Supplementary Note for EIA-EMP of

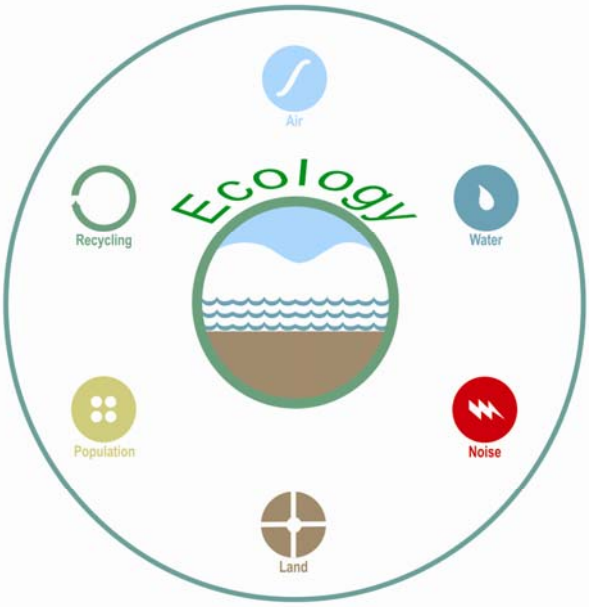
Orient U/G Mine No.1&2

(0.87 Mty)

(0.52 Mty Incremental)

Ib Valley Coalfield

Mahanadi Coalfields Limited



September 2012

CMPDI
ISO 9001 Company

Central Mine Planning & Design Institute Ltd.
(A Subsidiary of Coal India Ltd.)
Regional Institute-VII, OSHB Building, Bhubaneswar, Orissa 751001

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LIST OF ANNEXURES

LIST OF PLATES

ORIENT U/G MINE NO.1&2
(0.87 MTY; 0.52 MTY INCREMENTAL)

INTRODUCTION

Expert Appraisal Committee (EAC) (Thermal & Coal Mining) meeting was held on 23rd – 24th May 2011 for consideration of EIA-EMP of Orient U/G Mine No.1&2 (0.35 Mty to 0.87 Mty) (i.e. 0.52 incremental) of M/s.Mahanadi Coalfields Limited, located in Ib Valley Coalfields, Jharsuguda district of Odisha. MoEF has after detailed deliberation of EIA-EMP of the project in the EAC meeting sought the following information / data (Annexure-I) to further consider for environmental clearance.

1. The Committee desired that the coal being transported by road be also dispatched by conveyor system to be established within 2-3 years to a common CHP and loading should be by bulk loaders.
2. The Committee observed that the data generated on baseline environmental quality is old (2005-06) and noted that the same data has been shown for two different seasons – pre-monsoon and post monsoon which is not realistic.
3. The Committee also observed that no monitoring station has been provided in the southern direction (down wind direction) which should be established.
4. The Committee desired that a one season data which includes PM10 and PM2.5 should be collected for the same season as meteorological data and furnished.
5. The Committee sought details of distance of Ib River (HFL) form the mine operations.
6. The Committee also sought a detailed expenditure for CSR carried out during 2010-11 for Rs.51.04 crores and a Plan for 2011-12.
7. The Committee sought FC for the forestland involved in the project.

This report has been prepared incorporating the point-wise replies to the above queries for submission to MoEF, Govt. of India.

Point-wise Replies to MoEF Queries

Point No.(1)

The Committee desired that the coal being transported by road be also dispatched by conveyor system to be established within 2-3 years to a common CHP and loading should be by bulk loaders.

Orient U/G Mine No.1&2 is situated 100 m from railway siding. Maximum coal production is 2852 te/day. Tippers having capacity of 16 te are plying 178 trips per day to the railway siding. As the mine is adjacent to the railway siding and there is hardly any transportation distance.

Length and breadth of the railway siding is 300 m x 200 m having 2 nos. platform. Two nos. of fixed sprinklers are functioning at railway siding for dust suppression. However, the provision of conveyor system from the mine head to the siding is under active consideration and a study is being made to plan this system.

Point No. (2)

The Committee observed that the data generated on baseline environmental quality is old (2005-06) and noted that the same data has been shown for two different seasons – pre-monsoon and post monsoon which is not realistic.

Afresh baseline environmental quality data for air, water, noise and soil has been generated for pre-monsoon season March, April and May 2012. The baseline data has been generated by M/s.Richardson & Cruddas (1972) Ltd. and the data annexed in Annexure-II.

Point No. (3)

The Committee also observed that no monitoring station has been provided in the southern direction (down wind direction) which should be established.

Hourly meteorological data for wind velocity and wind direction for the pre-monsoon period from March, April & May 2012 has been collected and given in page 21 to 22 of Annexure-II. The windrose made from these data shows that the pre-dominant wind direction is from South West to North East. Eight air quality monitoring

stations have been fixed covering Orient Group of Mines (Page 32 in Annexure-II). The Lajkura village (A8) falls directly south of the Orient Mine No.1&2. The village Gandghara (A4) falls in the down wind direction (NE) of the Orient Mine No.1&2. The recorded ambient air quality data for these stations during pre-monsoon season March, April & May 2012 is given in Page 38 to 46 in Annexure-II.

Point No. (4)

The Committee desired that one season data which includes PM10 and PM2.5 should be collected for the same season as meteorological data and furnished.

Ambient air quality data PM10 and PM2.5 has been generated for the same season as meteorological data for pre-monsoon period March, April and May 2012. The recorded data has been given in Annexure-II. The abstract of the ambient air quality data and windrose for the pre-monsoon are given below :

(All units in µg/m^3)

Location name & code	Min	98th Per.	Max	AM	GM	Std.dev	CPCB Limit
PM10							
Corezone (Store) (A1)	64	94	94	84.0	83.8	6.1	100
Core zone (Near Temple) (A2)	89	115	115	100.9	100.7	6.8	
Mandlia (A3)	66	82	82	75.9	75.8	4.3	
Gandghora (A4)	65	77	77	71.0	70.9	3.8	
Gandhi Chowk (A5)	68	81	81	73.8	73.7	3.6	
Chheikuthi (A6)	58	84	84	71.6	71.2	8.2	
Jamkani (A7)	52	62	62	49.8	49.5	5.8	
Lajkura (A8)	50	70	70	58.3	58.0	5.6	
PM2.5							
Corezone (Store) (A1)	19	28	28	25.2	25.1	1.9	60
Core zone (Near Temple) (A2)	28	37	37	32.3	32.3	2.2	
Mandlia (A3)	23	29	29	26.5	26.5	1.5	
Gandghora (A4)	23	27	27	24.9	24.9	1.4	
Gandhi Chowk (A5)	26	31	31	28.0	28.0	1.3	
Chheikuthi (A6)	20	29	29	24.4	24.2	2.9	
Jamkani (A7)	14	21	21	16.9	16.8	2.0	
Lajkura (A8)	17	24	24	19.8	19.7	1.9	

Location name & code	Min	98th Per.	Max	AM	GM	Std.dev	CPCB Limit
SO_2							
Corezone (Store) (A1)	11.0	17.0	17.0	13.9	13.8	1.6	80
Core zone (Near Temple) (A2)	13.7	16.6	16.6	15.4	15.4	0.7	
Mandlia (A3)	14.2	16.0	16.0	15.0	15.0	0.5	
Gandghora (A4)	17.6	20.4	20.4	18.7	18.7	0.9	
Gandhi Chowk (A5)	14.0	16.8	16.8	15.1	15.1	0.9	
Chheikuthi (A6)	10.6	13.8	13.8	11.7	11.7	0.9	
Jamkani (A7)	10.0	13.1	13.1	11.4	11.4	0.8	
Lajkura (A8)	10.3	13.7	13.7	11.4	11.3	0.8	
NO_X							
Corezone (Store) (A1)	12.9	24.6	24.6	17.4	17.0	4.1	80
Core zone (Near Temple) (A2)	14.8	19.5	19.5	17.8	17.8	1.3	
Mandlia (A3)	17.6	20.3	20.3	19.0	19.0	0.8	
Gandghora (A4)	17.0	19.5	19.5	18.3	18.3	0.7	
Gandhi Chowk (A5)	16.9	19.4	19.4	18.2	18.2	0.7	
Chheikuthi (A6)	16.2	19.3	19.3	17.7	17.7	0.9	
Jamkani (A7)	13.3	16.7	16.7	14.8	14.7	1.0	
Lajkura (A8)	16.5	19.9	19.9	18.0	18.0	1.0	
NH_3							
Corezone (Store) (A1)	13	26	26	19.0	18.7	3.5	400
Core zone (Near Temple) (A2)	10	20	20	14.5	14.3	2.7	
Mandlia (A3)	14	25	25	20.2	19.9	3.1	
Gandghora (A4)	14	25	25	18.6	18.4	2.9	
Gandhi Chowk (A5)	16	25	25	20.3	20.2	2.2	
Chheikuthi (A6)	20	28	28	23.6	23.5	2.2	
Jamkani (A7)	11	20	20	15.3	15.1	2.3	
Lajkura (A8)	13	22	22	17.3	17.1	2.3	

Note : All CO, Benezene and BaP values were found to be BDL.

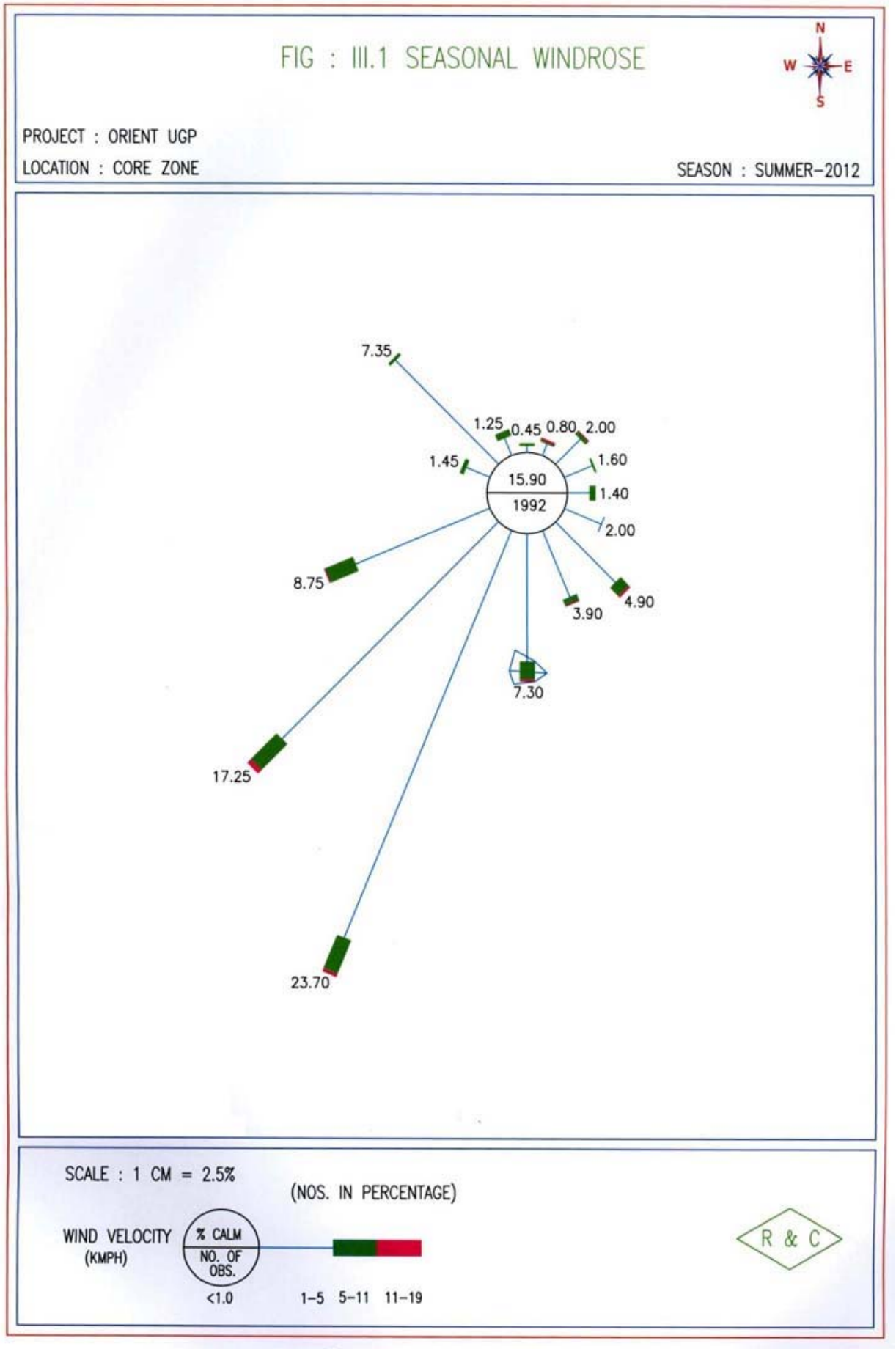


FIG : III.1 SEASONAL WINDROSE
N
W
E
S
PROJECT : ORIENT UGP
LOCATION : CORE ZONE
SEASON : SUMMER-2012
7.35
1.25
0.45
0.80
2.00
1.45
1.60
15.90
1992
1.40
2.00
8.75
4.90
3.90
7.30
17.25
23.70
SCALE : 1 CM = 2.5%
(NOS. IN PERCENTAGE)
WIND VELOCITY
(KMPH)
% CALM
NO. OF OBS.
<1.0
1-5
5-11
11-19
R & C

FIG : III.2 DAY TIME & NIGHT TIME WINDROSES

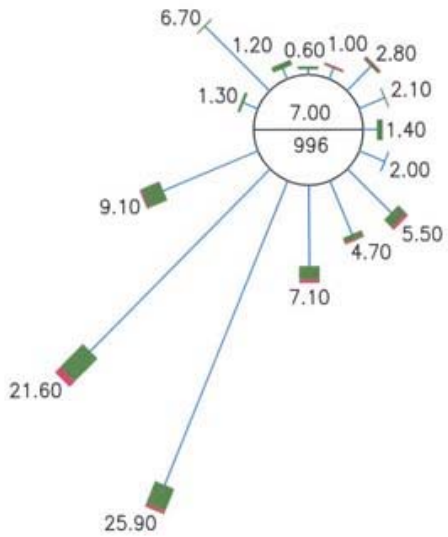
PROJECT : ORIENT UGP

LOCATION : CORE ZONE

SEASON : SUMMER–2012

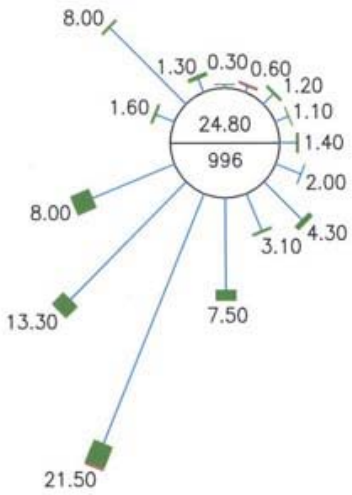
DAY TIME

TIME: 06.00hrs. TO 18.00hrs.



NIGHT TIME

TIME: 18.00hrs. TO 06.00hrs.



SCALE : 1 CM = 5%

(NOS. IN PERCENTAGE)

WIND VELOCITY (KMPH)

% CALM

NO. OF OBS.

<1.0 1–5 5–11 11–19

R & C

Point No. (5)

The Committee sought details of distance of Ib River (HFL) form the mine operations.

The RL of High flood level (HFL) of the Ib river is 195.47 m above msl. The RL of the bench mark of the Orient U/G Mine No.1&2 is 241.005 m above msl. The maximum depth cover of the mine is 320 m bgl and minimum depth cover is 63 m bgl. The distance of high flood level from the mine is 2.54 km. Considering hydro-geological set-up of the area, the estimated radius of influence is 972 m. Hence inundation of the mine is not predicted due to high flood level of Ib river.

Point No. (6)

The Committee also sought a detailed expenditure for CSR carried out during 2010-11 for Rs.51.04 crores and a Plan for 2011-12.

Activity-wise detailed expenditure incurred in the CSR for the year 2010 – 11 and 2011 – 12 is given in Annexure-III.

Point No. (7)

The Committee sought FC for the forestland involved in the project.

The total forest land area within the mining lease hold area of Orient Mine No.1&2 is 82.213 ha. Mining permission for the said forest land has already been applied and all compliances has already been made with payment of NPV including submission of DGPS maps duly authenticated by ORSAC and is pending with CCF (Nodal), Bhubaneswar for forwarding the same of MoEF, New Delhi at the earliest.

6. Orient UG Mine I & II (from 0.35 MTPA to 0.87 MTPA in an ML area of 1857.24ha) of M/s Mahanadi Coalfields Ltd., Tehsil Brajrajnagar, Dist. Jharsuguda, Orissa (EC based on TOR granted on 11.07.2008)

The proponent made presentation. It was informed that the proposal is for expansion in production from 0.35 MTPA to 0.87 MTPA (an incremental production of 0.54 MTPA) in the existing ML area of 1857.24 ha. It was informed that Orient UGP Mine 1 &2 would be carried beneath Orient UGP No.3, which is operating since 1942. Of the total ML area of 1857.24 ha, 950.429 ha is forestland, 522.728 ha is agricultural land, 111.826 ha is grazing land, 17.26 ha is surface water body, and 254.998 ha is ?others? (govt. land and tenancy land). Mining would be by Board & Pillar method with continuous miner. An additional one has been deployed for enhancing production. Depth of mining would be from 60-320m. Presently development of the mine is being carried out and depillaring is proposed after 25 years. It was informed that Subsidence Study has been carried out by CIMFR, Dhanbad and the predicted tensile strain of 7.98 mm/m max. was within the 20mm/m as per regulations for forest cover. Grade of coal was ?D?. Drainage of the mine is controlled by River Ib, which flows from north to south. Hirakud Reservoir is at a distance of 12km in the buffer zone. An estimated 910 m3/d of water would be required, which includes 110 m3/d for drinking and 800 m3/d for mining. Water table was in the range of 1.30-7.62m bgl during pre-monsoon and 1.1-5m bgl during post-monsoon. Mine water discharge was 23,445 m^3/d during monsoon. Balance life of the mine is 55 years. Cost of the project is Rs 277.08 crores and an additional capital investment of Rs 74 crores is required for the expansion project. A provision of Rs 535.58 lakhs has been made for env. measures and an amount of Rs 2365 lakhs or Rs 5/T of coal for CSR. The project does not involve R&R. Coal is loaded from mine face by belt conveyors and transferred to surface bunkers and dispatched to small consumers by road and to rail way siding at a distance of 1km to major consumers such as Rourkela Steel Plant and Power houses of Tamil Nadu State Electricity Board. It was informed that 950.429 ha of forestland exists in the ML area of which 868.216 ha is of Orient No.3 under which Orient No.1 &2 operates. Forestry clearance has not been obtained for mining Rights for the existing project. An application dated 11.6.2010 for Stage-I FC has been made to CCF, Forest Department, Govt. of Orissa for diversion of forest land. Public Hearing was held on 21.04.2010. Mining Plan was approved by MOC on 25.03.2009.

The Committee desired that the coal being transported by road be also dispatched by conveyor system to be established within 2-3 years to a common CHP and loading should be by bulk loaders. The Committee observed that the data generated on baseline environmental quality is old (2005-06) and noted that the same data has been shown for two different seasons - pre-monsoon and post monsoon which is not realistic. The Committee also observed that no monitoring station has been provided in the southern direction (down wind direction) which should be established. The Committee desired that a one season data which includes PM_{10} and $PM_{2.5}$ should be collected for the same season as meteorological data and furnished. The Committee sought details of distance of Ib River (HFL) form the mine operations. The Committee also sought a detailed expenditure for CSR carried out during 2010-11 for Rs 51.04 crores and a Plan for 2011-12. The Committee sought FC for the forestland involved in the project. The Committee decided to further consider the proposal based upon receipt of the aforesaid details.

Annexure-II

Baseline Environmental Data Generation for Orient UGP in Ib Valley area of Mahanadi Coal fields Limited, Odisha state

Season

Summer 2012

Client

CENTRAL MINE PLANNING & DESIGN INSTITUTE LIMITED

Regional Institute – VII, Bhubaneswar

Prepared by

M/s. RICHARDSON & CRUDDAS (1972) LTD.

(A Government of India Undertaking)

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June 2012

CONTENTS

FOREWORD

Environmental Management Plan (EMP), for a Coal Mining project is a prerequisite and the same constitutes basis for environmental appraisal of the project and its clearance from MoEF. In this context, baseline data of environmental quality (ambient air along with micrometeorology, water, noise, soil, etc.) has to be generated prior to the preparation of EMP.

Central Mine Planning and Design Institute Ltd. (CMPDI), Regional Institute-VII, Bhubaneswar, a subsidiary of Coal India Ltd. (CIL) has undertaken the task of preparation of EMP for coal projects under the jurisdiction of CIL. **Mahanadi Coalfields Ltd. (MCL), Sambalpur** a subsidiary of CIL has several ongoing mining projects in **IB valley Area** and has proposed operating **Orient UGP** for baseline data generation for environmental appraisal & its clearance.

CMPDI, Regional Institute -VII, Bhubaneswar which undertakes planning and design of mining projects for MCL, desired to have a existing environmental status of the operating Orient UGP in IB valley Area, MCL for preparing EIA & EMP. Hence, it entrusted the task of one complete season baseline environmental data generation to M/s. Richardson & Cruddas (1972) Ltd., a Government of India undertaking, Chennai through the work order No. CMPDI/RI-VII/CIVIL/2012/2722 dtd.13.02.2012.

The baseline data on micrometeorology, Ambient air quality, Noise level, Water / Waste water quality and soil quality collected during Summer season (05th March 2012 to 26th May 2012) are presented in this report.

Grateful thanks are due to the **Regional Director, Regional Institute-VII, CMPDI, Bhubaneswar** for the opportunity provided to be associated in this endeavor. The co-operation rendered by CMPDI, RI-VII and MCL Project authorities and their supporting staff is gratefully acknowledged.

13th June 2012
Chennai

(E. BALAKRISHNAIAH)
Unit In-charge

Project Personnel

Name	Qualification	Designation	Experience (Years)
Mr. E. Balakrishnaiah	B.Tech. (Civil), M.E. (Env. Engg.) Lead EMS Auditor (ISO 14001)	Incharge Env. Engg & Projects	20
Mr. P. Subburam	M.Sc.	Senior Analyst	16
Mr. M.N. Anil Kumar	B.Sc., EMS & ISO 14000	Senior Analyst	16
Mr. S.K. Mishra	B.Sc.	Sr. Analyst	15
Mr. V. Arun Kumar	Dip. Chem. Tech., D.C.P.I.C.	Sr. Engineer	12
Mr. M. Venumadhav	M.Tech. (Civil)	Project Engineer	7
Mr. B. Senthil Kumar	Dip. Chem. Tech., B.S.Engg.(Ind.tech)	Sr. Engineer	12
Mr. K. Vijayakumar	B.Sc	Site Analyst	6
Mr. K. Seetharaman	B.E.M.	Site Analyst	6
Mr.V.Mayakkannan	B.Sc	Analyst	6
Mr. Annamalai	M.Sc.	Site Analyst	5
Mr.Raguvaran	B.Sc	Analyst	4
Mr. S. Ravichandran	M.A., Dip. Multi. & Web	System Analyst	17

EXECUTIVE SUMMARY

1.0 **Central Mine Planning and Design Institute Ltd., Regional Institute-VII, Bhubaneswar** is preparing Environmental Impact Assessment & Environmental Management Plan (EIA & EMP) for obtaining environmental clearance for **operating Orient UGP** in IB valley Area, MCL. It entrusted one complete season baseline environmental data generation work to M/s. Richardson & Cruddas (1972) Ltd., Chennai, a Government of India undertaking.

2.0 Baseline data on environmental quality for Summer season are collected for 83 days during the period from 05th March to 26th May 2012. The study carried out during the said period is reported below.

3.0 APPROACH METHODOLOGY

3.1 Micrometeorological data generation

A meteorology station has been set up at core zone and micrometeorological parameters like wind velocity, wind direction, temperature, relative humidity, cloud cover etc. are recorded on hourly basis for Summer season. Daily rainfall also has been recorded and reported.

