ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR

PROPOSED 200 TPD CLINKER AND/OR CEMENT MANUFACTURING UNIT

AT

15TH MILE, G. S. ROAD, N. H. NO.: 40,
VILLAGE BYRNIHAT, TALUKA SONAPUR,
DIST. KAMRUP - 782 482, ASSAM.

Project Proponent:

SHIVSHAKTI CEMENTS
2nd FLOOR, H.M. TOWERS,
S. C. GOSWAMI ROAD,
PANBAZAR, GUWAHATI – 781 001,
ASSAM.

Prepared by:

en-VISION ENVIRO ENGINEERS PVT. LTD.
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GUJARAT.

JANUARY, 2009

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RAPID ENVIRONMENTAL IMPACT AND RISK ASSESSMENT REPORT

CLIENT	**:**	**M/S. SHIVSHAKTI CEMENTS,** **2nd FLOOR, H. M. TOWERS,** **S. C. GOSWAMI ROAD,** **PANBAZAR, GUWAHATI – 781 001,** **ASSAM.**
PROJECT TITLE	**:**	**ENVIRONMENTAL IMAPCT ASSESSMENT REPORT FOR PROPOSED 200 TPD CLINKER AND/OR CEMENT MANUFACTURING UNIT**
PROJECT NO.	**:**	**09010017**

**** PREPARED BY ****

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PREFACE

M/s Shivshakti Cements is proposing to set up 200 TPD Clinker and/or Cement manufacturing plant at 15th Mile, G. S. Road, N. H. No.: 40, Village Byrnihat, Taluka Sonapur, Dist. Kamrup - 782 482, Assam. The process involves Crushing Section, Storage & Proportioning, Raw Milling Blending & Homogenization, Palletizing & Burning, Clinker/gypsum crushing, storage & proportioning Cement Milling and Storage & Packing.

As per EIA Notification 2006, the proposed project is categorized as B, 3(b) Cement Plant (<1 million tonnes/annum production capacity). In order to assess the likely impacts arising out of the proposed project, Shivshakti had appointed M/s. En-vision Enviro Engineers Pvt. Ltd., Surat (Gujarat), to undertake the Rapid Environmental Impact Assessment (REIA) study for the various environmental components which may be affected, to assess the impact arising out of the proposed project and to prepare a detailed environmental management plan (EMP) to minimize those adverse impacts.

The cooperation and assistance rendered by Shivshakti in the preparation of this report is gratefully acknowledged.

M/s. En-vision Enviro Engineers Pvt. Ltd.

EXECUTIVE SUMMARY

INTRODUCTION

M/s Shivshakti Cements is planning to set up 200 TPD clinker and/or cement manufacturing plant based on Vertical Shaft Kiln technology at **15th Mile, G.S. Road, N. H. No.: 40, Village Byrnihat, Taluka Sonapur, District Kamrup - 782 482, Assam**. M/s Shiveshakti Cements is a partnership firm constituted on 21st day of Octomber of the year 2007. The present partners of the firm are:

1. Mr. Narayan Prasad Jhunjhunwala
2. Mr. Prithu Jhunjhunwala
3. Mrs. Ramita Jhunjhunwala
4. M/s Shubharambh Trading Pvt. Ltd.
5. M/s. H. M. Holdings Pvt. Ltd.

The office of the firm is at H. M. Tower, H. B. Road, Panbazar, Guwahati (Assam).
The proposed project of Shivshakti Cements is an extension of the existing campus where Clinker grinding unit is operating. Category of the project is B, 3(b) Cement Plants (<1 Million tonnes/annum production capacity) as per EIA Notification dated 14 September, 2006.

LOCATION OF THE PROPOSED PROJECT

The proposed unit to be located on a plot of land measuring 1927 sq.m. at **15th Mile, N. H. No.: 40, village Byrnihat, Taluka Sonapur, District Kamrup in the state of Assam** that is at the border Assam and Meghalaya at a distance of 25 km from Guwahati –Shillong road. Proposed project is extension of the existing campus where clinker grinding unit is operating by our group company, M/s. Mahashakti Cements. No new land is proposed to be acquired as the project is proposed in the same industrial campus.

Proposed plot is a part of the plot of land measuring 7 Bighas 3 Kathas 18 ¼ lechas bearing Dag No. 38 covered by Patta No. 40 Mouza Sonapura situated at village Burni, Circule Sonapur and is owned by M/s Shubharambh Trading Pvt. Ltd., the corporate partner of Shivshakti Cements. The entire plot of 7B-3K-28 1/4L has been leased out to M/s Mahashakti Cements for 15 years and which is further extended vide lease deed no. 1620/06 dated 20/02/2006. This lease deed between M/s Mahashakti Cements and M/s Shubharambh Trading Pvt. Ltd. is proposed to be modified in favour of M/s Shivshakti Cements with the prior approval of the Financial Institution with whom the leased right if mortgaged.

DETAILS OF THE SITE

The selection of the site has been highly influenced by location factor. The site enjoys maximum location advantage with respect to availability to raw materials, market proximity and infrastructure facility.

Details of the project site are as given in following table:

SR.NO.	PARTICULARS	DETAILS
1.	Location	
a	Site	Village : Byrnihat
b	Taluka	Sonapur
c	District	Kamrup
d	State	Assam
e	Latitude	$26^0$2’59.45” N
f	Longitude	$91^0$52’18.68” E
2.	Nearest Railway Station	Guwahati Raiway Station (25 km North west)
3.	Nearest Airport	Lokpriyo Gopinath Bordoloi Airport
4.	Reserved Forest	Kaziranga National Park (more than 150 km East)
5.	Nearest City	Guwahati (25 km North west)
6.	Nearest village	Sonapur
7.	Nearest River	Umtru (100 m East)

PROJECT COST

Cost of the proposed project would be Rs. 1242.66 Lacs. Breakup of proposed investment is as follows:

SR. NO.	DESCRIPTION	COST (Rs. in Lacs)
1	Land	(Lease Land)
2	Site Development	7.94
3	Building	29.34
4	Plant and Machinery	1011.65
5	Environmental Protection Measures	32.00
	Total (1 to 5)	**1080.93**
6	Preoperative Expense	27.38
7	Unpredictable Expense	22.24
8	Misc. Fixed Assets & Deposit	43.00
9	Working Capital Margin	69.11
	Total (6 to 9)	**161.73**
	Total (1 to 9)	**1242.66**

BRIEF PROCESS DESCRIPTION

1. **Crushing Section:** - The raw materials mainly limestone, clay, coke are crushed in the separate crushers and stored automatically into the respective silos.
2. **Storage & Proportioning:** - The different raw materials are extracted from the silos in the desired proportion through table feeders and conveyed to raw mill.
3. **Raw Milling:** - The raw mix is ground into a Ball Mill at desired fineness to produce Raw Meal, and transported for Homogenizing.
4. **Blending & Homogenization:** - The raw meal is homogenized in the blending silos, and is stored automatically into a storage silo for feeding to the kiln.
5. **Palletizing & Burning:** - The nodules are made into a nodulisor and charged into the kiln for burning. The clinker after discharge is stored in the clinker yard through deep **Bucket** Elevator.
6. **Clinker/gypsum crushing, storage & proportioning:** - Clinker & Gypsum after crushing stored into the hoppers and extracted in the desired proportion with the help of table feeders and transported to the Cement mill Hopper.
7. **Cement Milling:** - The clinker & Gypsum/Fly ash mix is ground in the cement mill to produce cement.
8. **Storage & Packing:** - The cement is stored into the cement silos and aerated, tested and packed for dispatch.

