evidence of their presence in the entire project area. The only mammalian species that are frequently seen in the project is five stripped squirrels.

- **Avifauna** : The project area is quite rich in avian diversity but mostly only generalist species are seen in area.

- **Reptiles** : Among reptiles there are direct sighting of Rat Snakes, Common Krait in the study area. Few moults of a Rat snake (*Ptyas mucosus*) are also found in the area. House Gecko (Hemidactylus flaviridis) is commonly seen in entire project area. Common Skink (Mabuya carinata) and Garden Lizards are also commonly seen. Discussion with local people did confirm the presence of Krait (*Bungarus caeruleus*), Saw's scaled viper (*Echis carinatus*), Russell's viper (*Vipera russellii*) in the area. As per the reports of local people

3.5 BIOLOGICAL ENVIRONMENT

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Rural Vegetation : The villages were seen spread over in all directions. The cultivation of the principal agriculture crop, paddy is confined to monsoon season, in the region. The main irrigation source at present appears to be rivers which, practically go dry during summer. The other agricultural crops include jowar, ulad and mung. The vegetable crops - brinjal, tomato and chillies are also often cultivated. Mangifera indica, Tamarindus indica, Cocos nucifera, Musa paradisiaca and Carica papaya are the fruit crops cultivated by villagers. Caryota urens, Azadirachta indica, Aegle marmelos and Melia azadirachta are the other cultivars around villages

the sightings are not very common and not many people had seen snakes in the study area. Rat snakes are fairly common in the forest area close to the human settlements as the people store paddy in their house which attract rat and bandicoots and in turn attract rat snakes.

- **Butterflies :** Number of butterflies are recorded from the study area. The butterfly richness is higher in the areas that appeared to be disturbed by human and livestock interference. In the disturbed areas openings are created and these openings act as good habitat for butterflies by letting enough sunlight reach the ground. Butterflies need open sunlight and prefer habitats which would provide food plants and sunlight. All such openings in the forested area provide excellent feeding and breeding habitat the butterflies. Natural Small openings in forest also provide excellent habitat for basking and flowering plants to come up in these forests. The moist patches in riverine areas also attract butterflies. Possibly these moist patches act as source of minerals for butterflies as many of them can be seen sitting over such patches. Areas in vicinity of natural drains close to the Villages provide excellent habitats for butterflies.

- **Spiders:** Spiders are seen in the buffer zone. Spiders are voracious predators of insects and because they are able to survive the periods of low food availability and take advantage of periods of abundance they are well adapted to variety of habitat types. The orb making spiders are more common in areas where there are clearly marked aerial galleries for insect movement.

- **Overall Habitat Status**: Overall habitat condition in the project area is not good, owing to tremendous amount of grazing pressure all over the project area. Local people now feel that it is not so easy to get wild animals as they have moved to the denser and deeper areas. The disturbance signs are prevalent and can be seen in the entire stretch of the project area.

3.5.2 BIOLOGICAL ENVIRONMENT: ANTICIPATED IMPACTS

Applied mining lease area covers hilly area and unclassified government land. Vegetation within the applied M.L. area is sparse. Open mixed jungles are around the applied M.L. area. Faunas of common occurrence in the area are mainly wild dog, bear, and rabbit. There is no reported species of endangered flora and fauna within the lease area.

3.5.3 BIOLOGICAL ENVIRONMENT: PROPOSED MITIGATIVE MEASURES

(i) New plantation should be undertaken in various types of areas for different objectives;

a) Plantation for reclamation of degraded area;
b) Plantation on waste rock deposition;

The rock as such will not support growth of trees. Addition of fertile top soil and supplement of Nitrogenous fertilizers will be required initially.

The existing and proposed roads should be flanked by trees on either side. Only tolerant species should be planted on waste rock dump.

c) A belt of trees with thick canopy should becreated to intercept dust, gaseous pollutants and noise;

d) Trees should be planted for beautifying the premises. Species for all these purposes are suggested in section on plantation;

ii) A review of shift in conditions should be taken after periodic interval. A span of three years is recommendedfor fresh appraisal.

