ENVIRONMENTAL IMPACT ASSESSMENT

for

Proposed (0.96 Million TPA) Coal Washery

at

Village: Bajarmura & Dholnara, Tahsil: Gharghoda (Tamnar) Distt: Raigarh (CG)

for

Sarda Energy & Minerals Limited

Prepared by

ANACON

LABORATORIES PVT. LTD.

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FOREWORD

M/s Sarda Energy & Minerals Limited. (SEML) Bajarmura & Dholnar, has proposed to install 0.96 million TPA Coal Washery to produce washed coal, for captive steel plant at Siltara, Raipur.

With a view to assessing the potential environmental impacts due to proposed activities, M/s Sarda Energy & Minerals Limited., retained M/s Anacon Laboratories Pvt. Ltd., Nagpur to undertake Environmental Impact assessment studies. The report envisages the assessment of the impact of various environmental components by collecting baseline data for Air, Noise, Water, Land and Socio-economic component and its mitigative measures in order to minimize the adverse impacts.

The timely cooperation and assistance rendered by officials of **M/s SEML** is gratefully acknowledged.

Nagpur

Dr. D. G. Garway
Anacon Laboratories Pvt. Ltd.,

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Chapter 1

Introduction

1.1 Preamble

M/s Sarda Energy & Minerals Limited., (SEML) formerly known as Raipur Alloys & Steel Ltd., is in a process of state of the art coal beneficiation facilities to meet the demand of washed coal for captive Sponge Iron Plant at Siltara, Raipur (CG). M/s. SEML has been allotted a captive coal block Gare Palma IV/7 at Karwahi, Tehsil Tamnar, Distt.- Raigarh, which is about 200 KM from their Steel Plant at Raipur. It is proposed to install a Coal Washery Plant of 400 tonnes per hour throughput capacity.

M/s Sarda Energy & Minerals Limited., (SEML) requested State Level Expert Appraisal Committee for miner change in location of proposed coal washery due to shortage of area for O.B. dump.

The State Level Environmental Appraisal Committee Chhattisgarh considered the request and have communicated there permission for change in location. (The Letter has been received from SLEAC Raipur, Chhattisgarh, Vide No. 93/SEAC-CG/EC/TPP/RGH/34/09 Dt. 10/06/09). The letter is enclosed as **Annexure –IA**.

The change in location is given as below:

Old Location	**New Location**
Village : Karwahi & Khamria	Village – Bajarmura - Dholnara
Tahsil –Gharghora (now Tamnar)	Tahsil – Gharghora (now Tamnar)
District – Raigarh C.G.	District – Raigarh C.G.

The salient features of the proposed Coal Washery are as under:-

Location	Village : Bajarmura - Dholnara Tahsil : Gharghora (now Tamnar) District : Raigarh, Chhattisgarh
Total Proposed Area	10.12 Ha (Pit head coal washery adjacent to captive coal mine at Karwahi)
Greenbelt Area	3.33 Ha (33 % of the total area)
Size of the Project (Annual throughput)	400 X 300 X 8

	= 960,000 tonnes Say 0.96 Million Tonnes per Annum 0.96 Million TPA Coal Washery (400 TPH)
No. of operating days in a year	300 days
No. of operating hours in a day	8 Hours
Plant utilization	100%
Source of Raw Coal:	Captive coal mine at Karwahi (Gare Palma Block IV/7).
Transportation of Raw Coal	Conveyor Belt /Tipper
Source of water:	@ 20 m ^{3}/hr. from coal mines
Cost of the Project	Rs. 30 Crores
Budgetary Provision for EMP	Rs. 2.55 Crores

1.1.1 Profile of Project Proponent

M/s Sarda Energy & Minerals (formerly Raipur Alloys & Steel Limited/ Chhattisgarh Electricity Company Limited). Raipur Alloys & Steel Limited is a public limited company incorporated under Companies Act 1956 on 6th July, 1973 with the main objective of manufacturing Steel, Sponge Iron, Power Generation, Ferro Alloys, Mines and Coal Washery .

In order to assess to potential environmental impacts likely to arise due to proposed coal washery of SEML at Bajarmura & Dholnara Distt, Raigarh (CG). M/s SEML has retained Anacon Laboratories Pvt. Ltd., Nagpur, to undertake Environmental Impact Assessment studies. The report envisages the assessment of the impact of various environmental components and its mitigation measures in order to minimize the adverse impacts.

1.2 Scope of the Study

The State Level Expert Appraisal Committee Chhattisgarh considered the project in the 8th meeting held on 30th June 2008 as per decision, subcommittee visited the site on 22/07/08 the inspection report of subcommittee was presented before SEAC, Chhattisgarh in 9th meeting held on 31st July 2008. As per decision taken in 9th meeting of SEAC, Chhattisgarh, project proponent made the presentation before SEAC, on 5th September 2008. After submission of the requisite information and based on the consideration of the documents submitted, the presentation made by the project proponent and discussion held, the Committee decided that the proposed project should be considered as 'B1' category and prescribed the following Terms of Reference (State Level EAC, CG enclosed **Annexure-I B**) EIA report for the above-mentioned project.

The EIA/EMP studies report has been prepared incorporating the TOR conditions and point wise TOR conditions compliance are as under:

Source of Raw Coal

1 The annual throughput of coal for the three years	The annual throughput of coal for the three years will be 2.88, million tones
2 The list of clients/companies along with copy of agreement between project proponent and companies to whom the washed coal to be supplied.	Washed Coal will be utilized in Sarda Energy & Minerals Limited steel plant at Siltara, Raipur for production of sponge iron.
3 The list of clients/companies along with copy of agreement between project proponent and companies to whom the rejects/ coal fines to be supplied/sold/returned	Coal Fines and Middling will be utilized in proposed 350 MW Thermal Power Plant of SEML at Kolam, Raigarh. Washery rejects will be disposed as landfill after extraction of coal from Karwahi Coal Mine.
4 The mode of transport/conveyance of incoming unwashed coal and outgoing washed coal, rejects, coal fines etc.	The unwashed coal for the proposed project will be transported by conveyor belt/tipper. Washed coal will be transported by Road.
Project Description	
5 A brief description of the plant, the technology used and energy conservation	A brief description of the plant, the technology used are discusses in **chapter 2** sub **head 2.6**
6 All the coordinates of the plant site with toposheet	All coordinates of the site is enclosed as **Annexure II.** Toposheet 64 N/8, 12
7 Detailed material balance and water balance break up of raw coal, washed coal, rejects, coal fines, break up of water requirement as per different activities in the washing operations	**Refer Table Below :**

1	Total quantity of beneficiated coal (finished product)	1760 Tons/day
2	Middling quantity	1216 Tons/day
3	Final Rejects	224 Tons/day
	Total of the above 1 + 2 + 3	3200 Tons/day
	Total quantity of raw coal processed	3200 Tons/day

Water balance (all values in m^3/day)

Details	Process Water	Process Water	System Loss	Waste Generation	Utilization/Disposal
1	Process	364	260	104	Recycle
2	Miscellaneous	110	110	--	-
3	Domestic	06	01	05	Septic tanks and soak pit
Total		**480**	**371**	**109**	

8 Source of water supplied for use in washery operations, sanction of the competent authority in the state Govt.	The total water requirement sourced from captive Karwahi coal mine pits.
9 Examine close circuit system for 100% recycling and reuse of the treated effluent in the washery operations or other uses such as irrigating the greenbelt within premises etc.:	The wastewater generated from coal washery will be recycled 100 % in the plant, for development of green belt and dust suppression etc.
10 Examine zero effluent discharge conditions	No wastewater will be discharged from the washery as it will be recycled 100% as mentioned at point no. 9
11 Submission of sample test analysis of:	I Characteristics of coal to be washed. This includes grade of coal and other characteristics such as ash, S and Hg level etc., II Characteristics- and quantum of washed coal and III Characteristics and quantum of coal waste rejects Refer Table below:

Proximate analysis of coal

Parameter	Coal	Washed coal	Middlings
Coal used	F- grade	-	-
Fixed carbon %	28 – 30	30 – 34	20 – 22
Volatile matter %	20 - 24	20 - 24	16 - 18
Total moisture %	10 - 12	10 - 12	10 - 12
Sulphur %	0.3 to 0.6	0.3 to 0.6	0.3 to 0.6
Mercury ppm	0.4 to 0.6	0.4 to 0.6	0.2 to 0.4
Ash %	40 – 45	30 ± 2	50 – 55
GCV (kcal/kg)	3000 -3700	4000 – 4200	2200 – 2400

Description of the Environment:	
12 Study area should cover an area of 10 km radius around the proposed site	Study area map is shown in **Fig. 1.1 of chapter 1**.
13 A study area map of the core zone and 10 km area of the buffer showing major topographical features such as land use, drainage, location of habitats, major construction including railways, highways pipelines major industries/mines and other polluting sources, which shall also indicate the migratory corridors of fauna, if any, and the areas where endangered fauna and plants of medicinal and economic importance found in the area	The study area map (**Fig. 1.1 of chapter 1**.) shows the major topographical features as given in the legend of map. No major industries are present in and around the proposed site except few mining activities.

14 Digital processing of the entire lease area of existing coal mines using remote sensing technique should be carried out and included in the report	Land use pattern based on the remote sensing data are presented in **chapter 3 sub head 3.2**
15 Contour map along with the site plan of the project and project land use area statement including land for project operations, such as coal handling plant, washery, building infrastructure effluent treatment plants, raw coal, washed coal reject coal, coal fines stock yard, colony, greenbelt, undisturbed area, natural topographical features (such as existing roads, drains/natural water bodies if any) to be left undisturbed, proposed diversion/ re-channeling of natural drainage or water courses, if any	Contour map is enclosed as **Annexure III**
16 One complete season site specific meteorological data	Site specific meteorological data has been presented in **Table 3.3.2** of **Chapter 3**.
17 Information regarding surface hydrology, water regime, hydrogeology and ground water regime	Geology and hydrology of the study area are presented in **chapter 3 sub head 3.2 .3**
18 Information regarding drainage pattern of the study area	The study area is drained through the rivers and nallah. The major rivers of the study area are Pajhar and Kelo.
19 Topography of study area, clearly indicating whether the site requires any filling? if so, details of filling, filling material, quantity of filling material required, filling material supply source and transportation etc. The filling material should be fly/bottom/pond ash of thermal power plants;	The topography of study area is gently slopping and does not require any filling
20 Locations of any National Park, Wildlife Sanctuary, Reserve Forest, Protected Forest and Eco-sensitive zones, elephant/tiger reserve (existing as well as proposed), migratory routes, if any within 10 km of the project site be specified and marked on the map duly authenticated by concerned Government department	No national park and sanctuary are present in the study area. The reserve forests are present only on NE and NNW. The list of flora and fauna are presented in **Table 3.2.10** and **3.2.11** of **chapter 3**
21 Map showing the core zone	Proposed coal washery will be constructed

delineating the agricultural land (irrigated and un-irrigated), uncultivable land (as defined in revenue records), forest areas (as per records) grazing land and waste land	inside the existing captive coal mine pit head.
22 Land use statement of the study area as well as project area:	Land use pattern of the study area based on Remote Sensing studies and Census of India 2001 are presented in **Chapter 3 sub head 3.2.2**.
23 Collection of one complete season (non-monsoon preferably winter season 2008) primary base line data (along-with dates of monitoring) on environmental quality such as air (RPM, SPM, SOx & NOx) noise, water (surface and ground water), soil	The baseline data collected in respect and Soil, Air, Noise, Water are presented in **Chapter 3** in **Table No. 3.2.4, 3.3.4, 3.4.2** and **3.5.2** (surface Water), **3.5.3** (ground water) respectively.
24 The monitoring be conducted as per Central Pollution Control Board's guidelines and parameters for water testing for both ground water as per ISI and surface water as per Central Pollution Control Board guidelines	The monitoring of environmental components have been dons as per CPCB and ISI guidelines
25 Surface water, ground water, soil, noise and ambient air quality be monitored at-least at eight stations/locations around the proposed site. At –least one monitoring station in the upwind direction/downstream/non-impact non-polluting area as a control station	The total eight soil sampling locations, nine air quality monitoring locations, ten noise monitoring locations, two surface water samples and eight ground water sampling locations have been identified and monitored.
26 The location of the air monitoring stations decided after taking into consideration the predominant wind direction, population zone and sensitive receptors including reserve forests	During the study period the predominant wind directions were NW and N and so the villages selected in the population zone are Khamaria, Lamdari, Gare and Mahloi. The sampling locations in the reserve forest area were not identified as the area is falling in up-wind direction
27 Details of various facilities to be provided for the personnel involved in raw coal/washed coal/ rejects transportation & handling in terms of parking rest areas, canteen, sanitation, and effluents/ pollution load from these activities	The facilities in terms of parking rest areas, canteen and sanitation will be provided to workers by project proponent. The personnel working in the ETP will be provided protective garments. These facilities will also be provided to personnel working in raw coal / washed coal / rejects transportation & handling activities
28 Details of infrastructure facilities such as sanitation, fuel, restroom, canteen etc. to be provided to the	The facilities will be provided to labour force including casual workers during the construction as well as operation stage

labour force including casual workers during construction as well as during operation phase. Effluents/ pollution load from these activities be included	
29 Details of workshop, if any, and treatment of workshop effluents	Not Applicable
30 Occupational health issues, baseline data on the health of the population	Occupational health issues, baseline data on the health of the population; has been presented in **Chapter 3** sub head 3.6.8 under socio economic survey
Environmental impacts:	
31 Impacts of project if any, in the landuse, in particular agricultural land, forest land, grazing land, water bodies, drainage of the area and the surroundings	There will not be any impact on agricultural land, forest land, grazing land and water bodies if the mitigation measures delineated in **Chapter 4** and implementation of Environmental Management Plan judiciously as discussed in the **Chapter 8**
32 Impact of choice of the selected coal washing technology and impact on air quality and waste generation (emission and effluents).	The technology selected for the proposed coal washery will have insignificant impact on air quality and waste generation due to the constant spraying of water for dust suppression. The use of bag filters will further reduce air pollution due to dust generation
33 Impacts of transportation covering the entire sequence of supply, transportation, handling, transfer and storage of raw coal, washed coal and rejects on air quality showing in a flow chart with the specific points of fugitive emissions generations	Impacts of transportation covering the entire sequence of supply of coal by conveyor belt/ tipper, transfer and storage of raw coal, washed coal and rejects will be in significant. The proper measures will be taken during these activities by spraying of water and providing the bag filters at junction points.
34 Impact of the project on local infrastructure of the area, such as road network. Examine whether existing roads are adequate to take care of additional load of washed coal/rejects transportation? whether any additional infrastructure would need to be constructed and the agency responsible for the same with time frame ?	There will not any change in local infrastructure of the area. The existing roads will be used for transportation
35 Prediction of impact of project on different environmental components inter-alia (1) air including noise (2) water (surface and groundwater) (3) soil, (4) flora and fauna and (5) socio-economic. Also take into account the	The detailed studies on anticipated environmental impact in respect of air, noise, water, flora and fauna and socio-economic structure are discusses in **Chapter 4**

emission from the vehicles and loading & unloading activities	
36 Impact of Coal handling plant, if any on ambient air and water (surface and ground water) quality;	The impact will be insignificant due to coal handling plant due to constant suppression of the dust by spraying of water
Mitigation measures:-	
37 Details of pollution control measures with respect to effluent treatment, air pollutants emission control, noise control and scientific & safe disposal of all solid wastes;	The mitigation measures for the pollution control with respect to air, noise, water and solid waste are discusses in **chapter 4 sub head 4.5**.
38 Sulphur concentration in coal is about 0.8-0.9% as indicated by project proponent. It may lead to acid water discharge. Adequate care should be taken during design/selection of process equipments and treatment systems	The coal washery involves washing of coal and wastewater generated is recycled back for dust suppression, thus zero discharge system will be adopted.
39 Specific pollution control and mitigative measures for the entire process, specific pollution control/mitigative measures proposed to be put in place at every transfer and handling points	Due care will be taken to suppress the dust during the operation phase by spraying the water and bag filters will be provided at junction points.
40 Coal stock yard (raw coal, washed coal, coal rejects and coal fines) be housed in closed sheds in pucca platform above ground level provided with wind shields/wind breaking walls; storage size and capacity of coal stock be decided in consultation with DGMS and Chhattisgarh Environment Conservation Board;	Coal stock yard (raw coal, washed coal, coal rejects and coal fines) will be housed in closed shades in pucca platform above ground level provided with wind shields/wind breaking walls; storage size and capacity of coal stock shall be decided in consultation with DGMS and Chhattisgarh Environment Conservation Board
41 Measures of occupational health and safety of the personnel and manpower for the project	The occupational health and safety of the personnel are presented in **chapter 6 sub head 6.4**
42 Compliance to the standards (Fugitive emission standards, effluent discharge standards, noise level standards) prescribed for coal washery by Ministry of Environment and Forests, Government of India/Central Pollution Control Board/ Chhattisgarh Environment Conservation Board (which ever stringent)	The emissions generated in respect of air, water, noise will be complied as per CPCB standards in work place environment.

43 Compliance to the code of practice prescribed for coal washery by Ministry of Environment and Forests, Government of India/Central Pollution Control Board;	Compliance to the code of practice prescribed for coal washery by Ministry of Environment and Forests, Government of India/Central Pollution Control Board will be adopted by the project proponent
44 Ensure the particulate matter emission limited to 50 mg/Nm^3;	Not applicable as the coal washery doesn't required stack.
45 Scheme for rainwater harvesting	Details of rainwater harvesting scheme are discussed in the **Chapter 8 sub head 8.1.4.2**
46 Details along-with action plan for development of greenbelt in 33% land area with not less than 1500 trees per ha giving details of species, width of plantation, planting schedule etc.	The details of green belt development have been given in **Chapter 8 sub head 8.1.4.1**.
47 Details regarding sale/disposal of solid wastes/rejects/coal fine from the unit to miscellaneous purchasers (if any). Explore the possibility for use of coal fines in briquettes making	Not Applicable
Environmental Management Plan	
48 The EIA-EMP report covering the impacts and management plan for the project specific activities on the environment of the region, and the environmental quality-air, water, noise, land, biotic community through collection of data and information, generation of data on impacts for a rated capacity	The Environmental management plan has been delineated in **Chapter 8** based on the projects specific activities where the dust emission has been considered as major pollutant. The component wise (air, water, noise, land and ecology) EMP has been given in **Chapter 8**.
49 Detailed EMP to mitigate the adverse impacts due to project along-with item-wise cost of its implementation (capital and recurring)	The total cost of the project is 30 cores, where the budgetary provision of 2.55 cores has been made towards environmental management plan.
50 Disaster Management Plan and mitigative measures for disaster prevention and control	The Disaster Management Plan has been discussed in **Chapter 6**.
51 Risk assessment to be undertaken, based on the same, propose safeguard measures	Risk assessment studies have not been envisaged in this report as the proposed coal washery doesn't involve the major consumption of the fuel and chemical storages
52 Details along-with action plan and year wise funds to be allocated for eco-development/ community/welfare works including maintenance of roads in nearby	Details are presented in **Chapter 5** Sub head 5.3.

villages/areas;	
Additional study	
53 Public Hearing details covering the notices issued in the newspaper, proceedings/minutes of public hearing, the points raised by the general public and commitments made, in a tabular form. If the public hearing is in the regional language, provide an authenticated English translation of the same	Public Hearing details will be submitted after completion of the public hearing
54 Status of litigations/court field/pending against the project (all cased including environment) and /or any direction/order passed by any hon'ble court of law against the project, if so, details thereof.	No litigations is pending against the project.
55 Examine the aspects, whether the company be permitted as per regulations to sell rejects/coal fines to nearby power plants and/or to brick kiln manufactures	M/s. SEML will sale rejects/coal fines to end users as a part of recycling of the waste under the solid waste management

1.3 Justification of Project

Coal from the captive coal mine cannot be directly used in the sponge iron kiln as the same contains very high ash (40% and above). Coal shall be used after beneficiation in captive power plant while the middlings from coal washery shall be used in the CFBC boiler for generation of thermal power. The rejects containing ash 70% and above shall be dumped in the nearby mines for back filling only after taking due permission from competent authorities.

1.4 Environmental Setting

The proposed site is located in Raigarh district of Chhattisgarh, the nearest railway station is at Raigarh on Hawara-Mumbai main line. The nearest airport is Raipur the ambient air temperature varies from minimum 7°C, maximum 48°C.

Sr. No.	Particulars	Details
1	Latitude	22^0 10' 10" N
2	Longitude	83^0 28' 14" E
3	Altitude	300 m above MSL.
4	Toposheet	64 N/8, 12.
5	Seismicity	Area falls under least affected earthquakes zone II as per IS 1893 – 2002.

6	Present land use	Single crop agricultural land
7	Climatic condition	Ambient Air temp 7°C to 48°C Average annual rainfall 1400 mm (IMD-Raigarh)
8	Nearest village	Karwahi (1.8 km / E)
9	Nearest town	Gharghora (8 km / NW)
10	Nearest railway station	Raigarh (35 km)
11	Nearest airport	Raipur 250 km
12	Streams/Rivers	River Kelo (5.0 km / E)
13	Topography	Gently sloping towards south.
14	Sanctuaries /National Parks/ Biospheres, etc.	Nil
15	Defense Installations	Nil
16	Historical Places	Nil

1.5 Selection of Site

The site has been selected at Bajarmura & Dholnar, Tehsil Tamnar, District Raigarh, C.G. the study area map (10 km radius) of the proposed project is shown in **Fig. 1.1.** The feasibility of proposed washery of 0.96 MTPA (400 TPH) Coal Washery was examined with respect to the following factors.

i. Availability of adequate land

ii. Availability of coal

iii Availability of water

iv. Availability of infrastructural facilities

v. Environmental aspects

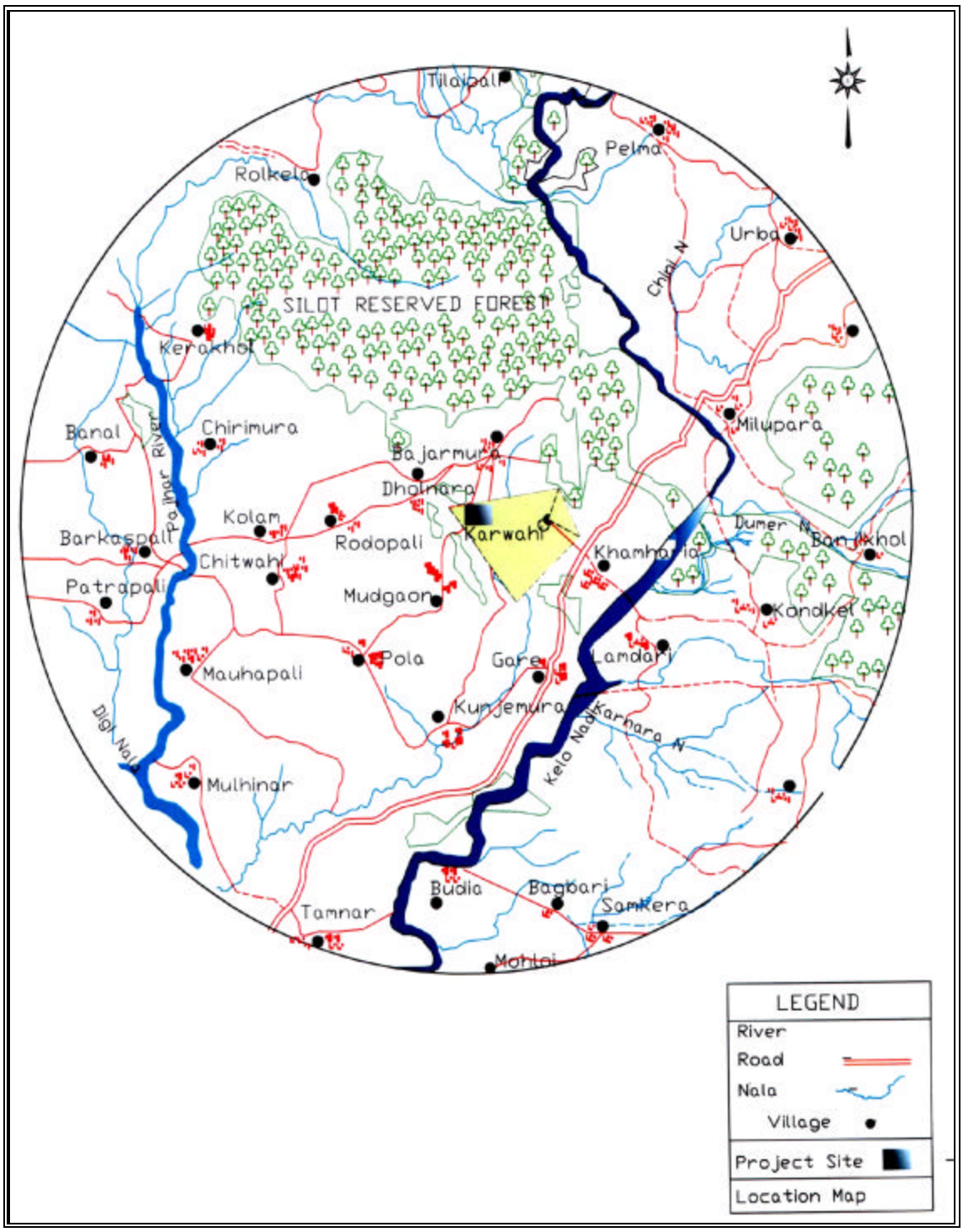


Figure 1.1

Study Area Map

Chapter 2

Project Description

2.1 Layout of the Plant

The site is more or less flat with minor undulations and is suitable for the construction of major heavy structures, buildings and foundations. The plant layout for the proposed washery is presented in **Figure-2.1**. All facilities in the plant area will be laid so as to minimize the land requirement. The layout will facilitate the movement of workers and material handling between the various facilities both during construction, operation and maintenance.