DETAILS OF RAW MATERIAL CONSUMPTION ITS SOURCE, AVAILABILITY & TRANSPORTATION

The mail raw material for the clinker and/or cement manufacturing unit is Limestone. Limestone is available in both Assam and Meghalaya.

The location of the unit is such that it is very close to Meghalay. The Prominent Limestone deposits in Meghalaya are Cherrapunjee, Mawlong-Ishamati, Komorrah, Shella, Borsora in Khasi Hills, Siju and Nagwalbibra in Garo Hills, Lumshnong, Sutnga, Nongkhlieh, Sybdai and Lakadong Jaintia Hills.

Hence the unit will be able to procure limestone both from the state of Assam and Meghalaya.

Other raw materials like Clay, Iron Dust, Cock Breeze and Gypsum are also readily available. Details of which given in following table.

SR. NO.	NAME OF THE RAW MATERIAL	CONSUMPTION		SOURCE & THEIR DISTANCE (KM)	MODE OF TRANSPORTATION
		TON/TON	MT/DAY		
1.	Limestone	1.36	272	Cherraounji – 150 km Meghalaya	By Road
2.	Clay	0.119	23.8	Byrnihat Assam	By Road
3.	Iron Dust	0.017	3.4	Durgapur – 500 km Bihar	By Road
4.	Cock Breeze	0.204	40.8	Byrnihat Assam	By Road
5.	Gypsum/Fly Ash	0.048	9.6	Samdrup – 200 km Jongkhar Bhutan	By Road

REQUIREMENTS FOR THE PROJECT

Land: Around 1927 sq.m. land will be required for the proposed clinker and/or Cement manufacturing unit. Proposed land will be taken on lease form the M/s Shubharambh Pvt. Ltd.

Water: Total water requirement of the proposed project is 33 KL/Day which shall be met through ground water using Bore Well. Water requirement will be mainly for the process of nodules preparation 25 KL/Day, Domestic use 3 KL/Day and for gardening 5 KL/Day.

Electrical Energy: The estimated power requirement for the proposed project will be 800 KW. Power supply to the proposed project will be sourced from Assam State Electricity Board.

Manpower: The proposed cement plant will have great employment potential providing employment to approximately 49 full time persons.

SOURCES OF POLLUTION AND CONTROL MEASURES

The particulate emissions are among the most significant impacts of cement manufacturing.

Air environnent :

1. Sources of Air Pollution

Particulate Matters: There will be emission of particulate matter due to operation of crusher, hammer mill, raw mill, kiln and cement mill. The cement dusts are alkaline with size varying from 5 µm to 250 µm.

The fugitive dust emissions from the proposed plant would be significant and the sources will be as under:

1. Raw materials handling
2. Materials transfer points (bucket elevators, conveyor belts)
3. Loading of raw materials
4. Packing of cement
5. Unloading of cement bags
6. Transportation of vehicles

Emission of SO_2, NOx and CO_2 from Kiln: Sulfur dioxide may generate due to the sulfur content in the coke breeze. However, the alkaline nature of the materials provide for direct absorption of SO_2, thereby mitigating the quantity of SO_2 emissions in the exhaust stream.

Oxides of nitrogen are generated during fuel combustion by oxidation of chemically bound nitrogen in the fuel and by thermal fixation of nitrogen in the combustion air.

The will be generation of CO_2 due to calcining of lime stone. In the calcining process, $CaCO_3$ thermally decomposes to CaO and CO_2.

2. Air Pollution Control Measures

The major sources of pollution are particulate matter from the proposed cement plant.

The unit will install twin cyclone separators and bag filters to control air pollutants. The stacks will be attached to the air pollution control equipments to disperse the air pollutants to the satisfactory levels. The details of proposed stacks and control equipments are as under.

SR. NO.	STACKS ATTACHED TO	AIR POLLUTION CONTROL EQUIPMENTS	STACK HEIGHT (M)	STACK DIAMETER (M)
1.	L/S Crusher	Reverse pulse jet type bag filter	10	0.5
2.	Hopper	Reverse pulse jet type bag filter	22	0.5
3.	Raw Mill	Twin cyclone Separator followed by Reverse pulse jet type bag filter	30	0.8
4.	B/Silo	Reverse pulse jet type bag filter	28	0.5
5.	Kiln	Reverse pulse jet type bag filter	32	0.5
6.	Cement Mill	Twin cyclone Separator followed by Reverse pulse jet type bag filter	30	0.8

***** Common Stack will be shared for two kilns.

The emissions of particulate matters from all the stacks will be limited to 50 mg/Nm^3.

3 To control fugitive emissions, the following measures are proposed.

- Raw materials loading and unloading will be done in the covered area.
- Raw materials will be stored in the covered structure.
- All the conveyors will be provided with conveyor cover.
- The automatic bagging machine will be provided. The suction of bag filter will be provided at the packing section.
- The sprinkling of water will be done along the internal roads in the plant in order to control the dust.
- All the workers and officers working inside the plant will be provided with disposable dust masks.
- Green belt will be developed around the plant to arrest the fugitive emissions.
- Bag filter will be cleaned regularly.
- Maintenance of air pollution control equipments will be done regularly.

Water environment:

Waste water generation and mitigation measure

The domestic wastewater shall be 2.5 KL/Day. It will be treated through septic tank, and disposed off through local drain. There will not be any process wastewater generation source in the proposed plant.

Noise environment:

The noise levels near the sources such as raw material mill, cement mill etc will be higher during the operational phase but general noise levels within plant are expected to remain below 75 dB(A). In order to mitigate the noise levels during the operational phase, a green belt will be developed around the periphery of the plant.

Land environment:

Solid waste generation and its disposal method

Dust collected from air pollution control equipment will be 100% recycled in the process. Other solid wastes will be used/spent oil and discarded drums and bags. The sources of solid wastes, generation and its management are as given in the following table.

SR. NO.	TYPE OF HAZARDOUS WASTE	SOURCE	QUANTITY MT/ MONTH	STATE	DISPOSAL METHOD
1	Used/spent Oil	Prime Movers	15 lit/month	Liquid	Sold to authorized recyclers

CLEANER PRODUCTION

The unit will take following steps to implement the cleaner production in the proposed plant.

1. The proposed unit will install air pollution control equipments to control dust emissions. The collected dust will be 100 % recycled.
2. The proposed unit will implement good housekeeping.
3. Maintenance of air pollution control equipments will be done regularly.
4. Efficiency of air pollution control equipments will be checked regularly.
5. Where ever possible Green Belt will be developed in the industrial premise.

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INTRODUCTION

CHAPTER – 1

INTRODUCTION

1.1 BACKGROUND

M/s. Shivshakti Cements is proposing to set up 200 TPD Clinker and/or Cement manufacturing plant at15th Mile, G. S. Road, N. H. No.: 40, Village Byrnihat, Taluka Sonapur, Dist. Kamrup - 782 482, Assam in the existing campus where a clinker grinding unit is operational. As per EIA Notification 2006, the proposed project is categorized as B, 3(b) Cement Plant (<1 million tonnes/annum production capacity).