Other requirements:

i. While planting on solid waste of waste rock layer of good agricultural soil (if possible garden soil) of approximately 9 inches thick will be laid down along with at least 20% of farmyard manure. An additional input of phosphate fertilizers will be highly desirable.

ii. While planting for beautification and as wind screen, the plantation will be done in the pits of suitable size usually 1.5 x 1.5 1.5 feet size and filled with 1 : 3 parts of organic manure : soil mixture.

iii. For other plantation i.e. to increase tree cover proper soil and water conservation methods mentioned below will be followed. The soil and water conservation by means of making staggered trenches contour bunding and gully plugging will be done. This will help to conserve water and to establish plantation successfully. Plants will be planted along the bunds of staggered trenches, contour bunds etc. and if necessary additional pits will be dug to plant the trees.

Plantation will require large number of seedlings establishment of a nursery will be undertaken from where seedlings of proper species will be available.

Plantation: Conducting the new plantations is of paramount necessity of the area. In addition to augmenting present vegetation, it will also check soil erosion, make the ecosystem more diverse and functionally more stable, make the climate more conducive and improve water balance. It can also be employed to bring areas with special problems under vegetal cover and prevent further deterioration of land. Based on nature of soil, performance of species and purpose of plantation, following species have been suggested in plantation programme. List of Recommended Species for Plantation

Plantation of Seedlings: Plantation of tree and shrubs species shall be started by first week of the month of May so that the saplings will get established and will not suffer shock due to heavy rain. Therefore, the seedlings to be planted should be ready by this time. The operations to be carried out are given below:

a. Staking operations
b. Digging pits before month of May
c. Transporting soil and Farm Yard Manure from outside
d. Filling in pits
e. Inoculation with Vesicular Arbuscular Mycorrhiza

Plantation should be carried out at a density of 2m x 2m (2500 plants/ha) or 3 m x 3m (1111 plants/ha). The pit size should be 2.5 ft x 2.5 ft x 2.5 ft. Soil and FYM should be mixed in the ratio of 5:1 in the pit. No of saplings proposed to be planted are given in Table

A. **Species for general plantation**

1. Ailanthus excelsa
2. Azadirachta indica
3. Butea frondosa
4. Acacia nilotica
5. Acacia farnesiana
6. Anogeissus latifolia
7. Dendrocalamus strictus
8. Erythrina suberosa
9. Eucalyptus species
10. Ficus benghalensis
11. Ficus racemosa
12. Holoptelia integrifolia
13. Leicaema leucocephala
14. Melia azaderach
15. Pongamic pinnata
16. Prosopis juliflora

B. **Species for waste rock reclamation**

1. Acacia auriculiformis
2. Azadirachta indica
3. Eucalyptus species
4. Lantana camara
5. Parkinsonia aculeata
6. Prosopis juliflora

C. **Species for beautificiation**

1. Albizzia procera
2. Butea frondosa
3. Cassia fistula
4. Cassia renigera
5. Cassia siamea
6. Casuarina equisetifolia
7. Erythrina indica
8. Delonix regia
9. Spathodea campanulata
10. Jackaranda species
11. Taboubia species
12. Melia azedarach

It is proposed to select the local tree species with the help of forest department having 5 tier arrangement for implementation all along the mining lease in order to control dispersion of fugitive dust from the mining lease.

Table 3.15
Proposed Plantation Programme

Period	Greenbelt on Safety Area and ML Boundary	
	ha	No. Saplings
At the end of 5th year	5	7500
At the end of 10th year	5	7500
At the end of 20th year	10	15000
Total	20	30000

Reclamation of the Land: The mining will be by slicing the slope and removing all the ore available in that bench and similarly continue in subsequent lower benches; hence question of formation of pit does not arise. The ore reserves will lost long even after the ML period expires , the same will be renewed for further period, hence question of back filling /reclamation does not arise at this stage. However the float area, after removal of float in first year will be back filled subsequently with waste material of subsequent year.

Wildlife Protection Measures :

- Fire lines will be made at the boundary of lease to prevent spread of fire in the forest area. The fire lines will be regularly cleaned,
- Slat licks and water holes will be provided for animals in the forest area in consultation with the Forest Department.
- The mine management will actively participate in the wildlife conservation plan prepared by the state government and same and will contribute funds for its implementation. Funds earmarked for the conservation of wildlife shall not be diverted.