2.2 Project Size

The technical details of proposed coal washery are presented in **Table-2.1**.

Table-2.1

Technical Details of Proposed Washery

Sr. No.	Features	
1	Capacity	0.96 Mtpa
2	Type of Process	Wet Washery
3	Land Required	25 Acres (10.12 Ha)
4	Atmospheric Pollution Control System	Water Sprinklers, Bag filters etc.
5	Source of Raw Coal	Captive coal mine at Karwahi (Gare Palma Block IV/7).

Source: Detailed Project Report

2.3 Basic Requirements for the Proposed Project

2.3.1 Land Requirement

The break-up of the proposed land use for the project is given in **Table-2.2**.

Table-2.2

Break-up of Landuse

Sr. No.	Description	Area (ha)
1	Land for Washery	3.39
2	Land for Reject Disposal Area	1.37
3	Land for Greenbelt Development	3.34
4	Land for Coal Storage Yard and Truck Tripling System Yards	0.93
5	Land for Raw Water Reservoir	0.25
6	Land for Fabrication/Construction Yard, etc.	0.5
7	Others	0.34
Total		**10.12**

2.3.2 Water Requirement

The total water requirement for the project is 480 m^3/day which will be sourced from the Coal Mines. The detailed fresh water requirement and wastewater generation of the proposed washery is given in **Table-2.3**. The break-up of water requirement is given in **Figure-2.2**.

Table-2.3

Water Balance

All values in m^3/day

Details	Process Water	Process Water	System Loss	Waste Generation	Utilization/Disposal
1	Process	364	260	104	Recycle
2	Miscellaneous	110	110	--	-
3	Domestic	06	01	05	Septic tanks and soak pit
Total		480	371	109	

2.3.3 Raw Coal Requirement

Raw coal requirement will be about 0.96 MTPA. Coal will be sourced from Captive coal mine at Karwahi. The coal used will be F grade with ash content 40-45%, washed coal ash 30 $\pm$ 2% and middlings ash 50 - 55 %.

2.3.4 Manpower

The proposed washery will require skilled and semi-skilled personnel during construction and operational phase. The people from neighboring villages will get opportunity for employment during construction and operational phase based on their experience. The total manpower for the proposed coal washery during operation period is estimated to be around 100 persons.

2.3.5 Transport Facilities

The coal for the proposed project will be transported by conveyor belt/tipper.

2.3.6 Health and Sanitation Facilities

To ensure optimum hygienic conditions in the plant area, proper drainage network will be provided to avoid water logging. Adequate health and safety measures will be adopted by environment department which will be established by M/s. SEML to ensure clean and healthy environment.

2.3.7 Fire Protection System

Fire hydrant system covering all the buildings of the proposed washery plant including coal stockyard would be provided. Part of the first stage treated output will be stored in fire water storage tank and service water overhead tank which will be used in fire extinguishing.

In addition to the fire hydrant system, the following fire protection systems are proposed:

- Automatic High Velocity Water Spray (HVWS) system for the protection of transformers
- Automatic MVWS system for coal conveyors, cable galleries, etc.;
- Automatic sprinkler systems for certain select areas
- Manual HVWS system for the protection of turbine oil tanks; and
- Portable extinguishers and fire tenders as required

- ***Communication System***

An effective communication system by way of automatic dial type telephones and public address system will be provided.

Figure- 2.1

Plant Layout

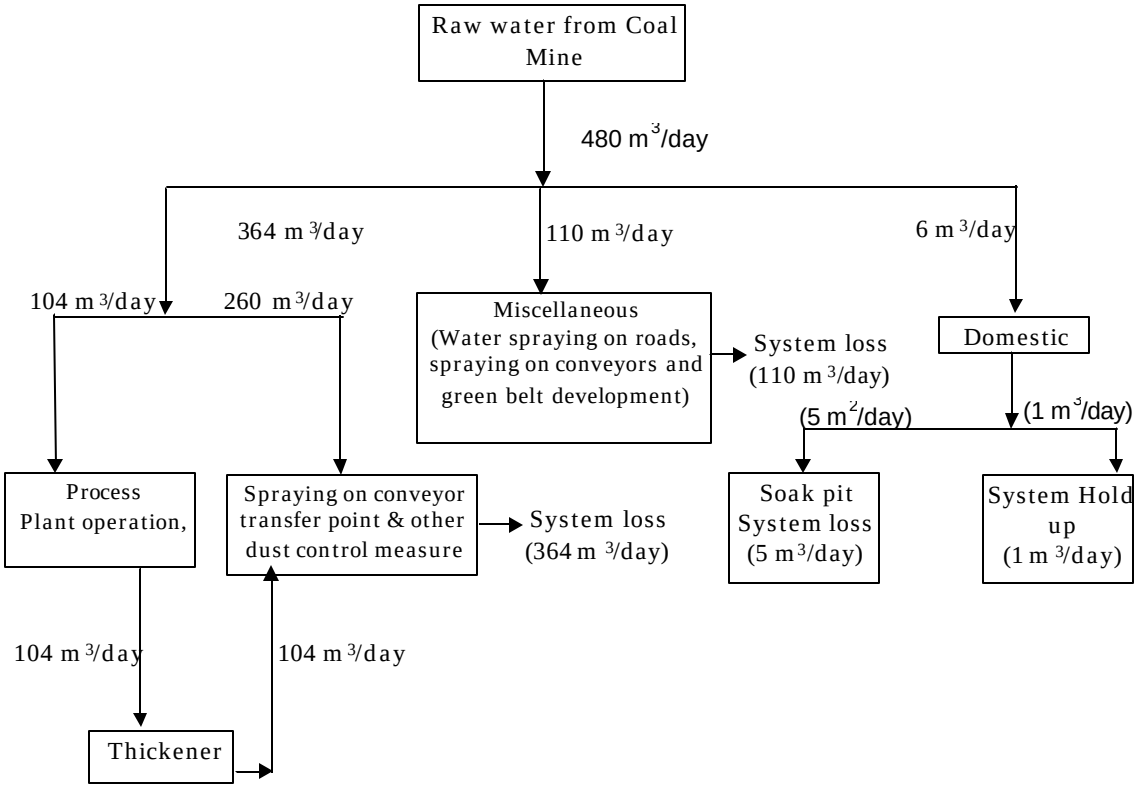


Figure- 2.2

Water Balance Diagram

2.4 Proposed Schedule for Approval and Implementation

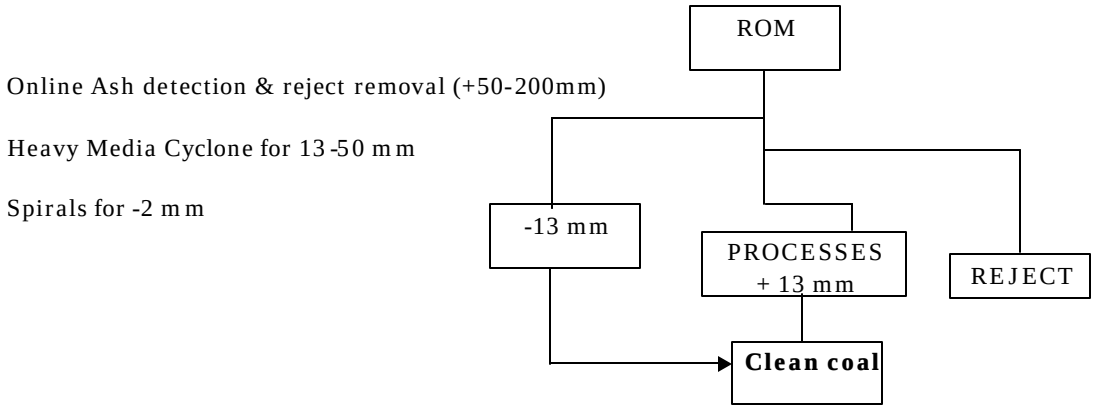
The expected date of commercial product will be July 2011

2.5 Technology and Process Description

From intermediate storage bunker, sized raw coal (- 20 mm) transported to the Washing Plant building through belt conveyor where the sized raw coal fed into coal wetting launder, where water to be added with coal. The slurry then flow through launder to a set of Desliming Sieve Bend and Screen to remove (-) 1 mm coal fines from the coal. The coal slurry collected in Desliming Sieve Bend box and Screen under pan is gravitate through pipes to a Fine Coal Sump.

The deslimed coal (coarser fraction of 20 – 1 mm) goes to the screen through oversize launder. The magnetite media of required specific gravity is added at the back of the launder to get mixed with the coal and simultaneously to push the mixture of magnetite & coal slurry into the central column provided in the centre of the primary HM Cyclone tank. The coal & magnetite mixture from the central column pumped by a HM Cyclone Feed Pump to feed 2 Nos. of 660 mm dia. Heavy Media cyclones are lined with high Alumna Ceramic tiles. The clean coal along with magnetite media is received as over flow from the cyclone and is fed to a set of clean coal Sieve Bend and Clean Coal Drain & Rinsing Screen. The magnetite media separated through a moving magnetic drum & is drained through Sieve Bend and first part of the screen and be collected in the screen's dense under pans. The same is circulated back to the system.

The carried away magnetite with the coal particles are removed by water spraying in the discharge part of the screens. The magnetite removed from coal by water spraying is collected in the dilute catch pan of screen as dilute media. The clean coal collected at discharge end is dried in centrifuge and then transported to storage bunker through belt conveyor. Thus the basic principle of the coal washery process plant will be as under. The process flow diagram of coal washery is presented in **Figure 2.3**.



The primary discard along with the magnetite media shall be received as underflow from the cyclone and fed to a set of double sieve bend. The magnetite collected from the sieve bend shall be circulated back to the system. The primary discard shall go to the central column of Secondary Heavy Media Tank.

The coal and magnetite mixture from the central column of Secondary Heavy Media Tank shall be pumped by a cyclone feed pump to feed 2 Nos. of 660 mm dia cyclones. The cyclones shall have overflow and underflow. The middlings along with magnetite media shall be received as overflow from the cyclone and be fed to a sieve bend and middling Drain and Rinsing Screen. The magnetite collected at dense catchpan shall be circulated back to the system. The same collected from dilute catchpan shall be taken to the dilute media tank. The reject along with magnetite media shall be received as a underflow from the cyclone and feed to the sieve bend and Drain and Rinsing Screen.

Middling

Middling collected at screen discharge end shall be dried in centrifuge and then transported to storage bunker through belt conveyor. The reject collected shall be transported to reject hopper through belt conveyor.

The fine coal slurry

The fine coal slurry collected in the fine coal tank shall be pumped into a set of classifying cyclones. The underflow of classifying cyclone shall be dewatered in Hi

Frequency screen while the overflow from cyclone shall be fed to a Thickener. The thickened slurry shall be dewatered in a Multi Roll Belt Press filter. Anionic and Cataionic flocculants shall be used in thickener and Belt Press to facilitate settling and dewatering process. The discharge from Hi Frequency screen and Multi Roll Filter Press shall be mixed with the rejects / middlings through a belt conveyor.

Media Preparation & regeneration Circuit

The dilute media as collected in the Dilute Media Tank shall be pumped by a Dilute Media Pump to Magnetic Separator Feed box. From there, the Dilute Media shall be feed to 915 mm dia X 3050 mm long Wet Drum Magnetic Separator. The Separators shall separate out the magnetite from water and the over dense media gets dislodged from the Magnetic Drum to the dense media launders and from there to the Primary & Secondary Heavy Media Tank.

The effluent from the magnetic separators goes to fine coal tank through desliming screens.

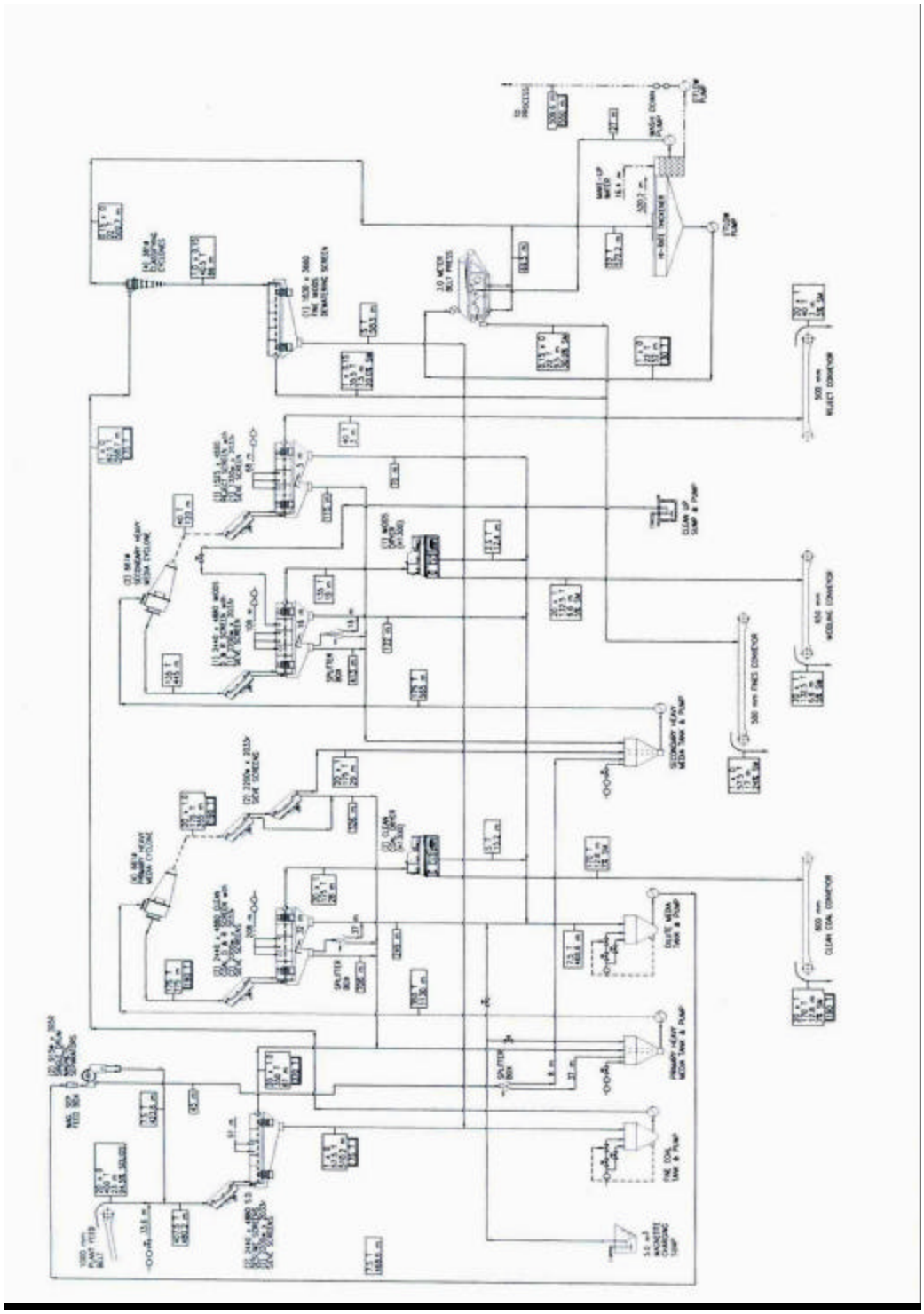


Figure-2.3

Process Flow Diagram

2.6 Sources of Pollution

The various types of pollution from the proposed washery are categorized under the following types:

- Air pollution;
- Water pollution;
- Solid waste; and
- Noise pollution.

The major type of pollution from the washery is fugitive emissions. In addition, wastewater and solid waste will also be generated. The quantities and the composition of the gaseous, liquid and solid waste that are likely to be generated in the plant will be managed and treated in such a way that their final disposal into the environment meets all the statutory requirements and thus the environmental impacts are minimized.

Chapter 3

Description of the Environment

The baseline status of Environmental Quality of the study area for the proposed 0.96 Million TPA Coal Washery Project of Sarda Energy & Minerals Limited serves as the basis for identification of impacts and its mitigation measures. The baseline environmental quality is assessed through field studies within the study area for various components of environment, viz. Air, Noise, Water, Land and Socio-economic. The baseline environmental quality for the study period in the present EIA study has been assessed in 10 km radial distance from the proposed Coal Washery project site.

This report incorporates the baseline data generated through primary surveys for three months from December 2008 to February 2009 representing the Winter Season.

3.1 Methodology

Appropriate methodologies have been followed in developing the EIA/EMP report. The methodology adopted for the study is outlined below:

- Conducting reconnaissance surveys for knowing the study area;
- Selecting sampling locations for conducting various environment baseline studies.

The sampling locations have been selected on the basis of the following:

- Predominant wind directions recorded by the India Meteorological Department (IMD) Raigarh observatory;
- Existing topography;
- Drainage pattern and location of existing surface water bodies like lakes/ponds, rivers and streams;
- Location of villages/towns/sensitive areas;
- Areas, which represent baseline conditions.

The field observations have been used to:

- Assess the positive and negative impacts due to the project site
- Suggest appropriate mitigation measures for negating the adverse environmental impacts, if any
- Suggest post-project monitoring

3.2 Land Environment

3.2.1 Objectives

The objectives of Landuse studies are:

- To determine the present Landuse pattern
- To analyze the impacts on Landuse due to the proposed plant in the study area
- To give recommendations for optimizing the future Landuse pattern and associated impacts

Landuse Studies based on Remote Sensing

Objectives

The objectives of Landuse Pattern are:

- To determine the present Landuse pattern
- To analyze the impacts on Landuse due to the proposed plant site in the study area;
- To give recommendations for optimizing the future Landuse pattern and associated impacts.

"Remote Sensing" has been proved as a powerful tool in the field of Environment Impact Assessment Studies in recent times. The satellite data provides reliable and accurate information on natural resources like water, soil, forests, etc. which forms the baseline information; prerequisite for systematic assessment of various environmental impacts. Remotely sensed data provides information for systematic analysis of various lithological, geomorphological, soil, hydrological and Landuse – land cover characteristics using synoptic and multi spectral coverage of the terrain.

Geographical Information System (GIS) has been proved as a powerful tool in the field of natural resources management over the years. GIS technologies having capability of data storage, retrieval and manipulation can play an important role in evolving the suitable methods of arriving at alternate scenarios for natural resources development and environmental planning.

Recent advances in the fields of remote sensing and GIS provide useful tools in environment impact assessment studies. These two new technological tools have emerged to meet the ever increasing demand for more precise and near real time information. An integrated element for generating map information is the combination and comparison of variety of data derived from different sources such as remotely sensed imagery, ground survey and existing topographic and other maps.

An attempt has been made to generate a Landuse/ land cover map of the study area using SOI topographical sheets, remotely sensed images and field survey data. The generated information has been integrated in GIS.

Following data were used in present studies: -

(A) Precision Geocoded product of Indian Remote Sensing Satellite IRS – P 6, Sensor – LISS III, Acquired on 09/11/2007 (**Refer Figure 3.2.1)**

(B) Survey of India Toposheets bearing nos. 64 N/8 and 12.

Methodology

- Acquisition of satellite data
- Preparation of base map from Survey of India toposheets
- Data analysis using visual interpretation techniques
- Ground truth studies or field checks
- Finalization of the map
- Digitization using heads up vectorisation method
- Area calculation for statistics generation

The satellite data was interpreted visually by using various interpretation keys like tone, colour, texture, structure and association to categorize different Landuse classes to their respective units. The different interpretation keys were cross verified during ground studies to refine the mapping.

Landuse/ Land cover Details

The Landuse / land cover map of the entire study area (10 km radius) is given as **Figure 3.2.2**, whereas the statistical brake up of the Landuse / land cover classes is given as **Table 3.2.1** and depicted in "Pie Diagram" as **Figure 3.2.3**. The following prominent Landuse classes have been observed in the study area.

Agriculture

The principal feature observed within the study area (314 km^2) is the agricultural activity. It is spreads over 57% (180.50 km^2) of the geographical area of study area. The agriculture in this area is principally rain fed. However, significant area is also found under second crop irrigated with the help of groundwater from tube wells in this region.

Forest

The forest forms the second most prominent Landuse of this area. It occupies about 28% (88.75 km^2) of this area. The forest is particularly noticed along the hill slopes in this area. It is dominated by Sal trees.

Wasteland

The wasteland is observed to be developed along the drainage lines in this area. It occupies about 8% (25 km^2) area.