This Rapid Environmental Impact Assessment study is carried out as a part of the process to obtain Environmental Clearance for the above mentioned project. A mitigation plan has been prepared and a detailed environmental management plan (EMP) is drawn out to effectively mitigate or minimize potentially adverse environmental impacts.

1.2 PURPOSE OF EIA

The purpose of the EIA study is to critically analyze the manufacturing process of different products, proposed to be manufactured with reference to types and quantity of different raw material consumption, possible source of wastewater, air emission and hazardous waste generation, control measures to reduce the pollution and to delineate a comprehensive environment management plan along with recommendations and suggestions in existing environment management system.

1.3 OBJECTIVES OF EIA

The main objectives of the study are

1) To assess the background environmental status.
2) To identify potential sources of pollution.
3) To predict and evaluate the impact on environment along with pollution control measures taken.
4) To prepare a comprehensive Environment and Disaster Management Plan.

1.4 METHODOLOGIES FOR EIA

Taking into consideration proposed project activities and guidelines, an area of 10 km radius from the center of the project has been selected and is designated as the study area for the purpose of rapid EIA studies.

1.4.1 BASE LINE ENVIRONMENTAL CONDITION

The samples of ambient air, ground and surface water and soil are collected and analyzed as per the standard methods for establishing the baseline data and to determine the impact of proposed activity on the same.

1.4.1.1 AMBIENT AIR ENVIRONMENT

The air environment around the plant was studied by setting up locations within the study area of 10 Km radius from the project site and collection and monitoring the site specific meteorological data, viz. wind speed, wind direction, humidity, rainfall and ambient temperature was carried out. Design of network for ambient air quality monitoring locations is based on guidelines provided by CPCB. The ambient air samples were collected and analyzed for SPM, RSPM, SO_2 and NO_X for identification, prediction, evaluation and assessment of potential impact on ambient air environment.

1.4.1.2 GROUND AND SURFACE WATER ENVIRONMENT

The water required for domestic and industrial use shall be met from ground water using bore well. To assess the Physico-chemical quality of the water, a number of water samples were collected and analyzed for pollution parameters viz., pH, TDS, Turbidity, BOD_3, COD, Fluorides, Chlorides, Sulphate, Nitrates, Ammonical Nitrogen, Hardness, Alkalinity, Oil & Grease and some heavy metals in order to find out the contamination, if any.

1.4.1.3 NOISE ENVIRONMENT

Noise pollution survey was conducted in the study zone for evaluating existing status. The anticipated noise sources were industrial activities, which are likely to be increased due to proposed activity. Noise levels were also recorded in surrounding villages for evaluating general scenario of the study area. Hourly equivalent sound levels (Leq) were also recorded for calculating Day and Night noise levels in the surrounding villages.

1.4.1.4 SOIL ENVIRONMENT

Soil sampling and analysis was carried out to assess Physico-chemical characteristics of the soils and delineate existing cropping pattern, existing land use and topography, within the study area.

1.4.1.5 BIOLOGICAL ENVIRONMENT

Keeping in view, the importance of biological component of total environment due to the proposed project, biological characterization of terrestrial and aquatic environments, changes in species diversity of flora and fauna in terrestrial as well as aquatic systems were studied for impact analysis due to proposed project activity, if any.

1.4.1.6 SOCIO-ECONOMIC ENVIRONMENT

Demographic and related socio-economic data was collected from census handbook to assess socio-economic status of the study area. Assessment of impact on significant historical, cultural, and archeological sites/places in the area and economic and employment benefit arisen out from the proposed project is given special attention.

1.4.2 IDENTIFICATION OF POLLUTION SOURCE

Detailed study of manufacturing process for proposed production is carried out along with input and output of materials, water, and wastewater as well as infrastructure facilities available.

1.4.3 EVALUATION OF POLLUTION CONTROL AND ENVIRONMENTAL MANAGEMENT SYSTEM

The qualitative and quantitative analysis of various pollution sources as well as evaluation of pollution control system is carried out.

1.4.4 EVALUATION OF IMPACT

A comprehensive evaluation of environmental impact with reference to proposed expansion activities is carried out.

1.4.5 PREPARATION OF ENVIRONMENTAL MANAGEMENT PLAN

A comprehensive Environmental Management Plan has been prepared covering all the aspects of pollution prevention measures, Air and Water Pollution Control measures, Hazardous Waste Management, Environmental Surveillance and Environmental Management Plan.

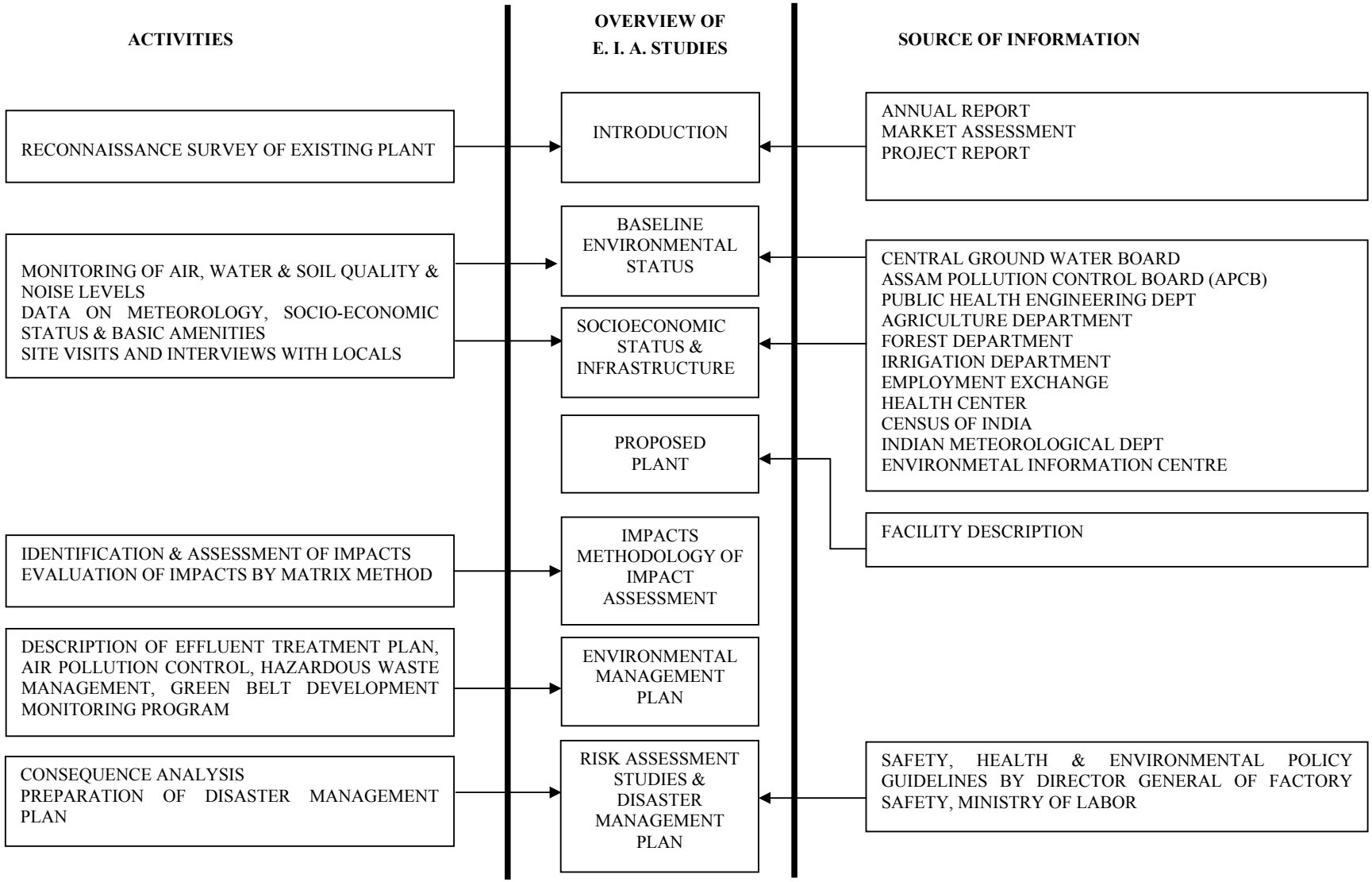
The present report is a rapid EIA conducted during the study period of Oct'08 to Dec'08. The baseline environmental conditions have been established through field monitoring and literature survey. The contents of EIA report, details of data collection and source of secondary data are presented in figure-1.1.