3.2 Ambient air quality monitoring

Ambient air quality was monitored at 8 locations i.e. two in core zone and the remaining six in buffer zone. A total of 24 samples (24-hrly) for PM10, PM2.5, SO2, NO_x, CO, O_3, NH_3 samples were collected from each location during the study period. Heavy metals samples were also collected once in the study period.

3.3 Water quality monitoring

Representative water samples 9 nos. one in mine effluent, four in surface water and four from ground water i.e. dugwell and tube well in buffer zone have been collected, preserved and transported to R&C Environmental Engg. Laboratory, Chennai and analyzed as per standard methods.

3.4 Noise levels recording

Noise levels were recorded by using CYGNET Integrated sound level meter (100X) from eight ambient air quality locations during day time and night time at an interval of four hours for one day for three months.

3.5 Soil quality monitoring

Soil samples from five locations, three in core zone, two in buffer zone were collected at depths of 30, 60 and 100 cms and analysed for various physico-chemical and fertility parameters.

4.0 DATA ANALYSIS AND RESULTS

4.1 Micrometeorology

The wind velocity readings were ranging from <0.4 – 18.8 m/sec. Predominant wind was from South-West direction. The maximum temperature recorded was 44.0°C and the minimum was 20.5 °C. The relative humidity ranges from 27% to 82% and no rainfall was recorded during the study period.

4.2 Air quality

Core zone

PM10 and PM2.5 values are ranging from 64 $\mu g/m^3$ to 115 $\mu g/m^3$ and 19 $\mu g/m^3$ to 37 $\mu g/m^3$ respectively. SO_2 and NO_x values are varying between 11.0 to 17.0 $\mu g/m^3$ and 12.9 to 24.6 $\mu g/m^3$ respectively. The ammonia and Ozone was to found to be maximum extent of 26 $\mu g/m^3$. *All the values are found to be within the CPCB Standards except* PM_{10}.

Buffer zone

PM10 and PM2.5 values are ranging from 42 $\mu g/m^3$ to 84 $\mu g/m^3$ and 14 $\mu g/m^3$ to 31 $\mu g/m^3$ respectively. SO_2 and NO_x values are varying between 10.3 to 20.4 $\mu g/m^3$ and 13.4 to 20.3 $\mu g/m^3$ respectively. The ammonia was to found to be maximum extent of 28 $\mu g/m^3$. *All the values are found to be within the CPCB Standards.*

Table – 4.2 Ambient Air Quality Status

(All units in µg/m^3)

Location name & code	Min	98th Per.	Max	AM	GM	Std.dev	CPCB Limit
PM10							
Corezone (Store) (A1)	64	94	94	84.0	83.8	6.1	100
Core zone (Near Temple) (A2)	89	115	115	100.9	100.7	6.8	
Mandlia (A3)	66	82	82	75.9	75.8	4.3	
Gandghora (A4)	65	77	77	71.0	70.9	3.8	
Gandhi Chowk (A5)	68	81	81	73.8	73.7	3.6	
Chheikuthi (A6)	58	84	84	71.6	71.2	8.2	
Jamkani (A7)	52	62	62	49.8	49.5	5.8	
Lajkura (A8)	50	70	70	58.3	58.0	5.6	
PM2.5							
Corezone (Store) (A1)	19	28	28	25.2	25.1	1.9	60
Core zone (Near Temple) (A2)	28	37	37	32.3	32.3	2.2	
Mandlia (A3)	23	29	29	26.5	26.5	1.5	
Gandghora (A4)	23	27	27	24.9	24.9	1.4	
Gandhi Chowk (A5)	26	31	31	28.0	28.0	1.3	
Chheikuthi (A6)	20	29	29	24.4	24.2	2.9	
Jamkani (A7)	14	21	21	16.9	16.8	2.0	
Lajkura (A8)	17	24	24	19.8	19.7	1.9	
SO_2							
Corezone (Store) (A1)	11.0	17.0	17.0	13.9	13.8	1.6	80
Core zone (Near Temple) (A2)	13.7	16.6	16.6	15.4	15.4	0.7	
Mandlia (A3)	14.2	16.0	16.0	15.0	15.0	0.5	
Gandghora (A4)	17.6	20.4	20.4	18.7	18.7	0.9	
Gandhi Chowk (A5)	14.0	16.8	16.8	15.1	15.1	0.9	
Chheikuthi (A6)	10.6	13.8	13.8	11.7	11.7	0.9	
Jamkani (A7)	10.0	13.1	13.1	11.4	11.4	0.8	
Lajkura (A8)	10.3	13.7	13.7	11.4	11.3	0.8	
NOx							
Corezone (Store) (A1)	12.9	24.6	24.6	17.4	17.0	4.1	80
Core zone (Near Temple) (A2)	14.8	19.5	19.5	17.8	17.8	1.3	
Mandlia (A3)	17.6	20.3	20.3	19.0	19.0	0.8	
Gandghora (A4)	17.0	19.5	19.5	18.3	18.3	0.7	
Gandhi Chowk (A5)	16.9	19.4	19.4	18.2	18.2	0.7	
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Lajkura (A8)	16.5	19.9	19.9	18.0	18.0	1.0	
NH_3							
Corezone (Store) (A1)	13	26	26	19.0	18.7	3.5	400
Core zone (Near Temple) (A2)	10	20	20	14.5	14.3	2.7	
Mandlia (A3)	14	25	25	20.2	19.9	3.1	
Gandghora (A4)	14	25	25	18.6	18.4	2.9	
Gandhi Chowk (A5)	16	25	25	20.3	20.2	2.2	
Chheikuthi (A6)	20	28	28	23.6	23.5	2.2	
Jamkani (A7)	11	20	20	15.3	15.1	2.3	
Lajkura (A8)	13	22	22	17.3	17.1	2.3	

Note : All CO, Benezene and BaP values were found to be BDL.

4.3 Water quality

The water samples (9 Nos.) collected from different water sources i.e. Surface & ground water, mine effluent etc. are analysed as per procedures outlined in IS : 2488 / IS : 3025 / AWWA / APHA.

At all locations, oil and grease, phenolic compounds, cyanides, sulphides and insecticides are found to be absent and all heavy metal values except Iron are found to be below the detectable limit.

In general, water quality at eight locations is found to be within the prescribed limits.

Table – 4.3(a) Waste water quality status

Source	pH	Suspended Solids (mg/l)	BOD (mg/l)	COD (mg/l)
Mine discharge	8.08	38	8	52
GSR 422E Norms	**5.5-9.0**	**100**	**30**	**250**

Table – 4.3(b) Water quality status

Source	pH		Turbidity (NTU)	TDS (mg/l)		Total Hardness (mg/l)		Iron (mg/l)		Chloride (mg/l)		Sulphate (mg/l)		Fluoride (mg/l)	
	Min	Max		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Drinking / Ground Water	7.25	7.88	5	310	410	154	182	0.08	0.12	40	88	14	24	0.09	0.01
IS 105000 Norms	6.5-8.5		10	500-2000		300-600		0.3-1.0		250-1000		200-1000		1.0	

Table – 4.3(c) Surface water quality status

Source	pH		Colour (Hazen Units)		TDS (mg/l)		Iron (mg/l)		Chloride (mg/l)		Sulphate (mg/l)		Fluoride (mg/l)	
	Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
River	7.14	7.96	5	18	254	612	0.09	0.24	54	174	14	68	0.10	0.30
IS:2296-1982	**6.5-8.5**		**300**		**1500**		**50**		**600**		**400**		**1.5**	

4.4 Noise levels

Mean L_{eq} noise levels at day time and night time are ranging from 41.5 to 60.0 dB(A) and 35.8 to 57.6 dB(A) respectively in the study area. While comparing with IS: 4954 -1986 norms for acceptable outdoor noise levels in residential area (55 dB(A)) in respect of buffer zone and Industrial area (75 dB(A)) in respect of core zone.

S.No.	Zone	Noise level (dB(A))		Noise level Standards	
		Daytime	Nighttime	Daytime	Nighttime
1.	Core zone	52.9 – 60.2	50.5 – 56.4	**75**	**70**
2.	Buffer zone	40.5 – 48.7	35.8 – 43.2	**55**	**45**

4.5 Soil quality

The soil quality of the project area appears to be good and would support vegetation after suitable reclamation / modification.

Table - 4.5 Soil quality status

S.No.	Parameters	Range of Concentration
1	pH	7.04 – 7.62
2.	Organic Carbon (%)	0.3 – 4.6
3.	Potassium (kg/ha)	110 – 164
4.	Nitrogen (Kg/ha)	59.4 – 458
5.	Available magnesium (Kg/Ha)	94 – 422
6.	Texture Class	Sandy Loam

5.0 CONCLUSIONS

The following conclusions are drawn based on the baseline data collected at core and buffer zone area.

i) Ambient air quality parameters viz., PM10, PM2.5, SO_2, NOx, O_3 and Ammonia are well within the CPCB norms for industrial and rural areas.

ii) The quality of mine water effluent is good even in untreated status. Further, the ground and surface water quality is also good and is well within the norms of IS : 10500-1991 and IS : 2296 – 1982 respectively. Therefore, the mixing of mine effluent will not have adverse effect on surface and ground water.

iii) Most of the noise levels recorded are generally less than 65 dB(A) and are well within the acceptable outdoor noise levels in residential areas in respect of buffer zone and Industrial area in respect of core zone as per the norms of IS: 4954 - 1986.

iv) The soil quality in the project area appears to be good and would support vegetation after suitable reclamation measures.

LIST OF EQUIPMENT USED IN THE PROJECT

Sl. No.	Name of the Equipment	Make / Model
	A. FIELD EQUIPMENT	
1.	Respirable D+ust Sampler	Envirotech
2.	Fine Particulate sampler	Envirotech
3.	Aneroid Barometer	Imported
4.	Wind Vane	Lawrence & Mayo
5.	Wet & Dry Bulb Thermometer	Lawrence & Mayo
6.	Whirling Hygrometer	Lawrence & Mayo
7.	Cup Anemometer	Lawrence & Mayo
8.	Hygrometer	Imported
9.	Rain Gauge	Lawrence & Mayo
10.	Noise Level Meter	CYGNET
	B. LAB EQUIPMENT	
11.	Single Pan Balance	Mettler (Imported)
12.	Hot Air Oven	Toshniwal
13.	Hot Plate	Instruments & Equipments
14.	Muffle Furnace	Toshniwal
15.	Water & Soil Analysis Kit	Elico
16.	Serological Water Bath	M.C. Dalal
17.	BOD Incubator 20 ± 1°C	M.C. Dalal
18.	Digital Spectrophotometer	Elico
19.	Refrigerator	Godrej

LIST OF FIGURES

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1.0 INTRODUCTION

Environmental Management Plan (EMP) for a Coal project is a prerequisite and the same constitutes basis for environmental appraisal of the project and its clearance from MoEF. In this context, baseline data of environmental quality (ambient air quality along with micrometeorology, water, noise, soil etc.) has to be generated prior to the preparation of EMP and it serves as pre-project datum lines for Environmental Impact Assessment (EIA).

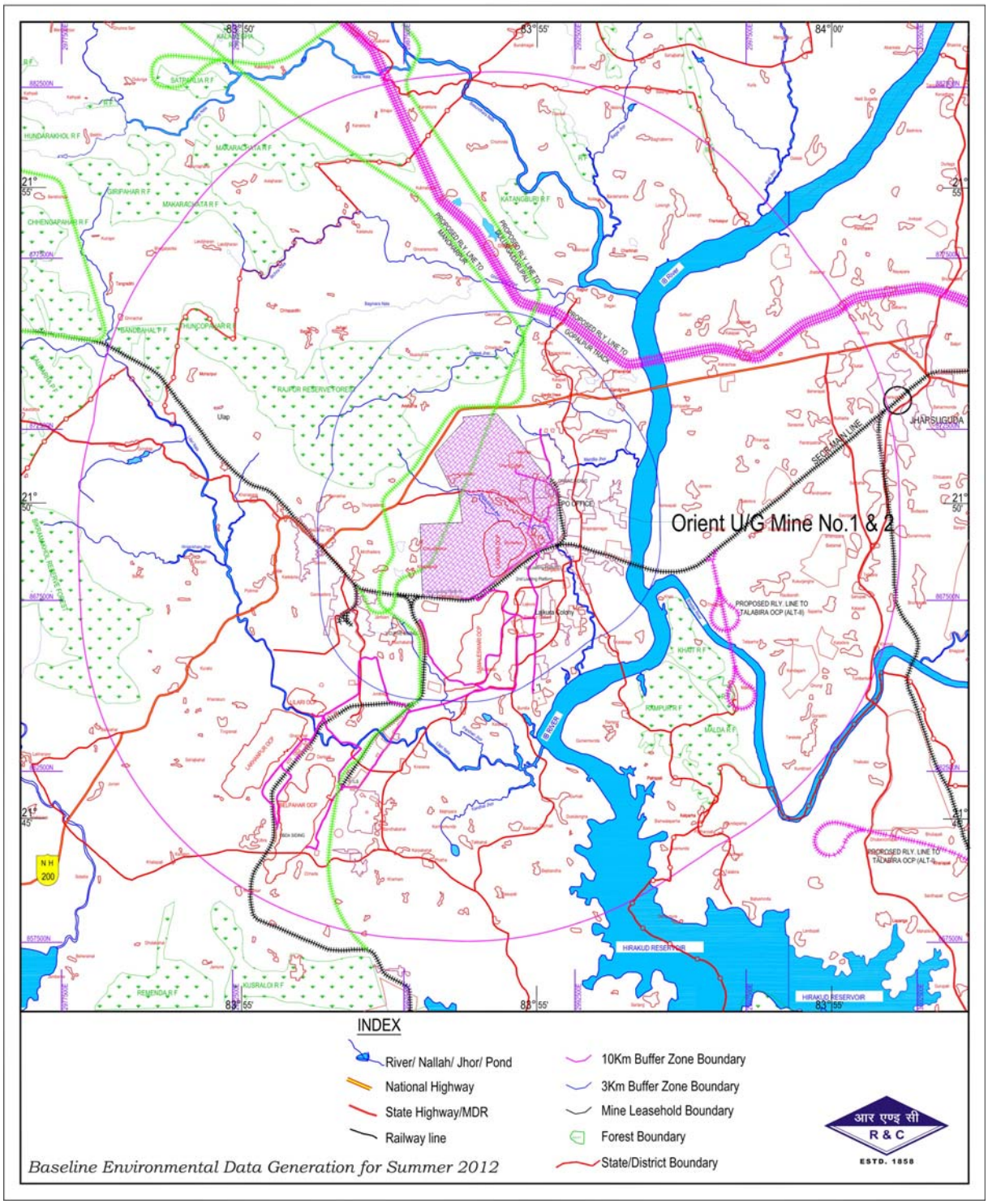
Central Mine Planning and Design Institute Ltd. (CMPDI), RI-VII, Bhubaneswar a subsidiary of Coal India Ltd. (CIL) has undertaken the task of preparation of EMP for coal projects under the jurisdiction of CIL. **Mahanadi** C**oalfields Ltd. (MCL), Sambalpur** a subsidiary of CIL, has several on going mining projects in **Ib Valley Coalfield** and has proposed **operating Orient UGP** for baseline data generation for environmental appraisal and its clearance.

CMPDI, Regional Institute –VII, Bhubaneswar which undertakes planning and design of mining projects for MCL, desired to have existing environmental status of the operating Orient UGP in Ib Valley area for preparing EIA & EMP. Hence, it entrusted the task of one complete season baseline environmental data generation to M/s. Richardson & Cruddas (1972) Ltd., a Government of India undertaking, Chennai.

The mine site environs are shown in Fig.I.1.

This report consists of baseline data collected from 05th March to 26th May 2012 representing Summer season for the proposed project.

FIG.I.1 LOCATION MAP OF ORIENT UGP AND ITS ENVIRONS



2.0 SCOPE AND METHODOLOGY

2.1 Preamble

The scope of the study and the present report covers the detailed characterisation of the existing environmental status in the study area for major environmental components viz. micrometeorology, ambient air quality, water/waste water quality, noise level and soil quality.

2.2 Micrometeorology

As a part of this study, micrometeorology and microclimatic parameters were recorded by installing a meteorological station at Core zone. Data of wind velocity, wind direction, ambient temperature, relative humidity and cloud cover were recorded at hourly intervals in a day throughout the study period. Further rainfall also has been recorded and reported.

Wind velocity and wind direction were recorded using cup anemometer and wind vane respectively. Ambient temperature was noted by wet and dry bulb thermometer. Relative humidity was measured from hygrometer and a self-recording rain gauge was used for rainfall data collection. Cloud cover data has been collected by visual inspection.

2.3 Ambient air quality

To assess the ambient air quality status, monitoring stations were identified on the basis of meteorology in the upwind and downwind direction as well as to represent the cross sectional scenario of the project site. Based on the production activities, the parameters chosen for assessment of air quality are Particulate Matter <10 (PM_{10}), Particulate Matter <2.5 ($PM_{2.5}$), Sulphur dioxide (SO_2), Oxides of Nitrogen (NO_x), Ammonia (NH_3), Ozone (O_3), Benzene , Benzo(a)pyrene and heavy metals.

Calibrated Respirable Dust sampler (with an average flow of 1.2 - 1.4 m3/min.) were used for monitoring of PM10 and a tapping provided in the hopper of the same sampler was utilised for sampling of SO_2,NO_2 , O3 , NH3 with proper flow controller (1 L/min). Calibrated APM 550 Fine Particle Sampler (with an average flow of 1.2

m3/min.) was used for monitoring of PM2.5. A temporary field laboratory for the purpose of calibration of equipments and standardisation of analytical procedures was also established. A digital imported CO detector was used for monitoring of CO. Collected samples were analysed on the day of sample collection with the following procedure.

PM & PM10

Calibrated Respirable Dust Sampler with Whatman's GF/A micro fibre filter paper was used for the determination of PM. PM10 is a measure of particulate matter having size <10 microns.The dust particles having size >10 microns is being collected in the cyclone and measured. This along with PM10 value gives total PM.

PM2.5

Calibrated APM 550 Fine Particle Sampler with Whatman's standard 47 mm diameter filter media was used for the determination of Fine Particles (PM2.5). PM2.5 is a measure of particulate matter having size <2.5 microns. APM 550 Fine Particle Sampler is based on impactor designs standardized by USEPA for ambient air quality monitoring.

Ambient air laden with suspended particulates enters the Respirable Dust Sampler (RDS) through the inlet pipe of sampler by means of high flow rate blower (1.2 to 1.4 m^3/min). As the air passes through the cyclone, coarse, non-respirable dust (size > 10 microns) is separated from the air stream by centrifugal forces acting on the solid particles. These separated particles fall through the cyclone's conical hopper and collect in the sampling bottle placed at bottom. The fine dust forming the respirable fraction (size <10 microns) of the Total Suspended Particulates passes through the cyclone and is carried by the air stream to the Glass Micro-fibre Filter Paper. The Respirable Particulate Matter (RPM) is retained by the filter and the carrier air exhausted from the system through the blower. The mass concentration (µg/m^3) of Respirable Particulate Matter in the ambient air is computed by measuring the mass of collected particulates and the volume of air sampled.

SO_2 (Modified West & Gaeke Spectrophotometer method)

Ambient air is bubbled at the rate of 0.5 -1.0 l/min in an Impinger containing a scrubbing solution of Sodium-Tetra Chloro Mercurate. The resultant compex is

reacted with P-Rosaniline and Formaldehyde to form coloured Para-Rosaniline methyl sulphuric acid. The absorbance of the solution is measured in a Spectrophotometer at a wavelength of 560nm. The SO2 is then calculated from standard graph.

NO_2 (Jacob & Hocheiser modified method)

Ambient air is bubbled at the rate of 0.5-1.0 l/min in an Impinger containing a solution of Sodium Hydroxide and Sodium Arsenate. The resultant Nitrite Ion is reacted with Phosphoric acid, Sulphanilamide and N-ethylene di-amine di-hydro chloride to form a coloured complex. The absorbance is measured in a Spectrophotometer at a wavelength of 540 nm. The concentration of NO_2 is then calculated by using standard graph.

Ozone (Chemical Method)

The micro amounts of ozone and the oxidants liberate Iodine when absorbed in a 1% solution of potassium iodide buffered at pH 6.8 +/-0.2.The iodine liberated is determined spectrophotmetrically by measuring the absorption of tri-iodide ion at 352nm**.**

Ammonia (Indophenol blue method)

Ammonia in the air is collected by bubbling a measured volume of air through a dilute solution of sulphuric acid to form ammonium sulphate.The ammonium sulphate thus formed in the sample is analysed colorometrically by reaction with phenol and alkaline sodium hypho chlorite to produce indophenol. The reaction is accelerated by the addition of Sodium Nitroprusside catalyst.

Benzene and Benzopyrene

The method is designed to collect particulate phase PAH in ambient air and fugitive emissions and to determine individual PAH compounds using capillary gas chromatography equipped with flame ionization detector.

Heavy metals

The AAS technique makes use of absorption spectrophotometry to assess the concentration of metals in the sample. The method is based on active sampling using PM10 high volume sampler and then sample analysis is done by Atomic absorption spectrophotometer. The methodology adopted are given as follows:

S.No.	Parameters	Methodology
1	Particulate Matter <10	Respirable dust sampling and gravimetric analysis
2	PM2.5	Gravimetric method
3	Sulphur di-oxide	Improved West-Gaeke-Spectrophotometric Method
4	Oxide of Nitrogen	Jacob and Hocheiser Modified Method
5	Carbon–monoxide	Detector method
6	Ammonia	Indophenol method
7	Benzene	Adsorption and desorption followed by EC
8	Benzo-pyrene	Solvent extraction followed by GC analysis
9	Heavy Metals	AAS method after sampling on EPM Filter paper

2.4 Water quality

Water samples were collected and analyzed as per procedures outlined in IS-2488/ IS-3025 / AWWA / APHA. Sterilized bottles were used for collection of water sample for bacteriological analysis, stored in icebox and transported to the laboratory for the analysis. Parameters like pH, Temperature, Dissolved Oxygen, Residual Chlorine, Conductivity, Free Ammonia, Total Hardness, Calcium Hardness and Magnesium Hardness were analyzed in the field while collecting the samples. MPN index of Coliforms are determined in the laboratory as per standard methods.

The analytical techniques used for water and wastewater analysis is given in the Table-2.1.

TABLE-2.1
ANALYTICAL TECHNIQUES FOR WATER AND WASTEWATER ANALYSIS

Parameter	Method
pH	APHA-4500-H+
Colour	APHA-2120 C
Odour	IS: 3025, Part-4
Temperature	APHA-2550 B
Dissolved Oxygen	APHA-4500 O
BOD	APHA-5210 B
lectrical conductivity	APHA-2510 B

Parameter	Method
Turbidity	APHA-2130 B
Chlorides	APHA-4500 Cl-
Fluorides	APHA-4500 F-
Total dissolved solids	APHA-2540 C
Total suspended solids	APHA-2540 D
Total hardness	APHA-2340 C
Sulphates	APHA-4500 SO4-2
Arsenic	APHA-3120 B/ APHA-3114 B/ APHA-3500 As
Calcium	APHA-3120 B/ APHA-3500 Ca
Magnesium	APHA-3120 B/ APHA-3500 Mg
Sodium	APHA-3120 B/ APHA-3500 Na
Potassium	APHA-3120 B/ APHA-3500 K
Manganese	APHA-3120 B/ APHA-3500 Mn
Mercury	APHA-3112 B/ APHA-3500 Hg
Selenium	APHA-3120 B/ APHA-3114 B/ APHA-3500 Se
Lead	APHA-3120 B/ APHA-3500 Pb
Copper	APHA-3120 B/ APHA-3500 Cu
Cadmium	APHA-3120 B/ APHA-3500 Cd
Iron	APHA-3120 B/ APHA-3500 Fe
Zinc	APHA-3120 B/ APHA-3500 Zn
Boron	APHA-4500 B
Coliform organisms	APHA-9215 D
Alkalinity	APHA-2320 B

2.5 Noise levels

Ambient noise level measurements in four co-ordinal directions were carried out using CYGNET sound level meter, with windscreen during daytime as well as night time.