3.6.1 SOCIO-ECONOMIC ENVIRONMENT – BASELINE DATA

HUMAN SETTLEMENT AND DEMOGRAPHY : Demographic characteristics of the study area are represented by a number of criteria, namely population composition, sex ratio, family structure, and age distribution pattern. Attempt has been made to compare the demographic features between the census data whenever corresponding data are available. The area selected for the study constitutes 10 inhabited villages. The **village size** as estimated from the number

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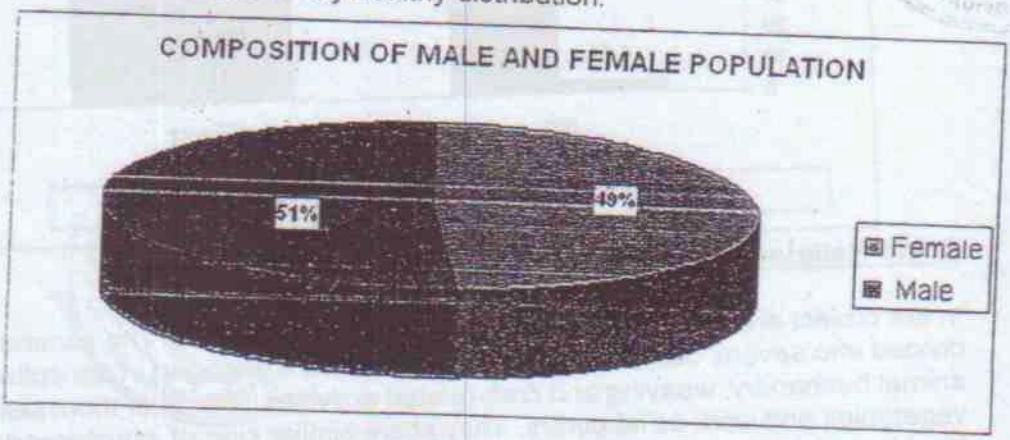
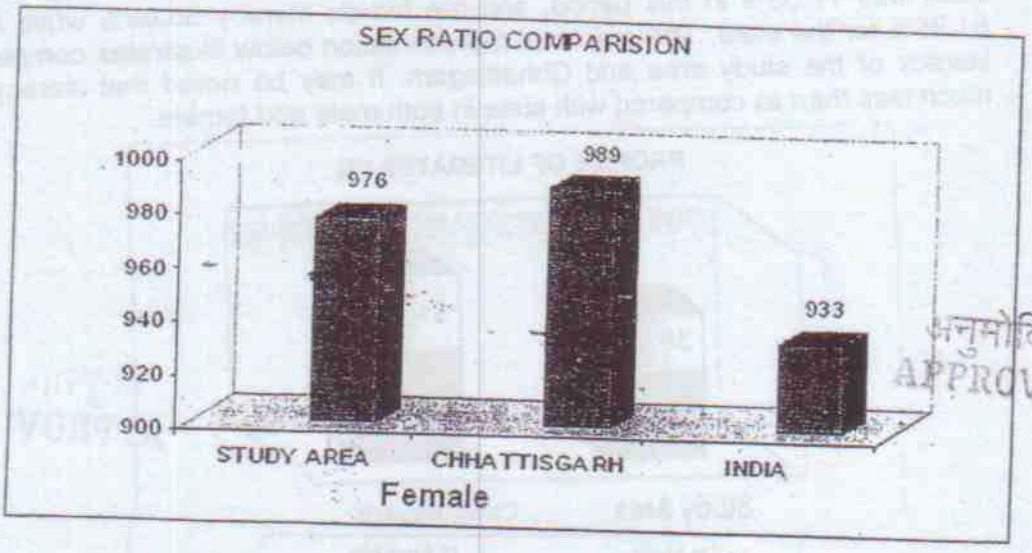
of inhabitants as per the 2001 census indicated that majority of the villages i.e. 9 villages fall within 1-500 population size and only one village fall in 501-1000 population size. Village **Nawgel** with population of 119 is the least populated village while **Chargaon** village with population 914 is the most populated village.

SOCIO ECONOMIC CHARACTERISTICS OF THE AREA

COMMUNITY PROFILE: The population is distributed among 646 households in the study area. The 10 inhabited villages have a population of 3692 comprising of 1868 males and 1824 females. As may be observed from the graph below the composition of the society as far as males and their counterparts female is concerned indicates very healthy distribution.