Miscellaneous

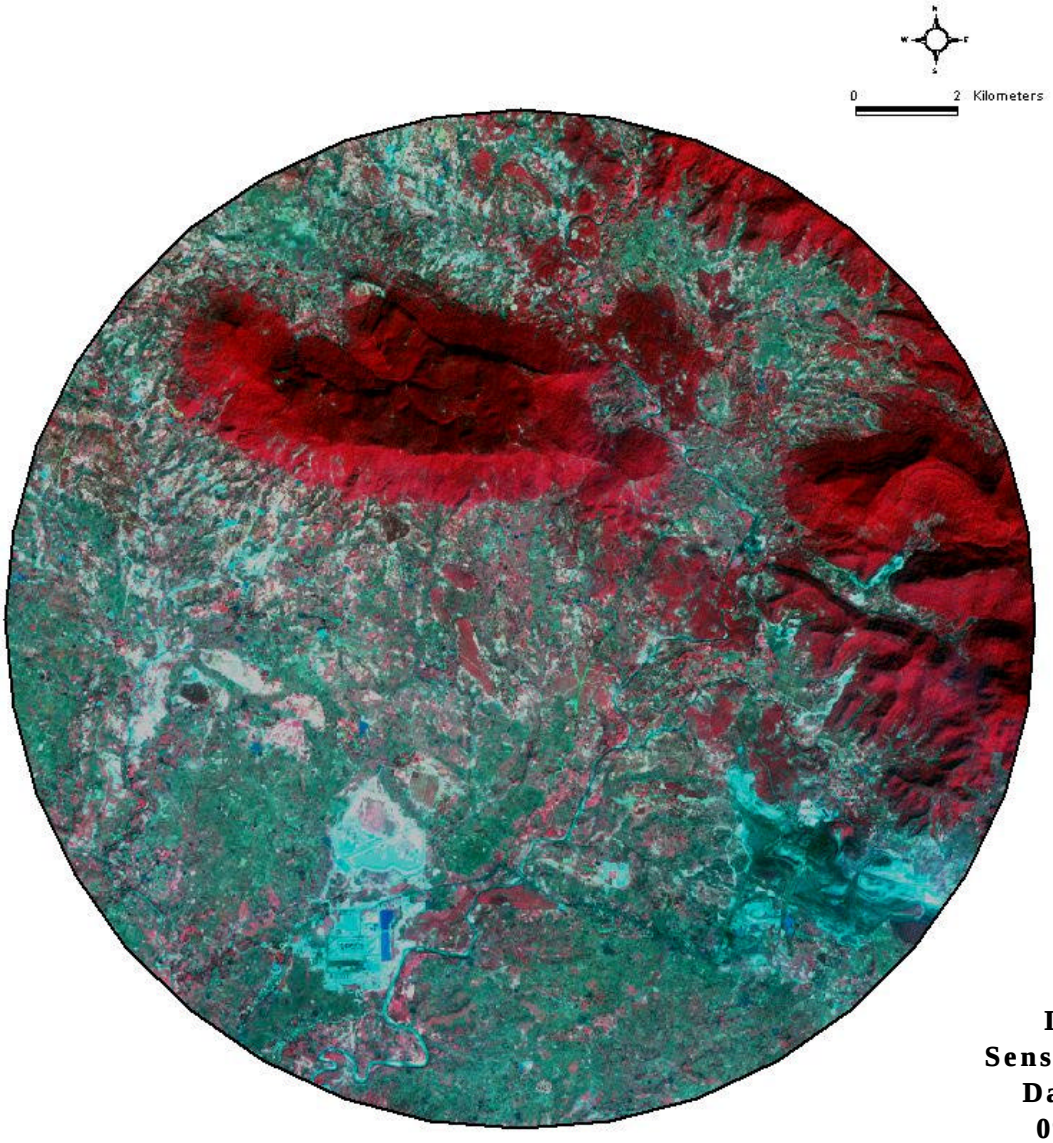
Along with the above the study area also features water bodies, power plant and built up land represented by the power plant and its ash pond. These features cover about 1.08%, 0.89% and 0.86% of the study area respectively.

Table 3.2.1
Landuse / Land Cover Details of Study Area

Landuse	Area (km^2)	PGA***
Agriculture	180.50	57.48
Forest	88.75	28.26
Wasteland	25.00	7.96
Mining Area	10.91	3.47
Water bodies	3.40	1.08
Power plant	2.76	0.89

Ash pond	2.68	0.86
Total	**314.00**	**100.00**

(*** PGA – Percentage Geographical Area)



IRS – P 6,
Sensor – LISS III,
Date of pass
09/11/2007

Figure .3.2.1
Satellite Imagery of Study Area

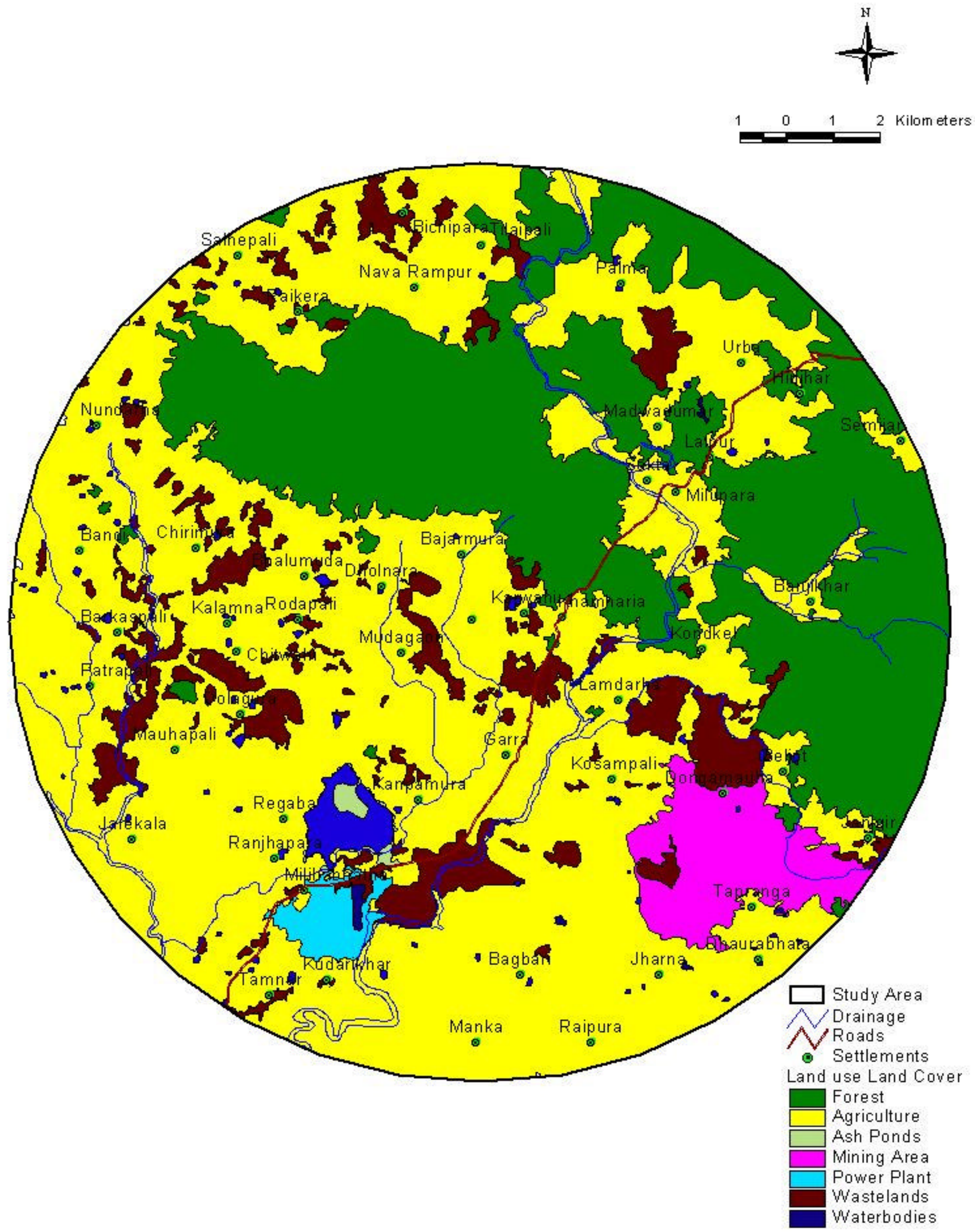

N
1 0 1 2 Kilometers
Nava Rampur
Palma
Urba
Bajarmura
Kalamna
Rodapali
Regaba
Jarekala
Kosampali
Jharna
Manka
Raipura
Study Area
Drainage
Roads
Settlements
Land use Land Cover
Forest
Agriculture
Ash Ponds
Mining Area
Power Plant
Wastelands
Waterbodies

Figure 3.2.2
Landuse map of 10 km radius around the Proposed Washery

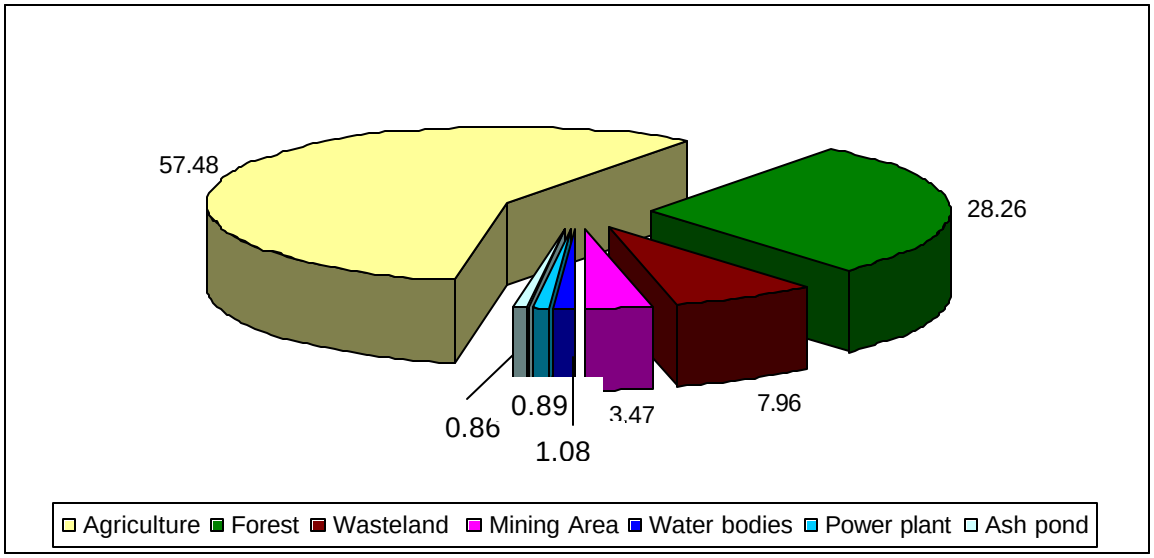


Figure 3.2.3
Pie Diagram showing the Landuse pattern in 10 km^2 area based on the Remote Sensing data around the proposed washery

3.2.2 Geology and Hydrogeology

On the regional scale, Raigarh area falls in the eastern part of Chhattisgarh basin. The intra-cratonic Chattisgarh basin is located within the Central Indian Shield comprising of variety of rock types. The archean gneisses and schists are in juxtaposition with the Chhattisgarh sediments. The basement has been subjected to weathering and erosional processes for million of years. The sediments are therefore widespread. The meta- sediments with associated granites, gneisses etc. have contributed the formation of sediments. The principal rocks of the Chhattisgarh basin are granite, schist, quartzite, limestone, shale, sandstone, etc. with associated coal seams and laterite.

3.2.3 Hydrogeology

The study area occupies a gently sloping slightly undulating plain land. This area receives about 1500 mm rainfall annually. The rainfall is stored in the surface water tanks, which play a vital role in the groundwater recharge. The

groundwater occurs both under phreatic i.e. water table aquifers tapped with the help of open dug wells as well as semi confined to confined aquifers tapped by means of bore wells. The dug wells are found to range in depth from 8 to 12 m bgl. The pre monsoon static water level in this region is observed to be 8 to 10 m bgl. Few shallow dug wells are reported to go dry due to lowering of water table in summer.

The surrounding area shows predominance of borewells, which are used for irrigation as well as daily usage. These structures are installed with hand pumps as well as machines. They range in depth from 60 to 120 m bgl and deliver water @ 1 lps to 3 lps (lps – Liter per second). The borewells are found to be widely accepted water bearing structures than the dug wells. This area has been rated as "safe" by CGWB for utilization of groundwater.

3.2.4 Physico-chemical Characteristics of Soil

The soil quality assessment has been carried out. **Eight** locations have been identified for collection of soil samples within 10 km radius of proposed coal washery. The sampling locations are shown in **Figure-3.2.4** and their distances and bearings from project site are listed in **Table 3.2.2**.

Table 3.2.2

Locations for Collection of Soil Samples

Sr. No.	Sampling Location	Direction	Aerial Distance w.r.t. Proposed plant (Km)
1.	Dholnara	WNW	1.5
2.	Bajarmura	NNE	1.8
3.	Lamdari	SE	5.5
4.	Gare	SSE	4.0
5.	Rodo Pali	W	3.5
6.	Milupara	ENE	6.0
7.	Tamnar	SSW	10.0
8.	Mahloi	SSE	10.0

Physical Characteristics

Physical characteristics of soil are delineated through specific parameters viz. particle size distribution, bulk density, porosity, water holding capacity and texture are presented in **Table 3.2.3**.

Regular cultivation practices increase the bulk density of soils thus inducing compaction. This results in reduction in water percolation rate and penetration of roots through soils. The soils with low bulk density have favorable physical conditions where as those with high bulk density exhibit poor physical conditions for agriculture crops. The bulk density of the soil in the study area ranged between 1.36 to 1.48 g/cc which indicates favorable physical condition for plant growth.

Soil porosity is a measure of air filled pore spaces giving information about movement of gases, inherent moisture, development of root systems and strength of soil. The porosity and water holding capacity of the soils are in the range of 26.40% to 33.26% and 25.62 % to 32.68% respectively. The soil in the impact zone has clayey structure with moderate water holding capacity.

Table-3.2.3
Physical Properties of Soil

Sr. No.	Location	Bulk Density g/cc	Porosity %	Water Holding Capacity %	Particle Size Distribution		
					Sand %	Silt %	Clay %
1	Dholnara	1.42	28.23	25.62	26.05	32.22	41.73
2	Bajarmura	1.36	27.61	27.28	24.23	34.27	41.50
3	Lamdari	1.37	29.64	28.48	27.42	29.56	43.02
4	Gare	1.45	30.68	28.42	28.60	35.47	35.93
5	Rodo Pali	1.38	33.26	31.17	27.31	29.64	43.05
6	Milupara	1.46	32.45	28.56	24.02	34.15	41.83
7	Tamnar	1.48	26.40	28.67	30.30	27.45	42.25
8	Mahloi	1.36	30.23	32.68	25.32	30.72	43.96

Chemical Characteristics

Data collected for chemical characteristics of soils through selected parameters viz. pH, EC, soluble cations and anions, organic content and fertility status are presented in **Table 3.2.4** and **Table 3.2.5**.

pH is an important parameter indicative of alkaline or acidic nature of soil. It greatly affects the microbial population as well as solubility of metal ions and regulates nutrient availability. Variation in the pH of the soil in the study area were

observed and it is found to be neutral (7.08 to 7.60), thus conducive for growth of plant.

Electrical conductivity, a measure of soluble salts in the soil is in the range of 0.134 mmhos/cm to 0.257 mmhos/cm. The important cations in the soil are Calcium and Magnesium whose concentrations range from 0.0042 to 0.0075 % and 0.0026 to 0.0039 % respectively. Chlorides are in the range of 0.0035 to 0.0086%.

Table-3.2.4

Chemical Characteristics of Soil in Study Area

Sr. No.	Location	pH	EC (mmhos)	Org. C	Cl	SO_4	Ca	Mg	CEC meq. 100gm
				%					
1	Dholnara	7.20	0.134	1.32	0.0035	0.0035	0.0049	0.0027	30.47
2	Bajarmura	7.60	0.165	2.10	0.0086	0.0057	0.0075	0.0038	28.32
3	Lamdari	7.40	0.174	1.87	0.0045	0.0035	0.0042	0.0026	29.42
4	Gare	7.34	0.137	1.76	0.0057	0.0078	0.0045	0.0027	30.57
5	Rodo Pali	7.24	0.168	1.45	0.0038	0.0047	0.0070	0.0038	25.48
6	Milupara	7.37	0.244	1.32	0.0048	0.0042	0.0075	0.0039	24.35
7	Tamnar	7.08	0.207	1.42	0.0050	0.0038	0.0052	0.0031	28.25
8	Mahloi	7.28	0.257	1.37	0.0054	0.0046	0.0049	0.0026	30.06

Table-3.2.5
Fertility Status of Soil

Sr. No.	Location	Organic matter (%)	N (kg/ha)	P_2O_5 (kg/ha)	K_2O (kg/ha)
1	Dholnara	1.82	208	26	128
2	Bajarmura	2.44	423	24	142
3	Lamdari	1.65	382	32	137
4	Gare	2.81	262	31	155
5	Rodo Pali	2.75	315	46	148
6	Milupara	1.68	340	28	172
7	Tamnar	2.68	280	42	145
8	Mahloi	3.41	434	33	138
-	Level in poor soil	0.5	< 280	< 23	< 133
-	Level in moderate soil	< 0.5 – 0.75	280-560	23-57	133 –337
-	Level in fertile soil	> 0.75	> 560	> 57	> 337

Organic matter present in soil influences its physical and chemical properties and is responsible for stability of soil aggregates. Organic matter and nitrogen are found in the range of 1.65-3.41 % and 208-434 kg/ha. This shows that soil is moderately good in organic and nitrogen contents. The relationship of CEC with productivity and absorptivity are presented in **Table-3.2.6** and **Table-3.2.7**.

Table-3.2.6

Relationship of CEC with Productivity

S. No.	CEC Range (meq/100g)	Productivity	Location
1	< 10	Very Low	-
2	10 – 20	Low	-
3	20 – 50	Moderate	1 to 8
4	> 50	High	-

Table-3.2.7
Relationship of CEC with Absorptivity

S. No.	CEC Range (meq/100g)	Absorptivity	Location
1	<10	Low	-
2	10 – 20	Moderate	-
3	20 – 30	Moderately high	1 to 8
4	30 – 40	High	-

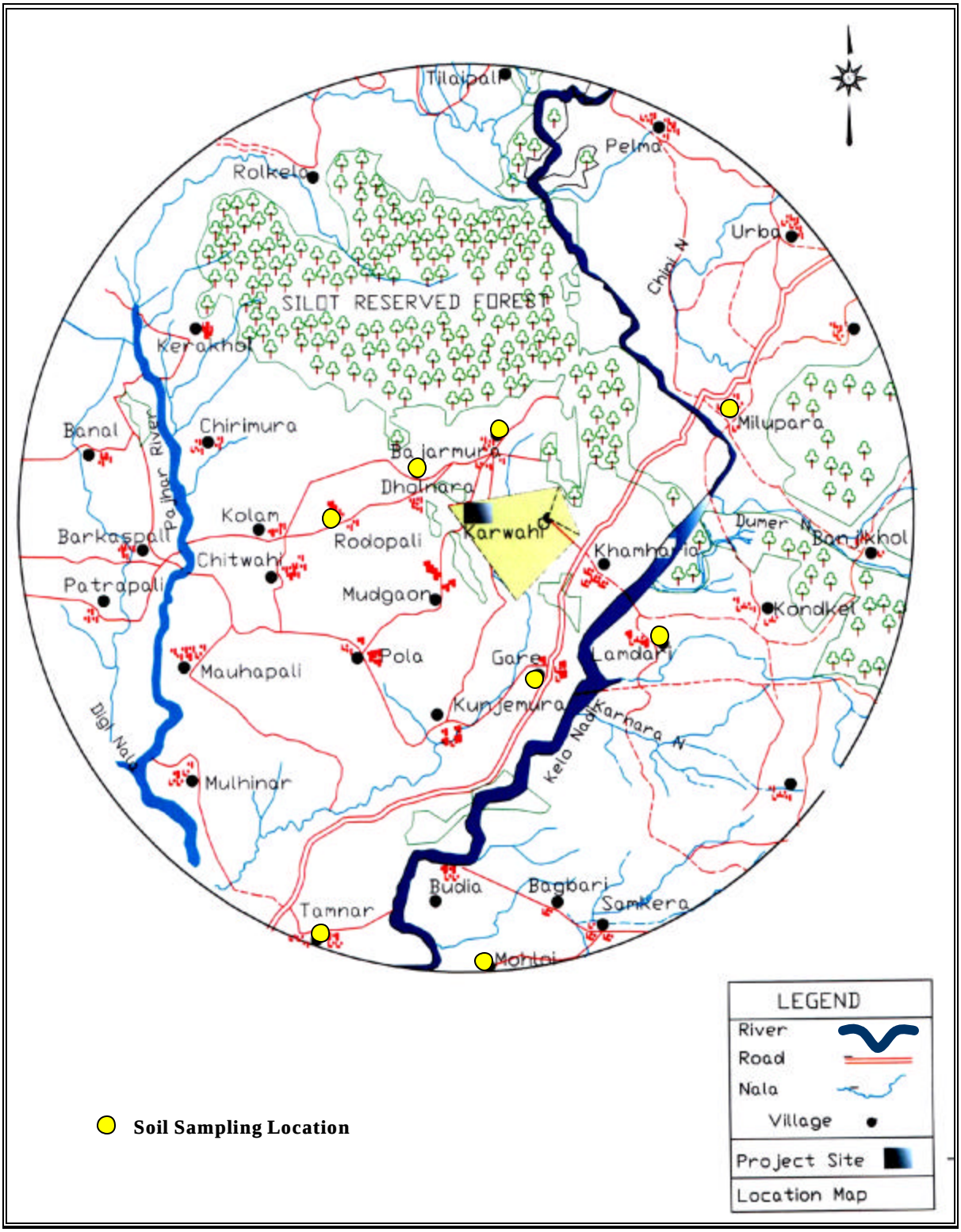

Tilaipali
Pelma
Rolkela
Urba
SILOT RESERVED FOREST
Chipi N
Kerakhol
Milupara
Banal
Chirimura
Pa jhar River
Bajarmura
Dhalnara
Kolam
Karwahi
Dumer N
Barkaspali
Rodopali
Khamharia
Banjkhol
Chitwahi
Patrapali
Mudgaon
Kandkel
Pola
Gare
Lamdari
Mauhapali
Kunjemura
Karhara N
Kelo Nadi
Digi Nala
Mulhinar
Budia
Bagbari
Samkera
Tamnar
Mohtai
LEGEND
River
Road
Nala
Village
Project Site
Location Map
Soil Sampling Location

Figure-3.2.4
Sampling Locations for Monitoring of Soil Quality

3.2.5 Flora and Fauna Studies

Introduction

An ecological survey of the study area was conducted particularly with reference to listing of species and assessment of the existing baseline ecological (Terrestrial ecosystem) conditions.

Flora

Natural flora and fauna are important features of environment. They are organized into communities with mutual dependencies among their members and show various responses and sensitivities to outside influences. Therefore, nature of development and baseline characteristics of terrestrial flora and fauna around the site of existing activities is required to be assessed. The details of flora are presented in **Table 3.2.8**.

Assessment of study area was carried out by collecting field data and collating available information. The climate of the study area is well suited for the growth of all types of vegetation.

Fauna

No national park or sanctuary is present in the study area. Common mammals, birds and reptiles are observed. Domestic animals were noted during the study period. Wild animals are not found in the study area. List of fauna is presented in **Table 3.2.9**.