Noise measurements were made at 1.5 m above ground and about 3m away from walls, buildings or other sound reflecting sources. The readings were taken at an interval of one minute for 30 minutes and mean Leq. values has been reported. Ambient noise levels are compared with Air quality standards in respect of noise for residential area.

2.6 Soil quality

To assess the baseline soil quality, soil samples were collected from identified locations in core & buffer zones using augers at depths 30, 60 and 100 cms. The samples were analyzed for chemical parameters like pH, EC, N, P, K and engineering parameters like textural class, bulk density, liquid limit, field capacity, wilting coefficient and available water storage capacity.

3.0 MICROMETEOROLOGICAL STATUS

3.1 Rationale behind sampling

Meteorological parameters are important factors in the study of air pollution. The transport and diffusion of the pollutants in the atmosphere are governed by meteorological factors. Factors like wind velocity, wind direction and atmospheric-stability are known as primary / basic meteorological parameters since the dispersion and diffusion of pollutants depend mainly on these factors. Factors like ambient temperature, humidity, rainfall, atmospheric pressure, etc., are known as secondary meteorological parameters as these factors control the dispersion of the pollutants indirectly by affecting the primary factors. Thus, to assess the air pollution impact it becomes essential to collect the above-mentioned meteorological parameters in the project area.

Micrometeorological and microclimatic parameters were recorded by installing a meteorology station in Corezone as it represents the prevailing micrometeorological aspects of the study area. During the study period, hourly reading of wind velocity, wind direction, temperature, humidity, cloud cover etc., were recorded and reported. Further daily rainfall has been recorded and reported.

3.2 Data presentation & analysis

The micrometeorological data thus collected has been processed and analyzed as per standard procedures. The seasonal wind distribution is given in the Table - 3.1. The meteorology status is furnished in Table - 3.2.The daily abstract, micrometeorology data and daily windrose are given in **Annexure I.** The seasonal & daytime and nighttime windroses are given in fig. III.1 & III.2.

Table – 3.1 :

Seasonal wind distribution data

Project : Orient UGP

Season : Summer 2012

Location : Core-zone

Wind Direction (from)	Wind Velocity (% Duration)			
	< 1	1 - 5	5 – 11	11 – 19
N	15.9	0.3	0.15	0
NNE		0.6	0.1	0.1
NE		1.75	0.2	0.05
ENE		1.5	0.1	0
E		1.1	0.3	0
ESE		2	0	0
SE		4.2	0.6	0.1
SSE		3.55	0.3	0.05
S		6.3	0.9	0.1
SW		15.2	1.8	0.25
SSW		21.75	1.8	0.15
WSW		7.2	1.5	0.05
W		0	0	0
WNW		1.25	0.2	0
NW		7.2	0.15	0
NNW		0.9	0.35	0
Season	15.9	74.8	8.45	0.85

The following is the summary of the analysis of the micrometeorological data collected at Orient OCP.

Table – 3.2 : Meteorology status

Meteorology station : Core Zone	
Climatic conditions	**Summer season (05th March – 26th May 2012)**
Predominant wind direction (from)	**South West**
Predominant prevailing wind range (Kmph)	1 – 5
Wind speed (m/sec)	
i) Minimum	< 1.0
ii) Maximum	18.8
Temperature (°C)	
i) Minimum	20.5
ii) Maximum	44.0
Relative humidity (%)	
i) Minimum	28.0
ii) Maximum	88.0
Total rainfall (cm)	-

Seasonal Windrose

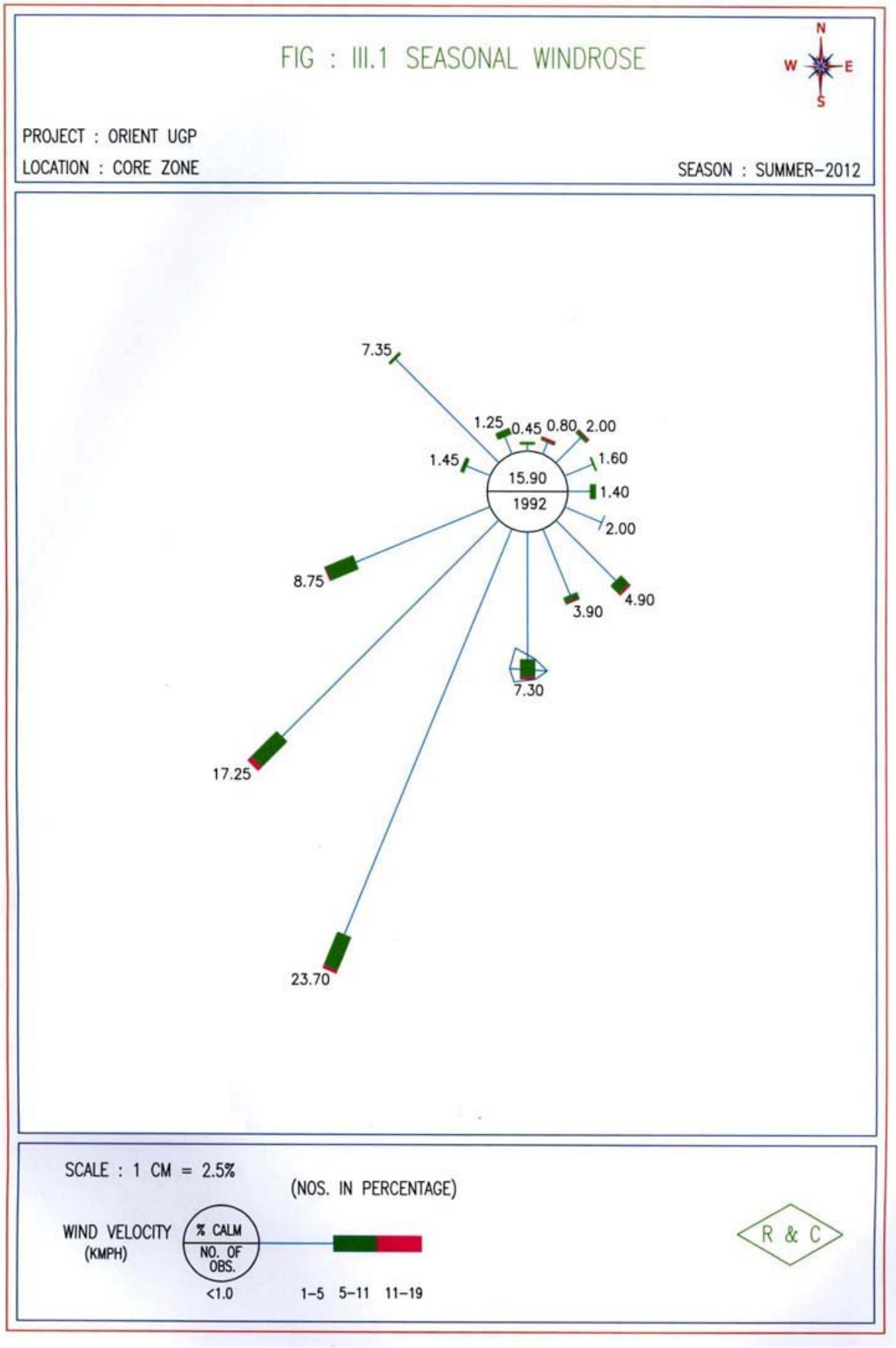


FIG : III.2 DAY TIME & NIGHT TIME WINDROSES

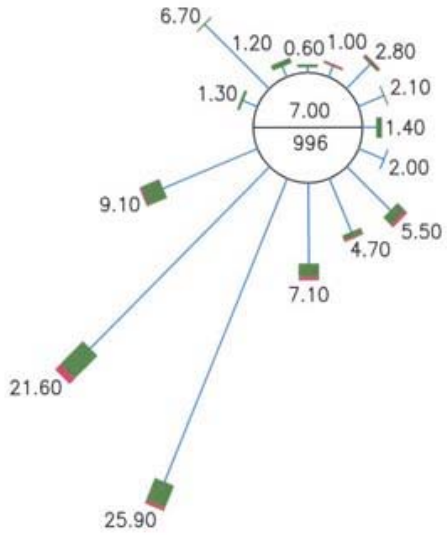
PROJECT : ORIENT UGP

LOCATION : CORE ZONE

SEASON : SUMMER–2012

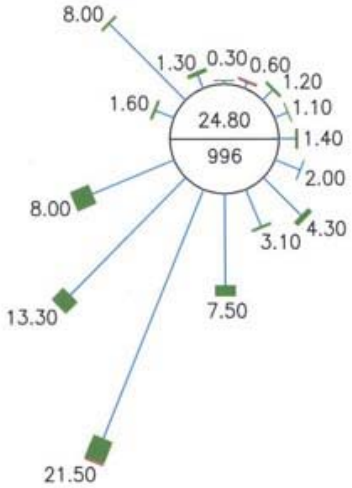
DAY TIME

TIME: 06.00hrs. TO 18.00hrs.



NIGHT TIME

TIME: 18.00hrs. TO 06.00hrs.



SCALE : 1 CM = 5%

(NOS. IN PERCENTAGE)

WIND VELOCITY (KMPH)

% CALM

NO. OF OBS.

<1.0 1–5 5–11 11–19

R & C

4.0 AMBIENT AIR QUALITY STATUS

4.1 Preamble

The principle objective of the ambient air quality monitoring is to assess the existing levels of air pollutants as well as the regional background concentration in and around the project area. Air pollution forms an important and critical factor to study the environmental issues in the mining areas. Air quality has to be frequently monitored to know the extent of pollution due to mining and allied activities. The ambient air quality monitoring was carried out at eight stations.

The monitoring stations were identified on the basis of meteorology in the upwind and downwind direction as well as to represent the cross sectional scenario of the project site. The monitoring network was designed based on the available meteorological and climatologically norms of predominant wind direction and wind speed of the study region.

The parameters selected for analyzing the air quality status are Particulate Matter <10 & 2.5 , Sulphur dioxide (SO_2),Nitrogen oxides (NO_x), Ammonia (NH3), Ozone (O3), BaP, Heavy Metals.As per the existing norms, air quality monitoring was carried out on 24 hourly basis for SPM & RPM ,SO_2 and NO_x samples for two days in a week for twelve weeks in the season. The location details of ambient air quality monitoring stations are given in the Table - 4.1 and are shown in the Fig.(Appendix)

Table - 4.1 Details of Ambient air quality monitoring stations (Location & Bearing)

Sl. No.	Location Name	Location Code	Direction (from Site)	Distance (Km)
1.	Corezone (Store)	A1	**-**	-
2.	Core zone (Near Temple)	A2	**-**	-
3.	Mandlia	A3	**E**	0.8
4.	Gandghora	A4	NE	1.5
5.	Gandhi Chowk	A5	**NNE**	1.6
6.	Chheikuthi	A6	**N**	1.4
7.	Jamkani	A7	**SW**	1.4
8.	Lajkura	A8	**S**	0.8

4.2 Rationale behind sampling

(i) Corezone (A1 & A2) : This location is selected to assess the increase in pollution levels due to the ongoing mining operation through post project monitoring.

(ii) Mandlia (A3): This location is situated at 0.8 km distance from the mine towards E direction. The data will help to know the extent of pollution, if any, due to mining operations in nearby area and to assess baseline status in the downwind direction.

(iii) Ganddhora (A4): This location is situated at 1.5 km distance from the mine towards North-East direction and it was selected for air quality monitoring to assess baseline status in the downwind direction.

(iv) Gandhi Chowk (A5): This location is situated about 1.6 km distance from site towards North-North East direction and it was selected for air quality monitoring to assess baseline status in the nearby area.

(v) Chheikuthi (A6): This location is situated at a distance of 1.4 km towards North of operating mine area. It was selected to assess the impact of air pollutants due to nearby mining and to know the baseline air quality status of this area.

(vi) Jamkani (A7): This location is situated at a distance of 1.4 km towards SW direction of operating mine area and it was selected for air quality monitoring to assess baseline status in the upwind direction.

(vi) Lajkura (A8): This location is situated at a distance of 0.8 km towards south direction of operating mine area and it was selected for air quality monitoring to assess baseline status in the upwind direction.

4.3 Data presentation & analysis

The ambient air quality data collected are furnished in **Annexure-II** and the abstract of the same is given in the Table - 4.2.

Table – 4.2 Ambient Air Quality Status

(All units in µg/m^3)

Location name & code	Min	98th Per.	Max	AM	GM	Std.dev	CPCB Limit
PM10							
Corezone (Store) (A1)	64	94	94	84.0	83.8	6.1	100
Core zone (Near Temple) (A2)	89	115	115	100.9	100.7	6.8	
Mandlia (A3)	66	82	82	75.9	75.8	4.3	
Gandghora (A4)	65	77	77	71.0	70.9	3.8	
Gandhi Chowk (A5)	68	81	81	73.8	73.7	3.6	
Chheikuthi (A6)	58	84	84	71.6	71.2	8.2	
Jamkani (A7)	52	62	62	49.8	49.5	5.8	
Lajkura (A8)	50	70	70	58.3	58.0	5.6	
PM2.5							
Corezone (Store) (A1)	19	28	28	25.2	25.1	1.9	60
Core zone (Near Temple) (A2)	28	37	37	32.3	32.3	2.2	
Mandlia (A3)	23	29	29	26.5	26.5	1.5	
Gandghora (A4)	23	27	27	24.9	24.9	1.4	
Gandhi Chowk (A5)	26	31	31	28.0	28.0	1.3	
Chheikuthi (A6)	20	29	29	24.4	24.2	2.9	
Jamkani (A7)	14	21	21	16.9	16.8	2.0	
Lajkura (A8)	17	24	24	19.8	19.7	1.9	
SO_2							
Corezone (Store) (A1)	11.0	17.0	17.0	13.9	13.8	1.6	80
Core zone (Near Temple) (A2)	13.7	16.6	16.6	15.4	15.4	0.7	
Mandlia (A3)	14.2	16.0	16.0	15.0	15.0	0.5	
Gandghora (A4)	17.6	20.4	20.4	18.7	18.7	0.9	
Gandhi Chowk (A5)	14.0	16.8	16.8	15.1	15.1	0.9	
Chheikuthi (A6)	10.6	13.8	13.8	11.7	11.7	0.9	
Jamkani (A7)	10.0	13.1	13.1	11.4	11.4	0.8	
Lajkura (A8)	10.3	13.7	13.7	11.4	11.3	0.8	
NOx							
Corezone (Store) (A1)	12.9	24.6	24.6	17.4	17.0	4.1	80
Core zone (Near Temple) (A2)	14.8	19.5	19.5	17.8	17.8	1.3	
Mandlia (A3)	17.6	20.3	20.3	19.0	19.0	0.8	
Gandghora (A4)	17.0	19.5	19.5	18.3	18.3	0.7	
Gandhi Chowk (A5)	16.9	19.4	19.4	18.2	18.2	0.7	
Chheikuthi (A6)	16.2	19.3	19.3	17.7	17.7	0.9	
Jamkani (A7)	13.3	16.7	16.7	14.8	14.7	1.0	
Lajkura (A8)	16.5	19.9	19.9	18.0	18.0	1.0	
NH_3							
Corezone (Store) (A1)	13	26	26	19.0	18.7	3.5	400
Core zone (Near Temple) (A2)	10	20	20	14.5	14.3	2.7	
Mandlia (A3)	14	25	25	20.2	19.9	3.1	
Gandghora (A4)	14	25	25	18.6	18.4	2.9	
Gandhi Chowk (A5)	16	25	25	20.3	20.2	2.2	
Chheikuthi (A6)	20	28	28	23.6	23.5	2.2	
Jamkani (A7)	11	20	20	15.3	15.1	2.3	
Lajkura (A8)	13	22	22	17.3	17.1	2.3	

Note : All CO, Benezene and BaP values were found to be BDL.

Core zone

PM10 and PM2.5 values are ranging from 64 μg/m^3 to 115 μg/m^3 and 19 μg/m^3 to 37 μg/m^3 respectively. SO_2 and NO_x values are varying between 11.0 to 17.0 μg/m^3 and 12.9 to 24.6 μg/m^3 respectively. The ammonia was to found to be maximum extent of 26 μg/m^3. *All the values are found to be within the CPCB Standards except PM_{10}.*

Buffer zone

PM10 and PM2.5 values are ranging from 42 μg/m^3 to 84 μg/m^3 and 14 μg/m^3 to 31 μg/m^3 respectively. SO_2 and NO_x values are varying between 10.0 to 20.4 μg/m^3 and 8.6 to 12.7 μg/m^3 respectively. The ammonia was to found to be maximum extent of 28 μg/m^3. *All the values are found to be within the CPCB Standards.*

4.4 Summary

In general, all values are found to be well within the prescribed limits of CPCB except PM10 in core zone area.

5.0 WATER QUALITY STATUS

5.1 Rationale behind sampling

Any adverse impact or pollution consequence of water will have serious effect on the environment. Hence, it becomes important to assess the water quality periodically in the mining area. Thus, to assess the water quality, nine locations are identified and samples (9 Nos.) were collected and analysed for physico-chemical and heavy metal parameters. Bacterial examination was also carried out to find out the Coliform contamination (if any) at water sources. The water quality assessment has been made from the following monitoring stations and are shown in Fig. I (Appendix).

- **Mine discharge – Orient UGP - W1**
- **Nalla near Core zone - W2**
- **Pond Water, Bundia village - W3**
- **IB River U/S - W4**
- **IB river D/S - W5**
- **Tube well, Brajrajnagar - W6**
- **Tube well, Juribaga village - W7**
- **Dugwell, Katapalli village - W8**
- **Dugwell, Belpahar village - W9**

5.2 Data presentation & analysis

The detailed water quality data generated are given in **Annexure III**. The abstract of water quality status is furnished in Table 5.1 – 5.3.

Table – 5.1(a) Waste water quality status

Source	pH	Suspended Solids (mg/l)	BOD (mg/l)	COD (mg/l)
Mine discharge	8.08	38	8	52
GSR 422E Norms	**5.5-9.0**	**100**	**30**	**250**

Table – 5.2 Water quality status

Source	pH		Turbidity (NTU)	TDS (mg/l)		Total Hardness (mg/l)		Iron (mg/l)		Chloride (mg/l)		Sulphate (mg/l)		Fluoride (mg/l)	
	Min	Max		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Drinking / Ground Water	7.25	7.88	5	310	410	154	182	0.08	0.12	40	88	14	24	0.09	0.01
IS 105000 Norms	6.5-8.5		10	500-2000		300-600		0.3-1.0		250-1000		200-1000		1.0	

Table – 5.3 Surface water quality status

Source	pH		Colour (Hazen Units)		TDS (mg/l)		Iron (mg/l)		Chloride (mg/l)		Sulphate (mg/l)		Fluoride (mg/l)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
River	7.14	7.96	5	18	254	612	0.09	0.24	54	174	14	68	0.10	0.30
IS:2296-1982	6.5-8.5		300		1500		50		600		400		1.5	

5.3 Summary

At all locations, Oil and grease, phenolic compounds, cyanides, sulphides and insecticides are found to be absent and all heavy metal values except Iron and Zinc are found to be below the detectable limit. In general, the water quality at all eight locations are found to be well within the prescribed norms of GSR: 422E, IS: 10500 - 1991 and IS: 2296 - 1982.

6.0 NOISE LEVEL STATUS

6.1 Rationale behind sampling

To know the background ambient noise level at the operating Orient UGP and surrounding environment, 8 locations (two in core zone and six in buffer zone) were identified for baseline study.

The noise level monitoring stations are given below and are shown in Fig. (Appendix) and given in Table 6.1.

TABLE - 6.1

AMBIENT NOISE LEVEL MONITORING STATIONS

Sl. No.	Location Name	Location Code
1.	**Corezone (Store)**	N1
2.	**Core zone (Near Temple)**	N2
3.	**Mandlia**	N3
4.	**Gandghora**	N4
5.	**Gandhi Chowk**	N5
6.	**Chheikuthi**	N6
7.	**Jamkani**	N7
8.	**Lajkura**	N8

6.2 Data presentation & analysis

The generated noise level data are given in **Annexure-IV** and the abstract is furnished in Tables - 6.2.

Table – 6.2: Noise level status

S.No.	Zone	Noise level (dB(A))		Noise level Standards	
		Daytime	Nighttime	Daytime	Nighttime
1.	Core zone	52.9 – 60.2	50.5 – 56.4	**75**	**70**
2.	Buffer zone	40.5 – 48.7	35.8 – 43.2	**55**	**45**

Mean L_{eq} noise levels at day time and night time are ranging from 41.0 to 60.0 dB(A) and 35.8 to 57.6 dB(A) respectively in the study area. While comparing with IS: 4954 -1986 norms for acceptable outdoor noise levels in residential area, these values are found to be within the limits.

6.3 Summary

While comparing with IS: 4954 -1986 norms for acceptable outdoor noise levels in residential area, the Leq values are found to be within the limits.

7.0 SOIL QUALITY

7.1 Rationale behind sampling

Soil characteristics, erosion aspects, soil fertility etc., have direct bearing on the environment. Knowledge of soil parameters is essential for the planning and implementation of afforestation. Further, major mining activities affect the soil regime of the surrounding areas directly or indirectly. Hence, it becomes important to study the soil characteristics.

By keeping the above aspects in view, five locations are selected in the core and buffer zone. Locations are selected in such a way that different type of soils for supporting different species of vegetation are covered. The soil quality monitoring stations are furnished below and are shown in Fig.(Appendix).

Forest Land, Corezone - S_1
Barren Land, Corezone - S_2
Barren Land, Near Corezone - S_3
Agricultural Land, Bundia village - S_4
Agricultural Land, Gangapur village - S_5

7.2 Data presentation & analysis

The soil quality data collected are given in **Annexure – V** and status of the soil quality is furnished in Table - 7.1.

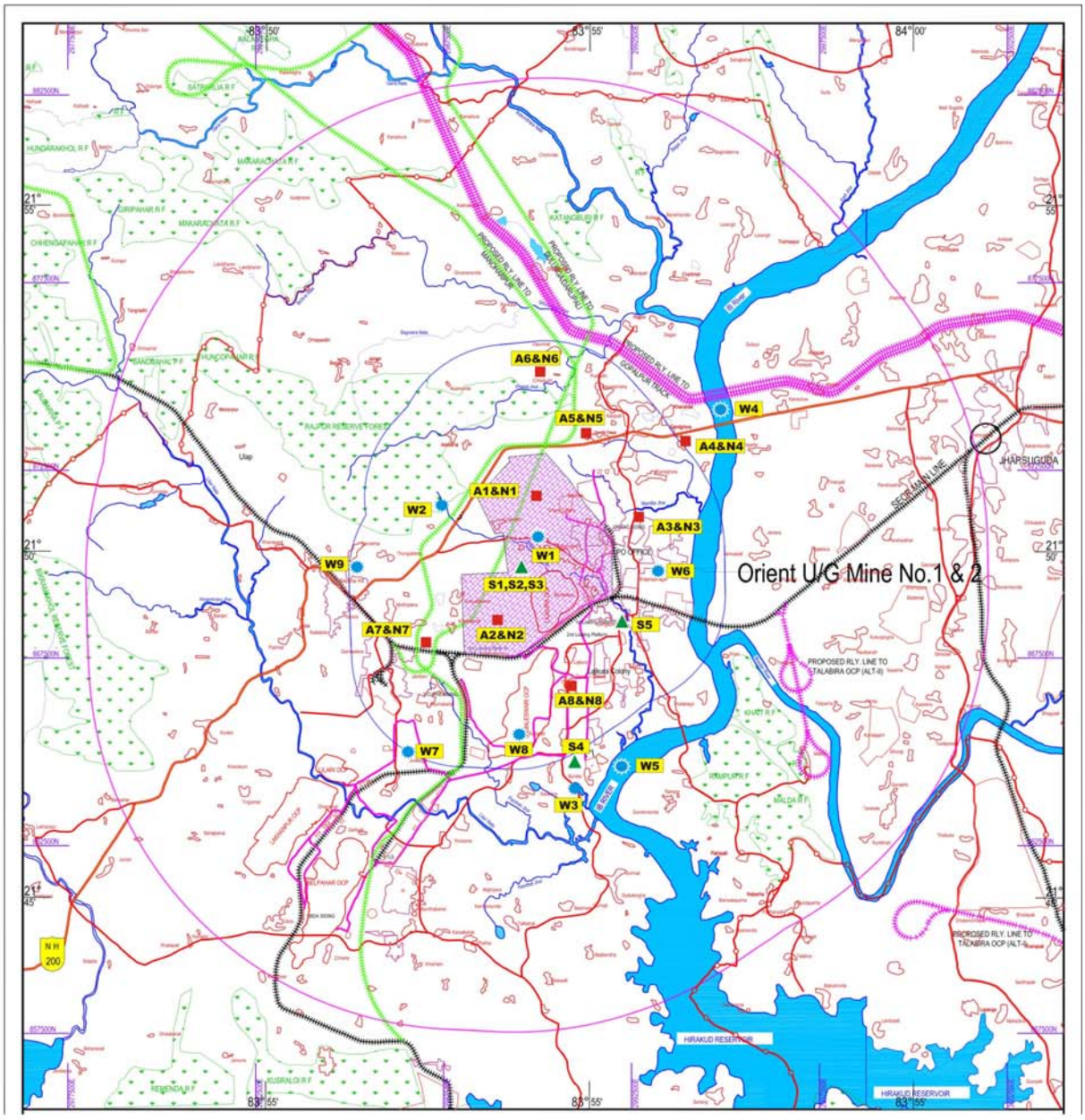
Table - 7.1 Soil quality status

S.No.	Parameters	Range of Concentration
1	pH	7.04 – 7.62
2.	Organic Carbon (%)	0.3 – 4.6
3.	Potassium (kg/ha)	110 – 164
4.	Nitrogen (Kg/ha)	59.4 – 458
5.	Available magnesium (Kg/Ha)	94 – 422
6.	Texture Class	Sandy Loam

7.3 Summary

The soil quality in the project area appears to be good and would support after suitable reclamation measures.