1.5 STRUCTURE OF REPORT

The objective of the EIA study is a preparation of Rapid Environment Impact Assessment (R-EIA) report based on the guidelines of the Ministry of Environment and Forests (MoEF) and CPCB. It incorporates the following.

- Chapter 1 is an Introduction to the Industry, their premises and surrounding areas. It also expresses the basic objectives and methodologies for EIA studies and work to be covered under each Environmental component.
- Chapter 2 presents a Description of Project and Infrastructure facilities including all industrial and environmental aspects of M/s. Shivshakti Cements during construction phase and operation phase activities as well as manufacturing process details of proposed product. This chapter also gives information about raw material storage and handling, water and wastewater quantitative details, air pollution and control system, Hazardous Waste generation, storage facility and disposal and utilities for proposed project.
- Chapter 3 covers Baseline Environmental Status including meteorological details, Identification of baseline status of Environmental components of the surrounding area covering air, water and land environment, study of land use pattern, Biological Environment & Socio-Economic Environment giving details about District Kamrup and the study area in terms of land use pattern, biological environment, and socio-economic environment.
- Chapter 4 deals with Identification and Prediction of Impact, which provides quantification of significant impacts of the proposed project activities on various environmental components. Evaluation of the proposed pollution control facilities has been presented.
- Chapter 5 describes Environment Management Plan (EMP) to be adopted for mitigation of anticipated adverse impacts if any and to ensure acceptable impacts.
- Chapter 6 describes Risk analysis and Disaster management plan that shall be adopted by the company.
- Chapter 7 gives the benefits of the proposed projects.
- Chapter 8 gives Summary and conclusion and
- Chapter 9 gives the information of consultants.

FIGURE - 1.1 ACTIVITIES, SOURCES OF INFORMATION AND CONTENTS OF EIA REPORT



CHAPTER - 2

PROJECT DESCRIPTION

AND

INFRASTRUCTURE FACILITIES

CHAPTER – 2

PROJECT DESCRIPTION AND INFRASTRUCTURAL FACILITIES

2.1 JUSTIFICATION OF PROJECT

Fast rising Government Expenditure on Infrastructure sector in India has resulted a higher demand of cement in the country. In the same direction, participation of larger companies in the sector has increased. With the view of the increasing demand and supply of the Cement in the North-Eastern region, the promoters have proposed to set up 200 TPD Clinker and/or Cement manufacturing plant under the name of M/s. Shivshakti Cements at N.H.40 in the district of Kamrup, Assam.

2.2 PROMOTERS & THEIR BACKGROUND

Mr. Narayan Prasad Jhunjhunwala, Mr. Prithu Jhunjhunwala, Mr. Ashu Jhunjhunwala, Mrs. Ramita Jhunjhunwala, all the parties mentioned being from Police Bazar, Shillong, Meghalaya and M/S Shubharambh Trading Private Ltd. Have proposed to come together in a partnership in the name of Shivshakti Cement having its registered and administrative office at 1st floor, H.M.Towers, S.C. Goswami Road, Pan Bazar, Guwahati-781001 in the district of Kamrup, Assam.

For successful implementation of a project, a lot of fieldwork has to be undertaken. On having a clear concept of the project its feasibility is explored and accordingly a blue print for actual execution including the arrangement for finance etc. is required to be made.

Taking a step forward in this direction, the promoters has retained the services of M/s. Suvidha Consultant Pvt. Ltd. as their projects and financial consultants. Suvidha is a corporate body registered under the Companies Act, 1956 having its registered office at Kelvin Cinema Compound, Tokobari Road, Guwahati-781001(Assam). Suvidha is one of the leading project consultants of the Eastern region and has provided Advisory services to blue chip companies across Eastern India.

2.3 PROJECT COST

The total Project Cost is Rs. 1242.67 Lacs. It includes site development, building, all the plant Machinery and its installation and Environment Protection measures cost. It does not include the land cost as it is available readily. Break up of proposed investment is given in following table-2.1, while break up of investment for environment control measures is given in table-2.2.

TABLE - 2.1 BREAK UP FOR THE PROPOSED INVESTMENT

SR. NO.	DESCRIPTION	COST (RS. IN LACS)
1.	Land	(Lease Land)
2.	Site development	7.94
3.	Building	29.34
4.	Plant and Machinery	938.00
5.	Environmental Protection Measures	32.0
6.	Electrical Installation	73.65
	TOTAL (1 TO 5)	**1080.93**
7.	Preoperative expense	27.38
8.	Unpredictable expense	22.24
9.	Misc. Fixed Assets & Deposit	43.00
10.	Working capital margin	69.11
	TOTAL (6 TO 9)	**161.73**
	TOTAL (1 TO 9)	**1242.66**

TABLE - 2.2 BREAK UP FOR THE PROPOSED INVESTMENT FOR THE ENVIRONMENT CONTROL MEASURE (RS. IN LACS)

(Rs. In Lac)

SR. NO.	DESCRIPTION	CAPITAL COST PER ANNUM
1.	Air Pollution Control equipment	18
2.	Water Pollution Control	2
3.	Noise Pollution Control	2
4.	Environment Monitoring and Management	7
6.	Occupational Health	1
7.	Green Belt	2
	TOTAL	**32**
RECURRING EXPENDITURE:		
8.	Recurring expenditure on environmental management cell and on pollution control systems	5

2.4 PROJECT SETTING

2.4.1 LOCATION

M/s. Shivshakti Cement is located at 15th Mile, G. S. Road, N. H. No.: 40, Village Byrnihat, Taluka Sonapur, Dist. Kamrup - 782 482, Assam at longitude $91^0$52'18.68"E and latitude $26^0$2'59.45"N. The total area covered by Kamrup is about 4345 sq km. Location map of Kamrup district and detailed layout map of the proposed plant is shown in figure-2.1 and figure-2.3 respectively.