Table-3.2.8
List of Flora in the Study Area

Sr. No.	Vernacular Name	Botanical Name	Family
1.	Aam	*Mangifera indica*	*Anacardiaceae*
2.	Aonla	*Emblica officinalis*	*Euphorbiaceae*
3.	Arjun	*Terminalia belerica*	*Combretaceae*
4.	Babul	*Acacia Arabica*	*Leguminosae*
5.	Bahera	*Terminalia belerica*	*Combretaceae*
6.	Bar/bargad/bad	*Ficus bengalensis*	*Moraceae*
7.	Bel	*Aegle marmelos*	*Rutaceae*
8.	Chichwa	*Albizzia odoratissima*	*Leguminose minoseae*
9.	Dhaman	*Grewia tiliaefolia*	*Tiliaceae*
10.	Gular	*Ficus racemosa*	*Moraceae*
11.	Imli	*Termarindus indica*	*Leguminosae*

Sr. No.	Vernacular Name	Botanical Name	Family
			(Caesalpinie)
12.	Jamun	*Syzgium cumini*	*Myrtaceae*
13.	Karanj	*Pongamia pinnata*	*Leguminosae*
14.	Khair	*Acacia catechu*	*Leguminosae mimossae*
15.	Lasora	*Cardia dichonoma*	*Boraginaceae*
16.	Lendia	*Lagerstroemia parvifolia*	*Lythraceae*
17.	Mauha	*Madhuca indica*	*Sapotaceae*
18.	Neem	*Azadirachta indica*	*Meliaceae*
19.	Palas (Parsa)	*Butea monosperma*	*Leguminosae (Papilionaceae)*
20.	Pipal	*Ficus religiosa*	*Meliaceae*
21.	Sagon (Sagwan)	*Tectona grandis*	*Verbenaceae*
22.	Saja	*Terminalia tomentosa*	*Combretaceae*
23.	Safed siris	*Albizzia procera*	*Leguminosae mimoseae*
24.	Semal	*Salmalia malabaricum*	*Malvaceae*
25.	Sissoo	*Dalbergia sissoo*	*Leguminosae papilionaceae*
26.	Tendu	*Diospyros melanoxylon (Gaertn.) D. Embryopteris*	*Ebenaceae*
Small Trees			
27.	Amti	*Bauhinia malabarica*	*Leguminosae (Caesalpinie)*
28.	Ber	*Zizyphus mauratiana*	*Rhamnaceae*
29.	Kachnar	*Bauhinia varigeta*	*Leguminosae Gaesalpinieae*
30.	Lokhandi	*Ixora arborea*	*Rubiaceae*
Shurbs and under Shurbs			
31.	Apamarg or Chirchita	*Achyranthes aspera*	*Amarantaceae*
32.	Bansuli	*Grewia rothii*	*Tiliaceae*
33.	Bantulsi	*Eranthemum puchellum*	*Acanthaceae*
34.	Chhind	*Phoenix acaulis*	*Palmeae*
35.	Karantha	*Dodonoea viscosa*	*Sapindaceae*
36.	Lokhandi	*Ixora pavriflora*	*Rubiaceae*
37.	Madhukamani (panmirchi)	*Murraya exotica*	*Rutaceae*
38.	Nirgudi	*Vitex negundo*	*Verbenaceae*
	Tarota	*Cassia tora*	*Legum inoaseae*
39.	Rajmunia	*Lantana acculeata*	*Verbenaceae*
Climbers			
40.	Kewanch	*Mucuna pruriens*	*Leguminosae papilionaceae*
41.	Malkangni (Amjun)	*Celastrus paniculata*	*Celastraceae*
42	Nagbel (Dudhi)	*Cryptolepis buchanani*	*Asclepiadaceae*
43.	Palasbel (Boidla)	*Butea superba*	*Leguminosae Papilionaceae*
44.	Raoni (Ail)	*Acacia pennata*	*Leguminosae papilionaceae*
Grasses and bamboos			
45.	Bans	*Dendrocalamus strictus*	*Gramineae*
46.	Bhurbhusi	*Eragrostis tenella*	*Gramineae*

Sr. No.	Vernacular Name	Botanical Name	Family
47.	Doob	*Cynodon dactylon*	*Gramineae*
48.	Kantangbans	*Bambusa aroundinaceae*	*Gramineae*
49.	Kusal (Sukal)	*Heteropogon contorus*	*Gramineae*
50.	Tikari (Rusa)	*Cymbopogon martini*	*Gramineae*
Other plants			
51.	Mysore gum	*Eucalyptus hybrid*	*Myrtaceae*
52.	Acacia auriculoformis	*Australian acacia*	*Myrtaceae*

Table 3.2.9
List of Fauna in the Study Area

Sr. No.	Local Name	English Name	Specific Name
Animal			
1.	Jangli billi	Common jungle cat	*Felis chaus*
2.	Kharghosh	Hare	*Lepus ruficaudatus*
3.	Langur	Langur (monkey)	*Presbytis entellus*
4.	Shiar n(Gidhar)`	Jackal	*Canis aureus*
5.	Suar (Barha)	Indian wild boar	*Sus cristatus*
Birds			
6.	Bater	Bush quail	*Perdicula asiatica*
7.	Chitta fakata	Spotted dove	*Sterptopelia chinensis*
8.	Koel	Koel	*Eudyanamys sclopace*
9.	Teetar (Kala)	Painted Partridge	*Francolinus pictus*
10.	Total (Jungli)	Sirkeer (Cuckoo)	*Taccocua leschenaur*
Reptiles			
11.	Ajghar	Indian python striped keel back	*Python molurus Natrix stolata*
12.	Chhipkali	Monitar lizard	*Varanus monitor*
13.	Dhaman	Oriental rat snake	*Piyas mucosus, calotes versicolor (Daudi) Sitana ponticeriana (Guvier) Ricpa lineata (Grey)*
14.	Nag	Indian cobra krait Russellis viper	*Naja naja bangarus caerulaus vipera russelli*

3.3 Air Environment

3.3.1 Meteorology

The meteorological data recorded during the monitoring period is very useful for proper interpretation of the baseline information as well as input for air quality prediction. Historical data on meteorological parameters will also play an important role in identifying the general meteorological regime of the region.

The year may broadly be divided into four seasons:

- Winter season : December to February
- Summer season : March to May

- Monsoon season : June to September
- Post-monsoon season : October to November

Methodology

On-site monitoring was undertaken for various meteorological parameters as per BIS and IMD guidelines to generate the site-specific data. The generated data was then compared with the meteorological data obtained from IMD.

Methodology of Data Generation

The automatic meteorological data recording instrument was installed on top of a building near to the project site to record wind speed, wind direction, relative humidity and temperature. Cloud cover was recorded by visual observation. Rainfall was monitored by rain gauge.

Hourly average, maximum, and minimum values of wind speed, direction, relative humidity, rainfall, and temperature were recorded continuously at this station during Dec.08 to Feb. 2009.

Sources of Information

Secondary information for the last 30 years on meteorological conditions was collected from the nearest IMD station at Raigarh. Pressure, temperature, relative humidity, rainfall, wind speed and direction are measured twice a day viz., at 0830 and 1730 hr. the climatological data of IMD Riagarh is presented in **Table-3.3.1**.

Analysis of IMD Data Raigarh

The Indian Meteorological Department records the data at two times a day viz. 0830 hr and 1730 hr, while the site-specific data was recorded at an hourly interval. Comparison of the site specific data generated during the study period vis-à-vis the data monitored by IMD shows that by and large these are comparable.

Temperature

The winter season starts from December and continues till the end of February. December is the coldest month with the mean daily maximum temperature recorded 31.6°C in the month of February and minimum temperature at 13.2°C in the month of December. Both the day and night temperatures increase rapidly during the

onset of summer season from March to May. During summer season, the mean maximum temperature (May) is observed at 42.6°C with the mean minimum temperature at 20.4°C in the month of March. The mean maximum temperature in the monsoon season was observed to be 38.0°C whereas the mean minimum temperature was observed to be 24.5°C. By end of September with the onset of post-monsoon, day temperatures decrease slightly with the mean maximum temperature at 32.4°C the mean minimum temperature at 17.1 ^{0}C.

Relative Humidity

The average monthly minimum and maximum relative humidity is observed around 20% to 41% during summer period. In the monsoon period the relative humidity ranges between 50% and 86%. During the post-monsoon season, the mean humidity is observed between 47% and 71%. During winter season, the mean humidity is observed between 30% and 62%.

Rainfall

The average annual rainfall based on the IMD data is 1552 mm. The monsoon generally sets in during the first week of June. The rainfall gradually decreases after August. The maximum numbers of rainy days are observed in the month of July.

Cloud Cover

During the winter and the summer seasons, it was observed that the sky was very clear. In the summer season, light clouds were observed in the evenings, with no clouds in the mornings. During monsoon season, both in the mornings and evenings the sky was observed to be generally cloudy.

Wind Speed / Direction

The wind rose based on IMD Raigarh for the study period representing winter season are shown in **Figure-3.3.1**.

Table-3.3.1

Climatological Data for IMD, Raigarh

Month	Temperature (°C)		Relative Humidity (%)		Rain-fall (mm)
	Max	**Min**	**Max**	**Min**	**Mean**

Month	Temperature (°C)		Relative Humidity (%)		Rain-fall (mm)
	Max	Min	Max	Min	Mean
January	28.3	13.3	61	40	11.2
February	31.6	16.0	53	30	15.7
March	36.0	20.4	41	23	2.4
April	40.3	25.1	38	20	13.8
May	42.6	28.0	40	21	17.5
June	38.0	27.1	63	50	199.0
July	31.6	24.7	85	76	453.8
August	31.1	24.7	86	78	494.5
September	32.2	24.5	81	73	287.2
October	32.4	22.0	71	59	49.1
November	30.3	17.1	61	47	3.7
December	28.2	13.2	62	44	4.1

Analysis of Meteorological Data Recorded near the Project Site

The meteorological data recorded at the project site is presented in **Table-3.3.2**.

It was observed that the temperature at the proposed site during study period ranged from 15.0 °C to 29.4 °C. Where as the relative humidity ranged from 12% to 74%.

Table-3.3.2

Summary of the Meteorological Data

Generated at Site (1st Dec, 08 TO 29th Feb, 09)

Month	Temperature (°C)		Relative Humidity (%)		Monthly Rainfall (mm)
	Max	Min	Max	Min.	
Dec 2008	24.3	15.0	70	18	2.6
Jan 2009	25.4	16.2	74	14	9.3
Feb 2009	29.4	18.5	65	12	12.0

The windrose for the study period representing winter season is shown in **Figure-3.3.2**. A review of the windrose diagram at site shows that dominant winds are mostly from N and NW. Calm conditions prevailed for about 32.1 % of the total time.

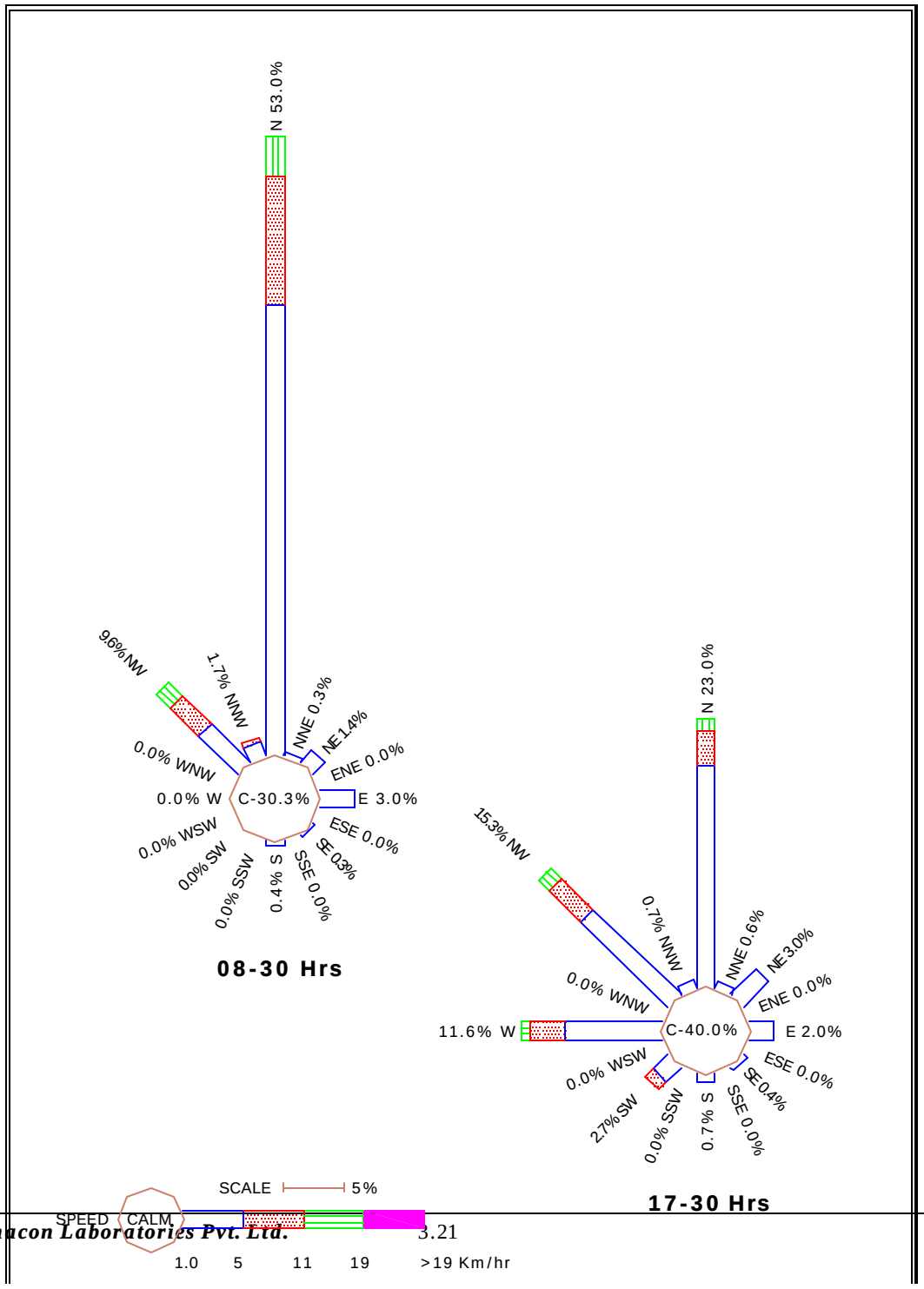

N 53.0%
9.6% NW
1.7% NNW
NNE 0.3%
NE 1.4%
ENE 0.0%
0.0% WNW
0.0% W
C-30.3%
E 3.0%
0.0% WSW
ESE 0.0%
0.0% SW
SE 0.3%
0.0% SSW
0.4% S
SSE 0.0%
08-30 Hrs
N 23.0%
15.3% NW
0.7% NNW
NNE 0.6%
NE 3.0%
0.0% WNW
ENE 0.0%
11.6% W
C-40.0%
E 2.0%
0.0% WSW
ESE 0.0%
2.7% SW
SE 0.4%
0.0% SSW
0.7% S
SSE 0.0%
17-30 Hrs
SCALE
5%
SPEED
CALM
1.0
5
11
19
>19 Km/hr

Figure-3.3.1

Windrose for Winter Season, IMD Raigarh

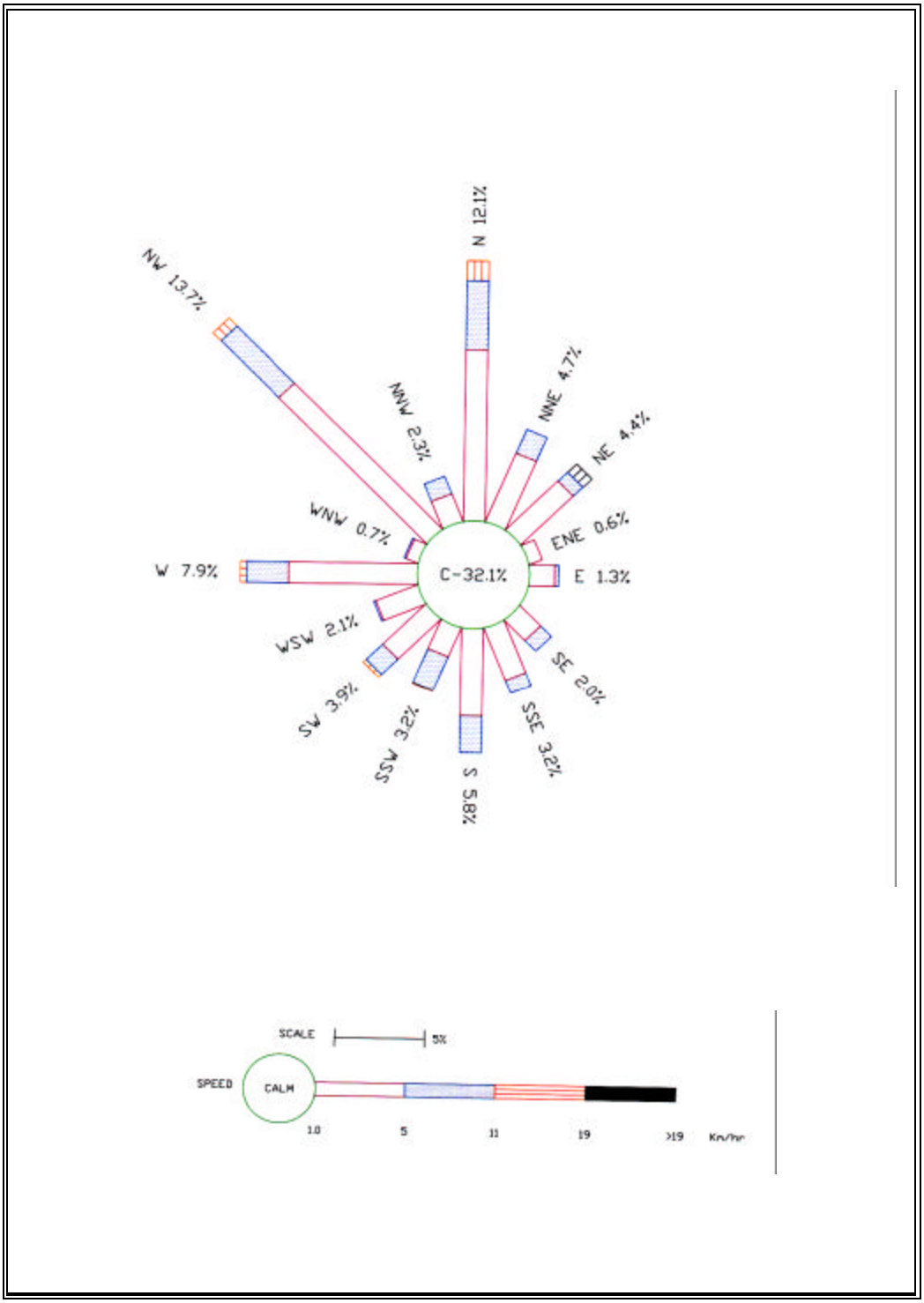


Figure-3.3.2

Windrose at Site (Dec08-Feb 09)

3.3.2 The Ambient Air Quality

The ambient air quality with respect to the study area of 10-km radius around the project site forms the baseline information. The various sources of air pollution in the region are industries and vehicular traffic. The prime objective of the baseline air quality study was to assess the existing air quality of the area.

The micro-meteorological data collected at site during the project period was used as a guideline to know the predominant wind direction during study period of different months. Ambient air monitoring was carried out at nine locations, within radial distance of 10 km. The details about sampling locations are depicted in **Figure-3.3.3** and presented in **Table-3.3.3**. The locations were identified keeping in view predominant wind directions prevailing during study period, sensitive receptors and human settlements. The levels of Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur Dioxide (SO_2,), Oxides of Nitrogen (NO_X) were monitored for establishing the baseline status. SPM and RPM is collected by respirable particulate sampler. It is a two stage frectionator, based on cyclone separator. The due particles collected on glass fiber filter paper are less than 10 µ size (Respirable range). While dust particles collected in a cup provided at the bottom of cyclone are above 10 µ to 100 µ size. Ambient air is drawn through a cyclone and then filtered through glass fiber filter paper (10" x 8" size) at the average flow rate of 0.8 to 1.2 m^3/min on 24 hourly bases. The dust deposited over the filter paper is measured as RPM and the sum of the dust deposited over filter paper and in the cup is measured as SPM which is determined by gravimetric method. Due to the high flow rate of the air suction in the sampler the vaccum is created into the hopper which is utilised for gaseous of sampling SO_2 and NO_x which is measured by wet chemical method and were analyzed by colorimetricaly.

The summary of ambient air quality within the study area monitored for December 2008 to February 2009 is presented in **Table 3.3.4**.

Table-3.3.3

Details of Ambient Air Quality Monitoring Locations

Sr. No.	Sampling Location	Direction	Aerial Distance w.r.t. Plant Site (Km)
1.	Project Site	-	-
2.	Khamharia	ESE	3.5
3.	Kondkel	ESE	7.0
4.	Taprpanga	SE	9.0
5.	Lamdari	SE	5.5
6.	Gare	SSE	4.0
7.	Rodopali	W	3.5
8.	Pelma	NNE	9.5
9.	Milupara	ENE	6.0

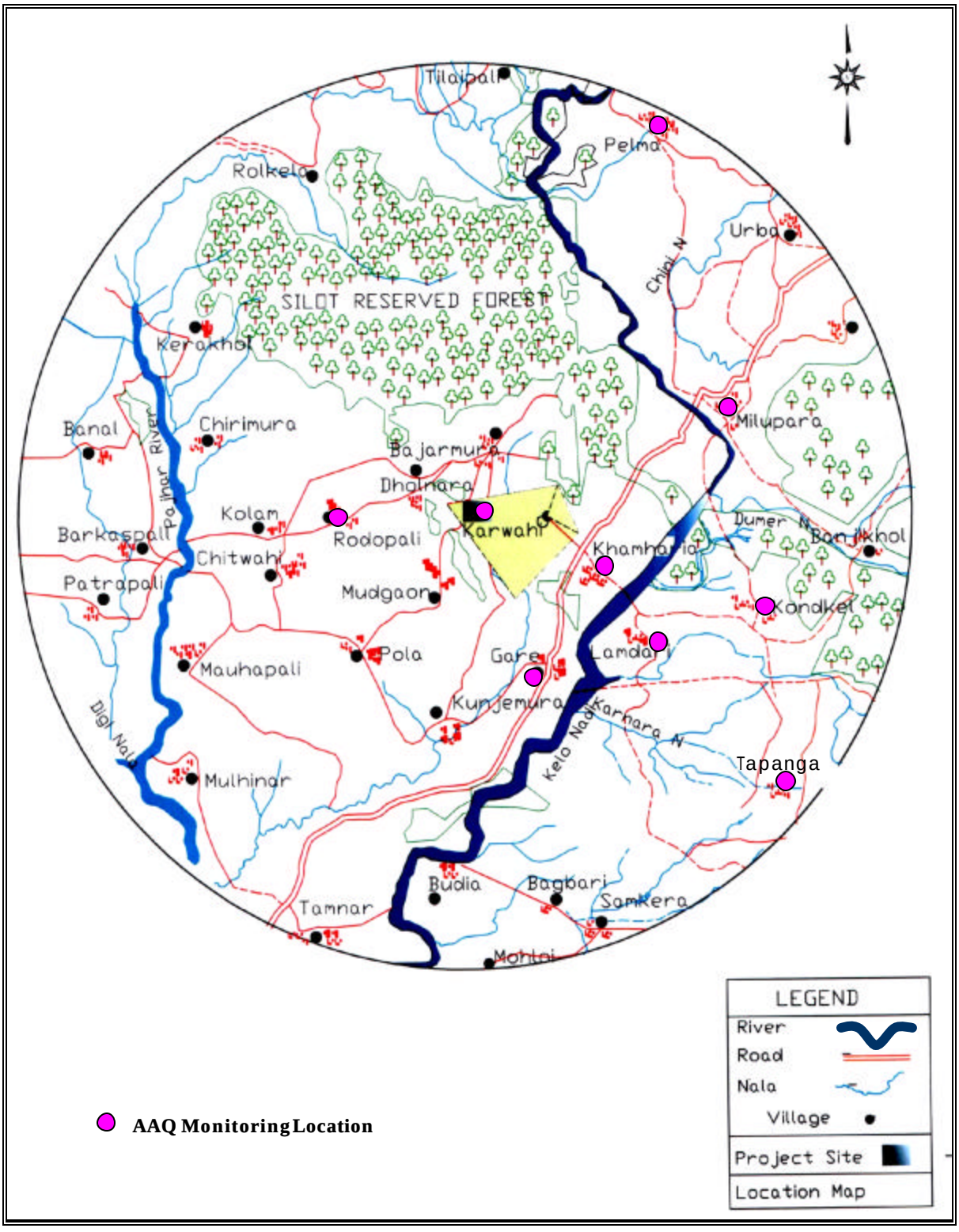


Figure: 3.3.3

Sampling Locations for Monitoring of Ambient Air Quality

Presentation of Primary Data

The air quality data collected during period of three months are presented in detail in **Annexure-IV**.