APPENDIX
LOCATION MAP OF ENVIRONMENTAL MONITORING STATIONS



Ambient Air Quality & Noise Level Monitoring Stations

- A1&N1 - Core Zone, Store
- A2&N2 - Core Zone, Near Temple
- A3&N3 - Mandlia village
- A4&N4 - Gandghora village
- A5&N5 - Gandhi chowk
- A6&N6 - Chheikuthi village
- A7&N7 - Jamkani village
- A8&N8 - Lajkura village

Water Quality Monitoring Stations

- W1 - Mine discharge
- W2 - Nalla, near Corezone
- W3 - Pond Water, Bundia village
- W4 - IB river U/S
- W5 - IB river D/S
- W6 - Tube well, Brajrajnagar
- W7 - Tubewell, Juriabag village
- W8 - Dugwell, Katpali village
- W9 - Dugwell, Belpahar village

Soil Quality Monitoring Stations

- S1 - Forest Land, Corezone
- S2 - Barren Land, Corezone
- S3 - Barren Land, Corezone
- S4 - Agri. Land, Bundia village
- S5 - Agri. Land, Gangapur village

Baseline Environmental Data Generation for Summer 2012

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Annexure-I

TABLE NO : 3.1 ABSTRACT OF METEOROLOGICAL DATA

Project : Orient UGP
Season : Summer Season `2012
Location : Core-zone
Month : 5th March`12 to 26th May '12

Date	Wind Velocity (kmph)			Predominant Wind Direction (From)	Temperature (˚C)			Relative Humidity (%) Average			Atm. Pr. (mm / Hg)	Rainfall (mm)	Sky Appearance
	Min	Max	Avg		Min	Max	Avg	Min	Max	Avg			
05/06.03.12	<1.0	5.3	1.7	SW	22.0	38.5	30.2	48	82	63.6	750	0	Clear
06/07.03.12	<1.0	9.8	3.0	SW	23.5	36.5	29.9	49	81	66.4	750	0	Clear
07/08.03.12	<1.0	6.3	2.4	SW	25.0	37.0	30.9	49	81	67.7	750	0	Clear
08/09.03.12	<1.0	7.8	2.7	SW	22.0	36.5	29.8	43	80	65.3	750	0	Clear
09/10.03.12	<1.0	14.2	4.4	SSW	24.5	38.5	30.5	42	82	63.2	750	0	Clear
10/11.03.12	<1.0	15.2	4.4	SW	24.0	36.5	30.0	44	86	62.2	750	0	Clear
11/12.03.12	<1.0	7.2	2.5	SE	23.5	36.5	29.9	49	82	67.9	750	0	Clear
12/13.03.12	<1.0	9.8	2.4	SE	23.0	38.5	30.4	42	82	63.0	750	0	Clear
13/14.03.12	<1.0	9.9	3.5	SE	23.5	36.5	29.9	44	79	61.8	750	0	Clear
14/15.03.12	<1.0	10.3	3.4	SW	23.0	36.5	29.8	44	80	64.6	750	0	Clear
15/16.03.12	<1.0	6.9	2.4	SW	24.5	38.0	30.4	42	80	62.8	750	0	Cloudy
16/17.03.12	<1.0	8.0	2.8	SW	24.0	36.5	30.0	43	80	61.7	750	0	Clear
17/18.03.12	<1.0	7.8	2.4	SE	24.0	36.5	30.0	42	81	61.3	750	0	Clear
18/19.03.12	<1.0	8.2	2.1	SW	23.5	36.5	29.8	38	76	54.5	750	0	Clear
19/20.03.12	<1.0	9.8	2.3	SW	23.5	36.5	29.2	36	75	54.0	750	0	Clear
20/21.03.12	<1.0	17.1	2.8	SE	23.0	36.0	27.5	41	73	56.8	750	0	Clear
21/22.03.12	<1.0	8.5	2.5	SW	22.0	36.5	28.3	45	81	64.2	750	0	Clear
22/23.03.12	<1.0	10.3	2.9	SW	22.0	38.5	29.9	40	79	60.9	750	0	Clear
23/24.03.12	<1.0	10.1	2.4	SW	22.0	38.5	28.8	43	74	59.3	750	0	Clear
24/25.03.12	<1.0	8.7	2.3	S	22.5	38.0	28.5	43	74	60.3	750	0	Clear
25/26.03.12	<1.0	12.6	2.6	SW	22.5	38.5	28.4	43	74	59.4	750	0	Clear
26/27.03.12	<1.0	10.5	2.2	SSW	22.5	38.0	30.3	40	76	60.3	750	0	Clear
27/28.03.12	<1.0	9.6	2.3	SW	24.0	38.5	30.4	40	76	60.5	750	0	Clear
28/29.03.12	<1.0	11.5	2.6	SW	23.5	38.5	28.5	43	76	60.2	750	0	Clear
29/30.03.12	<1.0	16.1	2.4	SE	24.0	36.5	30.0	41	74	56.5	750	0	Clear
30/31.03.12	<1.0	8.1	2.9	SW	23.5	38.5	29.9	42	75	58.3	750	0	Clear

ABSTRACT OF METEOROLOGICAL DATA (Contd.,)

Date	Wind Velocity (kmph)			Predominant Wind Direction (From)	Temperature (°C)			Relative Humidity (%) Average			Atm. Pr. (mm / Hg)	Rainfall (mm)	Sky Appearance
	Min	Max	Avg		Min	Max	Avg	Min	Max	Avg			
31/01.04.12	<1.0	8.6	3.7	SSW	21.5	36.5	28.5	39	71	57.3	750	0	Clear
01/02.04.12	<1.0	8.5	2.8	SW	23.0	38.5	29.7	38	69	55.5	750	0	Clear
02/03.04.12	<1.0	6.4	2.3	SW	22.5	38.5	29.0	40	74	58.1	750	0	Clear
03/04.04.12	<1.0	8.3	2.2	SW	22.0	38.5	29.5	36	78	56.8	750	0	Clear
04/05.04.12	<1.0	7.1	3.0	SW	21.5	38.0	29.4	45	78	60.0	750	0	Clear
05/06.04.12	1.3	18.8	3.8	SE	20.5	34.5	26.5	36	78	56.7	750	0	Clear
06/07.04.12	<1.0	7.5	3.2	SW	20.5	36.5	28.5	35	72	52.6	750	0	Clear
07/08.04.12	<1.0	8.0	2.8	SE	23.5	36.5	29.3	34	74	52.2	750	0	Clear
08/09.04.12	<1.0	10.1	3.4	SW	24.0	38.5	30.6	36	75	55.1	750	0	Clear
09/10.04.12	<1.0	10.3	2.9	SW	24.5	38.5	30.8	45	79	61.4	750	0	Clear
10/11.04.12	1.0	1.1	8.6	SE	24.5	40.0	30.5	45	83	65.8	750	0	Cloudy
11/12.04.12	1.9	12.1	4.7	SW	25.5	40.5	31.3	50	88	71.2	750	0	Clear
12/13.04.12	<1.0	10.2	4.4	SE	26.5	39.0	31.4	51	87	71.5	750	0	Clear
13/14.04.12	1.2	9.8	4.3	S	26.5	40.0	31.8	50	88	67.2	751	0	Clear
14/15.04.12	1.7	8.2	4.5	SE	25.0	42.0	31.8	40	87	31.8	751	0	Clear
15/16.04.12	<1.0	6.7	2.7	S	23.5	42.0	31.6	38	85	59.4	751	0	Clear
16/17.04.12	1.6	5.2	2.9	S	22.5	42.0	31.1	36	82	61.2	751	0	Clear
17/18.04.12	<1.0	8.1	2.8	S	22.5	44.0	32.7	33	82	56.8	751	0	Clear
18/19.04.12	<1.0	5.4	2.0	SSW	22.5	36.0	29.3	36	85	63.6	751	0	Clear
19/20.04.12	<1.0	6.5	2.3	SE	23.0	39.0	29.5	36	82	60.0	751	0	Clear
20/21.04.12	<1.0	6.7	2.4	NW	22.5	42.0	31.5	35	79	56.8	751	0	Clear
21/22.04.12	<1.0	10.6	3.9	SW	22.5	40.0	29.7	33	80	58.4	751	0	Clear
22/23.04.12	1.2	8.3	3.7	SSW	23.0	37.5	28.3	36	82	64.8	751	0	Clear
23/24.04.12	1.2	8.5	3.7	SE	23.0	40.4	29.6	34	83	61.0	751	0	Clear
24/25.04.12	1.1	5.2	2.8	SE	22.5	37.0	28.7	33	85	60.7	751	0	Clear
25/26.04.12	1.3	4.9	2.3	SSW	22.5	40.0	30.5	34	85	62.2	751	0	Clear
26/27.04.12	1.0	3.4	1.9	SSW	23.0	40.0	30.5	32	83	59.6	751	0	Clear
27/28.04.12	1.0	2.6	1.7	E	23.0	38.5	28.5	36	84	65.1	751	0	Clear
28/29.04.12	1.6	4.4	3.2	SW	23.5	40.0	29.5	34	83	61.4	751	0	Clear

ABSTRACT OF METEOROLOGICAL DATA (Contd.,)

Date	Wind Velocity (kmph)			Predominant Wind Direction (From)	Temperature (°C)			Relative Humidity (%) Average			Atm. Pr. (mm / Hg)	Rainfall (mm)	Sky Appearance
	Min	Max	Avg		Min	Max	Avg	Min	Max	Avg			
29/30.04.12	3.1	6.9	4.8	SSE	22.5	40.0	30.5	33	80	59.1	751	0	Clear
30/01.05.12	5.4	9.2	7.2	SE	22.5	37.0	28.3	36	84	65.2	751	0	Clear
01/02.05.12	2.2	11.2	7.3	S	22.5	39.0	29.3	33	78	57.6	751	0	Clear
02/03.05.12	1.7	6.2	3.5	SSW	23.0	38.5	29.5	35	81	55.5	751	0	Clear
03/04.05.12	<1.0	4.5	1.8	SE	23.0	40.0	29.5	33	79	56.1	751	0	Clear
04/05.05.12	1.2	7.4	2.8	SW	23.5	39.5	29.5	32	78	55.2	751	0	Clear
05/06.05.12	<1.0	5.8	2.6	SSW	22.5	40.0	29.4	33	75	55.4	751	0	Clear
06/07.05.12	1.1	4.4	2.7	SSE	23.0	39.5	29.6	32	74	54.2	751	0	Cloudy
07/08.05.12	1.3	7.5	3.8	SW	22.5	40.0	29.8	33	78	54.1	751	0	Clear
08/09.05.12	<1.0	3.6	1.6	SSW	23.0	38.5	23.4	30	75	53.2	751	0	Clear
09/10.05.12	<1.0	4.5	2.1	SW	23.0	39.0	30.3	28	75	52.4	751	0	Clear
10/11.05.12	<1.0	7.7	2.8	S	22.5	40.0	29.2	29	75	55.1	751	0	Clear
11/12.05.12	<1.0	4.8	2.6	WSW	23.0	40.0	30.5	32	75	53.2	751	0	Clear
12/13.05.12	<1.0	5.5	2.6	SW	23.0	40.0	29.5	31	82	58.9	751	0	Clear
13/14.05.12	<1.0	4.6	2.7	SE	23.5	37.5	23.3	36	81	64.7	751	0	Clear
14/15.05.12	<1.0	9.8	4.0	SE	22.5	40.0	29.6	34	83	60.3	751	0	Clear
15/16.05.12	<1.0	4.8	2.8	SSE	22.0	40.0	29.6	34	81	60.6	751	0	Clear
16/17.05.12	<1.0	4.2	1.9	SSW	23.0	39.0	29.6	28	76	57.1	751	0	Clear
17/18.05.12	<1.0	5.1	2.3	SW	22.5	38.0	28.3	36	78	62.3	751	0	Clear
18/19.05.12	<1.0	2.4	1.3	S	23.0	40.0	29.6	32	81	60.7	751	0	Clear
19/20.05.12	<1.0	2.8	1.6	SE	22.5	38.0	28.5	33	80	60.1	751	0	Clear
20/21.05.12	<1.0	3.1	1.5	SW	22.5	40.0	30.0	34	79	60.1	751	0	Clear
21/22.05.12	<1.0	3.2	1.7	SW	22.5	39.5	29.3	29	78	57.2	751	0	Clear
22/23.05.12	<1.0	3.4	1.8	SW	22.0	38.0	28.3	36	76	61.5	751	0	Clear
23/24.05.12	1.2	6.8	3.0	SW	23.0	39.0	29.5	35	77	61.6	751	0	Clear
24/25.05.12	1.8	4.6	3.4	SE	23.0	39.5	29.6	36	76	61.2	751	0	Clear
25/26.05.12	<1.0	4.8	2.6	SSE	23.5	40.0	29.5	34	81	60.6	751	0	Clear
26/27.0512	<1.0	6.7	2.8	SE	23.0	38.5	28.5	32	80	59.2	751	0	Clear
Season	**<1.0**	**18.8**	**3.0**	**SW**	**20.5**	**44.0**	**29.7**	**28**	**88**	**59.7**	**751**	**0**	**Clear**

Annexure-II

REPORT ON AMBIENT AIR QUALITY DATA

Name of Project : Orient UGP (IB Valley area)
Location : Corezone (Store)(A1)
Season : Summer 2012
Instrument used : Respirable dust sampler / Fine Particulate Matter

Week	Date	PM_{10} µg/m³	$PM_{2.5}$ µg/m³	SO_2 µg/m³	NOx µg/m³	NH_3 µg/m³	O_3 µg/m³	C_6H_6 µg/m³	CO µg/m³	BaP ng/m³
I	06.03.2012	90	27	16.8	21.0	16	BDL	BDL	BDL	BDL
	07.03.2012	93	28	15.8	23.3	20	BDL	BDL	BDL	BDL
II	15.03.2012	86	26	16.4	24.0	20	BDL	BDL	BDL	BDL
	16.03.2012	84	25	17.0	24.6	23	BDL	BDL	BDL	BDL
III	25.03.2012	94	28	16.2	23.0	24	BDL	BDL	BDL	BDL
	26.03.2012	84	25	13.7	21.6	26	BDL	BDL	BDL	BDL
IV	30.03.2012	83	25	13.5	21.0	22	BDL	BDL	BDL	BDL
	31.03.2012	82	25	13.7	23.1	24	BDL	BDL	BDL	BDL
V	05.04.2012	84	25	11.9	13.4	13	BDL	BDL	BDL	BDL
	06.04.2012	85	26	11.0	13.2	16	BDL	BDL	BDL	BDL
VI	14.04.2012	88	26	11.8	13.3	14	BDL	BDL	BDL	BDL
	15.04.2012	87	26	12.5	15.8	16	BDL	BDL	BDL	BDL
VII	18.04.2012	83	25	13.2	17.3	14	BDL	BDL	BDL	BDL
	19.04.2012	78	23	12.7	16.2	18	BDL	BDL	BDL	BDL
VIII	23.04.2012	83	25	13.8	15.8	20	BDL	BDL	BDL	BDL
	24.04.2012	78	23	14.4	16.9	20	BDL	BDL	BDL	BDL
IX	02.05.2012	84	25	13.6	15.1	16	BDL	BDL	BDL	BDL
	03.05.2012	83	25	14.0	15.4	18	BDL	BDL	BDL	BDL
X	08.05.2012	81	24	13.3	13.6	16	BDL	BDL	BDL	BDL
	09.05.2012	64	19	13.8	14.8	20	BDL	BDL	BDL	BDL
XI	16.05.2012	77	23	13.5	14.6	22	BDL	BDL	BDL	BDL
	17.05.2012	87	26	14.0	14.1	18	BDL	BDL	BDL	BDL
XII	24.05.2012	92	28	13.3	13.7	20	BDL	BDL	BDL	BDL
	25.05.2012	87	26	12.5	12.9	20	BDL	BDL	BDL	BDL

BDL Values for O_3 = <10 µg/m³
BDL Values for C_6H_6 = <0.01 µg/m³
BDL Values for CO = <114.5 µg/m³
BDL Values for BaP = <1 ng/m³

Richardson & Cruddas (1972) Limited

Annexure-II (Contd.)

REPORT ON AMBIENT AIR QUALITY DATA

Name of Project : **Orient UGP (IB Valley area)**
Location : **Corezone (Near Temple)(A2)**
Season : **Summer 2012**
Instrument used : **Respirable dust sampler / Fine Particulate Matter**

Week	Date	PM_{10} µg/m³	$PM_{2.5}$ µg/m³	SO_2 µg/m³	NOx µg/m³	NH_3 µg/m³	O_3 µg/m³	C_6H_6 µg/m³	CO µg/m³	BaP ng/m³
I	06.03.2012	106	34	15.7	18.8	14	BDL	BDL	BDL	BDL
	07.03.2012	102	33	16.0	18.5	18	BDL	BDL	BDL	BDL
II	15.03.2012	93	30	15.8	18.2	18	BDL	BDL	BDL	BDL
	16.03.2012	94	30	15.3	17.2	16	BDL	BDL	BDL	BDL
III	25.03.2012	89	28	16.6	19.5	18	BDL	BDL	BDL	BDL
	26.03.2012	98	31	16.3	19.2	20	BDL	BDL	BDL	BDL
IV	30.03.2012	106	34	15.9	19.1	16	BDL	BDL	BDL	BDL
	31.03.2012	102	33	15.6	19.0	19	BDL	BDL	BDL	BDL
V	05.04.2012	94	30	15.5	18.4	14	BDL	BDL	BDL	BDL
	06.04.2012	104	33	15.7	18.8	15	BDL	BDL	BDL	BDL
VI	14.04.2012	96	31	16.3	19.0	13	BDL	BDL	BDL	BDL
	15.04.2012	108	35	15.1	18.5	14	BDL	BDL	BDL	BDL
VII	18.04.2012	115	37	15.5	18.1	16	BDL	BDL	BDL	BDL
	19.04.2012	103	33	15.2	17.3	15	BDL	BDL	BDL	BDL
VIII	23.04.2012	90	29	15.8	18.9	14	BDL	BDL	BDL	BDL
	24.04.2012	107	34	15.6	18.1	15	BDL	BDL	BDL	BDL
IX	02.05.2012	113	36	14.7	16.9	13	BDL	BDL	BDL	BDL
	03.05.2012	101	32	14.9	17.8	12	BDL	BDL	BDL	BDL
X	08.05.2012	99	32	14.5	17.1	12	BDL	BDL	BDL	BDL
	09.05.2012	107	34	14.9	17.3	13	BDL	BDL	BDL	BDL
XI	16.05.2012	102	33	13.7	14.8	11	BDL	BDL	BDL	BDL
	17.05.2012	93	30	14.4	15.5	10	BDL	BDL	BDL	BDL
XII	24.05.2012	102	33	14.7	15.6	11	BDL	BDL	BDL	BDL
	25.05.2012	98	31	15.1	15.8	12	BDL	BDL	BDL	BDL

BDL Values for O_3 = <10 µg/m³
BDL Values for C_6H_6 = <0.01 µg/m³
BDL Values for CO = <114.5 µg/m³
BDL Values for BaP = <1 ng/m³

Richardson & Cruddas (1972) Limited

Annexure-II (Contd.)

REPORT ON AMBIENT AIR QUALITY DATA

Name of Project : Orient UGP (IB Valley area)
Location : Mandlia (A3)
Season : Summer 2012
Instrument used : Respirable dust sampler / Fine Particulate Matter

Week	Date	PM_{10} µg/m³	$PM_{2.5}$ µg/m³	SO_2 µg/m³	NOx µg/m³	NH_3 µg/m³	O_3 µg/m³	C_6H_6 µg/m³	CO µg/m³	BaP ng/m³
I	06.03.2012	77	27	15.1	19.2	14	BDL	BDL	BDL	BDL
	07.03.2012	75	26	15.4	19.3	16	BDL	BDL	BDL	BDL
II	15.03.2012	78	27	15.3	18.6	16	BDL	BDL	BDL	BDL
	16.03.2012	76	27	14.8	19.4	18	BDL	BDL	BDL	BDL
III	25.03.2012	74	26	16.0	18.4	22	BDL	BDL	BDL	BDL
	26.03.2012	78	27	15.6	19.4	20	BDL	BDL	BDL	BDL
IV	30.03.2012	76	27	15.4	18.6	20	BDL	BDL	BDL	BDL
	31.03.2012	74	26	15.2	19.8	22	BDL	BDL	BDL	BDL
V	05.04.2012	78	27	14.6	18.0	17	BDL	BDL	BDL	BDL
	06.04.2012	79	28	15.2	18.3	19	BDL	BDL	BDL	BDL
VI	14.04.2012	73	26	15.0	17.9	19	BDL	BDL	BDL	BDL
	15.04.2012	66	23	14.7	18.3	21	BDL	BDL	BDL	BDL
VII	18.04.2012	68	24	14.9	19.4	25	BDL	BDL	BDL	BDL
	19.04.2012	69	24	14.6	20.3	23	BDL	BDL	BDL	BDL
VIII	23.04.2012	69	24	15.5	19.3	23	BDL	BDL	BDL	BDL
	24.04.2012	77	27	15.3	20.1	25	BDL	BDL	BDL	BDL
IX	02.05.2012	78	27	14.2	19.6	16	BDL	BDL	BDL	BDL
	03.05.2012	76	26	14.8	19.3	18	BDL	BDL	BDL	BDL
X	08.05.2012	79	28	14.3	18.1	18	BDL	BDL	BDL	BDL
	09.05.2012	82	29	14.6	17.6	20	BDL	BDL	BDL	BDL
XI	16.05.2012	81	28	14.2	17.7	24	BDL	BDL	BDL	BDL
	17.05.2012	78	27	14.8	19.3	22	BDL	BDL	BDL	BDL
XII	24.05.2012	82	29	14.7	19.7	22	BDL	BDL	BDL	BDL
	25.05.2012	78	27	15.0	19.6	24	BDL	BDL	BDL	BDL

BDL Values for O_3 = <10 µg/m³
BDL Values for C_6H_6 = <0.01 µg/m³
BDL Values for CO = <114.5 µg/m³
BDL Values for BaP = <1 ng/m³

Richardson & Cruddas (1972) Limited

Annexure-II (Contd.)