1. Location:
   a) Site Village : **Byrnihat**
   b) Taluka : **Sonapur**
   c) District : **Kamrup**
   d) State : **Assam**
   e) Latitude : **$26^0$2'59.45" N**
   f) Longitude : **$91^0$52'18.68" E**
2. Nearest Railway Station: **Guwahati Raiway Station (25 km North West**)
3. Nearest Airport : **Lokpriyo Gopinath Bordoloi Airport**
4. Reserved Forest : **Kaziranga National Park (more than 150 km East)**
5. Nearest City : **Guwahati (25 km North West)**
6. Nearest village : **Sonapur**
7. Nearest : **River Umtru (100 m East)**

The location of plant is considered based on availability of infrastructure facilities and careful evaluations of other inter related factors. The location is supposed to be most favorable, where the following facilities are already available or can be developed at minimum cost: -

A) Sources of Raw materials:

The main raw material for the unit is Limestone. Limestone is available in both Assam and Meghalaya.

The location of the unit is such that it is very close to Meghalaya. The Prominent Limestone deposits in Meghalaya are Cherrapunjee, Mawlong-Ishamati, Komorrah, Sheila, Borsora in Khasi Hills, Siju and Nangwalbibra in Garo Hills, Lumshnong, Sutnga, Nongkhlieh, Syndai and Lakadong in Jaintia **Hills.** Hence the unit will be able to procure both from the state of Assam and Meghalaya.

B) Power & Fuel:
Power required for the proposed project shall be 800 KW and shall be met through Assam Electricity Board.
There is already a D.G. set in the existing campus for uninterrupted power supply during load shedding. The diesel required for running the Gen Set is available from Petrol Pump located nearby the existing campus.

C) Water:
Water required for production is estimated around 33 Kilolitres per day. The requirement shall be met from existing source of ground water which is located within the campus. Water shall be collected through pumps and stored overhead.
Assam has plenty of ground water reserves. Whereas there is shortage of water everywhere specifically during the dry season there is no shortage of water anywhere in the state. There is abundant rainfall in rainy seasons and hence the underwater reservoirs, the perennial source, is huge enough to cater to the needs of the industries present here and also the other upcoming industries in the area. The quality of ground water is better than surface water and is tapped at convenient location close to the consumption Center.

D) Roads Transportation facilities:
The proposed plant site is within 7 km of the Jorabat crossing. Being the first plot on the National highway 37(NH 37) and well connected with entire upper Assam and the whole of North East States, it is considered as the most favourable location.
Being located on the National Highway, it is well connected with the entire North East and Upper Assam for means of transportation and communication facilities.

E) Manpower availability:
Technically skilled / semi skilled and unskilled manpower is readily available in the area for establishment of the project. It is expected that there will be no dearth in availability of the required personnel for the proposed unit. Total 49 personals shall be employed for the proposed project.

2.4.2 KEY INFRASTRUCTURE FEATURES AND SETTLEMENTS

2.4.2.1 METHOD OF DATA PREPARATION
The data for administrative boundaries and key infrastructure features have been extracted from Survey of India (SoI) topographical maps of 1:50,000 scale and Census of India maps. The features have been updated using satellite data and have been verified with ancillary information derived from TTK maps and guide maps. The indicative locations of the villages extracted from Census of India (CoI) maps and major landmarks have also been marked for the ease of spatial reference.

2.4.2.2 DISTANCE OF NEAREST KEY INFRASTRUCTURE FEATURES FROM PROJECT SITE
The distance of railways and National and State highways from the project site are presented in table-2.3 below.

TABLE - 2.3 DISTANCE OF NEAREST KEY INFRASTRUCTURE FEATURES FROM PROJECT SITE

SR. NO.	NEAREST INFRASTRUCTURE FEATURE	DISTANCE FROM PROJECT SITE
1	Village Borbhuin	0.38Km in South-West Direction
2	Village Byrnihat	0.83Km in North-West Direction
3	NH-40	0.33Km in East Direction
4	NH-37	5.50Km in North-West Direction
5	Railway line	11.15Km in North-West Direction
6	Satgaon RS	10.92Km in North-West Direction
7	Digaru River	0.43Km in East Direction
8	Guwahati Airport	29.20Km in North-West Direction

(Courtesy: Environment Information Center, New Delhi)

2.4.2.3 MAP OF KEY INFRASTRUCTURE FEATURES AND SETTLEMENTS

A map depicting administrative boundaries up to taluka level, showing locations of major landmarks along with National and State highways, major and medium roads and railways is presented in figure-2.2. The major water bodies with the rivers and the river beds are illustrated in the map to provide a better understanding of the project area. The map marks the area within 10 km buffer around the project area.