Various statistical parameters like 98th percentile, average, minimum and maximum values have been computed from the observed raw data for all the AAQ monitoring stations.

Observations of Primary Data

The minimum and maximum concentrations for SPM were recorded as 92 µg/m^3 and 179 µg/m^3 respectively. The maximum concentration was recorded at Rodapali and the minimum concentration was recorded at village Khamnaira. The average concentrations were ranged between 137 to 151 µg/m^3.

The minimum and maximum concentrations for RPM were recorded as 26 µg/m^3 and 63 µg/m^3 respectively. The minimum concentration was recorded at Khamnaira, and the maximum concentration was recorded at Gare. The average concentrations were ranged between 40 to 48 µg/m^3.

The minimum and maximum SO_2 concentrations were recorded as 5.0 µg/m^3 and 6.8 µg/m^3 respectively. The average concentrations were ranged between 5.0 to 6.0 µg/m^3.

The minimum and maximum NOx concentration was recorded as 5.0 µg/m^3 and 8.5 µg/m^3. The average concentrations were ranged in between 5.7 µg/m^3 and 7.0 µg/m^3.

Table-3.3.4

Summary of Ambient Air Quality Results

Sr. No.	Location	SPM (µg/m³)				RPM (µg/m³)			
		Min	Max	Avg	98th %P	Min	Max	Avg	98th %P
1.	Project Site	97	162	138	159	28	53	41	52
2.	Khamnaira	92	164	137	162	26	48	40	47
3.	Kondkel	110	162	138	161	32	54	43	54
4.	Taprpanga	112	167	143	166	30	55	44	55
5.	Lamdari	110	165	144	163	34	54	44	53
6.	Gare	127	173	150	171	36	63	47	60
7.	Rodopali	122	179	151	177	38	56	48	56
8.	Pelma	108	163	141	163	32	53	44	53
9.	Milupara	124	165	144	164	38	54	45	54

CPCB Standards: SPM 24 hours Average — Industrial area, Residential area: 500 µg/m³ 200 µg/m³

RPM 24 hours Average — Industrial area, Residential area: 150 µg/m³ 100 µg/m³

Sr. No.	Location	SO_2 (µg/m³)				NOx (µg/m³)			
		Min	Max	Avg	98th %P	Min	Max	Avg	98th %P
1.	Project Site	5	6.5	5.5	6.4	5.0	7.0	6.0	7.0
2.	Khamnaira	5	5.5	5.0	5.5	5.4	7.0	6.0	6.9
3.	Kondkel	5	6.5	5.5	6.4	5.5	7.4	6.0	7.3
4.	Taprpanga	5	6.0	5.3	6.0	5.5	7.5	6.1	7.0
5.	Lamdari	5	6.0	5.5	6.0	5.2	7.0	5.8	6.9
6.	Gare	5	6.0	5.4	6.0	5.0	7.5	5.7	7.3
7.	Rodopali	5	6.8	6.0	6.8	6.0	8.5	7.0	8.4
8.	Pelma	5	6.5	5.6	6.4	5.5	7.5	6.0	7.2
9.	Milupara	5	6.0	5.5	6.0	5.6	7.0	6.4	7.0

CPCB Standards: SO_2 24 hours Average — Industrial area, Residential area: 120 µg/m³ 80 µg/m³

NOx 24 hours Average — Industrial area, Residential area: 120 µg/m³ 80 µg/m³

3.4 Noise Environment

Ambient noise standards have been prescribed for different types of land use, i.e. residential, commercial, industrial areas and silence zone, as per 'The Noise Pollution (Regulation and control) Rules, 2000, notified by Ministry of Environment and Forest, New Delhi on February 14, 2000. The ambient noise standards have been stipulated during day time (6 am to 10 pm) and night time (10 pm to 6 am) keeping in the view the different sensitive and the resultant impacts at community level during these periods. The ambient noise levels were monitored at selected villages within the study area during day and night time.

Identification of Sampling Locations

A preliminary reconnaissance survey has been undertaken to identify the major noise generating sources in the area. Noise at different noise generating sources has been identified based on the activities in the village area, ambient noise due to industries and traffic and the noise at sensitive areas like hospitals and schools.

Method of Monitoring

The noise monitoring has been conducted for determination of noise levels at eight locations in the study area using Sound Pressure Level (SPL). The day noise levels have been monitored during 6 am to 10 pm and night levels during 10 pm to 6 am at all the monitoring locations within the study area.

The environmental settings of each noise monitoring location is given in **Table-3.4.1** and depicted in **Figure-3.4.1**.

Presentation of Results

The statistical analysis is done for measured noise levels at eight locations for once during study period. The parameters are analyzed for L_{day}, L_{night}, and L_{dn}. These results are presented in **Table-3.4.2**.

Table-3.4.1

Details of Ambient Noise Monitoring Locations

Sr. No.	Sampling Location	Direction	Aerial Distance w.r.t. Plant Site (Km)
1.	Dholnara	WNW	1.5
2.	Bajarmura	NNE	1.8
3.	Khamaria	ESE	3.5
4.	Lamdari	SE	5.5
5.	Gare	SSE	4.0
6.	Mudgaon	SSW	2.5
7.	Rodo Pali	W	3.5
8.	Milupara	ENE	6.0

Table 3.4.2
Noise Levels in the Study Area

All values in dBA

Sr. no.	Location	L_{10}	L_{50}	L_{90}	L_{eq}	L_{day}	L_{night}	L_{dn}
1	Dholnara	50.6	49.4	42.6	50.5	**48.8**	**42.9**	50.8
2	Bajarmura	51.3	46.2	43.7	47.2	**49.5**	**44.6**	52.3
3	Khamaria	54.2	47.1	42.3	49.5	**53.0**	**43.4**	53.2
4	Lamdari	50.7	47.2	38.2	49.8	**49.9**	**39.0**	49.6
5	Gare	52.4	48.2	40.1	50.7	**50.6**	**41.2**	50.8
6	Mudgaon	51.2	47.6	41.5	49.2	**49.4**	**42.6**	50.9
7	Rodo Pali	50.6	46.3	43.5	47.1	**48.8**	**44.0**	51.5
8	Milupara	48.2	45.2	42.4	45.8	**46.4**	**43.1**	50.2

CPCB Standards: Industrial area Day Time 75 dBA, Night Time 70 dBA
Residential area Day Time 55 dBA, Night Time 45 dBA

Observations

Day Time Noise Levels [(L_{day})]

The day time noise levels at all locations were observed to be within the prescribed limit of 55 dB (A). The noise levels ranged between 46.4 dB (A) to 53.0 dB (A).

Night Time Noise Levels (L_{night})

The night time noise levels at all locations were observed to be within the prescribed limit of 45 dB (A). The noise levels ranged between 39.0 dB (A) to 44.6 dB (A).

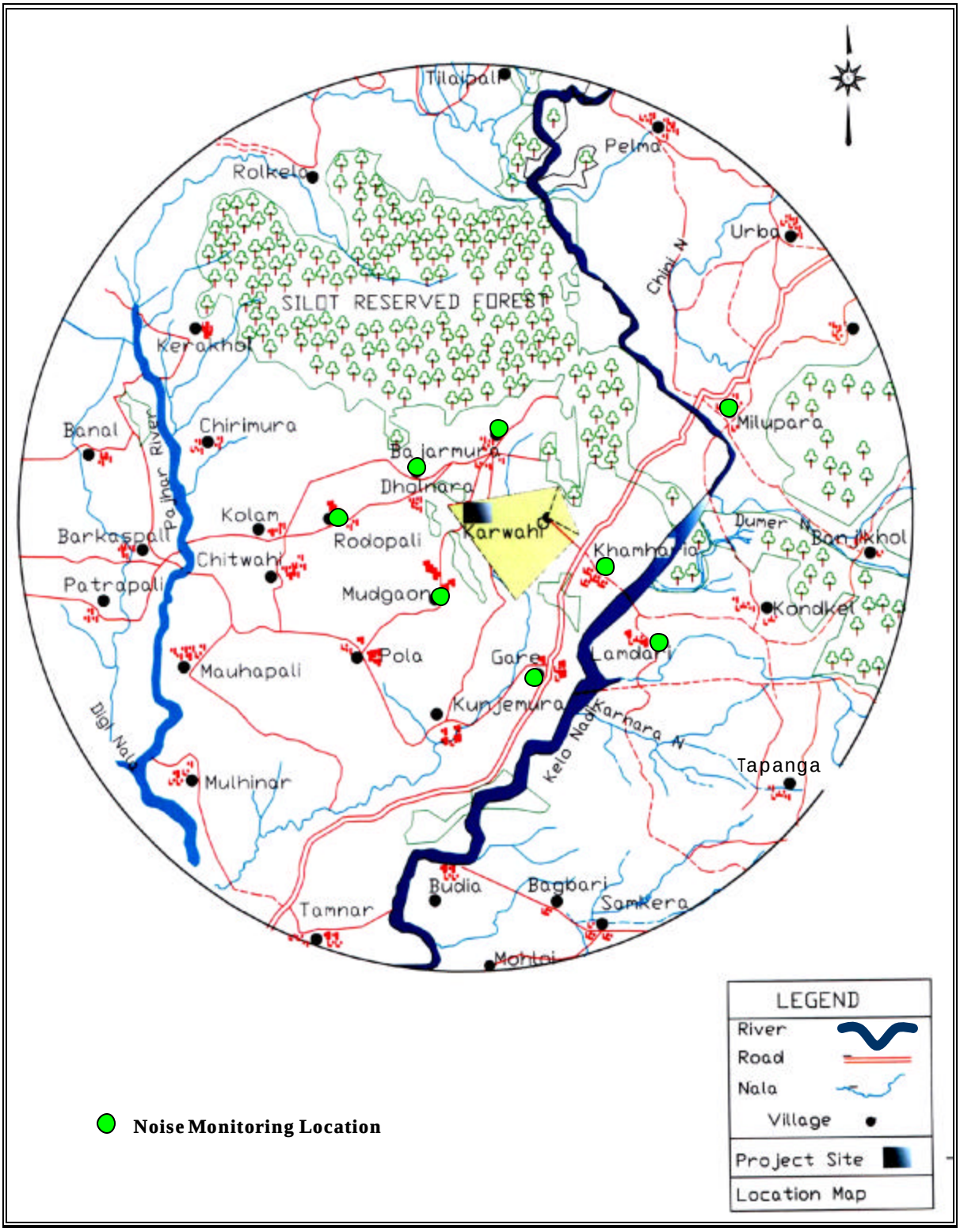


Figure-3.4.1

Noise Monitoring Locations

3.5 Water Environment

The impacts on water environment form inherent part of development and operation of washery projects in two ways, i.e. stress on water resources (continuous drawl of large quantities of water) and the pollution impacts due to discharge of effluents. These impacts may be related to either or both; surface and groundwater resources in the project area depending on the specific situation. To address these issues it is necessary to take a stock of available water resources in project area with respect to their existing quality as well as their supportive capacity to represent the baseline status of water environment as part of impact assessment study for a proposed project.

The existing water resources, both surface and groundwater with respective significance are identified through reconnaissance within the study area (10 km radial distance) around project site. These locations are selected to assess the existing status of water quantity in impact zone. Water sample analysis with respect to physico-chemical and bacteriological parameters having relevance to public health and aesthetic significance are selected to assess the water quantity status with special attention to raw water resources for proposed project and the receiving water body for the treated effluent. The standard methods prescribed for surface and groundwater samples as well as the analytical methods prescribed for individual parameters are followed in this study.

Baseline Data

The water quality in the impact zone was assessed through physico-chemical analysis of ground water samples collected during December 2008. The existing status of groundwater and surface water quality assessed by identifying 8 ground water (Bore wells) samples in different villages and 2 surface water samples is depicted in **Figure-3.5.1** and listed in **Table-3.5.1**. The physico-chemical characteristics of surface and groundwater samples collected are presented in **Table 3.5.2** and **Table 3.5.3** whereas bacteriological quality of surface water is presented in **Table 3.5.4**.

It was observed that all the physico-chemical parameters and heavy metals of water samples from surface and ground water are below the stipulated drinking

water standards. The bacteriological quality of surface water shows fecal contamination which may be due to human activities observed during study period.

Table-3.5.1
Details of Water Sampling Locations

Code	Location	Direction w.r.t. Project Site	Distance w.r.t. Project Site
Surface Water			
SW1	Pajhar River	W	6.5
SW2	Kelo River	E	5.0
Ground Water			
GW1	Karwahi	E	1.8
GW2	Bajarmura	NNE	1.8
GW3	Khamaria	ESE	3.5
GW4	Gare	SSE	4.0
GW5	Mudgaon	SSW	2.5
GW6	Milupara	ENE	6.0
GW7	Kunjemura	SSW	5.0
GW8	Tamnar	SSW	10.0

Table 3.5.2
Surface Water Quality

Sr. No	Test Parameters	Pajhar River	Kelo River	Class C of IS : 2296 Limits
1	pH	7.59	7.50	6.5 to 8.5
2	Turbidity (NTU)	10.0	5.3	5
3	Dissolved Oxygen (DO)	6.2	6.4	4 minimum
4	Total Dissolved Solids (TDS)	80	95	1500
5	Total Hardness ($CaCO_3$)	40	44	$
6	Calcium as (Ca)	12	14	$
7	Magnesium as (Mg)	2.43	2.43	$
8	Sulphate as (SO_4)	2.62	13.5	400
9	Chlorides as (Cl)	7.9	6.8	600
10	Nitrates as (NO_3)	0.20	< 0.1	50
11	Fluorides as (F)	0.10	0.1	1.5
12	Alkalinity	46	41	$
13	Iron as (Fe)	0.25	0.28	50
14	Lead as Pb	< 0.001	< 0.001	0.1

15	Mercury as Hg	< 0.001	< 0.001	$
16	Arsenic as As	< 0.001	< 0.001	0.2
17	Chromium as Cr^{6+}	< 0.001	< 0.001	0.05

Note: All analytical results are in mg/lit except pH and Turbidity

$: Limits not specified

Table 3.5.3
Ground Water Quality

Sr. No.	Test Parameters	Karwahi (BW)	Bajrmura (BW)	Khamariya (BW)	Gare (BW)	Limits of IS : 10500
1	pH	6.6	6.8	6.5	7.15	6.5 to 8.5 (NR)
2	Turbidity (NTU)	5.6	4.0	4.2	4.0	5 (10)
3	Total Dissolved Solids (TDS)	80	92	86	110	500 (2000)
4	Total Hardness ($CaCO_3$)	44	47	46	68	300 (600)
5	Calcium as (Ca)	13.6	14	14	20	75 (200)
6	Magnesium as (Mg)	2.43	2.91	2.67	16.28	30 (100)
7	Sulphate as (SO_4)	4.4	5.5	6.0	4.4	200 (400)
8	Chlorides as (Cl)	8.4	9.2	8.0	11.0	250 (1000)
9	Nitrates as (NO_3)	< 0.1	< 0.1	< 0.1	< 0.1	45 (NR)
10	Fluorides as (F)	0.3	0.4	0.3	0.3	1.0 (1.5)
11	Alkalinity	52	58	46	86	200 (600)
12	Iron as (Fe)	0.08	0.08	0.23	0.13	0.3 (1.0)
13	Copper (as Cu)	< 0.001	< 0.001	< 0.001	0.05	0.05 (1.5)
14	Manganese (as Mn)	0.086	0.08	0.082	0.05	0.1 (0.3)
15	Cadmium (as cd)	< 0.001	< 0.001	< 0.001	< 0.001	0.01 (NR)
16	Selenium (as Se)	< 0.001	< 0.001	< 0.001	< 0.001	0.01 (NR)
17	Arsenic (as As)	< 0.001	< 0.001	< 0.001	< 0.001	0.05 (NR)
18	Mercury (as Hg)	< 0.001	< 0.001	< 0.001	< 0.001	0.001 (NR)
19	Lead (as Pb)	< 0.001	< 0.001	< 0.001	< 0.001	0.05 (NR)
20	Zinc (as Zn)	0.39	0.35	0.30	0.08	5 (15)
21	Aluminum (as Al)	< 0.001	< 0.001	< 0.001	< 0.001	0.03 (0.2)
22	Boron (as B)	< 0.001	< 0.001	< 0.001	< 0.001	1
23	Chromium (as Cr)	< 0.001	< 0.001	< 0.001	< 0.001	0.05 (NR)

Note: All analytical results are in mg/lit except pH and Turbidity
(): permissiable limit in absence of alternate source

(Table 3.5.3 Contd...)

Sr. No	Test Parameters	Mudgaon (BW)	Milupara (BW)	Kunjemura (BW)	Tamnar (BW)	Desirable Requirement
1	pH	6.6	6.4	7.2	7.32	6.5 to 8.5
2	Turbidity (NTU)	7	12	3.5	4.0	5
3	Total Dissolved Solids (TDS)	92	96	196	220	500
4	Total Hardness ($CaCO_3$)	48	52	152	187	300
5	Calcium as (Ca)	14	15	34	37.54	75
6	Magnesium as (Mg)	3.16	3.52	16.28	22.85	30
7	Sulphate as (SO_4)	4.7	2.0	4.5	2.0	200
8	Chlorides as (Cl)	6.0	10.5	17.0	25	250
9	Nitrates as (NO_3)	0.2	0.2	0.1	0.1	45
10	Fluorides as (F)	0.2	0.1	0.3	0.3	1.0
11	Alkalinity	42	50	160	185	200
12	Iron as (Fe)	0.15	0.19	0.08	0.08	0.3
13	Copper (as Cu)	< 0.001	< 0.001	< 0.001	< 0.001	0.05
14	Manganese (as Mn)	0.07	0.02	0.04	0.06	0.1
15	Cadmium (as cd)	< 0.001	< 0.001	< 0.001	< 0.001	0.01
16	Selenium (as Se)	< 0.001	< 0.001	< 0.001	< 0.001	0.01
17	Arsenic (as As)	< 0.001	< 0.001	< 0.001	< 0.001	0.05
18	Mercury (as Hg)	< 0.001	< 0.001	< 0.001	< 0.001	0.001
19	Lead (as Pb)	< 0.001	< 0.001	< 0.001	< 0.001	0.05
20	Zinc (as Zn)	< 0.001	0.057	0.032	1.6	5
21	Aluminum (as Al)	< 0.001	< 0.001	< 0.001	< 0.001	0.03
22	Boron (as B)	< 0.001	< 0.001	< 0.001	< 0.001	5
23	Chromium (as Cr)	< 0.001	< 0.001	< 0.001	< 0.001	0.05

Note: All analytical results are in mg/lit except pH and Turbidity

Table -3.5.4
Bacteriological Quality

Sr. No.	Sampling Source	Total Coliform (CFU / 100 ml)	Faecal Coliforms (CFU / 100 ml)
Surface Water			
1	Pajhar River	42	07
2	Kelo River	38	05

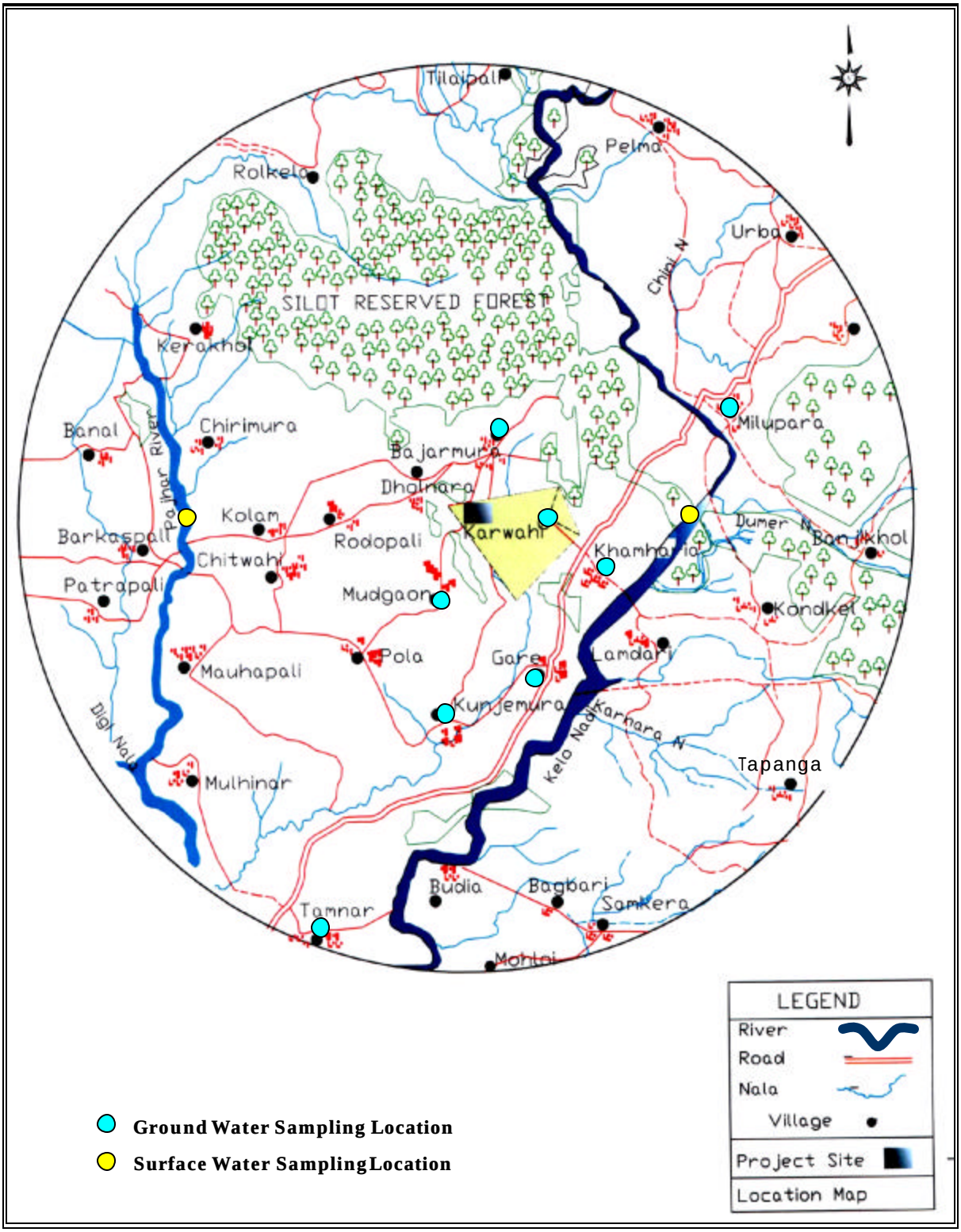

Tilaipali
Pelma
Rolkela
Urba
Chial N
SILOT RESERVED FOREST
Kerakhol
Milupara
Banal
Chirimura
Pathar River
Bajarmura
Dhalnara
Kolam
Barkaspali
Rodopali
Karwahi
Khamharia
Dumer N
Banjkhol
Chitwahi
Patrapali
Mudgaon
Kondkel
Mauhapali
Pola
Gare
Lamdari
Kunjemura
Karhara N
Kelo Nadi
Digi Nala
Tapanga
Mulhinar
Budia
Bagbari
Samkera
Tamnar
Mohtai
LEGEND
River
Road
Nala
Village
Project Site
Location Map
Ground Water Sampling Location
Surface Water Sampling Location

Figure-3.5.1

Water Sampling Locations

3.6 Socio-economic Environment

3.6.1 Reconnaissance

The study of socio-economic component incorporating various facets related to socio-economic conditions of the project area is an integral part of the EIA. The socio-economic component of the environment with reference to human interests, aesthetic and cultural attributes needs to be studied while delineating Environmental Management Plan (EMP) for achieving desired targets without impairing the quantity of life. In order to carry out such studies information on issues such as land acquisition, compensation and assistance, effect on employment and income generating facilities etc. along with parameters of health and risk was collected. The proposed expansion plan do not involve land acquisition therefore issues such as compensation, rehabilitation and settlement have not been involved in the present report.