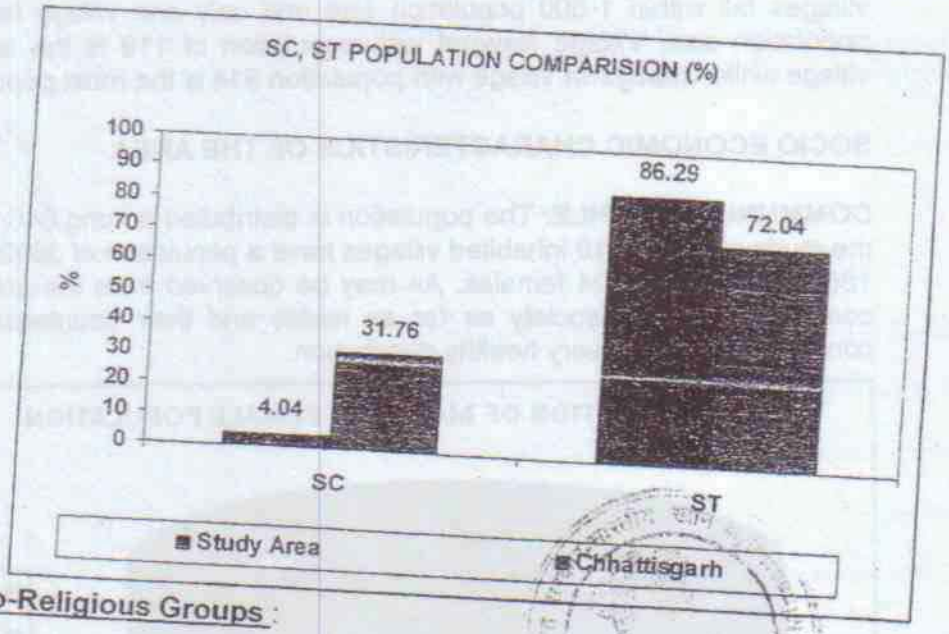


The number of females per 1000 males is 976 when compared with the figures of the Chhatisgarh State 989 and for the nation 927 the study area found to be less than state figures while it more than national figures indicating an equally composite society of male and female.



The scheduled caste population of the study area on percentage basis is 4.04% the total population and **scheduled tribe** population 86.29%. Comparison with

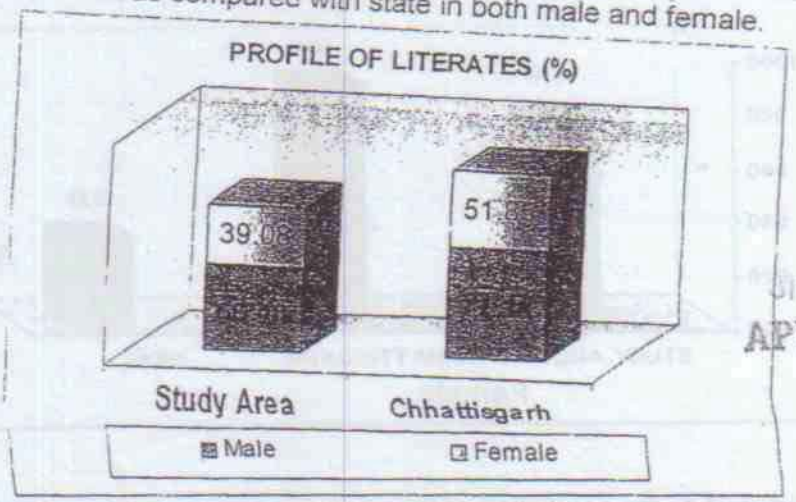
the state level figures indicates percentage of SC population in study area is less and ST population in study area is more than that of state level. The distribution as depicted in the graph below;



Socio-Religious Groups :

In the project area, the predominant community is of Hindus. The community is divided into several castes and sub-castes. They are engaged in agriculture, animal husbandry, weaving and craft-related activities. Some of them sell vegetables and work as labourers. They share similar kind of interdependency, kinship relation and strong identity with the all community. There is communal harmony in the region.

Literacy: The overall literacy in the 10 villages of the study area was **50.10%**. The male literacy in the study area was less **60.46%** as compared with state was 77.38% in this period, and the female literacy **39.08%** while it was 51.85% for the state. The graphical representation below illustrates comparative literacy of the study area and Chhattisgarh. It may be noted that literacy was much less than as compared with state in both male and female.