FIGURE - 2.1 DETAILED MAP OF KAMRUP DISTRICT

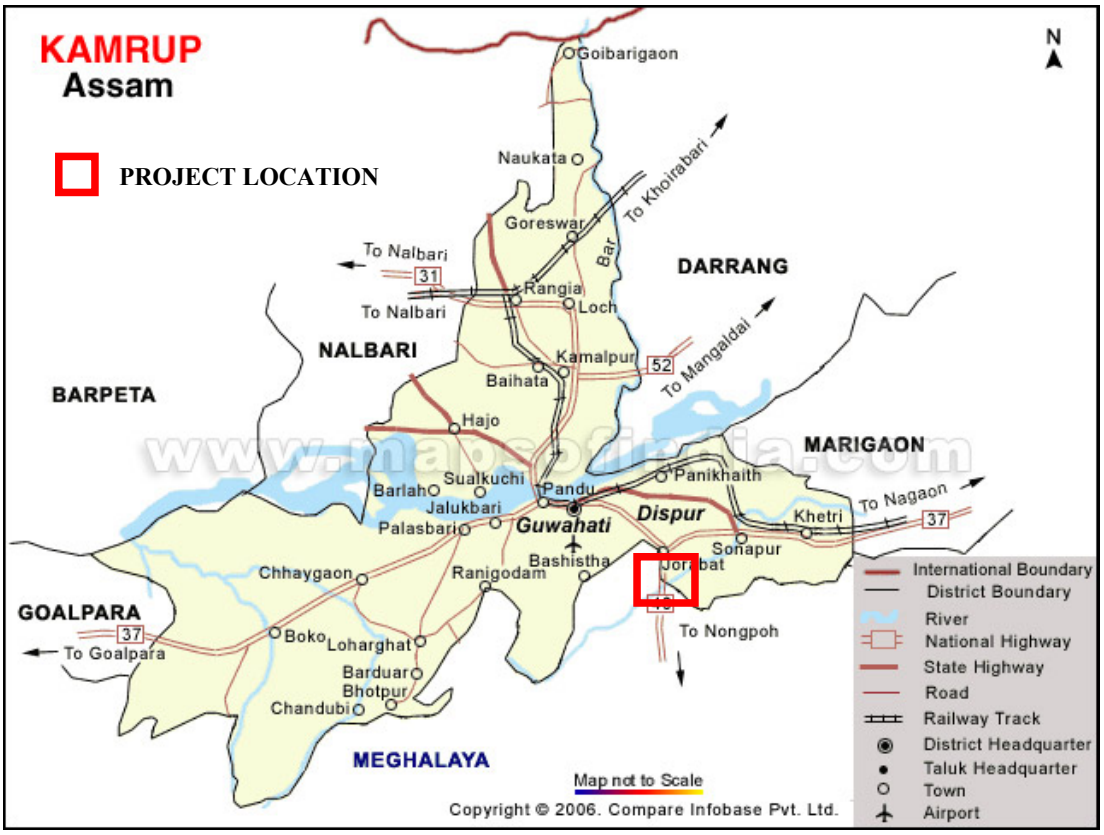


FIGURE - 2.2 KEY INFRASTRUCTURE FEATURES AND SETTLEMENTS

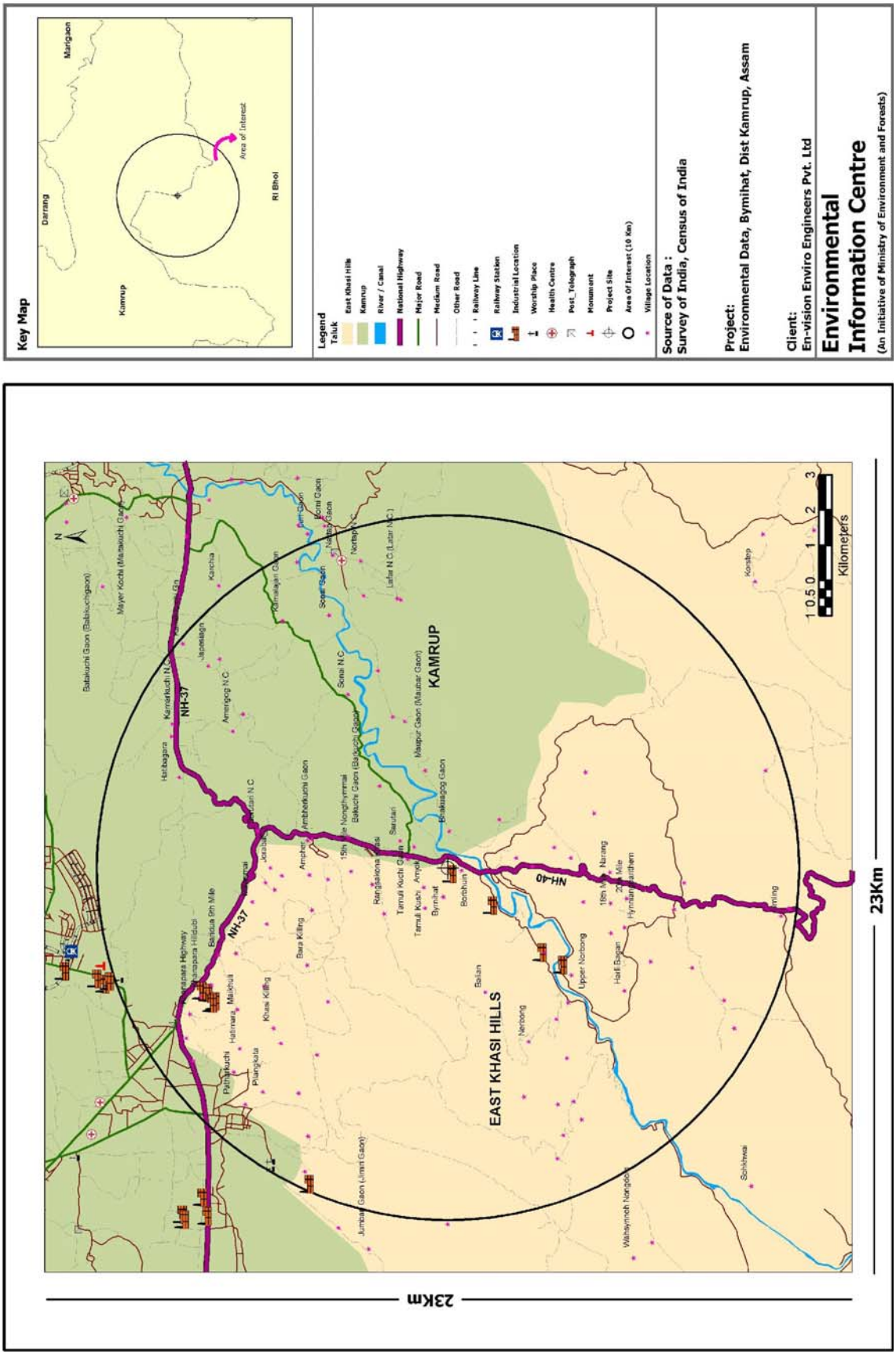
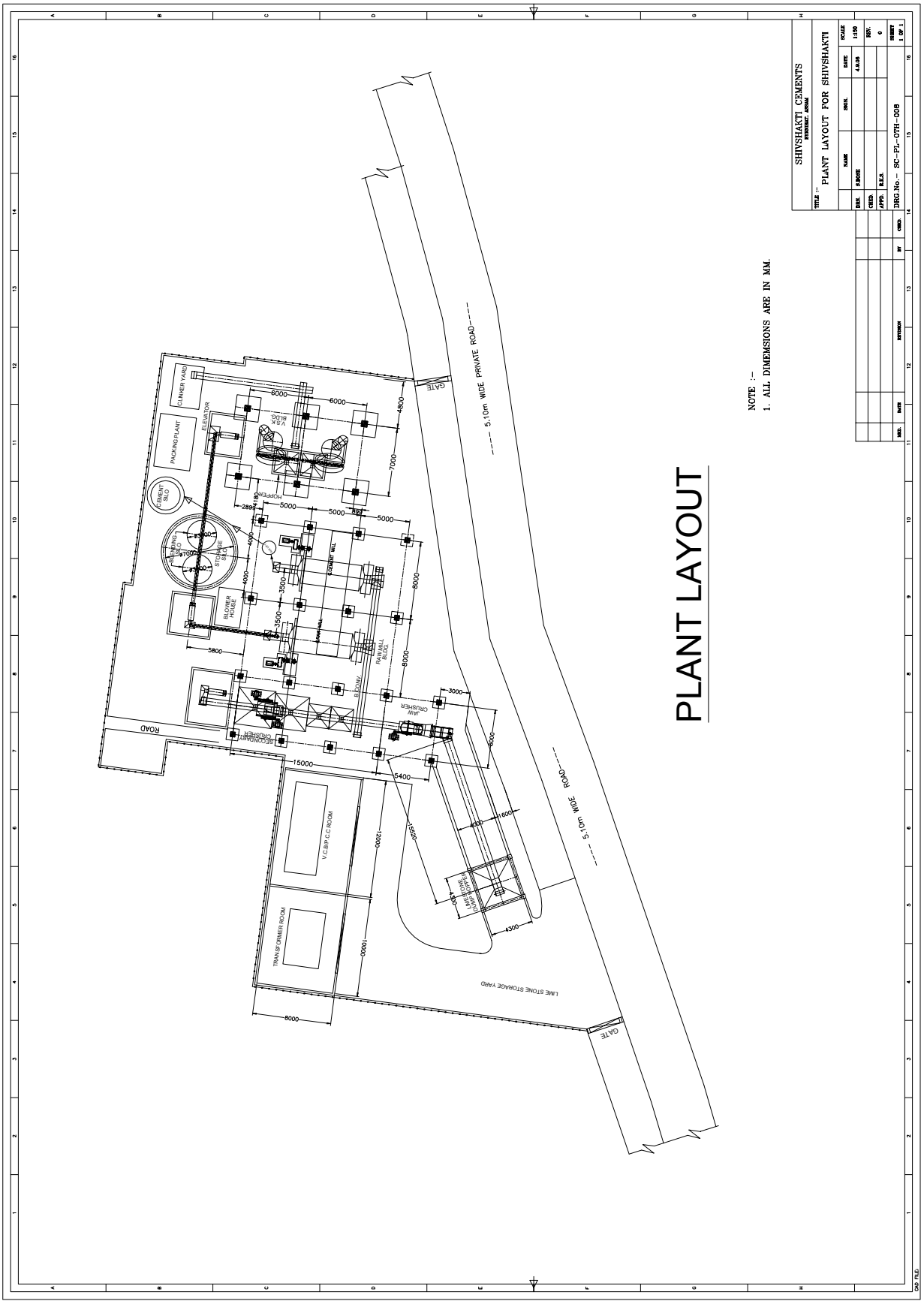