Baseline data on socio-economic parameters such as demography, infrastructure, economic resource base, health status, cultural aspects and aesthetic attribute was generated using information available with Govt. agencies, census data, and statistical abstract and health agencies.

Socio-economic survey was carried out covering select villages of the study area to record awareness, opinion, apprehensions, and expectations of the local people about the proposed coal washery of Sarda Energy and Minerals Ltd. The opinion of local people about the proposed activities plan was obtained through socio-economy survey of the villages, focus group discussion and public consultation with the villagers in the proximity of Project Area.

3.6.2 Location of the Proposed Activity

The Sarda Energy and Minerals Ltd. site is located at Latitude 22°10'10" N to 22 Longitude 83°28'14" E (Toposheet No. 64/N/8), village Bajarmura Kelo River are located on SE of project site.

The land is mostly agriculture land. Silot Reserved forest and Gate reserved protected forest are 1-2km away from periphery of the project site.

The National Highway connecting Raigarh and Bilaspur is about 50 km away from the project site. Raigarh- Korba State Highway is passing 6 km from the site. A district road passes through entire village.

3.6.3 Methodology

The methodology adopted for the study is based on the review of secondary data, such as District Census Statistical Handbooks-2001 and the records of National Informatics Center, New Delhi, for the parameters of demography, occupational structure of people within the study area of 10-km radius around the proposed project site.

3.6.4 Demography of Study Area

The sociological aspects of these studies include human settlements, demography, social structure such as scheduled castes and scheduled tribes and literacy levels besides infrastructure facilities available in the study area. The economic aspects include occupational structure of workers.

The village wise demographic data as per 2001 census of India is presented in **Annexure-V.** The salient features of the demographic and socio-economic details are described in the following sections.

Demography

Distribution of Population

As per 2001 census, the study area consists of 82954 persons. The distribution of population in the study area is given in **Table-3.6.1**. The males and females constitute 49.9% and 50.1% of the study area population respectively.

Table-3.6.1

Distribution of Population

Particulars	Within 0-10 Km radial distance
No. of Households	18846
Male Population	41553
Female Population	41401

Total Population	82954
Average Household Size	4.4
Male %	50.1
Female%	49.9

Average Household Size

The average household size of the study area is 4.4 persons. The low family size could be attributed to a high degree of urbanization with migration of people with higher literacy levels who generally opt for smaller family size and family welfare measures.

Gender Ratio

The configuration of male and female indicates that the males constitute to about 49.9% and females to 50.1% of the total population as per 2001 census records. The sex ratio i.e. the number of females per 1000 males indirectly reveals certain sociological aspects in relation with female births, infant mortality among female children and single person family structure, a resultant of migration of industrial workers. The study area on an average has 996 females per 1000 males as per 2001 census.

Social Structure

As per 2001 census, the percentage of scheduled caste population is 8.82% within 10-km radius study area. The percentage of Schedule tribe population is 58.11%. The distribution of population by social structure is given in **Table-3.6.2**.

Table - 3.6.2
Distribution of Population by Social Structure

Particulars	**Within 0 -10 Km radial distance**
Schedule Caste	7320
% To the total population	8.82
Schedule Tribes	48211
% To the total population	58.11
Total SC and ST population	55531
% To total population	66.93
Other caste population	27423
% To total population	33.07
Total Population	**82954**

Literacy Levels

The study area experiences an average literacy rate of 59.82%. The distribution of literate and literacy rate in the study area is given in **Table -3.6.3.**

Table 3.6.3
Distribution of Literate and Literacy Rates

Particulars	Within 0-10 Km radial distance
Total literate	49624
Average literacy (%)	59.82
Total population	**82954**

Occupational Structure

The occupational structure of residents in the study area is studied with reference to main workers, marginal workers and non-workers. The main workers include 10 categories of workers defined by the Census Department consisting of cultivators, agricultural labourers, those engaged in live-stock, forestry, fishing, mining and quarrying; manufacturing, processing and repairs in household industry; other than household industry, construction, trade and commerce, transport and communication and other services.

The marginal workers are those workers engaged in some work for a period of less than six months during the reference year prior to the census survey. The non-workers include those engaged in unpaid household duties, students, retired persons, dependents, beggars, vagrants etc.; institutional inmates or all other non-workers who do not fall under the above categories.

As per 2001 census records, altogether the main workers worked out to be 37.47% of the total population. The marginal workers and non-workers constitute to 13.75% and 48.78 % of the total population respectively. The distribution of workers by occupation indicates that the non-workers are the predominant population. The occupational structure of the study area is shown in **Table-3.6.4**.

Table-3.6.4
Occupational Structure

Particulars	0-10 Km
Total main workers	31084
% To study area	37.47
Marginal workers	11405
% To study area	13.75
Non-workers	40465
% To study area	48.78
Total population	**82954**

3.6.5 Socio economic survey of selected villages

Socio-economic survey has been conducted in all the villages identified in the study area. The unit of population like, literate, illiterate employed, unemployed, males and females were included in the survey. The survey was conducted with the help of pre designed set of interview schedule to assess opinion of the population regarding expansion of the project and to know their expectations. Based on primary and secondary data available with various Govt. Departments, like census data, PHC records, literatures, and published information analysis has been done. Probability sampling methods has been used for sample collection during survey.

3.6.6 Demographic Structure (based on data from Census of India 2001)

Location of the villages surveyed are presented in **Table 3.6.5**

Table 3.6.5
Distance & Direction of Few villages Surveyed

Sr. No	Name of Village	Distance (Km)	Direction
		With respect to Industries	
Village			
1	Uraba	9.5	NE
2	Bajarmuda	1.8	NNE
3	Karwahi	1.8	E
4	Milupara	6.0	ENE
5	Rodopali	3.5	W
6	Mauhapali	7.5	SW
7	Gare	4.0	SSE
8	Dhaurabhanta	8	SE
9	Kondkel	7.0	ESE
10	Mahloi	10.0	SSE

The significant observations are as follows:

- The total population of the villages surveyed is 17602.
- The ratio of Female/Male is 812/1000 for the villages surveyed as compared to the national average of 929/1000 which is high.
- Literacy level among the respondent is satisfactory as the educational facilities are adequate in the villages surveyed. The literacy rate is 60%.
- The percentage of scheduled caste (SC) and scheduled tribe (ST) population is 8% and 50% respectively in the study area. The ST population is comparatively higher in the project area.
- The employment rate is 48% & marginal workers are 24%.

3.6.7 Basic Amenities

The basic infrastructural facilities are as follows: **(Table 3.6.6).**

- Educational facilities are available in the form of primary and secondary schools. Very few villages are having a facility of High school, all high schools are private in nature no Govt. school has been observed in the study area. For higher education the students are availing facilities from Tamnar and Raigargh, which are approximately 10 to 15 km from their place of residence.
- Medical facilities are very poor in the study area, Public Health Center at Tamnar imparting services to nearly 35 villages. Primary health sub centre is available at Urba, Karwai, Rodopali, Gare, Dhaurabhanta, Kondkheland Mohloi, in each village one health worker is coming to provide primary health facilities.
- Village people are availing Drinking water facilities generally from the Hand pump, open well and some times from river water. During summer scarcity of water has been noted in the study area.
- Communication services like post office and telephones are available in some villages. Few villagers are having mobile phones.
- 100% villages in the study area are electrified. Electricity is available for domestic and in few areas for agriculture purpose.

Table 3.6.6
Provision of Basic Amenities in the Study Area

Sr. No	Name of Village	Avilable Amenities					
		Edu-cation	Medical	Water Supply	Communi cation	Trans portation	Electric ity
1	Uraba	A/P/M/H	Sub-Center	LW/W/HP	PO	Bus	ED
2	Bajarmuda	A/P/M/H	10 Km	LW/W/HP	-	Bus	ED
3	Karwahi	A/P/M	Sub-Center	HP	-	Bus	ED
4	Milupara	A/P/M	9 Km	LW/W/HP	PO	Bus	ED
6	Rodopali	A/P	Sub-Center	W/HP	-	Bus	ED
5	Mauhapali	A/P/M	6 Km	LW/W/HP	-	Bus	ED
7	Gare	A/P/M	Sub-Center	W/R/P	-	Bus	ED
8	Dhaurabhanta	A/P/M/H	Sub-Center	TW/W/HP	PO	Bus	ED
9	Kondkel	A/P/M	Sub-Center	HP	PO	Bus	ED
10	Mahloi	A/P/M/H	Sub-Center	TW/W/HP	PO	Bus	ED

Source: Census Survey by Anacon Laboratories Ltd, Nagpur

List of Abbreviations

Educational Institution

P – Primary School
S – Secondary School
H – Higher Secondary

Communication Facility

PO – Post office

Drinking Water

W – Well Water
HP – Hand Pump
TK – Tank Water

Medical Facilities

CHC – Community Health Centre
PHC – Primary Health Centre
Ayu – Ayurvedic Dispensary

Transportation Facilities

BS – Bus Service

Power Supply

EA/ED – Electricity for Agriculture & Domestic and < 5 km means the particular facility is not available in the village but it is available in the 5 km from that village.

3.6.8 Socio-economic Survey

The social structure of the study area was assessed by selecting respondent (Stratified random sampling method) from the villages through set of interview schedule.

The observations of the respondents during survey work are as under:

- The social structure of the study area is influence by traditional Chhatisgarhi cast system and its traditional costumes. Social changes have been observed in rural communities which is the positive impact of development of project area.
- All the respondents are aware of activities of SARDA Power plant and have favorable opinion for proposed activities.
- The people of the villages are anticipating better job opportunities and improvement in the basic amenities viz., transportation, communication, health and education. Some respondent opined that local man power should be given preference for employment in the proposed expansion.
- Literacy level among the respondent is satisfactory.
- Educational facilities are adequate to improve level of literacy which is indicated by literacy rate of 58%.
- Private vehicles, Auto, Tractor are the main modes of transportation. Bus, service is available in few villages. The villages where transportation facility is not available have to walk down 1 to 5 km from their place of residence.
- All the villages are connected with each other by Pucca as well as Kutcha roads. The road conditions are very poor which leads to poor transportation during rainy season. Due to the poor conditions of the road serious patients can not be taken to hospitals/health centre which may results in loss of life of patients.
- The employment rate is average in project area (51%). Agriculture plays an important role in rural economy; the work force availability for the agricultural activities is low but in some area people are cultivating summer paddy. People are engaged in the secondary source of employment like industries, construction activities etc. Fishing and livestock related activities are practiced in the study area.
- People are having very few acres of land with them. The land is not enough to meet their needs & therefore the workforce prefers to work in the industries and construction related activities. They are paid 40 to 50 Rs. per day. Their earning is not enough to meet their requirement and therefore indebtness has been observed in the study area.

- 90% of houses in the study area are "Kutchha". Generally people are using clay tiles for roof, wooden strips and mud for construction of walls. RCC construction has been observe d in some villages.

3.6.9 Energy Consumption Pattern

The quantity of the fuel requirement for cooking depends on various factors such as no. of persons in the family, food habits, income of the family & Cost of fuel. The fuel that is being used by villagers is fire wood, cow dung cakes (Kanda), Kerosene, LPG gas. The supply of kerosene is controlled by government and supplied through fair price shops approved by government. As a result most of the villages use more than one type of cooking fuel.

Total 200 respondents were interviewed on fuel consumption during the study period. The observations made are as follows.

– The overall fuel requirement of the respondents examined showed that 100% of the people are using fire wood along with cow dung cakes, 78% are using kerosene and 8% are using LPG.

3.6.10 Health Status

The morbidity pattern in the study area collected from Primary Health Sub Centre (PHC) of Karwahi/Khamaria is presented in **Table 3.6.7.**

Table 3.6.7
Morbidity Status Data: (Public Health Centre Karwai/Khamaria)
Period: Jan 2007 to Dec 2008

Sr. No.	Months	Fever	Jaundice	Diar rhea	Gast ritis	Typhoid	Malaria	T B	Skin	Asthm a	RTI	Leprosy
1	January	30	1	-	25	-	2	1	22	-	-	-
2	February	35	-	-	15	-	-	-	31	-	-	-
3	March	40	1	-	19	-	4	-	27	-	-	-
4	April	40	2	-	17	1	-	-	16	-	-	-
5	May	50	-	2	20	-	-	-	13	-	4	-
6	June	45	-	15	23	-	3	1	33	-	-	-
7	July	40	-	10	14	-	-	-	40	-	-	-
8	August	46	-	20	9	-	4	-	47	-	2	-
9	September	37	-	2	23	-	-	-	30	-	-	-
10	October	38	-	-	17	-	-	-	37	-	-	-
11	November	25	-	1	8	-	-	-	15	-	-	-

12	December	36	-	-	15	-	-	-	20	-	-	-
	Total	**462**	**4**	**50**	**205**	**1**	**13**	**2**	**331**	**-**	**6**	**-**

Fever, diarrhea, gastritis, malaria and skin diseases are common diseases and few cases of T.B, Leprosy, RTI, have been reported in this PHC. During discussion with Medical officer of PHC has pointed that common fever, diarrhea and respiratory disorders are due to seasonal changes. Ring worm infestations are mostly reported among the patients. The main cause of infestation is the use of contaminated water. It is found that people of the area use stagnated pond water for bath. The regular unhygienic activities such as washing of livestock, clothes vehicles and defecation have been observed in stagnated pond water.

3.6.11 Economic Resource Base

Agriculture is the back bone of rural economy and plays an important role in study area. Agriculture production has been lowered down due to insufficient facility and poor resources of irrigation. The impact of poor resources and land is generally on the food production and it leads to insufficient income generation, migration, indebt ness, and work as a labour in nearby industry. To develop their economic straight villagers prefer construction related work, fishery, dairy and other live stock related activity. The agricultural land is not that much productive hence the yield is not satisfactory therefore have to develop and adopt other skill to earn money for their daily requirement. Youth of the project area is literate and having the capacity to grasp any occupation, hence project area has a potential to develop their economy.

Major khariff crop in the entire project area is paddy. The rate of production is approximately 18 to 20 Quintals per acre per year. Wheat, sunflower, groundnut and vegetables are secondary crops and depend upon the facility of irrigation, however all crops are rainfeid.

3.6.12 Cultural and Aesthetic Attribute

No significant Archaeological or Historical Monuments are present in study area. At the time of festival, people enjoy Ghatisgardi music and dance.

3.6.13 Awareness and opinion about the project

- The respondents from almost all the villages are aware about the project activity.
- The respondents have average opinion about the project and they opined that due to proposed project activity, economy of the villages will improve.
- The respondents from the nearby villages have shown favorable opinion about activity as it may lead to increase in infrastructural facilities, job opportunities and business opportunities, but at the same time people are worried about the likely increase in environmental pollution in the region.
- Respondent have suggested minimizing the environmental pollution during and after project activity.
- People from Bajarmura and Khamaria (the land from these villages is to be acquired for the project) were asked to put their opinion and willingness to give the land for project.
- People from these four villages gave mixed reactions. The financially sound cultivators are against of giving the land for the project but on the contrary the poor cultivators are ready for this project.
- The project affected population expects fair compensation and permanent jobs in the power plant.

The educated youths opined that the management should give preference to them/local people for employment as per their educational qualifications.

Chapter 4

Anticipated Environmental Impact and Mitigation Measures

Prediction of impacts is an important component in environmental impact assessment process. Several techniques and methodologies are available for predicting the impacts due to proposed development in coal washery on ecological and socio-economic components of environment. Such predictions are superimposed over the baseline (pre-project) status of environmental quality to derive the ultimate (post-project) scenario of environmental conditions. The quantitative prediction of impacts lead to delineate suitable environmental management plan needed for implementation during the commissioning of proposed washery activities and in its operational phase in order to mitigate the adverse impacts on environmental quality. The coal washery activities will contribute to dust emissions from various sources. The predictions in respect of air, water, land and socio-economic components of environment have been made based on baseline data collected, application of suitable model available scientific knowledge and judgments.

4.1 Air Environment

The impacts on air quality from coal washery depend on various factors involved in transportation of coal from mines, coal handling equipments and processing of the coal in washery. The severity of impacts on air environment from coal washery projects are governed by terrain conditions around the project site and the prevailing micro-meteorological conditions in the project region. Coal washery projects are associated with several onsite facilities such as, viz. raw coal handling system (unloading), washed coal handling system (loading) and reject handling system, are the major sources of air pollution.

Fugitive Emissions

The impacts on air quality from coal washery depends on coal washery technology, its operation & maintenance as well as transportation of coal. The fugitive emissions of coal dust would be due to coal handling activities at storage yard, wind erosion, coal breakers, sieves spillages from conveyor system, loading operation etc. The fugitive emissions (mainly coal dust) would generally be less in quantity and it would be released relatively closer to ground level which would cause impacts in the immediate vicinity to very limited distances (about 1-2 km). The scenario for transportation of the raw and beneficiated coal is as follows.

Total quantity of raw coal	: 3200 Tons/day
Total Quantity of beneficiated coal (finished product)	: 1760 Tons/day
Middling Quantity	: 1216 Tons /day
Final Rejects	: 224 Tons/day

Beneficiated coal and Middling will be transported by Trucks. The details are presented in **Table 4.1**.

- Management is planning to reduce transportation of coal by truck to minimum possible extent by using belt conveyer.
- Dust suppression system and water sprinklers will be provided at storage and coal transfer point.

Table 4.1

Numbers of Trucks

Sr. No	Product	Quantity (TPD)	Truck Capacity (Tonnes)	No. of Trucks
1	Beneficiated Coal	1760	25	70
2	Middling	1216	25	48
Total				**118**

Air Pollution Modeling

After implementation of washery, there will be increase in traffic flow on road due to movement of trucks carrying bebeficiated coal & Middling. The extent of these impacts, at any given time, will depend upon (i) the rate of vehicular emission within a given stretch of the road and (ii) the prevailing meteorological conditions. The impacts will have strong temporal dependence as both of these factors vary with time. The temporal dependence would have diurnal, seasonal as well as long term components.

The air quality predictions have been carried out by using the air quality model CALINE-4 developed by California Department of Transportation. The model is based on Gaussian diffusion equation and uses a mixing zone concept to characterize pollutant dispersion over the roadway. The model has been extensively tested for its predictive capability for traffic related air quality impacts. Given the source strength, meteorology, site geometry and site characteristics, the model can reliably predict pollutant concentrations for receptors located within 150-m of the roadway, the most important region for estimating the impacts due to the low elevation emissions.

The long term variations in air quality scenarios during the project life are expected due to the change in traffic on the highway with time. The existing and the predicted traffic volumes have been considered to project future air quality scenarios to provide an indication of variations in air quality.

To account for the effect of the diurnal variations in model inputs (vehicular emissions and meteorological conditions), the averaging time for model predictions has been restricted to 60 minutes. The averaging time is so selected because the primary meteorological factors that influence the air quality predictions i.e. wind speeds and directions do not remain steady for longer time periods. During the peak traffic hours, the traffic volumes typically show significant variations over longer periods than one hour.

Due to average time of 60 minutes, the project impacts on air quality are essentially assessed based on one hourly standard for CO, NOx however, modeling has been done for peak traffic conditions and compared with WHO standard of 400 $\mu g/m^3$ for hourly average.

HC is not considered for modeling since its limits are not specified for ambient levels in the Environment Protection Act. In the absence of standards for HC, the predictions could not have been interpreted meaningfully.

With respect to SPM, vehicular particulate emission levels have not been specified by the Indian Institute of Petroleum. Further the SPM contributions are dominated by background concentrations as well as traffic induced re-suspension, both of which are difficult to quantify. Hence, SPM was not modeled.

Proposed Traffic

The proposed additional traffic mainly includes trucks, which are used to transport washed coal. Hence, only heavy traffic is considered in assessing the impact of traffic. The proposed truck traffic due to proposed activity is considered in assessing the impact on surrounding area.

The additional traffic due to coal washery will be 118 trucks per day.

Emission Factors

The emission standards for Indian vehicles as proposed by the Indian Institute of Petroleum (IIP) have been used to provide the emission factors for the different vehicle types. Emission factors after accounting for the vehicle speeds are as specified in **Table-4.2**.

Table-4.2

Emission Factors

All values are in gm/km/vehicle*

Trucks/Buses		Cars		Two & Three Wheelers	
CO	NOx	CO	NOx	CO	NOx
10.67	18.97	2.72	0.970	4.0	1.5

Note: To be multiplied by 1.6 for converting into gm/mile for use in CALINE4.

Meteorological Data

Air quality scenarios were developed for worst case stability classes using the wind speeds. The meteorological data considered for the modeling studies is given below in **Table-4.3**.

Table-4.3

Meteorological Data Considered for Modeling

Stability Class	Wind Speed (m/sec)
A	1.0
B	2.0
C	3.0
D	5.0
E	2.0
F	2.0

Details of National Highway

For model computations Right of Way (ROW) of 20-m has been considered for perusal of violations of standards and accordingly receptor locations have been chosen to account for its location with respect to edge of ROW.

Results and Discussions for Traffic Impact

The general observation reveals that the maximum concentration occurs at 20-m from the edge of the road, and the incremental concentration is about 1.3 $\mu g/m^3$ for NOx which are well within the permissible limit.

To summarize the above the impact due to the proposed washery will be insignificant.

- The above mentioned prediction results would be complying the prescribed air quality standard for industrial zone. After installation of belt conveyors, the GLCs will be insignificant.
- The stack are not required in wet washing of coal hence impact due to conventional air pollutant SO_2 and NOx is not envisaged
- Wet process of coal beneficiation has been adopted at the washery hence the generation/dispersion of SPM from the washery is not envisaged
- If the proper sprinkling of water is not done on haul road and inside the plant it may result in deposition of dust on leaves of vegetation thus likely to affect the photosynthetic activities of the plants. The impact due to these conditions will not occur if the proper schedule of sprinkling is maintained.

4.2 Water Environment

- The wastewater generated from the domestic use is treated in septic tank followed by soak pit. thus there is no adverse impact on surface and ground water quality
- Proper control measures are suggested in EMP to prevent the flow of suspended matter from the coal reject. It may have adverse impact on near by surface water bodies if EMP is not properly implemented
- There is no effluent discharge from the process in water bodies, hence no impact is envisaged from coal washery

- The pollution control devises such as Cyclone, Thickener, Belt press and Clarified water pump are integral part of plant. These are electrically coupled with the other equipment in such a way that the plant will stop as and when any of the equipment stops, hence the impact due to power failure is not envisaged
- Introduction of water recovery system involving high speed thickener coupled with belt press for 100% recovery of water makes the plant a zero discharge unit.

4.3 Land Environment

- As such there will be no impact on topography and drainage due to proposed activities.
- Biological Environment the dust generated during loading and unloading operations, vehicular movement constitute heavy particles that will settle down on a very small area within the premises, thus the top soil is likely to be affected. The proper top soil management will control any adverse impact on the growth of the plants. During the study period no significant impact (deposition of dust on leaf area) was observed on the plantation due to the spraying of water at regular intervals is maintained. The vegetation in the study area contributes towards the ecological sustenance. The proposed activities are likely to affect vegetation by deposition of dust over foliage, which will result in the reduction of photo-synthetic activities. This situation will be overcome by spraying of water.
- Solid waste generated in the form of washery rejects which comprises of stone associated with coal i.e. shale, sand, stone etc. are being stacked in reject dump area in compliance with consent; hence no impact is envisaged due to solid waste.