REPORT ON AMBIENT AIR QUALITY DATA

Name of Project : Orient UGP (IB Valley area)
Location : Gandghora (A4)
Season : Summer 2012
Instrument used : Respirable dust sampler / Fine Particulate Matter

Week	Date	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NOx µg/m^3	NH_3 µg/m^3	O_3 µg/m^3	C_6H_6 µg/m^3	CO µg/m^3	BaP ng/m^3
I	06.03.2012	66	23	17.9	18.7	14	BDL	BDL	BDL	BDL
	07.03.2012	72	25	18.2	19	16	BDL	BDL	BDL	BDL
II	15.03.2012	73	26	17.6	18.4	15	BDL	BDL	BDL	BDL
	16.03.2012	74	26	17.9	18.5	16	BDL	BDL	BDL	BDL
III	25.03.2012	75	26	18.3	18.1	18	BDL	BDL	BDL	BDL
	26.03.2012	68	24	18.5	18.4	17	BDL	BDL	BDL	BDL
IV	30.03.2012	76	27	18.6	18.7	19	BDL	BDL	BDL	BDL
	31.03.2012	65	23	19.0	19.1	22	BDL	BDL	BDL	BDL
V	05.04.2012	67	23	19.2	19.4	16	BDL	BDL	BDL	BDL
	06.04.2012	76	27	19.7	19.5	18	BDL	BDL	BDL	BDL
VI	14.04.2012	68	24	20.0	19.0	18	BDL	BDL	BDL	BDL
	15.04.2012	74	26	20.4	19.2	19	BDL	BDL	BDL	BDL
VII	18.04.2012	71	25	19.9	18.6	20	BDL	BDL	BDL	BDL
	19.04.2012	77	27	20.1	18.8	18	BDL	BDL	BDL	BDL
VIII	23.04.2012	68	24	19.3	18.1	16	BDL	BDL	BDL	BDL
	24.04.2012	67	23	19.6	18.4	15	BDL	BDL	BDL	BDL
IX	02.05.2012	74	26	18.1	17.7	19	BDL	BDL	BDL	BDL
	03.05.2012	69	24	18.4	18.1	20	BDL	BDL	BDL	BDL
X	08.05.2012	70	25	17.7	17.3	20	BDL	BDL	BDL	BDL
	09.05.2012	73	26	18.0	17.7	22	BDL	BDL	BDL	BDL
XI	16.05.2012	69	24	18.3	17.0	24	BDL	BDL	BDL	BDL
	17.05.2012	67	23	18.4	17.4	25	BDL	BDL	BDL	BDL
XII	24.05.2012	68	24	17.7	17.1	18	BDL	BDL	BDL	BDL
	25.05.2012	77	27	17.9	17.3	22	BDL	BDL	BDL	BDL

BDL Values for O_3 = <10 µg/m^3
BDL Values for C_6H_6 = <0.01 µg/m^3
BDL Values for CO = <114.5 µg/m^3
BDL Values for BaP = <1 ng/m^3

Annexure-II (Contd.)

REPORT ON AMBIENT AIR QUALITY DATA

Name of Project : **Orient UGP (IB Valley area)**
Location : **Gandhi Chowk (A5)**
Season : **Summer 2012**
Instrument used : **Respirable dust sampler / Fine Particulate Matter**

Week	Date	PM_{10} µg/m³	$PM_{2.5}$ µg/m³	SO_2 µg/m³	NOx µg/m³	NH_3 µg/m³	O_3 µg/m³	C_6H_6 µg/m³	CO µg/m³	BaP ng/m³
I	06.03.2012	77	29	14.3	18.6	16	BDL	BDL	BDL	BDL
	07.03.2012	74	28	14.6	18.9	18	BDL	BDL	BDL	BDL
II	15.03.2012	72	27	14.0	18.3	18	BDL	BDL	BDL	BDL
	16.03.2012	73	28	14.3	18.4	17	BDL	BDL	BDL	BDL
III	25.03.2012	80	30	14.7	18.0	18	BDL	BDL	BDL	BDL
	26.03.2012	75	29	14.9	18.3	20	BDL	BDL	BDL	BDL
IV	30.03.2012	81	31	15.0	18.6	22	BDL	BDL	BDL	BDL
	31.03.2012	77	29	15.4	19.0	20	BDL	BDL	BDL	BDL
V	05.04.2012	75	29	15.6	19.3	18	BDL	BDL	BDL	BDL
	06.04.2012	80	30	16.1	19.4	20	BDL	BDL	BDL	BDL
VI	14.04.2012	71	27	16.4	18.9	20	BDL	BDL	BDL	BDL
	15.04.2012	74	28	16.8	19.1	19	BDL	BDL	BDL	BDL
VII	18.04.2012	77	29	16.3	18.5	20	BDL	BDL	BDL	BDL
	19.04.2012	74	28	16.5	18.7	22	BDL	BDL	BDL	BDL
VIII	23.04.2012	71	27	15.7	18.0	24	BDL	BDL	BDL	BDL
	24.04.2012	69	26	16.0	18.3	22	BDL	BDL	BDL	BDL
IX	02.05.2012	73	28	14.5	17.6	19	BDL	BDL	BDL	BDL
	03.05.2012	71	27	14.8	18.0	21	BDL	BDL	BDL	BDL
X	08.05.2012	75	29	14.1	17.2	21	BDL	BDL	BDL	BDL
	09.05.2012	72	27	14.4	17.6	20	BDL	BDL	BDL	BDL
XI	16.05.2012	69	26	14.7	16.9	21	BDL	BDL	BDL	BDL
	17.05.2012	68	26	14.8	17.3	23	BDL	BDL	BDL	BDL
XII	24.05.2012	70	27	14.1	17.0	25	BDL	BDL	BDL	BDL
	25.05.2012	73	28	14.3	17.2	23	BDL	BDL	BDL	BDL

BDL Values for O_3 = <10 µg/m³
BDL Values for C_6H_6 = <0.01 µg/m³
BDL Values for CO = <114.5 µg/m³
BDL Values for BaP = <1 ng/m³

Richardson & Cruddas (1972) Limited

Annexure-II (Contd.)

REPORT ON AMBIENT AIR QUALITY DATA

Name of Project : **Orient UGP (IB Valley area)**
Location : **Chheikuthi (A6)**
Season : **Summer 2012**
Instrument used : **Respirable dust sampler / Fine Particulate Matter**

Week	Date	PM_{10} µg/m³	$PM_{2.5}$ µg/m³	SO_2 µg/m³	NOx µg/m³	NH_3 µg/m³	O_3 µg/m³	C_6H_6 µg/m³	CO µg/m³	BaP ng/m³
I	06.03.2012	66	22	12.8	16.2	20	BDL	BDL	BDL	BDL
	07.03.2012	76	26	12.6	16.7	20	BDL	BDL	BDL	BDL
II	15.03.2012	80	27	12.2	16.8	21	BDL	BDL	BDL	BDL
	16.03.2012	81	28	11.7	17.2	22	BDL	BDL	BDL	BDL
III	25.03.2012	80	27	12.8	16.9	20	BDL	BDL	BDL	BDL
	26.03.2012	78	27	13.2	17.4	21	BDL	BDL	BDL	BDL
IV	30.03.2012	81	28	13.8	17.1	22	BDL	BDL	BDL	BDL
	31.03.2012	82	28	13.2	17.0	24	BDL	BDL	BDL	BDL
V	05.04.2012	75	26	11.8	16.6	23	BDL	BDL	BDL	BDL
	06.04.2012	72	24	12.2	16.7	23	BDL	BDL	BDL	BDL
VI	14.04.2012	66	22	11.3	17.7	24	BDL	BDL	BDL	BDL
	15.04.2012	64	22	11.6	17.8	25	BDL	BDL	BDL	BDL
VII	18.04.2012	76	26	11.4	18.3	23	BDL	BDL	BDL	BDL
	19.04.2012	82	28	12.1	19.0	24	BDL	BDL	BDL	BDL
VIII	23.04.2012	84	29	10.8	19.1	25	BDL	BDL	BDL	BDL
	24.04.2012	59	20	10.6	19.3	27	BDL	BDL	BDL	BDL
IX	02.05.2012	58	20	11.3	18.8	24	BDL	BDL	BDL	BDL
	03.05.2012	59	20	11.8	18.6	24	BDL	BDL	BDL	BDL
X	08.05.2012	68	23	10.8	19.0	25	BDL	BDL	BDL	BDL
	09.05.2012	66	22	10.6	18.1	26	BDL	BDL	BDL	BDL
XI	16.05.2012	67	23	10.6	17.8	24	BDL	BDL	BDL	BDL
	17.05.2012	66	22	10.7	17.5	25	BDL	BDL	BDL	BDL
XII	24.05.2012	69	23	10.8	17.6	26	BDL	BDL	BDL	BDL
	25.05.2012	64	22	11.1	17.2	28	BDL	BDL	BDL	BDL

BDL Values for O_3 = <10 µg/m³
BDL Values for C_6H_6 = <0.01 µg/m³
BDL Values for CO = <114.5 µg/m³
BDL Values for BaP = <1 ng/m³

Richardson & Cruddas (1972) Limited

Annexure-II (Contd.)

REPORT ON AMBIENT AIR QUALITY DATA

Name of Project : **Orient UGP (IB Valley area)**
Location : **Jamkani (A7)**
Season : **Summer 2012**
Instrument used : **Respirable dust sampler / Fine Particulate Matter**

Week	Date	PM_{10} µg/m^3	$PM_{2.5}$ µg/m^3	SO_2 µg/m^3	NOx µg/m^3	NH_3 µg/m^3	O_3 µg/m^3	C_6H_6 µg/m^3	CO µg/m^3	BaP ng/m^3
I	06.03.2012	54	18	10.3	13.4	12	BDL	BDL	BDL	BDL
	07.03.2012	52	18	11.0	14.3	14	BDL	BDL	BDL	BDL
II	15.03.2012	62	21	10.4	13.6	14	BDL	BDL	BDL	BDL
	16.03.2012	56	19	11.3	14.4	16	BDL	BDL	BDL	BDL
III	25.03.2012	60	20	12.1	15.2	14	BDL	BDL	BDL	BDL
	26.03.2012	58	20	12.2	15.3	13	BDL	BDL	BDL	BDL
IV	30.03.2012	51	17	11.3	14.4	12	BDL	BDL	BDL	BDL
	31.03.2012	56	19	10.4	13.6	11	BDL	BDL	BDL	BDL
V	05.04.2012	44	15	11.2	14.5	16	BDL	BDL	BDL	BDL
	06.04.2012	47	16	12.3	16.2	18	BDL	BDL	BDL	BDL
VI	14.04.2012	45	15	12.0	16.1	18	BDL	BDL	BDL	BDL
	15.04.2012	42	14	11.1	16.1	20	BDL	BDL	BDL	BDL
VII	18.04.2012	48	16	10.4	14.2	18	BDL	BDL	BDL	BDL
	19.04.2012	53	18	11.3	14.4	17	BDL	BDL	BDL	BDL
VIII	23.04.2012	49	17	10.0	13.3	16	BDL	BDL	BDL	BDL
	24.04.2012	46	16	12.6	15.2	15	BDL	BDL	BDL	BDL
IX	02.05.2012	43	15	11.2	14.6	14	BDL	BDL	BDL	BDL
	03.05.2012	45	15	12.1	16.7	16	BDL	BDL	BDL	BDL
X	08.05.2012	47	16	13.1	16.4	16	BDL	BDL	BDL	BDL
	09.05.2012	44	15	12.4	16.2	18	BDL	BDL	BDL	BDL
XI	16.05.2012	48	16	11.5	14.3	16	BDL	BDL	BDL	BDL
	17.05.2012	55	19	11.6	14.6	15	BDL	BDL	BDL	BDL
XII	24.05.2012	48	16	10.3	13.4	14	BDL	BDL	BDL	BDL
	25.05.2012	43	15	11.1	14.4	13	BDL	BDL	BDL	BDL

BDL Values for O_3 = <10 µg/m^3
BDL Values for C_6H_6 = <0.01 µg/m^3
BDL Values for CO = <114.5 µg/m^3
BDL Values for BaP = <1 ng/m^3

Richardson & Cruddas (1972) Limited

Annexure-II (Contd.)

REPORT ON AMBIENT AIR QUALITY DATA

Name of Project : **Orient UGP (IB Valley area)**
Location : **Lajkura (A8)**
Season : **Summer 2012**
Instrument used : **Respirable dust sampler / Fine Particulate Matter**

Week	Date	PM_{10} µg/m³	$PM_{2.5}$ µg/m³	SO_2 µg/m³	NOx µg/m³	NH_3 µg/m³	O_3 µg/m³	C_6H_6 µg/m³	CO µg/m³	BaP ng/m³
I	06.03.2012	62	21	12.3	16.6	14	BDL	BDL	BDL	BDL
	07.03.2012	60	20	13.7	17.5	16	BDL	BDL	BDL	BDL
II	15.03.2012	70	24	12.5	16.8	16	BDL	BDL	BDL	BDL
	16.03.2012	64	22	12.3	17.6	18	BDL	BDL	BDL	BDL
III	25.03.2012	68	23	12.1	18.4	16	BDL	BDL	BDL	BDL
	26.03.2012	66	22	11.7	18.5	15	BDL	BDL	BDL	BDL
IV	30.03.2012	59	20	11.3	17.6	14	BDL	BDL	BDL	BDL
	31.03.2012	64	22	11.5	16.8	13	BDL	BDL	BDL	BDL
V	05.04.2012	52	18	11.4	17.7	18	BDL	BDL	BDL	BDL
	06.04.2012	55	19	11.3	19.4	20	BDL	BDL	BDL	BDL
VI	14.04.2012	53	18	11.7	19.3	20	BDL	BDL	BDL	BDL
	15.04.2012	50	17	11.5	19.3	22	BDL	BDL	BDL	BDL
VII	18.04.2012	57	19	11.1	17.4	20	BDL	BDL	BDL	BDL
	19.04.2012	62	21	10.9	17.6	19	BDL	BDL	BDL	BDL
VIII	23.04.2012	58	20	10.5	16.5	18	BDL	BDL	BDL	BDL
	24.04.2012	55	19	10.3	18.4	17	BDL	BDL	BDL	BDL
IX	02.05.2012	52	18	10.5	17.8	16	BDL	BDL	BDL	BDL
	03.05.2012	54	18	10.6	19.9	18	BDL	BDL	BDL	BDL
X	08.05.2012	56	19	10.9	19.6	18	BDL	BDL	BDL	BDL
	09.05.2012	53	18	10.9	19.4	20	BDL	BDL	BDL	BDL
XI	16.05.2012	57	19	10.8	17.5	18	BDL	BDL	BDL	BDL
	17.05.2012	64	22	10.9	17.8	17	BDL	BDL	BDL	BDL
XII	24.05.2012	57	19	10.9	16.6	16	BDL	BDL	BDL	BDL
	25.05.2012	51	17	10.8	17.6	15	BDL	BDL	BDL	BDL

BDL Values for O_3 = <10 µg/m³
BDL Values for C_6H_6 = <0.01 µg/m³
BDL Values for CO = <114.5 µg/m³
BDL Values for BaP = <1 ng/m³

Richardson & Cruddas (1972) Limited

Annexure-II (Contd.)

REPORT ON AMBIENT AIR QUALITY DATA

Name of Project : **Orient UGP (IB Valley area)**
Season : **Summer 2012**
Instrument used : **Respirable dust sampler / ICP - MS**

Analysis of Heavy Metals in PM_{10} Samples

Unit : ng/m^3

Location Code	Date of sampling	As	Co	Hg	Se	Cr	Cu	Mn	Ni	Pb	Zn
A1	05.04.2012	BDL	BDL	BDL	BDL	BDL	0.07	0.11	0.07	0.04	1.24
	06.04.2012	BDL	BDL	BDL	BDL	BDL	0.04	0.09	0.07	0.08	1.20
A2	05.04.2012	BDL	BDL	BDL	BDL	BDL	0.04	0.13	0.12	0.04	1.36
	06.04.2012	BDL	BDL	BDL	BDL	BDL	0.06	0.07	0.10	0.04	1.66
A3	05.04.2012	BDL	BDL	BDL	BDL	BDL	0.04	0.22	0.09	0.06	1.08
	06.04.2012	BDL	BDL	BDL	BDL	BDL	0.06	0.16	0.08	0.05	1.16
A4	05.04.2012	BDL	BDL	BDL	BDL	BDL	0.05	0.15	0.10	0.07	1.00
	06.04.2012	BDL	BDL	BDL	BDL	BDL	0.06	0.15	0.10	0.06	1.06
A5	05.04.2012	BDL	BDL	BDL	BDL	BDL	0.08	0.21	0.12	0.07	1.33
	06.04.2012	BDL	BDL	BDL	BDL	BDL	0.05	0.20	0.11	0.10	1.44
A6	05.04.2012	BDL	BDL	BDL	BDL	BDL	0.07	0.18	0.14	0.12	1.30
	06.04.2012	BDL	BDL	BDL	BDL	BDL	0.09	0.18	0.16	0.12	1.40
A7	05.04.2012	BDL	BDL	BDL	BDL	BDL	0.05	0.08	0.09	0.07	1.08
	06.04.2012	BDL	BDL	BDL	BDL	BDL	0.05	0.11	0.02	0.06	1.00
A8	05.04.2012	BDL	BDL	BDL	BDL	BDL	0.04	0.06	0.03	0.04	1.14
	06.04.2012	BDL	BDL	BDL	BDL	BDL	0.06	0.03	0.08	0.16	1.10

BDL Values for As: < 0.30 ng/m3
BDL Values for Co: <0.01 ng/m3
BDL Values for Hg: <0.01 ng/m3
BDL Values for Se: <1.10 ng/m3
BDL Values for Cr: <0.004 ng/m3

Richardson & Cruddas (1972) Limited

Annexure-III

WATER QUALITY DATA

Location : Mine discharge – Orient UGP (W1)

S. No	Parameter	Unit	Result	General Standards for discharge of Effluents into Inland Surface water GSR 422(E)
1.	Colour & Odour	Pt-Co	15 & Odourless	-
2.	Total Suspended Solids	mg/l	38	100
3.	Particle size of suspended solids	Shall pass 850 micron ISI sieve	100% are passing through 850 micron ISI sieve	Shall pass 850 micron ISI sieve
4.	Total Dissolved solids	mg/l	480	-
5.	pH	-	8.08	5.5-9.0
6.	Temperature	^{o}C	29	5°C above water temperature
7.	Oil & Grease	mg/l	Nil	10
8.	Total residual chlorine	mg/l	Nil	1.0
9.	Ammonical Nitrogen (as N)	mg/l	0.48	50
10.	Kjeldahl nitrogen	mg/l	1.12	100
11.	Free ammonia (as NH_3)	mg/l	Nil	5.0
12.	BOD - 3 Days at $27^{o}C$	mg/l	8	30
13.	COD	mg/l	52	250
14.	Arsenic (as As)	mg/l	<0.01	0.2
15.	Mercury (as Hg)	mg/l	<0.001	0.01
16.	Lead (as Pb)	mg/l	<0.01	0.01
17.	Cadmium (as Cd)	mg/l	<0.01	2
18.	Hexavalent Chromium (as Cr^{6+})	mg/l	<0.001	0.10
19.	Total Chromium	mg/l	<0.001	2.0
20.	Copper (as Cu)	mg/l	<0.001	3
21.	Zinc (as Zn)	mg/l	<0.01	5
22.	Selenium (as Se)	mg/l	<0.01	0.05
23.	Nickel (as Ni)	mg/l	<0.01	3
24.	Boron (as B)	mg/l	<0.01	-
25.	Percent Sodium	mg/l	39.48	-
26.	Residual Sodium Carbonate	mg/l	Nil	-
27.	Cyanides (as CN)	mg/l	Nil	0.2
28.	Chloride (as Cl)	mg/l	120	-
29.	Fluorides (as F)	mg/l	0.14	2
30.	Dissolved Phosphates (as PO_4)	mg/l	0.68	5.0
31.	Sulphates (as SO_4)	mg/l	38	-
32.	Sulphides (as S)	mg/l	Nil	2
33.	Phenols (as C_6H_5OH)	mg/l	Nil	1.0
34.	Bio-assay test	90%survival of fish after 96 hours in 100% effluent	100%survival of fish after 96 hours in 100% effluent	90%survival of fish after 96 hours in 100% effluent
35.	Manganese (as mn)	mg/l	Nil	2.0
36.	Iron (as Fe^{+2})	mg/l	0.22	3.0
37.	Vanadium (as V)	mg/l	Nil	0.2
38.	Nitrate Nitrogen	mg/l	2.34	10

WATER QUALITY DATA

Location : Nallah Near Core Zone (W2)

Sl. No.	Parameter	Unit	Result	IS:2296-1982 Tolerance limits for Inland Surface water (Class C)
1	pH	-	7.96	6.5 – 8.5
2	Colour	Hazen Units	18	300
3	Temperature	^{o}C	28.5	-
4	Turbidity	NTU	30	-
5	Total suspended solids	mg/l	28	-
6	Total dissolved solids	mg/l	612	1500
7	Total volatile solids	mg/l	--	-
8	Dissolved Oxygen	mg/l	5.6	4.0
9	BOD - 3 days, $27^{o}C$	mg/l	2	3.0
10	COD	mg/l	34	-
11	Oil & grease	mg/l	Nil	-
12	Residual chlorine	mg/l	Nil	-
13	Chloride (as Cl)	mg/l	174	600
14	Fluoride (as F)	mg/l	0.30	1.5
15	Sulphate (as SO_4)	mg/l	68	400
16	Sulphide (as S)	mg/l	Nil	-
17	Cyanide (as CN)	mg/l	<0.01	0.05
18	Insecticides/pesticides	mg/l	Nil	Absent
19	Phenols (as C_6H_5OH)	mg/l	<0.001	0.005
20	Chromium (as Cr)	mg/l	<0.01	0.05
21	Copper (as Cu)	mg/l	<0.01	1.5
22	Selenium (as Se)	mg/l	<0.01	0.05
22	Arsenic (as As)	mg/l	<0.01	0.2
23	Barium (as Ba)	mg/l	<0.01	-
24	Cadmium	mg/l	<0.01	0.01
25	Nickel (as Ni)	mg/l	<0.01	-
26	Boron (as B)	mg/l	<0.01	-
27	Mercury (as Hg)	mg/l	<0.001	-
28	Silver (as Ag)	mg/l	<0.01	-
29	Lead (as Pb)	mg/l	<0.01	0.1
30	Zinc (as Pb)	mg/l	0.14	15
31	Alkalinity to phenolphthalein	mg/l	Nil	-
32	Alkalinity to methyl orange	mg/l	170	-
33	Iron (as Fe)	mg/l	0.24	50
35	Calcium (as Ca)	mg/l	62	-
36	Magnesium (as Mg)	mg/l	20	-
37	Total Nitrogen (as N)	mg/l	3.8	-
38	Percent sodium	%	39.32	-
39	Coliform organisms	MPN/100ml	<1100	5000
40	Sodium (as Na)	mg/l	79	-
41	Potassium (as K)	mg/l	22	-

WATER QUALITY DATA

Location : Pond Water Bundia Village (W3)

Sl. No.	Parameter	Unit	Result	IS:2296-1982 Tolerance limits for Inland Surface water (Class C)
1	pH	-	7.84	6.5 – 8.5
2	Colour	Hazen Units	18	300
3	Temperature	^{o}C	28	-
4	Turbidity	NTU	20	-
5	Total suspended solids	mg/l	18	-
6	Total dissolved solids	mg/l	452	1500
7	Total volatile solids	mg/l	--	-
8	Dissolved Oxygen	mg/l	5.7	4.0
9	BOD - 3 days, $27^{o}C$	mg/l	--	3.0
10	COD	mg/l	14	-
11	Oil & grease	mg/l	Nil	-
12	Residual chlorine	mg/l	Nil	-
13	Chloride (as Cl)	mg/l	94	600
14	Fluoride (as F)	mg/l	0.10	1.5
15	Sulphate (as SO_4)	mg/l	24	400
16	Sulphide (as S)	mg/l	Nil	-
17	Cyanide (as CN)	mg/l	<0.01	0.05
18	Insecticides/pesticides	mg/l	Nil	Absent
19	Phenols (as C_6H_5OH)	mg/l	<0.001	0.005
20	Chromium (as Cr)	mg/l	<0.01	0.05
21	Copper (as Cu)	mg/l	<0.01	1.5
22	Selenium (as Se)	mg/l	<0.01	0.05
22	Arsenic (as As)	mg/l	<0.01	0.2
23	Barium (as Ba)	mg/l	<0.01	-
24	Cadmium	mg/l	<0.01	0.01
25	Nickel (as Ni)	mg/l	<0.01	-
26	Boron (as B)	mg/l	<0.01	-
27	Mercury (as Hg)	mg/l	<0.001	-
28	Silver (as Ag)	mg/l	<0.01	-
29	Lead (as Pb)	mg/l	<0.01	0.1
30	Zinc (as Pb)	mg/l	0.10	15
31	Alkalinity to phenolphthalein	mg/l	Nil	-
32	Alkalinity to methyl orange	mg/l	170	-
33	Iron (as Fe)	mg/l	0.09	50
35	Calcium (as Ca)	mg/l	80	-
36	Magnesium (as Mg)	mg/l	22	-
37	Total Nitrogen (as N)	mg/l	0.78	-
38	Percent sodium	%	30.95	-
39	Coliform organisms	MPN/100ml	<1100	5000
40	Sodium (as Na)	mg/l	48	-
41	Potassium (as K)	mg/l	20	-