Vocation-wise distribution of the population based on 2001 census data of the

study area is graphically represented below indicate that about 45.61% non working population is dependent on 54.39% working population. The male workers are observed to be more than the female workers.

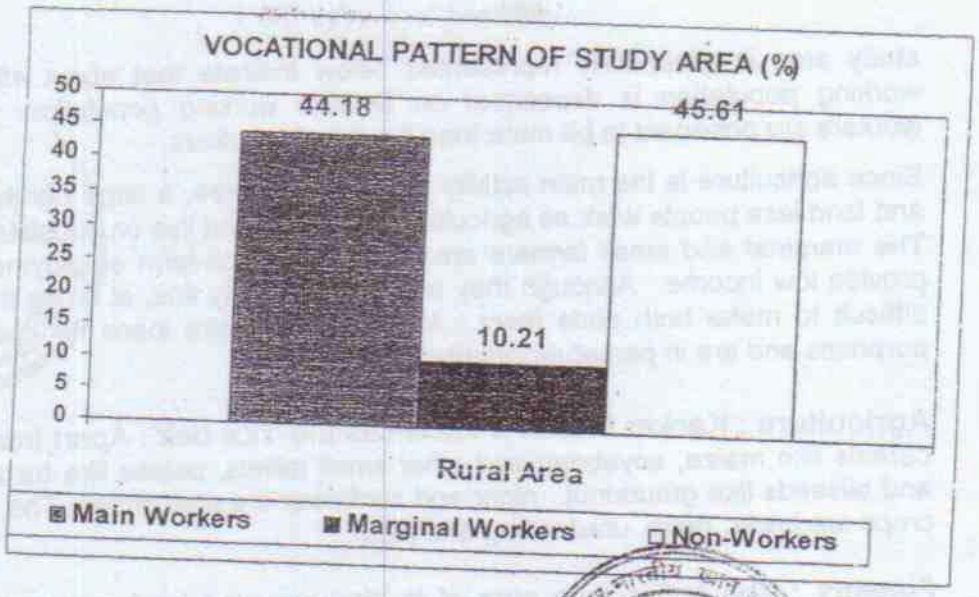
Since agriculture is the main activity in the project area, a large number of poor and land less people work as agricultural labourers and live on subsistence level. The marginal and small farmers are likely to get non-farm employment, which provide low income. Although they are above poverty line, at times they find in difficult to make both ends meet. Many of them take loans for consumption purposes and are in perpetual indebtedness.

Agriculture : Kanker District is known as the "rice belt". Apart from paddy, cereals like maize, soyabean and other small millets, pulses like tur and kulthi and oilseeds like groundnut, niger and sunflower are also grown. The main rabi crops are jowar, gram, urad, mong and moth.

Forestry : The buffer zone area of is also occupied by forests, which is in heritage for tribes. Therefore their basic need fulfilled by forests. Various forest produces, fruits, roots of various plants, Lakh, Honey , are used for their survival. Roots as Gethiyan, Bhanu , Senta etc. are used for food . Tribal women collects tendu patta , char, amla, hawai , tendu , and sal leaves. Sal, Dhawai, Aamla, Char, Mahua, are of great economic importance as they direct sold them to various government and non government agencies as well as in the open market. Lakh, Gond, Honey are other sources of income. Tribes also cut dry wood from forest and bring them to village and nearer service centers to sell. Generally Korwa, Pando and Kanwar tribes are good bowmen and they caught and hunt the wild animals and birds as Dear, Pig, Rabbit, Rukhi, Wild bird and Hen, Peacock, Parot etc. Although due to government order, they are complete coffined to kill and hunt the wild animals.

Table 3.16
Vocational Pattern

	Profession	Study Area
1.	Total Main Workers	44.18
	* Cultivators	(95.77)
	* Agricultural Labour	(1.53)
	* House Hold industry	(0.25)
	* Other Workers	(2.45)
2.	Marginal Workers	10.21
3.	Non-Workers	45.61



As may be seen from these data, the percentage of main workers in the study area was 44.18, in 2001. The proportion of cultivators was very high 95.77% in area. On the other hand, percentage of agricultural laborers was quite less 1.53% and 2.45% people were engaged in other activities. The percentage of household industries was lowest 0.25% in the study area. The marginal workers in the rural area were 10.21%. The non-workers were 45.61% in rural area; it shows that dependency of non working population on the working population in the area is less than half of corresponding working population.