FIGURE - 2.3 LAYOUT OF THE PLANT



2.5 MAIN PHASES OF THE PROJECT

2.5.1 PRE CONSTRUCTION ACTIVITIES

As the project site is in the existing campus where clinker grinding unit is operating, so there is no need to construct any approach road or site access. No significant pre-construction activities are anticipated.

2.5.2 CONSTRUCTION ACTIVITIES

The project site is located on level ground, which does not require any major land filling for area grading work. Construction activities will include only production facilities no other construction is supposed to be carried out.

Construction materials, like steel, cement, crushed stones, sand, rubble, etc. shall be required for the project, will be procured from the local market of the region.

2.6 PRODUCTION AND MANUFACTURING PROCESS

The manufacturing process of cement consists of mixing, drying and grinding of limestone, clay and silica into a composite mass. The mixture is then heated and burned in a pre heater and kiln and then cooled in an air cooling system to form clinker, which is the semi-finished form. This clinker is cooled by air, subsequently ground with gypsum to form cement. Thus the clinker forms the main ingredient in manufacturing cement.

2.6.1 RAW MATERIALS

2.6.1.1 RAW MATERIAL CONSUMPTION

Limestone is the key raw material and normally, 1.2-1.5 tons are needed for every ton of cement. The quality of the limestone significantly affects the operating efficiency of the units and also the quality of the end product - cement. Under normal conditions, to produce 1 ton of cement, 0.25 ton of coal, 120 kwh of power and 0.05 ton of gypsum/fly ash is required.

Details of the raw materials, their source, mode of transportation and consumption for production of one tone of cement and 200 TPD cement are given in following table-24.

TABLE - 2.4 RAW MATERIAL CONSUMPTION

SR. NO.	NAME OF THE RAW MATERIAL	CONSUMPTION		SOURCE & THEIR DISTANCE (KM)	MODE OF TRANSPORTATION
		TON/TON	MT/DAY		
1.	Limestone	1.36	272	Cherrapunji – 150 km Meghalaya	By Road
2.	Clay	0.119	23.8	Byrnihat Assam	By Road
3.	Iron Dust	0.017	3.4	Durgapur – 500 km Bihar	By Road
4.	Cock Breeze	0.204	40.8	Byrnihat Assam	By Road
5.	Gypsum/Fly Ash	0.048	9.6	Samdrup – 200 km Jongkhar Bhutan	By Road

2.6.1.2 RAW MATERIAL HANDLING

The raw materials will be purchased from the external sources. The raw materials will be transported to the site by trucks. The unloading and storage of the raw materials will be done in the covered raw yards.

2.6.1.3 PHYSICAL AND CHEMICAL PROPERTIES OF RAW MATERIALS AND PRODUCT

Lime Stone (Raw Material) :

Lime stone contains Silicon dioxide (SiO_2), Aluminum Oxide (Al_2O_3), Ferric Oxide (Fe_2O_3), Mangesium Oxide (MgO), Calcium Oxide (CaO), Sodium Oxide (Na_2O), Potassium Oxide (K_2O) and Calcium Carbonate ($CaCO_3$).

Physical State	:	Solid
Appearance	:	Angular gray/white particles of varying sizes
Odor	:	None
Vapor Pressure	:	Not applicable
Vapor Density	:	Not applicable
Evaporation rate	:	0
Boiling point	:	Not applicable
Specific Gravity (H_2O = 1)	:	2.60 - 2.8
Solubility in Water	:	Negligible

Silica (Raw Material) :

Physical State	:	Granular Solid
Appearance	:	Light buff to white sand
Odor	:	None
Vapor Pressure	:	Not applicable
Vapor Density	:	Not applicable
Evaporation rate	:	Not applicable
Melting point	:	Not applicable
Boiling point	:	> 1900 oC
pH (in water)	:	Not applicable
Specific Gravity, g/cm3	:	2.65 (quartz)
Solubility in Water	:	Insoluble

Coke Breeze :

It contains carbon, quarts, sulphur, calcium oxide, magnesium oxide, potassium oxide, alumina, iron oxide and manganese oxide.

Physical State	:	Solid
Odor	:	None
Vapor Pressure	:	Not applicable
Evaporation rate	:	Not applicable
Melting point	:	Not applicable
Boiling point	:	Not applicable
pH (in water)	:	Not applicable
Specific Gravity, g/cm3	:	1.75 (water = 1)
Sulfur	:	< 1% by weight

Gypsum (Raw Material) :

The gypsum contains Hydrous calcium sulfate ($CaSO_4.2H_2O$), Calcium carbonate ($CaCO_3$), magnesium aluminum silicate ((Mg.Al) SiO_3) and silicon dioxide (SiO_2).

Physical State	:	Solid (powder)
Appearance	:	White or off-white
Odor	:	None
Vapor Pressure	:	Not applicable
Vapor Density	:	Not applicable
Evaporation rate	:	Not applicable
Melting point	:	Not applicable
Boiling point	:	> 1000 oC
pH (in water)	:	5.0 - 8.0
Specific Gravity, g/cm3	:	2.3
Solubility in Water	:	Negligible

2.6.2 MANUFACTURING PROCESS:

The manufacturing process of cement is basically based on VSK technology. In vertical Shaft technology the kiln is stationary, vertical and tubular kiln. The process comprises of the following operations: -

1. Crushing of limestone and other raw meal to a minimum size of 12mm.
2. Proportioning of raw materials and fuel (coke breeze) based on raw mix design, grinded to desired fineness and blending of finally grounded raw mix to obtain raw meal of desired homogeneity.
3. Preparation of nodules by addition of water to raw meal in a pan type noduliser.
4. Feeding nodules to VSK where drying, calcining, sintering and coking takes places as the nodules travel down the VSK and ultimately get converted to clinker.
5. Grinding of clinker with desire quantity of Gypsum/fly ash.