WATER QUALITY DATA

Location : Ib River Up Stream (W4)

Sl. No.	Parameter	Unit	Result	IS:2296-1982 Tolerance limits for Inland Surface water (Class C)
1	pH	-	7.08	6.5 – 8.5
2	Colour	Hazen Units	5	300
3	Temperature	^{o}C	28	-
4	Turbidity	NTU	5	-
5	Total suspended solids	mg/l	18	-
6	Total dissolved solids	mg/l	254	1500
7	Total volatile solids	mg/l	--	-
8	Dissolved Oxygen	mg/l	6.1	4.0
9	BOD - 3 days, $27^{o}C$	mg/l	--	3.0
10	COD	mg/l	12	-
11	Oil & grease	mg/l	Nil	-
12	Residual chlorine	mg/l	Nil	-
13	Chloride (as Cl)	mg/l	54	600
14	Fluoride (as F)	mg/l	0.10	1.5
15	Sulphate (as SO_4)	mg/l	14	400
16	Sulphide (as S)	mg/l	Nil	-
17	Cyanide (as CN)	mg/l	<0.01	0.05
18	Insecticides/pesticides	mg/l	Nil	Absent
19	Phenols (as C_6H_5OH)	mg/l	<0.001	0.005
20	Chromium (as Cr)	mg/l	<0.01	0.05
21	Copper (as Cu)	mg/l	<0.001	1.5
22	Selenium (as Se)	mg/l	<0.001	0.05
22	Arsenic (as As)	mg/l	<0.001	0.2
23	Barium (as Ba)	mg/l	<0.01	-
24	Cadmium	mg/l	<0.001	0.01
25	Nickel (as Ni)	mg/l	<0.01	-
26	Boron (as B)	mg/l	<0.1	-
27	Mercury (as Hg)	mg/l	<0.001	-
28	Silver (as Ag)	mg/l	<0.01	-
29	Lead (as Pb)	mg/l	<0.001	0.1
30	Zinc (as Pb)	mg/l	0.08	15
31	Alkalinity to phenolphthalein	mg/l	Nil	-
32	Alkalinity to methyl orange	mg/l	102	-
33	Iron (as Fe)	mg/l	0.12	50
35	Calcium (as Ca)	mg/l	40	-
36	Magnesium (as Mg)	mg/l	12	-
37	Total Nitrogen (as N)	mg/l	0.48	-
38	Percent sodium	%	29.8	-
39	Coliform organisms	MPN/100ml	<1100	5000
40	Sodium (as Na)	mg/l	29	-
41	Potassium (as K)	mg/l	10	-

WATER QUALITY DATA

Location : Ib River D/S (W5)

Sl. No.	Parameter	Unit	Result	IS:2296-1982 Tolerance limits for Inland Surface water (Class C)
1	pH	-	7.14	6.5 – 8.5
2	Colour	Hazen Units	6	300
3	Temperature	^{o}C	28.0	-
4	Turbidity	NTU	6	-
5	Total suspended solids	mg/l	22	-
6	Total dissolved solids	mg/l	312	1500
7	Total volatile solids	mg/l	--	-
8	Dissolved Oxygen	mg/l	6	4.0
9	BOD - 3 days, $27^{o}C$	mg/l	--	3.0
10	COD	mg/l	13	-
11	Oil & grease	mg/l	Nil	-
12	Residual chlorine	mg/l	Nil	-
13	Chloride (as Cl)	mg/l	58	600
14	Flouride (as F)	mg/l	0.12	1.5
15	Sulphate (as SO_4)	mg/l	16	400
16	Sulphide (as S)	mg/l	Nil	-
17	Cyanide (as CN)	mg/l	<0.01	0.05
18	Insecticides/pesticides	mg/l	Nil	Absent
19	Phenols (as C_6H_5OH)	mg/l	<0.001	0.005
20	Chromium (as Cr)	mg/l	<0.01	0.05
21	Copper (as Cu)	mg/l	<0.01	1.5
22	Selenium (as Se)	mg/l	<0.01	0.05
22	Arsenic (as As)	mg/l	<0.01	0.2
23	Barium (as Ba)	mg/l	<0.01	-
24	Cadmium	mg/l	<0.01	0.01
25	Nickel (as Ni)	mg/l	<0.01	-
26	Boron (as B)	mg/l	<0.01	-
27	Mercury (as Hg)	mg/l	<0.001	-
28	Silver (as Ag)	mg/l	<0.01	-
29	Lead (as Pb)	mg/l	<0.01	0.1
30	Zinc (as Pb)	mg/l	0.10	15
31	Alkalinity to phenolphthalein	mg/l	Nil	-
32	Alkalinity to methyl orange	mg/l	132	-
33	Iron (as Fe)	mg/l	0.12	50
35	Calcium (as Ca)	mg/l	44	-
36	Magnesium (as Mg)	mg/l	15	-
37	Total Nitrogen (as N)	mg/l	0.78	-
38	Percent sodium	%	27.14	-
39	Coliform organisms	MPN/100ml	<1100	5000
40	Sodium (as Na)	mg/l	32	-
41	Potassium (as K)	mg/l	12	-

WATER QUALITY DATA

Location : Tubewell, Brajrajnagar (W6)

Sl. No.	Parameter	Unit	Result	IS: 10500-1991 Norms
1	pH	-	7.88	6.5 – 8.5
2	Colour	Hazen Units	<5	10
3	Temperature	^{o}C	29	-
4	Turbidity	NTU	6	10
5	Total suspended solids	mg/l	<2	-
6	Total dissolved solids	mg/l	388	500
7	Total volatile solids	mg/l	-	-
8	Dissolved Oxygen	mg/l	4.2	-
9	BOD - 3 days at $27^{o}C$	mg/l	-	-
10	COD	mg/l	18	-
11	Oil & grease	mg/l	Nil	-
12	Residual chlorine	mg/l	Nil	0.2
13	Chloride (as Cl)	mg/l	66	250
14	Fluoride (as F)	mg/l	0.09	1.0
15	Sulphate (as SO_4)	mg/l	24	200
16	Sulphide (as S)	mg/l	Nil	-
17	Cyanide (as CN)	mg/l	Nil	0.05
18	Insecticides/pesticides	mg/l	Nil	Absent
19	Phenols (as C_6H_5OH)	mg/l	<0.001	0.001
20	Chromium (as Cr)	mg/l	<0.01	0.05
21	Copper (as Cu)	mg/l	<0.01	0.05
22	Selenium (as Se)	mg/l	<0.01	0.01
22	Arsenic (as As)	mg/l	<0.01	0.05
23	Barium (as Ba)	mg/l	<0.01	-
24	Cadmium	mg/l	<0.01	0.01
25	Nickel (as Ni)	mg/l	<0.01	-
26	Boron (as B)	mg/l	<0.01	-
27	Mercury (as Hg)	mg/l	<0.001	0.001
28	Silver (as Ag)	mg/l	<0.01	-
29	Lead (as Pb)	mg/l	<0.01	0.05
30	Zinc (as Pb)	mg/l	0.08	5
31	Alkalinity to phenolphthalein	mg/l	Nil	-
32	Alkalinity to methyl orange	mg/l	156	200
33	Iron (as Fe)	mg/l	0.08	0.3
34	Total Hardness	mg/l	182	300
35	Calcium (as Ca)	mg/l	48	75
36	Magnesium (as Mg)	mg/l	15	30
37	Total Nitrogen (as N)	mg/l	Nil	-
38	Percent sodium	%	31.07	-
39	Coliform organisms	MPN/100ml	-0-	Absent
40	Sodium,(as Na)	mg/l	40	6.5 – 8.5
41	Potassium (as K)	mg/l	9	10

WATER QUALITY DATA

Location : Tube well Juribaga village (W7)

Sl. No.	Parameter	Unit	Result	IS: 10500-1991 Norms
1	pH	-	7.28	6.5 – 8.5
2	Colour	Hazen Units	<5	10
3	Temperature	^{o}C	29	-
4	Turbidity	NTU	7	10
5	Total suspended solids	mg/l	<2	-
6	Total dissolved solids	mg/l	362	500
7	Total volatile solids	mg/l	-	-
8	Dissolved Oxygen	mg/l	4.4	-
9	BOD - 3 days at $27^{o}C$	mg/l	-	-
10	COD	mg/l	16	-
11	Oil & grease	mg/l	Nil	-
12	Residual chlorine	mg/l	Nil	0.2
13	Chloride (as Cl)	mg/l	54	250
14	Fluoride (as F)	mg/l	0.10	1.0
15	Sulphate (as SO_4)	mg/l	16	200
16	Sulphide (as S)	mg/l	Nil	-
17	Cyanide (as CN)	mg/l	Nil	0.05
18	Insecticides/pesticides	mg/l	Nil	Absent
19	Phenols (as C_6H_5OH)	mg/l	<0.001	0.001
20	Chromium (as Cr)	mg/l	<0.01	0.05
21	Copper (as Cu)	mg/l	<0.01	0.05
22	Selenium (as Se)	mg/l	<0.01	0.01
22	Arsenic (as As)	mg/l	<0.01	0.05
23	Barium (as Ba)	mg/l	<0.01	-
24	Cadmium	mg/l	<0.01	0.01
25	Nickel (as Ni)	mg/l	<0.01	-
26	Boron (as B)	mg/l	<0.01	-
27	Mercury (as Hg)	mg/l	<0.001	0.001
28	Silver (as Ag)	mg/l	<0.01	-
29	Lead (as Pb)	mg/l	<0.01	0.05
30	Zinc (as Pb)	mg/l	0.08	5
31	Alkalinity to phenolphthalein	mg/l	Nil	-
32	Alkalinity to methyl orange	mg/l	166	200
33	Iron (as Fe)	mg/l	0.12	0.3
34	Total Hardness	mg/l	177	300
35	Calcium (as Ca)	mg/l	40	75
36	Magnesium (as Mg)	mg/l	18	30
37	Total Nitrogen (as N)	mg/l	Nil	-
38	Percent sodium	%	32.7	-
39	Coliform organisms	MPN/100ml	-0-	Absent
40	Sodium,(as Na)	mg/l	50	6.5 – 8.5
41	Potassium (as K)	mg/l	15	10

WATER QUALITY DATA

Location : Dugwell, Katapalli village (W8)

Sl. No.	Parameter	Unit	Result	IS: 10500-1991 Norms
1	pH	-	7.78	6.5 – 8.5
2	Colour	Hazen Units	<5	10
3	Temperature	^{o}C	29.0	-
4	Turbidity	NTU	5	10
5	Total suspended solids	mg/l	<2	-
6	Total dissolved solids	mg/l	410	500
7	Total volatile solids	mg/l	-	-
8	Dissolved Oxygen	mg/l	4.8	-
9	BOD - 3 days at $27^{o}C$	mg/l	-	-
10	COD	mg/l	15	-
11	Oil & grease	mg/l	Nil	-
12	Residual chlorine	mg/l	Nil	0.2
13	Chloride (as Cl)	mg/l	88	250
14	Fluoride (as F)	mg/l	0.09	1.0
15	Sulphate (as SO_4)	mg/l	24	200
16	Sulphide (as S)	mg/l	Nil	-
17	Cyanide (as CN)	mg/l	Nil	0.05
18	Insecticides/pesticides	mg/l	Nil	Absent
19	Phenols (as C_6H_5OH)	mg/l	<0.001	0.001
20	Chromium (as Cr)	mg/l	<0.01	0.05
21	Copper (as Cu)	mg/l	<0.01	0.05
22	Selenium (as Se)	mg/l	<0.01	0.01
22	Arsenic (as As)	mg/l	<0.01	0.05
23	Barium (as Ba)	mg/l	<0.01	-
24	Cadmium	mg/l	<0.01	0.01
25	Nickel (as Ni)	mg/l	<0.01	-
26	Boron (as B)	mg/l	<0.01	-
27	Mercury (as Hg)	mg/l	<0.001	0.001
28	Silver (as Ag)	mg/l	<0.01	-
29	Lead (as Pb)	mg/l	<0.01	0.05
30	Zinc (as Pb)	mg/l	0.06	5
31	Alkalinity to phenolphthalein	mg/l	Nil	-
32	Alkalinity to methyl orange	mg/l	170	200
33	Iron (as Fe)	mg/l	0.08	0.3
34	Total Hardness	mg/l	170	300
35	Calcium (as Ca)	mg/l	48	75
36	Magnesium (as Mg)	mg/l	12	30
37	Total Nitrogen (as N)	mg/l	Nil	-
38	Percent sodium	%	32.05	-
39	Coliform organisms	MPN/100ml	-0-	Absent
40	Sodium,(as Na)	mg/l	40	6.5 – 8.5
41	Potassium (as K)	mg/l	12	10

WATER QUALITY DATA

Location : Dug well, Belpahar village (W9)

Sl. No.	Parameter	Unit	Result	IS: 10500-1991 Norms
1	pH	-	7.25	6.5 – 8.5
2	Colour	Hazen Units	<5	10
3	Temperature	^{o}C	29.5	-
4	Turbidity	NTU	5	10
5	Total suspended solids	mg/l	<2	-
6	Total dissolved solids	mg/l	310	500
7	Total volatile solids	mg/l	-	-
8	Dissolved Oxygen	mg/l	4.8	-
9	BOD - 3 days at $27^{o}C$	mg/l	-	-
10	COD	mg/l	14	-
11	Oil & grease	mg/l	Nil	-
12	Residual chlorine	mg/l	Nil	0.2
13	Chloride (as Cl)	mg/l	40	250
14	Flouride (as F)	mg/l	0.10	1.0
15	Sulphate (as SO_4)	mg/l	14	200
16	Sulphide (as S)	mg/l	Nil	-
17	Cyanide (as CN)	mg/l	Nil	0.05
18	Insecticides/pesticides	mg/l	Nil	Absent
19	Phenols (as C_6H_5OH)	mg/l	<0.001	0.001
20	Chromium (as Cr)	mg/l	<0.01	0.05
21	Copper (as Cu)	mg/l	<0.01	0.05
22	Selenium (as Se)	mg/l	<0.01	0.01
22	Arsenic (as As)	mg/l	<0.01	0.05
23	Barium (as Ba)	mg/l	<0.01	-
24	Cadmium	mg/l	<0.01	0.01
25	Nickel (as Ni)	mg/l	<0.01	-
26	Boron (as B)	mg/l	<0.01	-
27	Mercury (as Hg)	mg/l	<0.001	0.001
28	Silver (as Ag)	mg/l	<0.01	-
29	Lead (as Pb)	mg/l	<0.01	0.05
30	Zinc (as Pb)	mg/l	0.08	5
31	Alkalinity to phenolphthalein	mg/l	Nil	-
32	Alkalinity to methyl orange	mg/l	144	200
33	Iron (as Fe)	mg/l	0.10	0.3
34	Total Hardness	mg/l	154	300
35	Calcium (as Ca)	mg/l	38	75
36	Magnesium (as Mg)	mg/l	14	30
37	Total Nitrogen (as N)	mg/l	Nil	-
38	Percent sodium	%	27.73	-
39	Coliform organisms	MPN/100ml	-0-	Absent
40	Sodium,(as Na)	mg/l	22	6.5 – 8.5
41	Potassium (as K)	mg/l	8	10

Annexure- IV

NOISE LEVEL DATA

Location : **Core zone (Store)(N1)**

Sl. No.	Time (Hrs.)		L_{eq} Noise Level, dB(A)		
			March 2012	April 2012	May 2012
1.	Day	06-10	53.9	53.0	57.9
2.		10-14	56.9	57.3	60.3
3.		14-18	61.5	61.3	63.2
4.		18-22	57.9	58.3	59.3
		Leq. (Mean)	**57.6**	**57.5**	**60.2**
5.	Night	22-02	54.9	57.5	54.3
6.		02-06	53.2	55.3	52.5
		Leq. (Mean)	**54.1**	**56.4**	**53.4**

NOISE LEVEL DATA

Location : **Corezone (Near Temple)(N2)**

Sl. No.	Time (Hrs.)		L_{eq} Noise Level, dB(A)		
			March 2012	**April 2012**	**May 2012**
1.	**Day**	06-10	48.3	49.4	52.3
2.		10-14	51.5	52.2	60.0
3.		14-18	56.9	57.7	63.4
4.		18-22	54.7	54.5	55.3
		Leq. (Mean)	**52.9**	**53.5**	**57.8**
5.	**Night**	22-02	51.5	54.7	51.3
6.		02-06	49.7	52.3	49.7
		Leq. (Mean)	**50.6**	**53.5**	**50.5**

NOISE LEVEL DATA

Location : Mandlia Village (N3)

Sl. No.	Time (Hrs.)		L_{eq} Noise Level, dB(A)		
			March 2012	April 2012	May 2012
1.	Day	06-10	43.6	41.5	47.5
2.		10-14	46.9	44.2	48.9
3.		14-18	48.9	46.3	50.4
4.		18-22	43.7	43.7	44.7
		Leq. (Mean)	**45.8**	**43.9**	**47.9**
5.	Night	22-02	41.7	40.6	41.4
6.		02-06	39.0	41.8	40.2
		Leq. (Mean)	**40.4**	**41.2**	**40.8**

NOISE LEVEL DATA

Location : Gandghora (N4)

Sl. No.	Time (Hrs.)		L_{eq} Noise Level, dB(A)		
			March 2012	**April 2012**	**May 2012**
1.	**Day**	06-10	42.3	42.8	41.6
2.		10-14	45.3	45.4	43.4
3.		14-18	46.9	48.6	46.7
4.		18-22	42.4	45.4	40.4
		Leq. (Mean)	**44.2**	**45.6**	**43.0**
5.	**Night**	22-02	41.2	43.5	38.2
6.		02-06	39.0	41.9	37.4
		Leq. (Mean)	**40.1**	**42.7**	**37.8**

NOISE LEVEL DATA

Location : Gandhi Chowk (N5)

Sl. No.	Time (Hrs.)		L_{eq} Noise Level, dB(A)		
			March 2012	**April 2012**	**May 2012**
1.	**Day**	06-10	46.7	47.3	47.3
2.		10-14	49.3	49.5	50.5
3.		14-18	50.9	50.1	51.3
4.		18-22	43.9	43.3	45.7
		Leq. (Mean)	**47.7**	**47.6**	**48.7**
5.	**Night**	22-02	41.3	43.9	44.5
6.		02-06	40.5	42.5	42.5
		Leq. (Mean)	**40.9**	**43.2**	**43.5**

NOISE LEVEL DATA

Location : Chheikuthi (N6)

Sl. No.	Time (Hrs.)		L_{eq} Noise Level, dB(A)		
			March 2012	April 2012	May 2012
1.	Day	06-10	40.7	40.6	41.2
2.		10-14	42.4	41.7	42.4
3.		14-18	43.7	43.0	44.3
4.		18-22	40.2	40.1	40.7
		Leq. (Mean)	**41.8**	**41.4**	**42.2**
5.	Night	22-02	39.3	41.4	37.9
6.		02-06	38.4	40.7	39.0
		Leq. (Mean)	**38.9**	**41.1**	**38.5**

NOISE LEVEL DATA

Location : Jamkani (N7)

Sl. No.	Time (Hrs.)		L_{eq} Noise Level, dB(A)		
			March 2012	**April 2012**	**May 2012**
1.	**Day**	06-10	42.1	43.1	40.8
2.		10-14	45.2	44.2	43.2
3.		14-18	40.3	46.2	39.3
4.		18-22	38.4	42.4	38.7
		Leq. (Mean)	**41.5**	**44.0**	**40.5**
5.	**Night**	22-02	35.4	38.5	37.9
6.		02-06	36.1	35.4	35.9
		Leq. (Mean)	**35.8**	**37.0**	**36.9**

NOISE LEVEL DATA

Location : Lajkura (N8)

Sl. No.	Time (Hrs.)		L_{eq} Noise Level, dB(A)		
			March 2012	**April 2012**	**May 2012**
1.	**Day**	06-10	43.7	41.7	42.4
2.		10-14	46.4	43.2	44.3
3.		14-18	48.2	46.1	46.7
4.		18-22	44.9	40.5	41.8
		Leq. (Mean)	**45.8**	**42.9**	**43.8**
5.	**Night**	22-02	40.6	39.3	37.4
6.		02-06	41.8	40.5	38.7
		Leq. (Mean)	**41.2**	**39.9**	**38.1**

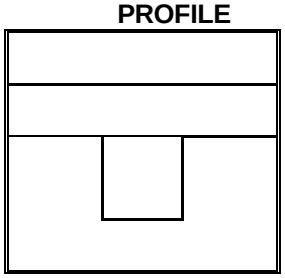
Annexure V

SOIL QUALITY DATA

Location : Forest Land, Corezone (S1)

Sl. No.	Parameter	Depth, cm		
		0-30	**30-60**	**60-100**
1.	pH	7.56	7.48	7.62
2.	Temperature (^{o}C)	28.0	25.8	24.3
3.	Electrical conductivity (m-mhos/cm at 20°C)	252	139	129
4.	Nitrogen, kg/ha	458	436	435
5.	Phosphorus, kg/ha	5.8	6.5	5.8
6.	Potassium, kg/ha	149	158	142
7.	Calcium, kg/ha	796	848	826
8.	Magnesium, kg/ha	275	293	289
9.	Sodium , kg/ha	16	18	15
10.	Chlorides, kg/ha	43	49	47
11.	Sulphates, kg/ha	22	26	23
12.	Iron, kg/ha	4.6	4.5	4.8
13.	Boron (%)	0.00001	0.00001	0.00001
14.	Organic matter (%)	3.6	3.9	3.7
15.	Microbial Activity (CO_2 evolved /sq.m.)	1.22	0.82	0.59
16.	Grain size distribution Sand Clay Silt	 46 39 22	 49 38 21	 43 39 223
17	Sodium Absorption Ratio (SAR)	2.9	2.8	2.7
18	Natural Moisture content (%)	3.0	2.8	2.7
19	Field Capacity (%)	--	9.6	--
20	Wilting Co-efficient (%)	--	0.8	--
21	Available Water Storage Capacity (%)	--	8.4	--
22	Bulk Density (gms /cc)	1.24	1.27	1.31
23	Cation exchange Capacity (cm/hr)	1.33	1.36	1.38
24	Infiltration rate (cm/hr)	--	4.8	--
25	Atterburg Limits Liquid limit (%) Plastic Limit (%) Shrinkage (%)	 27.4 13.1 4.2	 26.9 12.7 4.4	 27.6 13.3 3.8

PROFILE

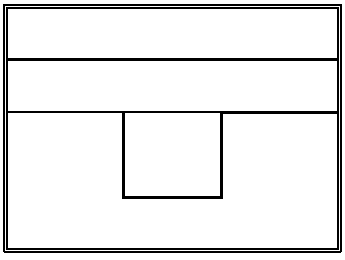


SOIL QUALITY DATA

Location : Barren Land, Corezone (S2)