Group Activities – Festivals, Fairs And Village Markets: Festivals and fairs are colorful aspects of rural society. Festivals bring peace, harmony and happiness. It is the time when people forget their past rivalries to make merry together. All communities, irrespective of caste, creed and religion celebrate festivals such as Holi (Festival of Colour) Durga Puja, Diwali and Chat. Apart from these, some national functions are also observed such as Independence Day and Republic Day. Along with festivals, people celebrate fairs. These are meant for social and community participation. Important decisions are taken during these fairs. The local fairs play an important role in rural people's life. People bring their artifacts, products and even cattle for selling and buying. It is not necessary to buy and sell in exchange for cash; one can pay in kind, meaning exchange one's products. Weekly market is an important feature of the rural areas. These are held in larger villages. Although they are meant for buying and selling goods and services required daily by the village household, the occasion is also used for socialization and communication.

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Infrastructural Facilities And Services: To understand the existing facilities in the project area information was collected secondary sources. The collected data shows that water supply in most of the villages was available. Latrine facility, Waste Water disposal, garbage disposal were totally absent. Inter-village transport facility was available while educational facilities were available health facilities were generally also available in most of the villages. This study clearly shows that there is an urgent for providing sanitation facilities within the villages and also in selected areas on the subproject.

IMPACTS ASSESSMENT ON SOCIAL ENVIRONMENT: Mining of manganese from this area have significant beneficial impact on social environment. Further some increase in income of local people is expected as some local unskilled, semiskilled and skilled persons may gain direct or indirect employment. Since the immigration of work force during construction phase is likely to be very small, the social impacts on literacy, health care, transport facilities and cultural aspect are expected to be insignificant. The proposed improvement project is expected to generate a considerable amount of employment in terms of requirement of both skilled and unskilled labourers during the mining operation. The available local labourers will be engaged by the contractors, which will be ensured by the Implementing Agency engaged in the respective contract packages. The project is not only meant to increase in production in a better way or to provide for income restoration to the affected vulnerable social groups; but also has a scope for wider poverty reduction in the region. The following probable direct and cumulative positive impacts are anticipated due to the project.

- Increase in current sources of income and average household income and expenditure of the project area.
- Increase in current land value and commercial use of land in the project area.
- Access to credit as the improved socio economic status will boost up the banking and financial institution in anticipation to the commercial growth of the project area.
- Increase in number of existing organised, unorganised markets and volume of produce market.
- Linkages to local and regional markets in the project area.

The population in the buffer zone will be benefited flowingly from the proposed project.

- Increase in literacy level, availability of schools, assess to schools, increase in number of schools going children (particularly girls), decrease in drop out rates, and availability of teachers especially in government schools.
- Access to health facilities such as Primary Health Centres, Anganwadi, and health programmes.
- Availability of transport services, availability of bus stops, low cost of transport, saving travel time, decrease in occurrence of road accidents and difficulties faced.
- Access to government's development programs and other services in the project area.

Negative impact: The project will not involve land acquisition. The impact on the forestland is even not significant and can very well be mitigated. During the construction there may be a problem of garbage disposal and the waste material management. The present project will avoid this type of hazardous issues by adopting proper environmental mitigation measures. An environmental management plan is being implemented for implementation during operation phase.

3.6.3 SOCIO-ECONOMIC ENVIRONMENT: PROPOSED MITIGATIVE MEASURES

The socio-economic conditions in the study area indicate the quality of life of the people. The important indicators which decide the quality of life and require to be improved for better living conditions are literacy levels, improved occupational structure, industrial development, infrastructural facilities, transportation communication linkages, land development and improvement in cropping pattern.