4.4 Socio-economic Environment

After critically analysing the baseline status of the socio-economic profile and visualizing the scenario with the proposed project, the impacts of the project are likely to be of varied in nature.

Positive Impacts

- Increase in infrastructural resources due to the proposed project activity by way of transport and communication and other basic requirements.
- The direct and indirect employment opportunities are likely to be generated due to proposed activities for local population.
- In addition to the opportunity of getting employment as construction laborers, the local population would also have employment opportunities in related services activities like commercial establishments, contracts and supply of construction materials for building and ancillary infrastructure etc. Consequently, this will lead to economic upliftment of the area.
- The project is not going to influence the existing traditional agricultural practices significantly. It may help to improve agricultural production by way of providing additional income to the farmers from supplementary sources.
- There will not be rehabilitation due to proposed activity as the proposed coal washery is within the existing coal block boundary .

Negative Impacts

- Immigration of population from nearby areas for jobs
- Strain on the existing infrastructure.
- If proper sanitation facilities are not provided during project activities it may create unhygienic atmosphere in the area.

4.5 Mitigation Measures

4.5.1 Air Environment

The project proponent has adopted a wet process of coal beneficiation. No air emissions are generated from this process. Water spraying system has been established for coal handling and crushing facilities. Bag filters will be installed at junction points. Water spraying system involves surface water tanks, network of spray water pipeline and headers. Adequate moisture is maintained in coal handling area to ensure that dust is not getting air borne. Vehicle movement in the coal washery area shall be regulated effectively to avoid traffic congestion and workers shall be protected from dust. Heavy duty vehicle emissions in coal washery shall confirm the standard under motor vehicles Rules 1989.

4.5.2 Noise Environment

- By providing padding at various locations to avoid rattling due to vibration;
- Encasement of noise generating equipment where otherwise noise cannot be controlled;
- Providing noise proof cabins to operators where remote control for operating noise generating equipment is feasible;
- All the design/installation precautions as specified by the manufacturers with respect to noise control shall be strictly adhered to;
- High noise generating sources shall be insulated adequately by providing suitable enclosures;
- Design and layout of building to minimize transmission of noise, segregation of particular items of plant and to avoid reverberant areas;
- Use of lagging with attenuation properties on plant components / installation of sound attenuation panels around the equipment;
- The noise control system will be designed to form an integral part of the plant;
- Other than the regular maintenance of the various equipment, ear plugs/muffs are recommended for the personnel working close to the noise generating units;
- All the openings like covers, partitions shall be designed properly; and
- Inlet and outlet mufflers shall be provided which are easy to design and construct.

4.5.3 Water Environment

The wastewater arising from the plant will be re-utilized for the plant purposes. No effluent discharge is envisaged due to recycling into the plant operation. Hence, there will be no impact on the water regime due to the effluents from the plant premises.

Coal Yard Drainage

During monsoon season, the problem of coal yard drainage becomes critical due to coal particles and dust in the yard, to take care of this problem, the entire coal storage yard would be provided with separate drains, which will led to a separate sump of adequate capacity.

Wastewater Management for Zero Discharge Effluent

Zero discharge concept shall be adopted in the proposed coal washery by recycling the waste water for dust suppression /plantation; hence disposal of treated wastewater will be zero.

4.5.4 Land Environment

The roads within the plant premises will be pucca, however the some of patches are required to be asphalted. Quantification of the reject waste will be done regularly which will help proper management in respect of storage. Coal dust nuisance to the neighboring agriculture fields and residential areas will be prevented with suitable measures/ by strengthening the greenbelt.

4.5.5 Socio-economic Environment

Following measures are suggested for minimizing the adverse impacts on socio-economic environment.

- Heads of the local population control authorities/Administration shall be taken into the confidence to minimize friction between management and local people.
- Communication with the local community would be done on regular basis by the project authorities to provide an opportunity for discussion.
- Project authorities will organize regular environmental awareness programs.
- Social welfare activities to be undertaken by the project authorities, in collaboration with local administration.
- Project authority will provide free medical facilities to near by villagers.
- Locally available workforce shall be given preference in the employment.
- To minimize the strain on infrastructure, existing facilities shall be augmented.

Chapter 5

Environmental Monitoring Programme

The environmental monitoring is important to assess performance of pollution control equipment installed at the project site. The sampling and analysis of environmental attributes including monitoring locations, which will be as per the guidelines of the Central Pollution Control Board.

- Environmental monitoring will be conducted on regular basis by M/s SEML to assess the pollution level in and around the project area.
- The attributes, which require regular monitoring, are specified as follows:
- Air quality
- Water and wastewater quality
- Noise levels
- Soil quality
- Afforestation; and
- Socio-economic aspects and community development

A comprehensive monitoring program is suggested in **Table 5.1**.

Table 5.1
Monitoring Schedule for Environmental Parameters

Sr. No.	Particulars		Monitoring Frequency	Method of Sampling	Important Monitoring Parameters
I	**Air Pollution & Meteorology**				
	A	**Air Quality Monitoring**			
	1	Six locations in and around the plant	Once in month	24 hr continuously HVS	SPM, RPM, SO_2, NO_x
	2	Work zone monitoring	Twice in a month	High volume sampler	do
	B	**Fugitive Emissions**			
		Raw material handling, feed area, and other areas specified by SPCB	Twice in a month	8-hour basis with High Volume Sampler	SPM & RPM
II	**Water and Wastewater Quality**				
	A	**Water Quality**			
	1	Surface /Ground Water	Once in a season	Grab	Parameters specified under IS:2296 (Class C) and IS:10500, 1986
	B	**Industrial Effluents**			
		Treated waste water, if to be discharged out side the plant during monsoon	Once in 15 days	24 hr composite	pH, SS, and O& G
III	**Ambient Noise Levels**				
	1	On the Plant Boundary at three locations	Once in three months for the industry Once in each season for ambient noise levels	24 hr continuous with one hr interval	Noise levels in dB(A)
V	**Soil Quality**				
		In and around the plant	Once in Pre-Monsoon and Post Monsoon season	Grab	Physio-chemical parameters and metals

5.1 Institutional Arrangements for Environment Protection and Conservation

Environmental management cell will be established at the project site, which will be supervised and controlled by an independent plant Manager supported by a team of technically qualified personnel apart from other operating staff. Organization structure is presented in **Figure 5.1**. It will be the responsibility of this department to supervise the monitoring of environmental attributes viz. ambient air quality, water and effluent quality, noise level either departmentally or by appointing external agencies wherever necessary. In case the monitored results of environmental pollution are found to exceed the allowable limits, the environmental Management cell will suggest remedial measures and get them implemented.

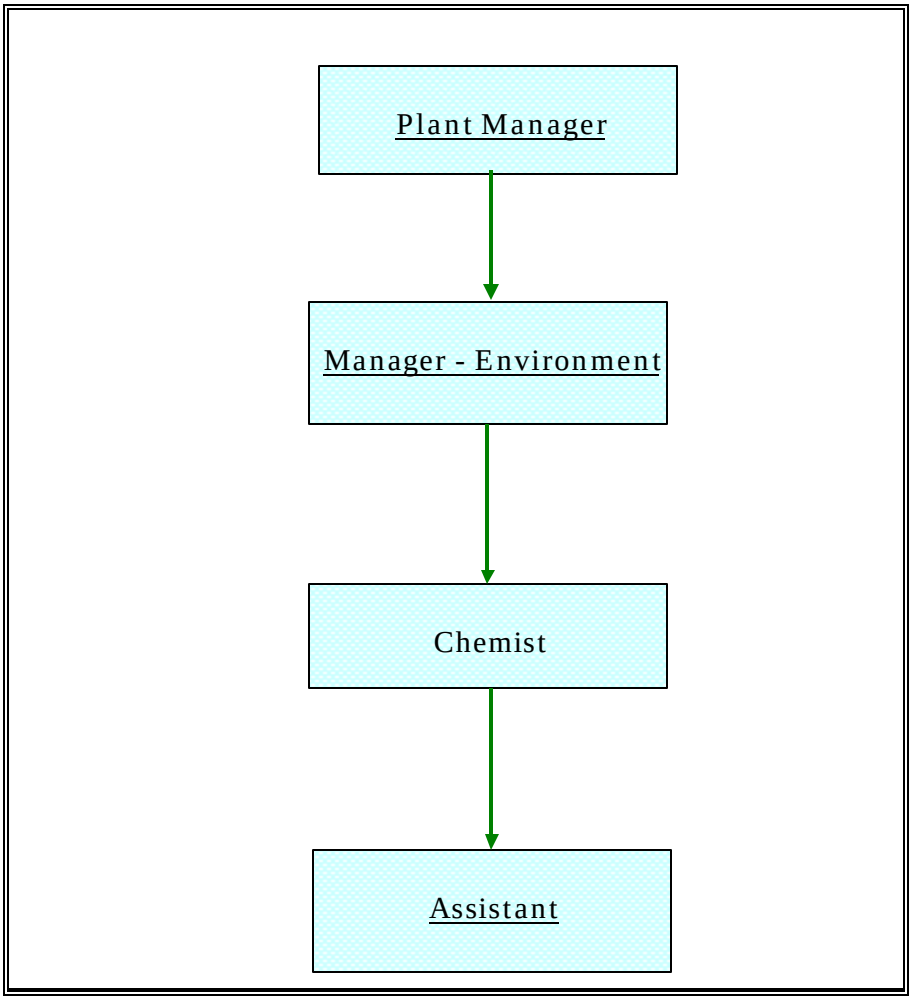


Figure 5.1

Organization Structure of Environment Management

5.2 Budgetary Provisions for EMP

Adequate budgetary provisions should be made and spent by the project authorities for construction, operation and maintenance of different pollution control systems. A detailed account of th e estimates is presented below.

Environment Management Cost

Sr. No.	Activities	Capital Cost (Lakhs)	Recurring Cost (Lakhs)
1	Air Pollution Control devices	105	10.0
2	Slurry handling, treatment, recycling system	45	4.5
3	Plantations	35	3.5
4	For noise Pollution (Providing Ear Muffs etc.)	30	3.0
5	Environmental Monitoring & O & M of Pollution Control Equipments	40	4.0
	Total	**255**	**25.0**

5.3 Corporate Social Responsibility

Being a corporate citizen the company has the responsibility of contributing to the welfare of the society in which it operates. The company will organise various awareness programmes for its employee and the general public of the area where it operates to ensure a better, sustainable way of life for the weaker sections of society. The proposed expenditure for CSR activities are presented in **Table-5.2**.

Table-5.2
Budgetary Provision for CSR Activity

Particular	**Capital Cost** (in Lakh)
Education	2
Health Care	2
Community Development	4
Total	**8**

Chapter 6

Disaster Management Plan

6.1 Disasters

A disaster is a catastrophic situation in which suddenly, people are plunged into helplessness and suffering, as a result need protection, clothing, shelter, medical and social care and other necessities of life.

Disasters can be divided into two main groups. In the first, disasters resulting from natural phenomena like earthquakes, volcanic eruptions, storm surges, cyclones, tropical storms, floods, avalanches, landslides, forest fires etc. The second group includes disastrous events occasioned by man, or man's impact upon the environment. There can be no set criteria for assessing the gravity of a disaster in the abstract since this depends to a large extent on the physical, economic and social environment in which it occurs.

In coal washery disaster management plan is focused on fire of coal, the chances of which is very rare due to the onsite mitigation measures like fire hydrants and fire brigade. Thus these facilities are mandatory at coal handling plant.

6.2 Objectives of Disaster Management Plan (DMP)

The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installations, restoration of production and salvage operations in this same order of priorities. For effective implementation of the Disaster Management Plan, it will be widely circulated and personnel training given through rehearsals/drills.

The Disaster Management Plan would reflect the probable, consequences of the undesired event due to deteriorating conditions or through 'Knock on' effects. Further the management should be able to demonstrate that their assessment of the

consequences uses good supporting evidence and is based on currently available and reliable information, incident data from internal and external sources and if necessary the reports of out side agencies.

To tackle the consequences of a major emergency inside the factory or immediate vicinity of the factory, a Disaster Management Plan has to be formulated and this in document is called "Disaster Management Plan".

The objective of the Industrial Disaster Management Plan is to make use of the combine resources of the plant and the outside services to achieve the following:

- Effect the rescue and medical treatment of casualties;
- Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Identify any dead;
- Provide for needs of relatives;
- Provide authoritative information to the news media;
- Ensure safe rehabilitation of affected area; and
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the Emergency.

6.3 Emergencies

The emergencies that could be envisaged in the plant are as follows:

- Slow isolated fires in coal storage area;
- Structural failures;
- Sabotage/Social disorder

6.3.1 Emergency Cell

It is recommended to setup an Emergency cell. A senior executive who has control over the affairs of the plant would be heading the Emergency cell. As per the General Organization chart, would be designated as the Incident Controller.

Each Incident Controller, for himself organizes a team responsible for controlling the incidence with the personnel under his control. Shift In charge would be the reporting officer, who would bring the incidence to the notice of the Incidence Controller.

Emergency Coordinators would be appointed who would undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and provide essential and support services. For this purposes, Security In charge and Personnel Department would be engaged. All these personnel would be designated as Key personnel.

In each shift, electrical supervisor, electrical fitters, pump house in charge, and other maintenance staff would be drafted for emergency operations. In the event of power or communication system failure, some of the staff members in the office/plant offices would be drafted and their services would be utilized as messengers for quick passing of communications. All these personnel would be declared as essential personnel.

6.3.2 Emergency Communication

Whoever notices an emergency situation, such as coal fire would inform his immediate superior and Emergency Control Center. The person on duty in the Emergency Control Centre would appraise the incident Controller. Incident Controller verifies the situation from the Shift In-charge and takes a decision about an impending On Site Emergency. This would be communicated to the emergency warning system which would be activated on the instructions of the Incident Controller.

Incident Controller

- Assembles the incident control team;
- Directs operations within the affected areas with the priorities for safety to personnel, minimize damage to the plant, property and environment and minimize the loss of materials;
- Directs the shutting down and evacuation of plant and areas likely to be adversely affected by the emergency;

- Provides tools and safety equipment to the team members;
- Keeps in touch with the team and advise them regarding the method of control to be used;

Emergency Coordinator - Fire Fighting

- Ensure fire pumps in operating conditions and instructs pump house operator to ready for any emergency with standby arrangement;
- Guides the fire fighting crew i.e. firemen, trained plant personnel and security staff;
- Organizes shifting the fire fighting facilities to the emergency site, if required;
- Directs the security staff to the incident site to take part in the emergency operations under his guidance and supervision;

Emergency Coordinator-Medical, Mutual Aid

- In the event of failure of electric supply and thereby internal telephones, sets up communication point and establishes contact with the Emergency Control Center (ECC);
- Organizes medical treatment to the injured and if necessary will shift the injured to nearby hospitals;
- Makes sure that all safety equipment are made available to the emergency team;

General Responsibilities of Employees during an Emergency

During an emergency, especially it becomes more enhanced and pronounced when an emergency warning is raised, the workers if they are In-charge of process equipment should adopt safe and emergency shut down and attend any prescribed duty as essential employee. If no such responsibilities are assigned, he should adopt a safe course to assembly point and await instructions. He should not resort to spread panic. On the other hand, he must assist emergency personnel towards objectives of DMP.

6.3.3 Emergency Control Center (ECC)

As an emergency measure the Office Block is identified as Emergency Control Center. It would have external Telephone, Fax, Telex facility and public address megaphone, hand bell, telephone directories etc. All the Site Controller/Incident Control Officers, Senior Personnel would be located here. Also, it would be an elevated place.

6.3.4 Assembly Point

Locations of assembly points, depending upon the plant layout and location would be identified wherein employees who are not directly connected with the disaster management would be assembled for safety and rescue. Emergency breathing apparatus, minimum facilities like water etc. would be organized.

6.3.5 Emergency Power Supply

Plant facilities would be connected to Diesel Generator and would be placed in auto mode. Thus water pumps, plants lighting and emergency control center, Administrative building and other auxiliary services need to be connected to emergency power supply. In all the blocks flame proof type emergency lamps would be provided.

6.3.6 Fire Fighting Facilities

First Aid, Fire fighting equipments suitable for emergency should be maintained in coal storage and reject area. This would be as per statutory requirements as per TAC Regulations. However, fire hydrant line covering major areas would be laid. Fire alarms would be located in the bulk storage areas.

6.3.7 Ambulance

An ambulance with driver shall be available in all the shifts. Emergency shift vehicle would be ensured and maintained to transport the injured or affected persons. A Number of persons would be trained in first aid so that, in every shift first aid personnel would be available.

6.3.8 All Clear Signal

At the end of an emergency, after discussing with Incident Controllers and Emergency Co-ordinators, the Incident Controller orders an all clear signal. When it becomes essential, the Incident Controller communicates to the District Emergency Authority, Police, Fire Service personnel regarding help required or development of the situation into an Off-Site Emergency.

6.3.9 Off-Site Emergency Preparedness Plan

The task of preparing the Off-Site Emergency Plan lies with the district collector, however the off-site plan will be prepared with the help of the local district authorities. The proposed plan will be based on the following guidelines.

Off-site emergency plan follows the on-site emergency plan. When the consequences of an emergency situation go beyond the plant boundaries, it becomes an off-site emergency. Off-site emergency is essentially the responsibility of the public administration. However, the factory management will provide the public administration with the technical information relating to the nature, quantum and probable consequences on the neighboring population.

The off-site plan in detail will be based on those events which are most likely to occur, but other less likely events which have severe consequence will also be considered. Incidents which have very severe consequences yet have a small probability of occurrence will also be considered during the preparation of the plan. However, the key feature of a good off-site emergency plan is flexibility in its application to emergencies other than those specifically included in the formation of the plan.

Depending on local arrangements, the responsibility for the off-site plan will be either rest with the works management or, with the local authority. Either way, the plan will identify an emergency co-ordinating officer, who would take the overall command of the off-site activities. As with the on-site plan, an emergency control center will be setup within which the emergency co-ordinating office can operate.

6.3.10 Role of the Emergency Co-ordinating Officer

The various emergency services will be co-ordinated by an emergency coordinating officer (ECO), who will be designated by the District Collector. The ECO will liaise closely with the site main controller. Again depending on local arrangements, for very severe incidents with major or prolonged off-site consequences, the external control will be passed to a senior local authority administrator or even an administrator appointed by the central or state government. This liaison will ensure that the plan is continually kept up-to-date. Rehearsals for off-site plans will be organized.

6.4 Occupational Health and Safety

Occupational Health

Occupational health needs attention both during construction & erection and operation & maintenance phases. However, the problem varies both in magnitude and variety in the above phases. The occupational health problems envisaged at this stage can mainly be due to constructional accident and noise.

Operation and Maintenance

The problem of occupational health, in the operation and maintenance phase is due to Respirable dust and noise. With suitable engineering controls the exposures can be reduced to less than TLV limits and proper personnel protective devices should be given to employees.

The working personnel should be given the following appropriate personnel protective devices.

Industrial Safety Equipments:

- Crash Helmets
- Zero power plain goggles with cut type filters on both ends.
- Zero power goggles with cut type filters on both sides and blue colour glasses

- Chemical goggles
- Welders protective equipment for eye & face protection
- Cylindrical type earplug
- Ear muffs
- Dust masks
- Canister Gas mask
- Self contained breathing apparatus
- Leather apron
- Aluminized fiber glass fix proximity suit with hood and gloves
- Leather hand gloves
- Asbestos hand gloves
- Acid/Alkali proof rubberized hand gloves
- Canvas cum leather hand gloves with leather palm
- Electrically tested electrical resistance hand gloves
- Industrial safety shoes with steel toe
- Rubber boots (alkali resistant)
- Electrical safety shoes without steel toe and gum boots

Full fledged hospital facilities should be made available round the clock for attending emergency arising out of accidents, if any. All working personnel should be medically examined at least once in every year and at the end of his term of employment. This is in addition to the pre-employment medical examination.

Safety Plan

Safety of both men and materials during construction and operation phases is of concern. The preparedness of an industry for the occurrence of possible disasters is known as emergency plan. The disaster in the plant is possible due to leakage of hazardous chemicals, collapse of structures and fire/explosion etc.

Keeping in view the safety requirement during construction, operation and maintenance phases, washery plant has formulated safety policy with the following regulations:

- To allocate sufficient resources to maintain safe and healthy conditions at work;
- To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of plants, machinery and equipment;
- To ensure that adequate safety instructions are given to all employees;
- To provide wherever necessary protective equipment, safety appliances and clothing, and to ensure their proper use;
- To inform employees about materials, equipment or processes used in their work which are known to be potentially hazardous to health or safety;
- To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety in the light of experience and upto date knowledge;
- To provide appropriate facilities for fist aid and prompt treatment of injuries and illness at work;
- To provide appropriate instructions, training, refresher programmes and supervision to employees in health and safety, first aid and to ensure that adequate publicity is given to these matters;
- To ensure proper implementation of fire prevention methods and an appropriate fire fighting service together with training facilities for personnel involved in this service;
- To organize collection, analysis and presentation of data on accident, sickness and incidents involving personnel injury or injury to health with a view to taking corrective, remedial and preventive action;
- To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees;

- To publish/notify regulations, instruction and notices in the common language of employees;
- To prepare separate safety rules for each types of occupation/process involved in a project; and

To ensure regular safety inspection by a competent authorities at suitable intervals of all buildings, equipment, work places and operations.

Chapter 7

Project Benefits

The proposed project will result in improvement of infrastructure as well as upliftment of social structure in the area. The people residing in the nearby areas will be benefited directly and indirectly. It is anticipated that the proposed plant will provide benefits for the locals in two phases i.e. during construction phase as well as during operational stage of the plant.

7.1 Construction Phase

Employment

The major benefit due to the proposed project will be in the sphere of generating temporary employment for about 100 persons in that area. The proposed project will benefit local population.

7.2 Operational Phase

7.2.1 Community Services

M/s SEML will employ local people to the extent possible for avoiding creation of additional infrastructure. SEML has already developed medical facilities for catering to the needs of the nearby villages.

7.2.2 Education

SEML is already helping in social upliftment in the area. Financial support is being extended to strengthen educational infrastructure in the region.

7.2.3 Employment

The manpower requirements for the operational phase of the plant will be about 100 people. In addition, there will be an indirect employment for skilled/ semi skilled people during project life. All attempts will be made to employ suitable locally

available skilled personnel from the study area. In case of non-availability of skilled persons, people will be taken from out side the study area.

7.2.4 Transportation

There will also be increase in the vehicular traffic due to coal transportation and passenger transport. This increase in traffic will not have any consequence to warrant special mention. One should expect that the increased passenger load in the sector would prompt the state government to start new and frequent public transport services to this area, bringing upliftment to the whole locality.

7.2.5 Other Benefits

SEML is equally conscious for the all round socio-economic development and are committed to raise the quality of life and social well being of communities where it operates. Its CSR initiatives have been prioritized on local needs, which focus on Health, Education, Sustainable Livelihood, Social Mobilization, Infrastructure Development, Rain Water Harvesting and Environment Conservation.