Sl. No.	Parameter	Depth, cm		
		0-30	**30-60**	**60-100**
1.	pH	7.40	7.10	7.12
2.	Temperature (^{o}C)	24.0	24.5	23.5
3.	Electrical conductivity (m-mhos/cm at 20°C)	240	248	258
4.	Nitrogen, kg/ha	59.4	62.4	67.4
5.	Phosphorus, kg/ha	5.4	6.1	6.3
6.	Potassium, kg/ha	110	118	124
7.	Calcium, kg/ha	84	88	94
8.	Magnesium, kg/ha	94	102	108
9.	Sodium , kg/ha	25	29	26
10.	Chlorides, kg/ha	68	74	88
11.	Sulphates, kg/ha	102	124	138
12.	Iron, kg/ha	0.86	1.02	1.12
13.	Boron (%)	0.0001	0.0001	0.0001
14.	Organic matter (%)	0.3	0.34	0.38
15.	Microbial Activity (CO_2 evolved /sq.m.)	1.28	1.38	1.46
16.	Grain size distribution Sand Clay Silt	 48 32 20	 54 30 16	 49 33 18
17	Sodium Absorption Ratio (SAR)	4.5	4.7	4.4
18	Natural Moisture content (%)	6.0	6.5	6.8
19	Field Capacity (%)	--	12.8	--
20	Wilting Co-efficient (%)	--	1.4	--
21	Available Water Storage Capacity (%)	--	11.4	--
22	Bulk Density (gms /cc)	1.88	1.94	1.96
23	Cation exchange Capacity (cm/hr)	10.2	10.6	10.8
24	Infiltration rate (cm/hr)	--	4.2	--
25	Atterburg Limits Liquid limit (%) Plastic Limit (%) Shrinkage (%)	 24.6 12.4 7.4	 25.3 13.2 6.8	 26.6 12.7 6.5

PROFILE

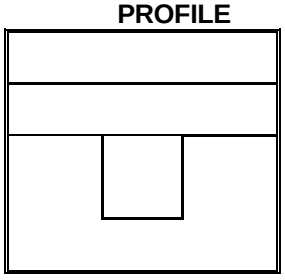


SOIL QUALITY DATA

Location : Barrent Land, Near Core Zone (S3)

Sl.No.	Parameter	Depth, cm		
		0-30	30-60	60-100
1.	pH	7.28	7.35	7.39
2.	Temperature (^{o}C)	27.5	25.0	23.0
3.	Electrical conductivity (m-mhos/cm at 20°C)	140	148	160
4.	Nitrogen, kg/ha	399	402	415
5.	Phosphorus, kg/ha	4.8	4.9	4.5
6.	Potassium, kg/ha	146	149	158
7.	Calcium, kg/ha	788	804	820
8.	Magnesium, kg/ha	326	338	346
9.	Sodium , kg/ha	12	14	13
10.	Chlorides, kg/ha	56	60	58
11.	Sulphates, kg/ha	27	30	25
12.	Iron, kg/ha	4.5	4.8	5.2
13.	Boron (%)	0.00001	0.00001	0.00001
14.	Organic matter (%)	3.9	4.6	4.3
15.	Microbial Activity (CO_2 evolved /sq.m.)	0.94	0.96	0.96
16.	Grain size distribution Sand Clay Silt	 62 18 20	 58 24 18	 54 28 18
17	Sodium Absorption Ratio (SAR)	3.0	3.1	3.3
18	Natural Moisture content (%)	3.1	3.3	3.5
19	Field Capacity (%)	--	7.7	--
20	Wilting Co-efficient (%)	--	0.6	--
21	Available Water Storage Capacity (%)	--	7.1	--
22	Bulk Density (gms /cc)	1.13	1.16	1.18
23	Cation exchange Capacity (cm/hr)	1.89	1.93	1.87
24	Infiltration rate (cm/hr)	--	4.2	--
25	Atterburg Limits Liquid limit (%) Plastic Limit (%) Shrinkage (%)	 23.4 12.4 5.6	 22.7 12.8 5.7	 22.1 12.7 5.4

PROFILE

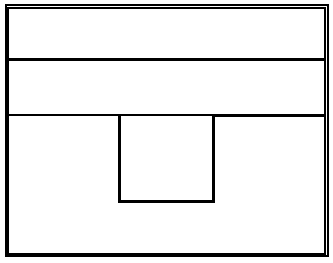


SOIL QUALITY DATA

Location : Agricultural Land, Bundia Village (S4)

Sl. No.	Parameter	Depth, cm		
		0-30	30-60	60-100
1.	pH	7.25	7.19	7.27
2.	Temperature (^{o}C)	27.0	24.5	23.0
3.	Electrical conductivity (m-mhos/cm at 20°C)	128	132	136
4.	Nitrogen, kg/ha	326	330	339
5.	Phosphorus, kg/ha	3.9	3.6	3.2
6.	Potassium, kg/ha	128	136	135
7.	Calcium, kg/ha	737	744	740
8.	Magnesium, kg/ha	332	340	337
9.	Sodium , kg/ha	8	9	7
10.	Chlorides, kg/ha	54	57	52
11.	Sulphates, kg/ha	29	32	30
12.	Iron, kg/ha	5.4	5.2	4.9
13.	Boron (%)	0.0001	0.0001	0.0001
14.	Organic matter (%)	3.0	2.8	2.7
15.	Microbial Activity (CO_2 evolved /sq.m.)	0.94	0.96	0.88
16.	Grain size distribution Sand Clay Silt	 68 19 13	 64 20 16	 62 18 20
17	Sodium Absorption Ratio (SAR)	3.1	2.8	2.6
18	Natural Moisture content (%)	3.4	3.2	3.0
19	Field Capacity (%)	--	5.4	--
20	Wilting Co-efficient (%)	--	0.6	--
21	Available Water Storage Capacity (%)	--	6.7	--
22	Bulk Density (gms /cc)	0.88	0.85	0.82
23	Cation exchange Capacity (cm/hr)	1.44	1.37	1.31
24	Infiltration rate (cm/hr)	--	5.2	--
25	Atterburg Limits Liquid limit (%) Plastic Limit (%) Shrinkage (%)	 19.2 10.8 4.7	 19.6 11.4 4.8	 20.2 11.8 4.6

PROFILE

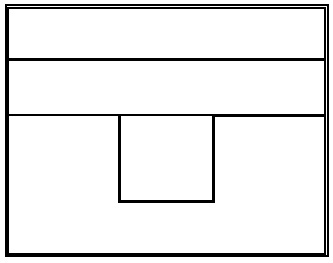


SOIL QUALITY DATA

Location : Agricultural Land, Gangapur village (S5)

Sl. No.	Parameter	Depth, cm		
		0-30	30-60	60-100
1.	pH	7.45	7.32	7.28
2.	Temperature (^{o}C)	27.0	24.5	23.5
3.	Electrical conductivity (m-mhos/cm at 20°C)	134	146	152
4.	Nitrogen, kg/ha	262	266	275
5.	Phosphorus, kg/ha	5.6	5.9	5.4
6.	Potassium, kg/ha	158	160	164
7.	Calcium, kg/ha	798	832	838
8.	Magnesium, kg/ha	410	414	422
9.	Sodium , kg/ha	10	12	14
10.	Chlorides, kg/ha	44	48	46
11.	Sulphates, kg/ha	68	72	74
12.	Iron, kg/ha	4.4	4.6	4.8
13.	Boron (%)	0.0001	0.0001	0.0001
14.	Organic matter (%)	3.2	2.9	2.8
15.	Microbial Activity (CO_2 evolved /sq.m.)	1.21	1.14	1.11
16.	Grain size distribution Sand Clay Silt	 66 18 16	 70 14 16	 68 16 16
17	Sodium Absorption Ratio (SAR)	4.22	4.18	4.14
18	Natural Moisture content (%)	3.8	3.6	3.4
19	Field Capacity (%)	--	5.7	--
20	Wilting Co-efficient (%)	--	0.4	--
21	Available Water Storage Capacity (%)	--	5.6	--
22	Bulk Density (gms /cc)	1.40	1.44	1.41
23	Cation exchange Capacity (cm/hr)	2.22	2.24	2.27
24	Infiltration rate (cm/hr)	--	3.5	--
25	Atterburg Limits Liquid limit (%) Plastic Limit (%) Shrinkage (%)	 22.7 15.0 6.4	 23.5 14.4 6.2	 23.7 14.5 6.3

PROFILE



Annexure-III

List of CSR Activities for the Year 2010-11 (Expenditure)

Sl. No.	Area/ Location	District	State	Particulars	Amount in Rs.lakhs
1.	Lakhanpur	Jharsuguda	Odisha	Water supply to nearby peripheral villages by mobile tanker during summer	28.61
2.	Lakhanpur	Jharsuguda	Odisha	Constn. of Boundary wall of Primary School of nearby village	0.64
3.	Orient	Jharsuguda	Odisha	Water Supply to nearby peripheral villages by mobile tanker during summer	0.15
4.	Jagannath	Angul	Odisha	Grant in aid to different Primary School	8.76
5.	Jagannath	Angul	Odisha	Water supply to nearby peripheral villages by mobile tanker during summer	47.42
6.	Jagannath	Angul	Odisha	Eye camp at Regional Hospital	1.59
7.	Jagannath	Angul	Odisha	Maintenance of village road	8.68
8.	Jagannath	Angul	Odisha	Constn. of Road in peripheral village	7.89
9.	Jagannath	Angul	Odisha	Supply to Ceiling Fans to Talcher College	0.31
10.	Jagannath	Angul	Odisha	Renovation of irrigation well near Rly.Stn. of Talcher	2.13
11.	Jagannath	Angul	Odisha	Renovation of Rifle Club at Talcher	3.19
12.	Jagannath	Angul	Odisha	Constn. of bridge Bangaru nala	10.76
13.	Jagannath	Angul	Odisha	Field Survey Report of Socio Economic studies	1.24
14.	Bharatpur	Angul	Odisha	Grant in aid to UP High School	7.00
15.	Bharatpur	Angul	Odisha	Water supply to nearby peripheral villages by mobile tanker during summer	22.54
16.	Bharatpur	Angul	Odisha	Eye Camp	0.10
17.	Bharatpur	Angul	Odisha	Constn. of road in the peripheral village	0.28
18.	MCL HQ	Sambalpur	Odisha	Family Planning Camp	0.09
19.	Talcher	Angul	Odisha	Financial Assistance for construction 100 sealed ST Girls Hostel, Angul	82.50
20.	Talcher	Angul	Odisha	Constn. of 138 nos. additional class room buildings in different School taken up through State Authority in Angul district	564.42
21.	Talcher	Angul	Odisha	Constn. of 134 nos. of Anganwadi Centers taken up through State Authority in Angul District	833.48
22.	MCL HQ	Bhubaneswar	Odisha	Financial Assistance to Sports complex at BJB college, Bhubaneswar.	10.00
23.	MCL HQ	Sambalpur	Odisha	3rd installment for execution of 3 piped water supply scheme to 19 nos. peripheral villages of Talcher coalfields of MCL	400.00
24.	MCL HQ	Bhubaneswar	Odisha	Plantation works at BBSR taken up through M/s.OFDC	75.00

Sl. No.	Area/ Location	District	State	Particulars	Amount in Rs.lakhs
25.	Basundhara	Sundargarh	Odisha	Maintenance of road BG Area	5.00
26.	Talcher	Angul	Odisha	Widening & strengthening of Angul – Chhendipada-Sarpal-Budhapal road upto 2 lane Standard, Angul	1300.00
27.	Ib Valley	Jharsuguda	Odisha	Construction Bldg. of Ashakiran Charitable Society, Jharsuguda	18.00
28.	MCL HQ	Sambalpur	Odisha	Deposit of fund for peripheral development works in Sambalpur district (works like constn. of community centre, class room / School building, water supply arrangement, infrastructure, etc.)	37.00
29.	MCL HQ	Sambalpur	Odisha	Deposit of fund for peripheral development works in Sambalpur district (works like constn. of community centre, class room / School building, water supply arrangement, infrastructure, etc.)	171.75
30.	Ib Valley	Jharsuguda	Odisha	Providing furniture D.P. Office, Jharsguda	5.00
31.	MCL HQ	Sambalpur	Odisha	Constn. dining hall for Kalpatsru Seva Sikshyashram, Hirakud	1.72
32.	MCL HQ	Bhubaneswar	Odisha	Providing Bolero jeep to Red Cross Society, Bhubaneswar	4.55
33.	CWS. Talcher	Angul	Odisha	Grant in aid to different Primary School and Colleges, Talcher, Angul	22.40
34.	Talcher	Angul	Odisha	Water supply to nearby peripheral village by mobile tanker during summer	27.40
35.	Talcher	Angul	Odisha	Constn. of class room in Primary School	1.49
36.	Talcher	Angul	Odisha	Misc. works for SRM bldg., Talcher, Angul	3.00
37.	Lingaraj	Angul	Odisha	Misc. works at Entrance of Talcher Town, Talcher, Angul	0.17
38.	Lingaraj	Angul	Odisha	Approach road to bridge over Bangaru Nallah	1.75
39.	Lingaraj	Angul	Odisha	Sinking of tube well in nearby village	1.14
40.	Lingaraj	Angul	Odisha	Constn. class room in the primary School	5.11
41.	Lingaraj	Angul	Odisha	Widening & strengthening of public road from Dera chowk to Handidhua chowk, Talcher	145.50
42.	Lingaraj	Angul	Odisha	Providing furniture for Talcher college	3.00
43.	Lingaraj	Angul	Odisha	Repairing of Talcher college building, Talcher	3.00
44.	Lingaraj	Angul	Odisha	Painting works of Talcher College Building	0.89
45.	Lingaraj	Angul	Odisha	Black topping of road	2.21
46.	Lingaraj	Angul	Odisha	Constn. of village road	20.13
47.	Lingaraj	Angul	Odisha	Boundary wall of OWSS	0.25
48.	Lingaraj	Angul	Odisha	Replacement of AC school of Jarda High School	2.04
49.	Lingaraj	Angul	Odisha	Misc. works on the road at Lingaraj	2.26

Sl. No.	Area/ Location	District	State	Particulars	Amount in Rs.lakhs
50.	Lingaraj	Angul	Odisha	Constn. of Community Hall under Lingarj	2.73
51.	Lingaraj	Angul	Odisha	Water supply to nearby peripheral villages by mobile tanker during summer	42.75
52.	Ib Valley	Jharsuguda	Odisha	Construction of class room for Primary School	0.75
53.	Ib Valley	Jharsuguda	Odisha	Water supply to nearby peripheral village by mobile tanker during summer	51.22
54.	Ib Valley	Jharsuguda	Odisha	Miscellaneous activities under Lingaraj Area	5.29
55.	Ib Valley	Jharsuguda	Odisha	Eye Camp	2.82
56.	Hingula	Angul	Odisha	Repairing & Maintenance of Community Hall near Hingula Temple	5.76
57.	Hingula	Angul	Odisha	Water supply to nearby peripheral village by mobile tanker during summer	107.27
58.	Hingula	Angul	Odisha	Miscellaneous activities under Hingula area	2.20
59.	Hingula	Angul	Odisha	Providing RCC hume pipes in the approach road to village	0.27
60.	Hingula	Angul	Odisha	Maintenance of Meditation Centre in the village	0.66
61.	Hingula	Angul	Odisha	Providing of Borewell in the peripheral village	9.10
62.	Hingula	Angul	Odisha	Constn. of class room in the peripheral village	2.45
63.	Hingula	Angul	Odisha	Misc. activities under Hingula Area	1.85
64.	Hingula	Angul	Odisha	Balance work of community centre of Solada	0.91
65.	Basundhara	Sundargarh	Odisha	Water supply to nearby peripheral village by mobile tanker during summer	3.70
66.	Basundhara	Sundargarh	Odisha	Resurfacing of road from Sundargarh to Bankibahal Chhawk at Sundeargarh (Length of road 37.50 km)	1198.18
67.	Basundhara	Sundargarh	Odisha	Centre line making on approach road Sundargarh	6.73
				Total :	5346.18

List of Activities for the Year 2011-12 (Expenditure)

Sl. No.	Area/ Location	District	State	Particulars	Amount in Rs.lakhs
1.	MCL HQ	Sambalpur	Odisha	Constn. of 100 seated Ladies Hostel for University College of Engineering, Burla, Sambalpur	26.45
2.	MCL HQ	Sambalpur	Odisha	Construction of Dining Hall for Kalpataru Seva Shikshyashram at Larpank, Hirakud	4.05
3.	MCL HQ	Sambalpur	Odisha	Purchase of Pump sets etc. for floods at Sambalpur Town	14.90
4.	MCL HQ	Sambalpur	Odisha	Providing of desk benches etc. for Sri Aurobindo Integral Research and Education School, Sambalpur	1.00
5.	MCL HQ	Sambalpur	Odisha	Providing Submersible pumps for drinking water at Leprosy Colony, Laxmi Gungri	0.50
6.	MCL HQ	Sambalpur	Odisha	Miscellaneous activity under CSR Head of MCL HQ for the year 2011-12	1.00
7.	MCL HQ	Sambalpur	Odisha	Supply of 30 nos. “wheel barrows” etc. for break out of Dengue at Sambalpur	2.03
8.	MCL HQ	Sambalpur	Odisha	Distribution of Blanket to the Villagers of periphery of Hqr.	1.50
9.	MCL HQ	Sambalpur	Odisha	Distribution of 100 nos. sewing machine to the needy women around Sambalpur Town	4.95
10.	MCL HQ	Sambalpur	Odisha	Improvement of water supply arrangement in Burla Town, Sambalpur	350.00
11.	MCL HQ	Sambalpur	Odisha	Misc. Sports Expenditure	15.19
12.	MCL HQ	Sambalpur	Odisha	Misc. exp. For organize Mega Health Check up Camp for the year 2011	1.00
13.	Bharatpur	Angul	Odisha	Construction of black topped road from “0” point to Lakeipasi	43.27
14.	Bharatpur	Angul	Odisha	Construction of concrete road in village Lakeipasi	19.02
15.	Bharatpur	Angul	Odisha	Construction of Community Hall at Karnapur	4.78
16.	Bharatpur	Angul	Odisha	Construction of Community Hall at village	1.28
17.	Bharatpur	Angul	Odisha	Construction of compound wall of School building at Karnapur village	7.14
18.	Bharatpur	Angul	Odisha	Construction of two class room at Primary School at Karnapur	6.24
19.	Bharatpur	Angul	Odisha	Development of community hall in village	4.82
20.	Bharatpur	Angul	Odisha	Health care camp for nearby village	0.59
21.	Bharatpur	Angul	Odisha	Construction of Community shed	1.85
22.	Bharatpur	Angul	Odisha	Construction of one no. Arch gate at Kuio village	0.61
23.	Bharatpur	Angul	Odisha	Repair and of market building at Kuio resettlement site	1.93
24.	Bharatpur	Angul	Odisha	Construction of School boundary wall at Kuio resettlement village	2.48
25.	Bharatpur	Angul	Odisha	Repair & Maintenance of Hall in village, Lakeipasi	0.19

Sl. No.	Area/ Location	District	State	Particulars	Amount in Rs.lakhs
26.	Bharatpur	Angul	Odisha	Sinking of one no. deep borewell at village Rakash	1.99
27.	Bharatpur	Angul	Odisha	Supply of water through mobile tanker to Padmabatipur & Nuasahi	5.55
28.	Bharatpur	Angul	Odisha	Supply of water through water tanker to village Bahal	3.28
29.	Bharatpur	Angul	Odisha	Supply of water by tankers to villages & wards	34.79
30.	Bharatpur	Angul	Odisha	Supply of water by mobile tankers to harizan sahi	0.38
31.	Bharatpur	Angul	Odisha	Grant in aid to Privately managed Primary School	8.65
32.	Bharatpur	Angul	Odisha	Water supply by Sinking deep bore well at R&R site	5.69
33.	Lingaraj	Angul	Odisha	Construction of Dining Hall at Chitrakut Bazar	8.32
34.	Lingaraj	Angul	Odisha	Washing & painting of Community Hall at Deulbera village	0.11
35.	Lingaraj	Angul	Odisha	Widening & strengthening of public road from Dera to Handidhua	16.23
36.	Lingaraj	Angul	Odisha	Misc. expenditure	0.15
37.	Lingaraj	Angul	Odisha	Spraying of water from Gandhi Chhak to Bye-pass road	0.88
38.	Lingaraj	Angul	Odisha	Sweeping & cleaning of road from Balanda rehabilitation to Rly. Siding	0.87
39.	Lingaraj	Angul	Odisha	Widening with geometric improvement to the T-Intersection of the road connecting Handidhua to HN-200	13.18
40.	Lingaraj	Angul	Odisha	Power supply arrangement from Lingaraj Township to police station	0.62
41.	Lingaraj	Angul	Odisha	Repairing & maintenance of road from Handidhua chhak to Pabitramohan Chhak	0.98
42.	Lingaraj	Angul	Odisha	Construction of Toilet for Town Police station Barrack, Talcher	2.46
43.	Lingaraj	Angul	Odisha	Providing & fixing high mast light at Talcher Town	0.30
44.	Lingaraj	Angul	Odisha	Water supply to nearby peripheral villages by mobile tanker during summer	78.60
45.	Talcher	Angul	Odisha	Misc. expenditure on social activities by Talcher Mahila Mandal	1.00
46.	Talcher	Angul	Odisha	Misc. expenditure	0.10
47.	Talcher	Angul	Odisha	Grant in aid to UP School Nandira	2.16
48.	Talcher	Angul	Odisha	Grant in aid to LWUP School Dera	2.83
49.	Talcher	Angul	Odisha	Grant in aid to LWUP School Handidhua	2.27
50.	Talcher	Angul	Odisha	Water supply to village Gurjang	10.35
51.	Talcher	Angul	Odisha	Water supply to village Brajanathpur	6.27
52.	Talcher	Angul	Odisha	Water supply to village Sirigida	3.44
53.	Talcher	Angul	Odisha	Water supply to village Raghunathpur	3.55

Sl. No.	Area/ Location	District	State	Particulars	Amount in Rs.lakhs
54.	Talcher	Angul	Odisha	Water supply to village Arakhapal	3.81
55.	Talcher	Angul	Odisha	Water supply to village Lahundi	4.15
56.	Talcher	Angul	Odisha	Water supply to village Kandhal	4.97
57.	Talcher	Angul	Odisha	Construction of Shmasan Ghat at village Handidhua	0.55
58.	Talcher	Angul	Odisha	Construction of additional class room at Bharati High School of village Kankil under PDC	0.89
59.	Hingula	Angul	Odisha	Water supply to nearby peripheral villages by mobile tanker during summer	111.85
60.	Hingula	Angul	Odisha	Washing & painting of Hingula Mahavidyalay	1.43
61.	Hingula	Angul	Odisha	Repairing of road from Kalamachhuin – Angul road junction to Jamunali village	2.93
62.	Hingula	Angul	Odisha	Repair of road from Lakeipasi (Bangaru nallah) to Satyabadipur Sahi of Solada	2.57
63.	Hingula	Angul	Odisha	Sinking of one Deep Bore well along with OH tank and ground water tank of Hingula Junior Mahavidyala	3.11
64.	Hingula	Angul	Odisha	Construction of new toilets and urinals and water supply and sanitary system at Hingula Mahavidyalaya near Hingula OCP	2.97
65.	Hingula	Angul	Odisha	Construction of new toilets and urinals and water supply and sanitary system at Hingula Mahavidyalaya near Hingula OCP	0.16
66.	Hingula	Angul	Odisha	Sinking of one Deep Borewell along with OH tank and ground water tank at Danara High School under Hingula Area	3.11
67.	Hingula	Angul	Odisha	Water supply to nearby peripheral village by mobile tanker during summer	33.35
68.	Hingula	Angul	Odisha	Repair of existing kutcha road at Puruna chasa sahi of village Solada	0.29
69.	Hingula	Angul	Odisha	Providing 2 nos. deep bore wells at Hingula High school and hospital campus of PHC, Kalamachhuin	3.75
70.	Hingula	Angul	Odisha	Distempering, painting, water proofing cement painting and improvement of existing school gate of Hingula High School	1.04
71.	CWS Talcher	Angul	Odisha	Grant in aid to Nilakanteswar Mahavidyalaya, South Balanda	16.00
72.	Jagannath	Angul	Odisha	Repair of class room at Sri Aurobinda Educational Society, Dera	5.98
73.	Jagannath	Angul	Odisha	Water supply arrangement at Villlage Chalagam	76.69
74.	Jagannath	Angul	Odisha	Development work in Community Hall at Hensamul village	1.05
75.	Jagannath	Angul	Odisha	Medical Camp at village Rakash	1.06
76.	Jagannath	Angul	Odisha	Exp. For free eye camp conducted at Regional Hospital, Talcher	2.62