The project proponents are envisaging undertaking the following socio-economic measures. Which are based on the need base assessment of the area under study;

- HONEY BEE KEEPING : Training for collection, processing & marketing.
- AGRICULTURE / HORTICULTURE : Paddy being major crop it is proposed to support the cultivators by providing high yielding varieties of paddy. Awareness campaigns & demonstration for improved agricultural practices will be arranged periodically. Promotion of vermicompost, organic fertilizers, Integrated Nutrient Management (INM) & Integrated Pest Management (IPM) etc.
- Each family of the Metabodeli village will be given local fruit plants like guava, chikoo, aam, jackfruit, imli, awala, jamun, sitaphal, Ber etc.
- Support to existing kitchen gardens in the form of high yielding varieties of vegetable.
- Local grass species for village waste land will be promoted as controlled grazing grounds.
- MINOR FOREST PRODUCE: Collection of Behada, hirda, amla, mahua, tembhre (tendu fruit), achar, imli, karanji, Chironji, ber, gum, lakh etc will be promoted through Tribal Development Corporation. Necessary support for Bamboo artifacts like transport and marketing will be made.
- Petty works like nursery development, tree plantation, cleaning operations, water conservation etc will be carried out with the help of willing non working population.
- Medical checkup camps for the villagers shall be arranged. Awareness camps for hygienic habits and its importance in avoiding water and air borne diseases. Reproductive Child Health programmes, awareness programme on family planning, nutrition improvement with the help of medical practitioner will be arranged on regular basis.
- Encouragement to the students from the village studying in higher studies. Free distribution of school books, uniform, raincoats, bags and stationary. Provision of scholarship for the needy children.
- Infrastructure support : School building, Aanganwadi repairing, Gokul (community centre) fencing & repairing, sanitation facilities.
- Skill up gradation for unemployed youth will be arranged.
- Participation in Cultural activity, sports etc will also be made.
- Provision for street solar lamps at selected places in 5 nearby villages.

Health Care : The following facilities will be provided and adequate funds will be allocated for the maintenance of them. These include mobile dispensary, family planning and medical camps and aid to the existing and proposed hospitals.

Educational Facilities : These include adult education facilities, financial assistance for higher studies, sponsorship to vocational / professional training institution, computer education camps, vacation training for students and aid to existing/proposed schools and colleges.

Civic Amenities: These include community toilets, support to drinking water facilities like public stand posts. In addition to this participation and support to government efforts in extending communication (post, telegraph, telephones, transport, power supply etc) to the remotest part of the region. Incidentally, all parameters mentioned above are directly or indirectly controlled by various State and Central Government Departments. The nearby villages through which the mineral will be transported shall be regularly sprinkled with water and avenue tree plantation shall be carried out in these villages.

Employment: It is proposed to employ the local population wherever possible in the proposed project activities. The work of reclamation of the entire area that will be damaged in mining operations and afforestation through plantation of 2500 trees per ha with survival rate of 80% to 85% has been envisaged. In this, local tribal people would be involved actively including employment and award of contracts for supply of materials and services. Vocational training programme for unemployed youths will be arranged regularly.

Occupational health :

- All the mine workers will be sent to Hospital which have the facilities for chest X-ray, pulmonary function test & audiometry, TB, Maleria, HIV etc. once in 5 year. Free Transport will be provided.
- It is proposed to install Reverse Osmosis (RO) plant for drinking water for the mine workers.
- A safety committee will be constituted to implement the proposed OSHA management plan and environment management programme and take proper mitigative measures as per EIA/EMP.
- Services of Occupational Health Specialist will be arranged regularly.
- The proponent will bear all the expenditure related to health check up and treatment of the mine workers.
- Individual health record of every worker will be maintained till the end of service or the end of mining operations. Records will be maintained and corrective action if required, shall be taken by the management Budget has been allocated under Recurring Annual Cost for Environmental protection

Mining sites in the present case is located at remote area which can be categorized as under developed. Standard of living of people is this area is normally low, therefore due to industrial activity like mining, people residing in the nearby villages within the buffer zone are to be benefited by direct and indirect

employment opportunities created by the mining activities. People are also beneficiaries for the facilities developed due to mining activity.

TABLE-3.17
Budget for Social Developmental Activities

Sr. No.	Activity	Budget (Rs. in lakhs)	Recurring (Rs. in Lakhs)
1	Education (Renovation of Anganwadi Centre, donation to Anganwadi center and Primary School renovation)	2.00 (Capital)	2.0
2	Education (Distribution of Books and uniforms)		1.00
3	Vocational Training to unemployed youth		1.00
4	SHG support (women SHG)		1.00
5	Medical facility	2.0	
6	Medical facility (Regular Health Camps)		1.00
7	Maintenance of Village Roads		2.00
8	Infrastructure development (support to civic amenities)		3.00
	TOTAL	**4.00**	**11.00**

The summary of environment management is tabulated in table 3.15 below:

अनुमोदित
APPROVED