Chapter 8

Environmental Management Plan

8.1 Coal Transport/Handling

8.1.1 Air Environment

- SEML will be adopted a wet process of coal beneficiation. No air emissions are generated from this process.
- An independent water spraying system shall be established for coal handling and crushing facilities. Water spraying system involves surface water tanks, network of spray water pipeline and headers. Adequate moisture will be maintained in coal handling area to ensure that dust is not getting air borne.
- Bag filters will be installed at junction points.
- The coal received at washery from mines will have sufficient surface moisture.
- Vehicle movement in the coal washery area, shall be regulated effectively to avoid traffic congestion and workers shall be protected from dust
- Emissions from the heavy duty vehicle operating in coal washery shall confirm the standard under Motor Vehicles Rules 1989.

8.1.2 Noise Environment

- It shall be ensured that low noise equipments are procured wherever feasible and strict adherence to O & M schedules.
- Acoustic laggings and silencers shall be provided in equipment wherever necessary.
- Noise attenuation measures shall be taken up by strengthening existing green belt.
- Ear plugs shall be provided to all workers working close to noise generating units
- The operator's cabins (control rooms) are properly (acoustically) insulated with special doors and observation windows.
- The operators working in the high-noise areas will be strictly instructed to use ear-muffs/ear-plugs.

8.1.3 Water Environment

- The efficiency of settling tank of wastewater treatment shall be 99%.
- SEML will adopt rainwater harvesting scheme to recharge ground water
- Treated wastewater shall be sprayed at all coal transfer points
- The zero effluent discharge system shall be implemented judicially

Coal Yard Drainage

During monsoon season, the problem of coal yard drainage becomes critical due to coal particles and dust in the yard. To take care of this problem, the entire coal storage yard would be provided with separate drains, which will lead to a separate sump of adequate capacity.

Wastewater Management for Zero Discharge Effluent

Zero discharge facilities will be adopted in the proposed coal washery project by recycling the wastewater for dust suppression /plantation; hence disposal of treated wastewater will be zero.

8.1.4 Land Environment

- The roads within the plant premises shall be concreted/asphalted.
- Quantification of the reject waste will be done regularly which will help proper management in respect of storage before it is sold to the authorized venders.
- Coal dust nuisance to the neighboring agriculture fields and residential areas will be prevented with suitable measures/ by strengthening the existing greenbelt.

8.1.4.1 Solid Waste Management

Middling and final reject (stone etc.) will be the main solid waste generated from coal washery . About 1216 TPD Middling quantity will be generated and 100% will be utilized in SEML Proposed 350 MW Power plant at Kolam. Final Reject (224 TPD) will be utilized for road formation and leveling of low lying areas.

8.1.4.2 Green Belt Development

The green belt helps to capture the fugitive emissions and to attenuate the noise generated apart from improving the aesthetics. Green vegetal cover is not only pleasing to the eyes but also beneficial in many ways, such as retention of soil moisture, prevention of soil erosion, recharge of ground water and moderation of microclimate. Another important role of green belt relates to containment of air pollution. Besides

acting as a carbon sink, certain species of plants even absorb the pollutants while others can thrive in polluted atmosphere. Broad leaves of the tree adsorb pollutants on their surface.

Guidelines for Greenbelt Development

In order to attenuate the pollutants a greenbelt along the periphery of washery area will be developed. Trees will be planted in consultation with the local Forest Department however a tentative list of plants suggested for green belt development is presented in **Table 8.1** and plant species for noise prone area is presented in **Table 8.2**.

The general guidelines for development of greenbelt are:

- Trees growing up to 10 m or more should be planted around the installations.
- Planting of trees should be undertaken in rows around the installation to prevent horizontal dispersion of pollutants.
- Trees should also be planted along roadsides, to arrest auto exhaust and noise pollution.
- As tree trunks are normally devoid of foliage up to 3 m height, it would be appropriate to plant shrubs.
- Lawns for effective trapping and absorption of air pollutants.
- Fast growing tress with thick perennial foliage should be grown.
- For adsorption of dust the following types of plants have been considered.
- Fast growing
- Thick canopy cover
- Longer duration of foliage
- Adequate height and spread of crown
- Big leaves (long and board laminar surfaces) supported by firm petioles.
- Large number of stomata apertures. (Large leaf area index)
- Perennial and evergreen
- Abundance of surfaces on bark and foliage through roughness of bark, epidermal outgrowth on petioles, abundance of auxiliary hairs, hairs or scales on laminar surfaces and protected stomata (by wax, arches, rings, hairs, etc.)

The choice of plants includes shrubs of height 1 to 2 m and trees of 3 to 5 m heights. It is ensured that the foliage area density in vertical is almost uniform by intermixing the trees and shrubs.

The species identified for greenbelt development shall be planted using pitting technique. The pit size should be either 45 cm X 45 cm X 45 cm or 60 cm X 60 cm X 60 cm depending on quality of soil. Bigger pit size shall be preferred for marginal and poor quality soil. Soil used for filling the pit should be mixed with well decomposed farm yard manure or sewage sludge at the rate of 2.5 kg (on dry weight basis) and 3.6 kg (on dry weight basis) for 45 cm X 45 cm X 45 cm and 60 cm X 60 cm X 60 cm respectively. The filling of soil should be completed at least 5-10 days before actual plantation.

8.1.4.3 Details of Rain Water Harvesting Scheme

SEML have decided to exercise rainwater harvesting over 10.12 ha area of the proposed project.

Quantum of Rainwater over SEML area:

- Area (A) = 101200 m^2
- Rainfall Intensity (I) = 1.5 m (average)
- Runoff coefficient (C) = 0.6
- Total runoff (Q) on 10.12 ha. = 91080 m^3

The harvested water will be recharged in ground through recharge pits.

Management of Rejects

- The quantity of rejects that is likely to be generated after commissioning of proposed capacity shall be used for landfill after extracting coal from Karwahi Coal Mine.
- The rejects will be stocked in temporary storage area. The slopes will be maintained at 15 degree around the storage area.

8.1.5 Socio-economic Environment

Following measures are suggested for minimizing the adverse impacts on socio-economic environment.

- Heads of the local population control authorities/Administration shall be taken into the confidence to minimize friction between management and local people.
- Communication with the local community would be done on regular basis by the project authorities to provide an opportunity for discussion.
- Project authorities will organize regular environmental awareness programmes.

- Social welfare activities to be undertaken by the project authorities, in collaboration with local administration.
- Locally available workforce would be given preference in the employment.
- To minimize the strain on infrastructure, existing facilities would be augmented.

Table 8.1
List of Plant (tentative) Suggested for Greenbelt Development

Sr. No.	Types Of Plant	Botanical Name	Common Name
1	Large Size Trees	*Albizzia chinensis (Leguminose)*	Siris (Black)
2	Large Size Trees	*Azadirachta indica (Meliaceae)*	Neem
3	Large Size Trees	*Boswellia serrata (Buseraceae)*	Salia
4	Large Size Trees	*Grevillea robusta (Proteaceae)*	Silver Oak
5	Large Size Trees	*Polyathia longifolia (Annonnaceae)*	Debdaru or Drooping asoka
6	Large Size Trees	*Pterocarpus marsupium (Leguminosae)*	Bija sal
7	Large Size Trees	*Pterospermum acerifolium (Sterculiaceae)*	Muchkund
8	Large Size Trees	*Shorea robusta (Dipterocarpaceae)*	Sal
9	Large Size Trees	*Syzygium cumini (Myrtaceae)*	Jamun
10	Large Size Trees	*Tamarindus indica (Leguminosae)*	Tamarind
11	Large Size Trees	*Terminalia arjuna (Combretaceae)*	Arjun
12	Medium Size Trees	*Acacia nilotica (Mimoseae)*	Babul
13	Medium Size Trees	*Albizzia chinensis (Leguminosae)*	Laphua
14	Medium Size Trees	*Bauhinia racemosa (Leguminosae)*	Jhinjora
15	Medium Size Trees	*Bombax cieba*	Semul
16	Medium Size Trees	*Butea monosperma (Leguminosae)*	Palas, Dhak
17	Medium Size Trees	*Dalbergia sisso (Lyuminosae)*	Shisham
18	Medium Size Trees	*Delonix regia (Leguminosae)*	Gold Mohur,
19	Medium Size Trees	*Diospyros melanoxylon (Ebenaceae)*	Tendu
20	Medium Size Trees	*Emblica officinalis (Euphorbiaceae)*	Amla
21	Medium Size Trees	*Ficus semicordata (Utricaceae)*	Ghul
22	Medium Size Trees	*Pongamia pinnata (Leguminosae)*	Karanj
23	Medium Size Trees	*Saraca indica (Caesalpinaceae)*	Asoka
24	Medium Size Trees	*Soyminda febrifuga (Meliaceae)*	Rohan
25	Medium Size Trees	*Tectona grandis (Verbenaceae)*	Sagwan
26	Medium Size Trees	*Annona aquamosa*	Custard Apple
27	Medium Size Trees	*Shorea robusta*	Sal
28	Medium Size Trees	*Terminalia alata*	Saj
29	Medium Size Trees	*Terminalia chebula*	Harra
30	Small Trees/Shrubs	*Acacia arbacia (mimoseae)*	Babool
31	Small Trees/Shrubs	*Acacia catechu (mimoseae)*	Khair
32	Small Trees/Shrubs	*Adhatoda pinnata (Mimoseae)*	Bhanker

Sr. No.	Types Of Plant	Botanical Name	Common Name
33	Small Trees/Shrubs	*Zizyphus mauratiana (Rhamnaceae)*	Ber
34	Climbers	*Acacia pinnata (Mimoseae)*	Aila
35	Climbers	*Dioscorrea daemona (Dioscoriaceae)*	Baichandi
36	Climbers	*Dioscorea pentaphylla (Dioscoriaceae)*	Musalkand
37	Grasses	*Alpuda mutica (Graminae)*	Phuli
38	Grasses	*Arundinella setosa (Graminae)*	Phulbahari
39	Grasses	*Bambusa arundinacea (Graminae)*	Bamboo
40	Grasses	*Cymbopogon martini (Graminae)*	Gingergrass
41	Grasses	*Cynodon dactylon (Graminae)*	Doob
42	Grasses	*Dactyloctcnium cristarum (Graminae)*	Marka
43	Grasses	*Dendrocalamus strictus (Graminae)*	Bomboo
44	Grasses	*Eulaliopsis binata (Graminae)*	Bagai Ghas

Table 8.2
Plant Species for Noise Prone Areas

Sr. No.	Biological Name	General Name
1.	*Azadriarchta indica*	Neem
2.	*Aegle marmelos*	Bel
3.	*Saraca indica*	Ashoka
4.	*Syzygium cimunil*	Zaman
5.	*Dal Bengia sissoo*	Shisham
6.	*C.Tora*	Wild Sena
7.	*B. variegata*	Kachnar
8.	*A. procera*	White Siris
9.	*Albizia lebbeck*	Siris
10.	*A. excelsa*	Maharukh
11.	*Thespesia populnea*	Tulip
12.	*Tectone grendis*	Teak
13.	*Shorea robuste*	Sal
14.	*Terminalia aarjuna*	Arjuna
15.	*Polyathiaa longifolia*	Ashoka
16.	*Ficus religiosa*	Peepal
17.	*Manifera indica*	Mango
18.	*Lagerstromia flosregeinal*	Jarul
19.	*Bauhinia purpuria*	Kachnar
20.	*Saraca indica*	Sita Ashoka
21.	*Ficus benghalensis*	Banyan

Chapter 9

Summary and conclusions

9.1 Introduction

M/s SEML proposes 0.96 MTPA pithead Coal washery at Village Bajarmura & Dholnara, Tehsil- Gharghora (Tamnar) District-Raigarh, C.G.

Project Description

The details of the proposed project are presented in **Table 9.1**.

Table 9.1

Details of Project

Sr. No.	Project	Details
1	Total Land	10.12ha
2	Washery area	3.39 ha
3	Green Belt Area	3.34 ha
4	Water Requirement	480 m^3/day
5	Raw Material	Coal: 0.96 Mtpa
6	Man Power	100
Technical Features		
7	Capacity	0.96 Mtpa
8	Process	Wet Process

9.2 Description of Environment

Air Environment

Results of ambient air quality indicate that concentrations of SPM, RPM, SO_2, NOx and CO are well within the prescribed standards.

SPM - 92 to 179 µg/m^3.

RPM - 26 to 63 µg/m^3.

SO_2 - 5.0 to 6.8 µg/m^3

NOx - 5.0 to 8.5 µg/m^3.

Noise Environment

Noise levels ranges from 46.4 dB(A) to 53.0 dB(A) during day time and 39.0 dB(A) to 44.6 dB(A) in the night time.

Water Environment

It has been observed that all the physico-chemical parameters and heavy metals of water samples from surface and ground water are below the stipulated drinking water standards. Refer **Table 3.5.2** and **Table-3.5.3** in **Chapter 3**.

Land Environment

About 7.05% of the total study area is forest land, 63.84% is agricultural land, and 19.05% is cultivable wasteland.

Flora & Fauna

The study area has sparse vegetation which includes timber, fruit, ornamental trees and shrubs. Herbaceous vegetation includes pulses, millets, oil seeds and grasses of economic importance. The vegetation in settlement area is heterogeneous in nature. In rural area *Mangifera indica*, (mango), *Ziziphus mauratiana* (ber), and *Syzgium cumini (Jamun). Dalbergia sissoo* (shisham), *Pongamia pinnata (Karanj) Terminali*a tomentosa (Saja), are common timber trees found in the study area. Some of the species observed as road side vegetation, shrubs like Vitex negundo (Nirgudi) *Lantana acculeata (Rajmunia). T*he climbers and glasses are also observed in study area.

There is no National Park, Sanctuary, Elephant or Tiger Reserve within 10 km radius around the project site. No migratory route of wild animals has been reported.

Anticipated Environmental Impacts and Mitigation

Sr. No	Particulars	Impacts and Mitigation Measures
1	Land Environment	There will be marginal impact on the land environment which will be mitigated by developing green belt and spraying of water for dust suppression.
2	Air Environment	Transportation and fugitive emissions will be the major air pollution sources. Adequate provision for sprinkling of water Bagfilter and vehicles maintenance will be provided.
3	Water Environment	Wastewater generated will be recycled back in the process and will be used dust suppression and plantation thus the zero discharge system will be adopted.
4	Noise Environment	Vehicle transportation and process will be the main noise generating sources. For plugs and ear muffs will be provided to workers.

9.3 Conclusions

The potential environmental, social and economic impacts have been assessed. The proposed plant has certain level of marginal impacts on the local environment. With effective implementation of proposed environment management plan, these effects will be insignificant. Implementation of the project has beneficial impact in terms of providing direct and indirect employment opportunities. This will be a positive socio-economic development in the region. Quality of life of the people will improve. No displacement of people from the project site is involved. The project is basically implementing the directions of MoEF for removing the Ash from coal before long transportation.

Chapter 10

Disclosure of Consultants

10.1 Disclosure of Consultants

Anacon is an established Environmental Consultancy firm with basic infrastructural facilities and man power. We are rendering our services in this field to various industries since last 13 years. We are group of experienced Ex. Scientists from the Government Institutions like IBM, NEERI & GSI and our Laboratory is empanelled by Maharashtra Pollution Control Board & Ministry of Environment & Science, New Delhi for carrying out environmental Studies. We have prepared the EIA reports for various industries, which includes Steel, Power, Distilleries, Textile and Pharmaceutical. We have worked in the state of Assam, Chhattisgarh, Madhya Pradesh & Maharashtra. Our esteemed client groups include many large scale industries from private as well as the Public Sector Units. National Productivity Council, BALCO, MECON, TATA STEEL, LAFARGE, GRASIM, Ultra Tech Cement Ltd., RAYMONDS, LUPIN, Ranbaxy, GAIL, Seagram & Sagar Distilleries and Sponge Iron are our major clients.

We have successfully carried out the monitoring of Air, Water & Waste Water, Noise, Hazardous Waste & Land Environment for the EIA of various industries. We have also carried land use and land cover studies based on the satellite studies.

Our operations are spread in six different states in Central India region with branches at Raipur, Korba, Ranchi, Bhopal and Delhi in North India.

Credentials of Testing Lab

Our laboratory is registered with following Govt. departments for providing technical services in the field of environment. The registration numbers are as follows;

1. MoEF Notification No. D.L.-33004/99 dt.24.10.2007–Recognized as "A" Grade lab under EPA. moef.gov.in/legis/env/so1811e.pdf
2. MPCB No.WP/Lab-Regn/B/1856 Dt.18.08.1993
3. MPPCB Bhopal No.9485 Dt.27.08.2001
4. Mah.Govt.WQM 2003/PK26 (2) PP12 Dt.1.9.2004 – Drinking water quality monitoring
5. Mah.Govt.JSP 2004/PK3715 PP11Dt.28.04.2004– Hydrogeological survey
6. RQP/NGP/328/2005/B Dated: - 01.02.2005 – Indian Bureau of mines for preparation of mine plan
7. MPCB/EPD/PL/EMPL/18/07 dt.23.02.2007

For the organizational statutory requirement the registration numbers are as follows;

1. Company Law Board Regn. No11-114169 Dt.25.03.98
2. Provident Fund Regn. No. MH – 63074 Dt. 15.06.2001
3. Professional tax Regn. No. PT/R/4/6/27/1496 Dt. 11.01.199
4. Service Tax Regn.No.ST– 2301/NAG – Dn – I/STS/2001 STC NO. AADCA 0435B ST001
5. Income Tax - PAN No. AADCA0435B TAN No.NGPA01248C

Services Offered:

Air (Monitoring/Survey/Modeling etc., Pl. specify)	**Yes**- Stack and Ambient Air Quality Monitoring, Survey / Modeling as per MoEF requirements. Specific gas monitoring like HC, CO, O2, CO2 using state of art microprocessor based portable kits.
Water : Surface, sea, inland & ground water (Monitoring/ Survey/Modeling etc., Pl. specify) Geohydrological Survey	**Yes**-Monitoring of Water Environment in EIA projects, hydrogeological survey and water shed development.
Soil (Analysis, Remediation, Salt water intrusions, Water Harvesting etc)	**Yes**–Monitoring of land environment in EIA projects.
Plant (Effect of pollution, Treatment	**Yes**-The effect of pollutant from various industrial sectors has been evaluated in

Technologies, Pollution Indicators etc.)	terrestrial ecology of EIA project.
Assessment & impact studies on Biodiversity (Flora and Fauna)	**Yes**–Studies on biodiversity has been reported in EIA projects.
Municipal Solid Wastes (Analysis, Management – Handling, Storage, Transportation, Treatment and Disposal, Site Identification, remediation, Development/ Evaluation of Technology etc.)	**Yes**-National Productivity Council is utilizing our services for monitoring and analysis of solid waste samples, which includes sampling and analysis of solid waste samples. **Anacon** lab can undertake the consultancy project on solid waste management for municipal corporation, resorts and newly developed cities. Preparation of detailed feasibility report is an expertise of **Anacon** lab.
Hazardous Wastes (Quantification, Site Assessment, Designing / Monitoring of Treatment Facilities, Technology Assessment etc., Pl. specify)	**Yes**–The project on development of landfill site including Engineering design, Hydrogeological studies and Environmental quality in respect of the Air, Water and Soil have been successfully completed for Force Motors (Bajaj Tempo), Kinetic Motors and Pratibha Syntex, Pithampur, Indore (M.P.)
Noise (Monitoring/Survey, Modeling etc)	**Yes**–The monitoring of the Noise Environment in the Impact zone of the industries and inplant have been carried out by **Anacon** Lab. For 32 EIA study reports.
Bio-Medical Wastes (Quantification, Site Assessment, Designing / Monitoring of Treatment Facilities Technology Assessment etc., Pl. specify)	**Yes**–The survey of Hospital waste management have been carried out in few cases.
Hazardous Chemicals (Site assessment, Inspection of Storages, Major Accident Hazards, Preparation/assessment of Safety Report, risk assessment/ Onsite/offsite Emergency Plan preparation etc.)	**Yes–** The storage of the hazardous chemicals have been assessed in respect of fugitive emissions and risk assessment for Pharmaceutical Industries at Lupin, Mandideep, Bhopal (M.P.). Four dumping sites developed maxi cap 8000 Tons for BALCO, Korba, Chhattisgarh.
Plastic Wastes (Management, recycling/reuse technology evaluation etc.)	**Yes–**In the similar line of solid waste management, studies on the plastic waste management could be undertaken by **Anacon** Laboratories Pvt. Ltd.

Electronic Waste (Management, recycling/reuse, technology evaluation etc.)	No
Environmental Education/Awareness (Projects approved/ grants received /campaigns carried out etc.)	**Yes-**Conducted Workshop at Raipur on 14.2.04 Theme - Latest Trends in Mining Technical and Legislative requirements, 67 participants attended. ; Conducted several Environment Awareness programs for PCB on different topics and also at Educational institutions/P.G. Departments. College students along with HOD have visited Anacon Laboratories Pvt. Ltd., for Educational tour. Anacon Laboratories Pvt. Ltd., has participated as a Key participant at CII seminar in the field of mining industries at Raipur Dt.22.03.06.
Environmental Impact Assessment (EIAs carried out/ sector wise expertise in EIA/ clearances obtained from MoEF/ State Government etc)	**Yes-**Successfully completed 65 EIA studies and 24 EIA presented before MoEF & environmental clearance is granted; remaining 41 presented at State level & the environmental clearance is granted.
Environmental Audit/s (Details of the audits conducted along with client list and Purposes of such audits)	**Yes**
Energy Audits / Water Audits (Expertise available, list of the clients and details on such audits)	**Yes -** Energy Audit for L & T Hirmi, Raipur on STP to conserve energy. In this exercise saving of the 40 % energy is suggested.
Environmental Planning & Management (Projects undertaken/ expertise for actual field implementation of the EMP)	**Yes -** The special efforts have been put up by Anacon for Seagram Distilleries Pvt. Ltd., and Sagar Industries & Distilleries Pvt. Ltd., Nashik for planning and implementation of EMP. Other projects also have been executed on Environmental Planning and Management.
Others (R&D Projects) (State briefly the other activities of your organization and the success Stories, if any)	**Yes** 1. Conducted feasibility studies for pyrite recovery plant for 1000 TPD Cap for GHCL Lignite mine to reduce Sulphur from 7 % to 2 % 2. Identification of route cause for river bed

	drying (300 m width) for Lafarge, Raipur

Facilities

Anacon offer vide range of services in indoor and outdoor monitoring and analytical characterization in the field of Environment. Further, it is ably supported by highly skilled and experienced team of professionals in the fields of Science, Engineering, Ecology, Meteorology, Social Planning, Geo & Hydro-geology, and Environmental Planning.

Besides the regular monitoring equipment such as Respirable Dust Samplers, Automatic Weather Monitoring Stations, Stack Monitoring Kits, Personal Samplers, Noise Meters, Portable Water Kits etc, the other major specialized equipment include:

Anacon Laboratories has established analytical laboratory with sophisticated instrument such as Thermo iCAP 6300 ICP UK make – OES Radial View Spectrometer with Standard Gas System for analysis of heavy metals and the instruments required for the analysis of drinking water quality (32 parameters as per IS 10500), waste water & Hazardous waste. + Gas Chromatograph.

Anacon Laboratories has established the facilities for Ambient Air Quality by using US Make Meteorological Station and High Volume Sampler. Stack Monitoring is also undertaken. The methodology for estimation of SO2, NOx and SPM has been established along with project specific pollutant e.g. hydrocarbon CO, O2, CO2 etc

Quality Systems

The fact that Environment division and its supporting Site Laboratories are accredited by NABL (IS0-17025) and Ministry of Environment and Forests.

Achievements

Being the first laboratory to be recognized under Environment Protection (EP) Act by GOI in 1986, Environment Division with its best mind power and industrial knowledge competency that allows it to compare with the best in the business.