Sl. No.	Area/ Location	District	State	Particulars	Amount in Rs.lakhs
77.	Jagannath	Angul	Odisha	Misc. expenditure	0.10
78.	Jagannath	Angul	Odisha	Misc. expenditure	0.47
79.	Jagannath	Angul	Odisha	Repair work of road at Tentuli village	2.10
80.	Jagannath	Angul	Odisha	Repair of road at Munda Bazar near Angul	2.89
81.	Jagannath	Angul	Odisha	Development of one tube well at Bagamara village	0.69
82.	Jagannath	Angul	Odisha	Repair of Gantapada village road	6.91
83.	Jagannath	Angul	Odisha	Constn. of concept road at village Balanda	10.26
84.	Jagannath	Angul	Odisha	Moorum spreading at village Rakas	1.66
85.	Jagannath	Angul	Odisha	Development work of polly sabha ground at village Rakash	1.38
86.	Jagannath	Angul	Odisha	Economic Survey & Social Cultural Resource Mapping at AOPC.	2.48
87.	Jagannath	Angul	Odisha	Providing RCC slab at Community Hall village Dera	3.13
88.	Jagannath	Angul	Odisha	Release of 4th installment for execution of 3 nos. Pipe Water Supply Scheme for 19 nos. peripheral villages of Talcher coalfields	222.00
89.	Jagannath	Angul	Odisha	Misc. payment for Mahanadi Medical Coalfields Limited	3.00
90.	Ib Valley	Jharsuguda	Odisha	Water supply through water tanker to Sanjob, Madhuban nagar, etc. under I.OCP, IBVA	4.82
91.	Ib Valley	Jharsuguda	Odisha	Providing 7 nos. of HDPE water storage tanks including supply of drinking water at Madhuban nagar	1.98
92.	Ib Valley	Jharsuguda	Odisha	Water supply through water tanker to the villages nearby SOCP under IBVA	3.26
93.	Ib Valley	Jharsuguda	Odisha	Water supply through water tanker to the Brajrajnagar township under IBVA	5.81
94.	Ib Valley	Jharsuguda	Odisha	Supply of fogging machine for break out of Dengue	4.55
95.	Ib Valley	Jharsuguda	Odisha	Constn. of bathing ghat in Ib River near Budhi Pada sand bandha under IBVA	2.16
96.	Ib Valley	Jharsuguda	Odisha	Constn. of temporary sand bandha on the bed of Ib River at intake point of O.P. Mills … for 2011-12	2.99
97.	Ib Valley	Jharsuguda	Odisha	Constn. of Nurshing School cum hostel at Central Hospital IBVA	277.76
98.	Lakhanpur	Jharsuguda	Odisha	Construction of Class room for Kaliga (Burkahandia) Primary School under PDC work	0.29
99.	Lakhanpur	Jharsuguda	Odisha	Supply of Drinking water by water tanker at Charala Village	12.56
100.	Lakhanpur	Jharsuguda	Odisha	Electrical Repairing at Belpahar college, Belpahar	0.68
101.	Lakhanpur	Jharsuguda	Odisha	School health camp of Thakurbapa Ashram Belpahar	0.05
102.	Basundhara	Sundargarh	Odisha	Drilling 2 nos. borewell and installation of	3.51

Sl. No.	Area/ Location	District	State	Particulars	Amount in Rs.lakhs
				submersible pump and providing pipe line up to Basundhara WTP	
103.	Basundhara	Sundargarh	Odisha	Dust suppression by sprinkling of water on road surface from bankhibahal chowk to out post of Balinga village	2.00
104.	Basundhara	Sundargarh	Odisha	Construction of 30000 ltr capacity RCC over head tank at RR side	0.98
105.	Basundhara	Sundargarh	Odisha	Extension of drinking water pipe line with stand post at Kanika village	3.23
106.	Basundhara	Sundargarh	Odisha	Repair and De-silting of Pucca drin at Manikeswari temple at Kanika village	1.25
107.	Basundhara	Sundargarh	Odisha	250 kVA substation issued to RR site Balinga (Store issue)	2.47
108.	Basundhara	Sundargarh	Odisha	Construction of rigid pavement with side drains in village portions within the road from Undergrad to Bankibahal Chowk	321.90
109.	Basundhara	Sundargarh	Odisha	Repairing of pond over flow cause way and approach road under CSR	2.70
110.	Basundhara	Sundargarh	Odisha	Making cross bunds across masina nallah for RR site	0.47
111.	Basundhara	Sundargarh	Odisha	Resurfacing of road from Sundergarh to Bankibahal Chowk (length of Road 37.5 km)	8.22
112.	Basundhara	Sundargarh	Odisha	Resurfacing of road from Sundargarh to Bankibahal Chowk (length of road 37.5 km)	260.02
113.	Basundhara	Sundargarh	Odisha	Medical exp. At under CSR	0.05
114.	Basundhara	Sundargarh	Odisha	Drinking water supply to Balinga Colony for 365 days	0.15
115.	Basundhara	Sundargarh	Odisha	Spraying of water through mobile tanker in the dwelling areas of village Ujlapur and Chhatlenpali on Sundargarh-Duduka road	0.08
116.	Basundhara	Sundargarh	Odisha	Construction of Compound wall at Primary School under CSR	1.28
117.	Basundhara	Sundargarh	Odisha	Misc. expenditure	0.95
118.	Basundhara	Sundargarh	Odisha	Construction of drain cump protection wall at Pond at RR site	3.46
119.	Basundhara	Sundargarh	Odisha	Providing 10 nos hand Pumps at different location at Basundhara township	5.98
120.	Basundhara	Sundargarh	Odisha	Making Boundary with grills and provision sing Board at Chircuit House, Sundargarh	1.84
121.	Basundhara	Sundargarh	Odisha	Supply of Drinking water to village Bankibahal through Tanker of capacity 4000 ltr for six month	1.01
122.	Basundhara	Sundargarh	Odisha	Construction of Rigid pavement with side drains in village portions within the road from Sundargarh to Bankibahal chowk	78.10
123.	All areas	Sambalpur / Sundargarh / Jharsuguda /	Odisha	Other Misc. works at different areas, etc.	52.39

Sl. No.	Area/ Location	District	State	Particulars	Amount in Rs.lakhs
		Angul			
124.	MCL HQ	Sundargarh	Odisha	Special Repair to Bankibahal Gopalpur Taperia road (ODR) from 21/245 km to 28/960 km	8.00
125.	MCL HQ	Sundargarh	Odisha	Special repair to Bankibahal Gopalpur Taparia roads (ODR) from (ODR) Chainage 7/240 to 21/240 km.	11.30
126.	MCL HQ	Sundargarh	Odisha	Relief fund to Odisha flood Victims (2011)	450.00
127.	MCL HQ	Sundargarh	Odisha	Const. of Library Room & Computer Centre at Sudam charan Degree College, Balangir	3.00
128.	MCL HQ	Sundargarh	Odisha	Misc. expenditure of Mahadi Medical Education Trust	3.00
129.	MCL HQ	Sundargarh	Odisha	Organizing a polio Handicap Check up Camp at Junagarh in Kalahandi District of Odisha in association with Lakshya Bharati Foundation	4.40
130.	MCL HQ	Puri	Odisha	Misc. works at Sri Jagannath Temple, Puri under Shree Jagannath Temple Administration	9.69
131.	MCL HQ	Sambalpur	Odisha	Expenditure on CSR awareness programme	2.25
				Total expenditure in the final year	2833.76

Annexure-IV

OFFICE OF THE DIVISIONAL FOREST OFFICER,
SAMBALPUR NORTH FOREST DIVISION, SAMBALPUR.

Memo No. 2059 /Dated 22-08-2012.

To

The Chief Conservator of Forests,
Forest Diversion & Nodal Officer, FC Act,
O/O the PCCF, Odisha.

Sub: Proposal for diversion of 99.06 ha of forest land for surface breaking and permission for 1064.93 ha for underground activities for Orient Underground Mine No.-1&2, Mine No.-3, Hingir-Rampur Colliery & Hirakhand Bundia Mine (Combine) by MCL in Jharsuguda District. **(State SI No.420/10, dt.26.08.2010).**

I am submitting herewith the digital plan both in hard and soft copy prepared by Odisha Space Application Centre (ORSAC) for Orient Underground Mine No.1 & 2, Mine No.3, HRC & HBM (Combine) of MCL for favour of necessary action at your end.

Encl: (1) Digital plan hard copy = 4 nos.
(2) Soft copy = 4 no CD.

22/8/12
Divisional Forest Officer,
Sambalpur North Forest Division.

Memo No. 2060 /Dated 22 -08-2012

Copy alongwith a copy of digital plan both in hard copy and soft copy of Orient Underground Mine No.-1&2, Mine No.-3, HRC & HBM (Combine) is submitted herewith to the Regional Chief Conservator of Forests, Sambalpur for favour of kind information and necessary action.

22/8/12
Divisional Forest Officer,
Sambalpur North Forest Division.

Memo No. 2061 /Dated 22 -08-2012

Copy forwarded to the General Manager, Orient Area, MCL, Brajarajnagar for information and necessary action.

22/8/12
Divisional Forest Officer,
Sambalpur North Forest Division.

Received
23.8.12

PRINCIPAL CHIEF CONSERVATOR OF FORESTS
ODISHA, BHUBANESWAR
23 AUG 2012
Received No.....
Dte.....

Annexure-IV(Contd.)

Mahanadi Coalfields Limited
(A Subsidiary of Coal India Limited)
A Mini Ratna Company
ORIENT AREA

PBX - 242891, 242893
Fax - 242190
e-mail: orient_mcl@rediffmail.com

MAHANADI COALFIELDS LIMITED
Office of the General Manager
ORIENT AREA

Regd. Office : Jagruti Vihar,
Post : Jagruti Vihar, Burla,
Dist: Sambalpur (Odisha).

Post Box No. 31,
Post: Brajrajnagar-768216
Dist: Jharsuguda(Odisha).

Ref. No. MCL:GM:OA:Secy:F-25:276

Date: 18-08-2012

To
The Divisional Forest Officer,
Sambalpur North Division,
SAMBALPUR.

Dear Sir,

We are hereby submitting 06(six) copies each of DGPS/Digital Geo-Referencing maps along with 06 (six) nos. each of soft copies made in CDs as authenticated by ORSAC as per the guidelines issued by Special Secretary to Govt. of Odisha, Deptt. of Forest and Environment, Bhubaneswar with regards to State Srl. No. 420/10, dtd. 26-08-2010 for our forest diversion/underground permission application in respect of Orient Colliery Mine No. 1&2, Orient Colliery Mine No. 3, Hingir Rampur Colliery and Hirakhand Bundia Mine (combined).

You are, therefore, requested to kindly forward the same to CCF (Nodal), Bhubaneswar without any further delay for forwarding our forest diversion/underground permission application for Stage-I clearance to MoEF, Govt. of India, so that, compliance to the CEC recommendation and Hon'ble Apex Court's Order dtd. 19-03-2012 can be made.

Thanking you,

Yours faithfully,

18.8.12
General Manager,
Orient Area, MCL.

Encl: **18 copies of hard copy**
& 18 copies soft copy as above.

cc to: CCF (Nodal), Bhubaneswar.
cc to: RCCF, Sambalpur.
cc to: Director of Mines, Bhubaneswar.
cc to: Dy. Director, Mines, Sambalpur Circle, Sambalpur.
cc to: Area Survey Officer, Orient Area.

Annexure-IV(Contd.)

OFFICE OF THE DIVISIONAL FOREST OFFICER
SAMBALPUR NORTH FOREST DIVISION, SAMBALPUR.

Memo No: 1913 /Dated 01/08/2012

To,

The Chief Conservator of Forests
Forest Conservation & Nodal Officer, FC Act.
Office of the PCCF, Odisha.

Sub: Submission of digital data geo-reference Map prepared by Odisha Space Application Centre (ORSAC) for diversion of 8.259 (Ha) forest land for surface breaking and permission of 389.180 (Ha) for underground activities for Orient underground Mine No-4 against (State Sl.No:310/09, Dtd:07.04.2009) by MCL in Jharsuguda Dist. for applications under Forest Conservation Act-1980 .

I am submitting herewith the digital plan both in hard copy and soft copy prepared by Odisha Space Application Centre (ORSAC) for Orient underground Mine No-4 against (State Sl.No:310/09, Dtd:07.04.2009) of MCL for favour of necessary action at your end.

Encl: (1) Digital plan hard copy=04 Nos.
(2) Digital plan soft copy =04 Nos.

1/8/2012

Divisional Forest Officer,
Sambalpur North Forest Division.

Memo No: /Dated - 2012

Copy alongwith a copy of digital plan both in hard copy and soft copy of Orient underground Mine No-4 is submitted herewith to the Regional Chief Conservator of Forests, Sambalpur for favour of kind information and necessary action.

Divisional Forest Officer
Sambalpur North Forest Division.

Memo No: /Dated -2012

Copy forwarded to the General Manager, Orient Area, MCL, Brajrajnagar for information and necessary action.

Divisional Forest Officer
Sambalpur North Forest Division.

Received
02 AUG 2012

Annexure-IV(Contd.)

Mahanadi Coalfields Limited
(A Subsidiary of Coal India Limited)
A Mini Ratna Company
ORIENT AREA

Phone – 06645 - 242134
PBX - 242891, 242893
Fax - 242190

e-mail: orient_mcl@rediffmail.com

MAHANADI COALFIELDS LIMITED
Office of the General Manager
ORIENT AREA

Regd. Office : Jagruti Vihar,
Post : Jagruti Vihar, Burla,
Dist: Sambalpur (Odisha).

Post Box No. 31,
Post: Brajrajnagar-768216
Dist: Jharsuguda(Odisha).

Ref. No. MCL:GM:OA:Secy:F-25: 259

Date: 31-07-2012

To
The Divisional Forest Officer,
Sambalpur North Division,
SAMBALPUR.

Dear Sir,

We are hereby submitting 06 (six) copies of DGPS/Digital Geo-Referencing maps 06 (six) nos. of soft copies made in CDs as authenticated by ORSAC as per the guidelines issued by Special Secretary to Govt. of Odisha, Deptt. of Forest & Environment, Bhubaneswar with regards to State Sl. No. 310/09, dtd. 07-04-2009 for our forest diversion/underground permission application.

You are, therefore, requested to kindly forward the same to CCF (Nodal), Bhubaneswar without any further delay for forwarding our forest diversion/underground permission application for Stage-I clearance to MoEF, so that, compliance to the CEC recommendation and Hon'ble Apex Court's Order dtd. 19-03-2012 can be made.

Thanking you,

Yours faithfully,

31.7.12

General Manager,
Orient Area, MCL.

Encl: **As above.**

cc to: CCF (Nodal), Bhubaneswar.
cc to: RCCF, Sambalpur.
cc to: Director of Mines, Bhubaneswar.
cc to: Dy. Director, Mines, Sambalpur Circle, Sambalpur.

Annexure-IV(Contd.)

OFFICE OF THE PRINCIPAL CHIEF CONSERVATOR OF FORESTS, ODISHA
BHUBANESWAR

Memo No. /9F(MG)-522/2010
Dated, Bhubaneswar, the April,2012

To

The Divisional Forest Officer,
Sambalpur (North) Forest Division.
Sambalpur.

Sub: Diversion proposal for 99.06 ha of forest land for surface breaking Pre-80 and permission for 1064.93 ha for underground activities for Orient Underground Mine No. 1&2, mine No. 3, Hingir Rampur Colliery & Hirakuda Bundia Mines (Combine) by Orient Area, MCL in Jharsuguda District. (State Sl No. 420/10 dt. 26.08.2010).

Ref: This office Memo No. 19351 dated 24.12.2011.

In inviting a reference to this office Memo cited above on the mentioned subject the required DGPS or total station geo-referenced boundary map for the forest land proposed to be diverted containing a digital map both in hard and soft copy along with shape file furnished to this office immediately for taking necessary action.

This is most urgent.

Sd/-
Chief Conservator of Forests
Forest Diversion & Nodal Officer, F.C. Act

Memo No. /Dt.
Copy forwarded to the Regional Chief Conservator of Forests, Sambalpur Circle for information and necessary action.

Sd/-
Chief Conservator of Forests
Forest Diversion & Nodal Officer, F.C. Act

2312 / 13.4.12

Memo No. 6060 /Dt. 05-04-12
Copy forwarded to the General Manager, Orient Area Mahanadi Coalfield Limited, Post Box- 31, Post- Brajrajnagar, Dist- Jharsuguda (Odisha) Pin- 768216 for information and necessary action.

5.4.12
Chief Conservator of Forests
Forest Diversion & Nodal Officer, F.C. Act

321 / 16/4/2012

SC (Sur)

GM/ho

SAM'S (KBA-2-05A)
For land information

Copy circulated

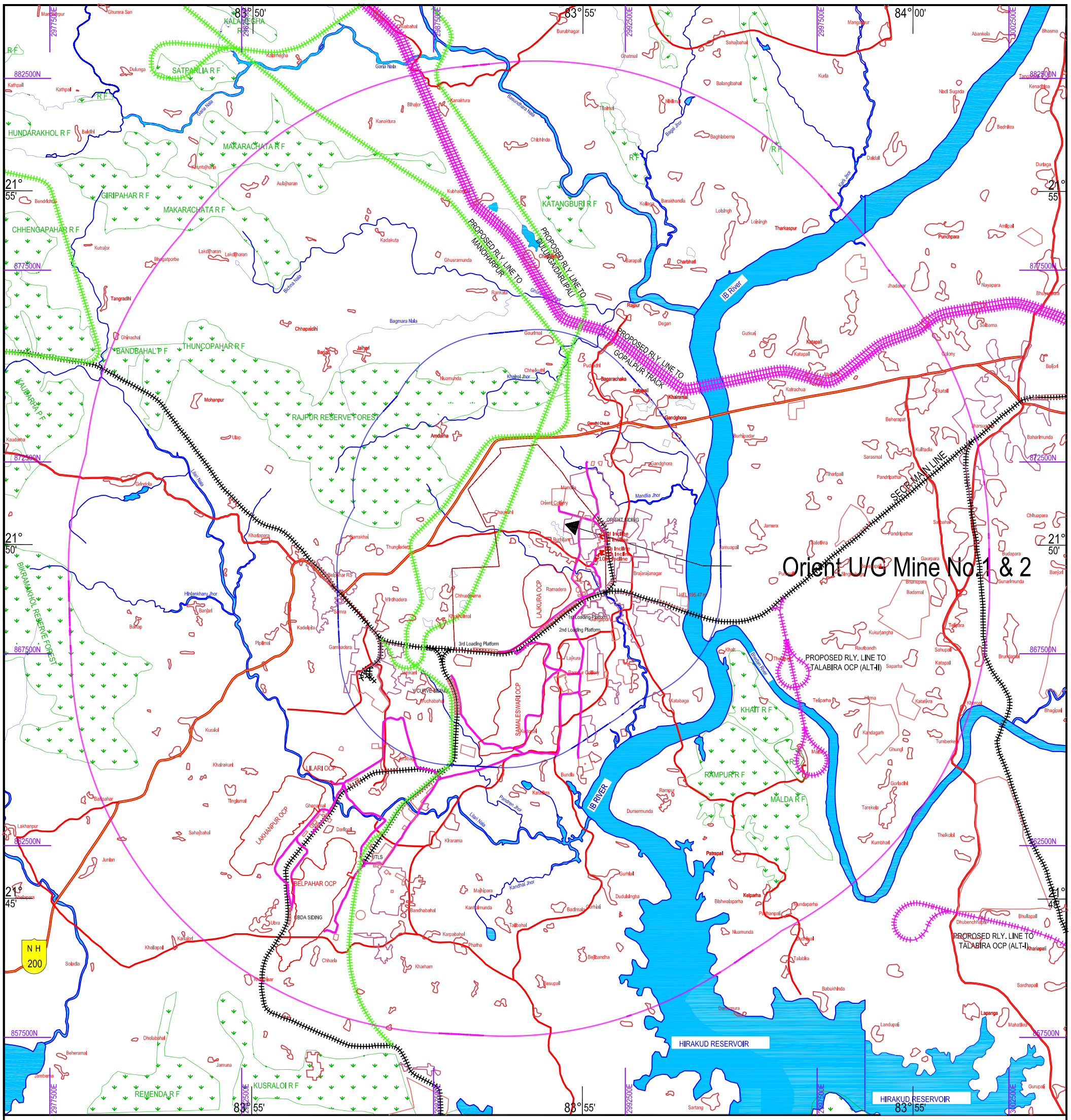


PLATE NO. I

INDEX

- National Highway
- State Highway/MDR
- Other Road
- Railway Line (Existing & Proposed)
- Forest Boundary
- 10km Buffer Boundary
- 3km Buffer Boundary
- Mine Lease Boundary
- State/District Boundary

Note: Forest Boundaries Are Taken From Survey of India Toposheets

- Incline
- Air shaft

Mahanadi Coalfields Limited

Job Title: EIA-EMP Of Orient U/G Mine No. 1 & 2

Job No. 706101

Subject: Surface Plan showing IB river & Mine No- 1 & 2

Activity	Name	Desig.	Signature	Date
Processed	T. K. Das	Sr.Manager(Civ)		07.02.2011
Processed	A. K. Samantaray	Sr.Manager (Env.)		07.02.2011
Checked	S. P. Mohanty	Dy. GM (GMT)		07.02.2011
Approved	Amarjit Singh	R.D. (RI-VII)		07.02.2011

CMPDI
ISO 9001:2000 Company

Scale: 0 0.5 1.0 1.5 2.0 3.0 4.0 Km

Sheet 1 of 1

Drg.No. R 7 GMT 3 0 0 2 0 1

REV.No. 0

Orient U/G Mine No.1 & 2

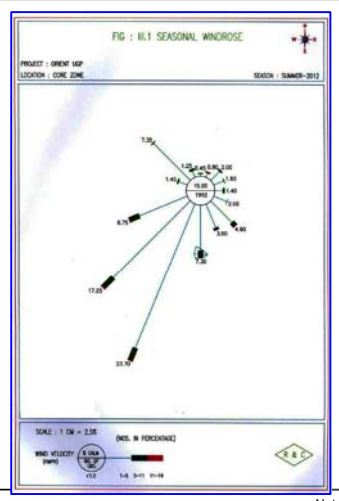


PLATE NO. II

INDEX

- National Highway
- State Highway/MDR
- Other Road
- Railway Line (Existing & Proposed)
- Forest Boundary
- 10km Buffer Boundary
- 3km Buffer Boundary
- Mine Lease Boundary
- State/District Boundary
- Incline
- Air shaft

Note: Forest Boundaries Are Taken From Survey of India Toposheets

▲ Ambient Air Quality & Noise Monitoring station

A1,N1 - Core zone, Store
A2,N2 - Core zone, Near Temple
A3,N3 - Mandlia village
A4,N4 - Ghandghora village
A5,N5 - Gandhi Chowk
A6,N6 - Chheikuthi village
A7,N7 - Jamakani Village,
A8,N8 - Lajkura Village

Mahanadi Coalfields Limited

Job Title: EIA-EMP Of Orient U/G Mine No. 1 & 2

Job No. 706101

Subject: Surface Plan showing Monitoring station of Mine no1 & 2

Activity	Name	Desig.	Signature	Date
Processed	T. K. Das	Sr.Manager(Civ)		07.02.2011
Processed	A. K. Samantaray	Sr.Manager (Env.)		07.02.2011
Checked	S. P. Mohanty	Dy. GM (GMT)		07.02.2011
Approved	Amarjit Singh	R.D. (RI-VII)		07.02.2011

CMPDI
ISO 9001:2000 Company

Scale: 0 0.5 1.0 1.5 2.0 3.0 4.0 Km

Sheet 1 of 1

Drg.No. R 7 GMT 3 0 0 2 0 1

REV.No. 0