The limestone procured is manually fed to a jaw crusher. The crusher limestone 90 mm size is then fed to a hammer mill to reduce it further to 12 mm size. Coke breeze, clay and other additives are also crushed in smaller jaw crusher and stored in separate silos. The crushed raw materials are taken out in predetermined proportion by means of mobile platform. Weighing scale fitted on trolley moving over rails and discharged into a bucket elevator to be conveyed to ball mill hoppers from where the material is fed to a ball mill and thoroughly grounded. The grounded raw meal is fed by means of a bucket elevator to a blending silo for proper homogenizations. The final adjustment of the raw meals is made in the homogenizer by replenishing the shortfall in either limestone or clay or coke breeze. The homogenized raw meal is then fed to raw meal storage silos.

The blended raw meal is conveyed by means of screw conveyer and bucket elevator to surge silo fitted above the pan noduliser. The raw meal from here is fed to noduliser where water is sprayed at the desired rate for forming green nodules. The inclination and speed of the nodulisers can be adjusted depending upon the diameter of the nodules required, which is normally 10mm to 12mm. The pan noduliser is fitted at a height above the feeder of kiln so that feed to the kiln is obtained by gravity only. The green nodules are allowed to travel downwards into vertical shaft kiln through a rotary chute discharge which facilitates their even distribution over the kiln top. Air blown from bottom of the kiln by roots blower.

The nodules during their travel down the kiln get dried, heated, Calcined and sintered to clinker and cooled whilst the air during its travel up the kiln gets heated and initiates the calcining and clinkerisation of the green nodules. The cooled clinker is discharged through a double release system in covered storage yard. The Clinker stored into the hoppers after crushing and extracted in the desired proportion with the help of table feeders and transported to the Cement mill Hopper. In the cement mill Clinker is grounded with Gypsum to produce cement. Grounded Cement is stored in cement silo and than packed.

KEY BENEFITS OF VSK TECHNOLOGY:

1. Low Capital Cost
2. Less power consumption.
3. Less fuel.
4. Persons with little technical knowledge can also work in the unit unlike that in rotary kiln.
5. Achievement of high quality cement.

2.7 INFRASTRUCTURE FACILITIES

2.7.1 LAND

The proposed project of will come up within the same campus where a group company‘s cement grinding unit is running under the name of Mahashakti Cements. Enough land is available for expansion activity. So there will be no additional requirement of land.

2.7.2 TRANSPORTATION FACILITIES

As project site is well connected through road. Hence Transportation of all the raw materials and products shall be primarily by road only.

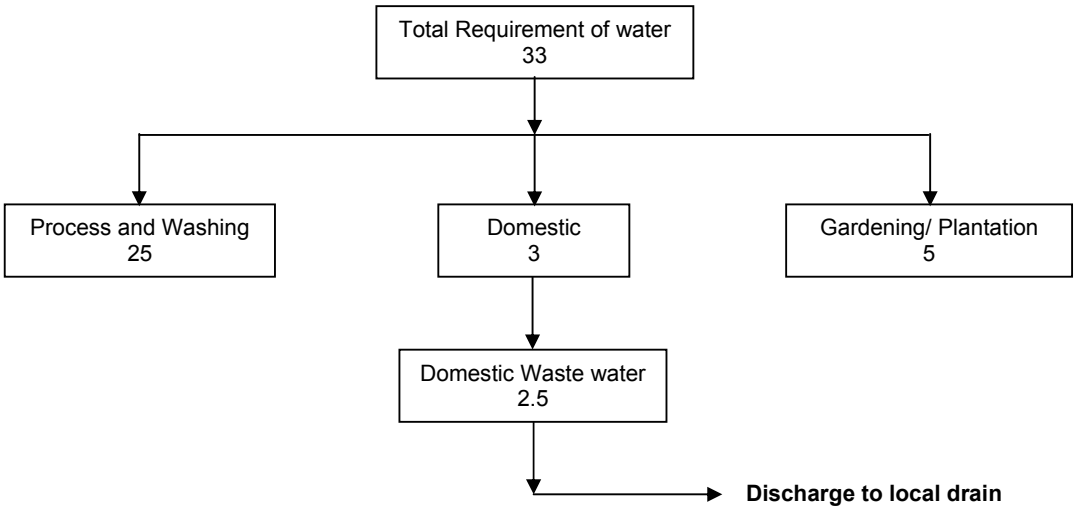
2.7.3 WATER SOURCE AND UTILIZATION

Daily water requirement for the proposed project of M/s. Shivshakti Cements shall be 33 KL/day and would be met through Ground water using existing bore well of the campus. Water requirement is primarily for industrial use, domestic use and for gardening.

TABLE - 2.5 WATER CONSUMPTION AND WASTE WATER GENERATION

SR. NO.	USE FOR	WATER CONSUMPTION KL/DAY	WASTE WATER GENERATION KL/DAY
1.	Industrial Purpose	25	-
2.	Domestic Purpose	3	2.5
3.	Gardening & Other	5	-
	TOTAL	**33**	**2.5**

FIGURE - 2.4 WATER BALANCE DIAGRAM



Note: All the figures are in KL/Day

2.7.4 POWER REQUIREMENTS

Total power requirement will be 800 KW and shall be taken from Assam State Electricity Board. During emergency existing D. G. Set of M/s. Mahashakti Cements shall be used.

2.7.5 FUEL REQUIREMENTS

Fuel requirement, their source and distance and mode of transportation are given following table-2.6.

TABLE - 2.6 FUEL REQUIREMENT

SR. NO.	FUEL	SOURCE AND THEIR DISTANCE	DAILY FUEL CONSUMPTION (MT/DAY)	MODE OF TRANSPORTATION
1.	Lignite / Coke Breeze	Local	41 M.T.	Road

2.8 SOURCE OF POLLUTION AND CONTROL MEASURES

2.8.1 WATER POLLUTION

No industrial waste water shall be generated from the proposed project, but only domestic waste water 2.5KL/Day will be generated. Entire quantity of domestic waste water generated shall be treated through septic tank, and disposed of through local drain. Details of wastewater generation from proposed project are given in the table-2.5.

2.8.2 AIR POLLUTION

The particulate emissions are among the most significant impacts of cement manufacturing.

2.8.2.1 SOURCES OF AIR POLLUTION

Particulate Matters :

There will be emission of particulate matter due to operation of crusher, hammer mill, raw mill, kiln and cement mill. The cement dusts are alkaline with size varying from 5 μm to 250 μm (Chemical Technology and Pollution Control by Martin B. Hocking).

The fugitive dust emissions from the proposed plant would be significant and the sources will be as under:

1. Raw materials handling
2. Materials transfer points (bucket elevators, conveyor belts)
3. Loading of raw materials
4. Packing of cement
5. Unloading of cement bags
6. Transportation of vehicles

Dust Emission Load :

The exhaust gas volume, temperature of exhaust gases and their burden for different processes of proposed plant are taken from the IS : 12002 – 1987 "Code of Practice for Control of air pollution in cement plants" and presented as under :

1. Lime Stone Crushing:
   - a. Jaw Crusher : Dust burden - 20 to 75 g/Nm^3
   - b. Hammer Mill : Dust burden - 20 to 75 g/Nm^3

2. Raw Mill :
   - Temperature of Exhaust gases : 90 to 100 oC
   - Dust burden : 130 to 300 g/Nm^3

3. Vertical Shaft Kiln:
   - Exhaust gas volume : 2 to 3 Nm^3/kg of product
   - Temperature of exhaust gases : 100 to 150 oC
   - Dust burden : 0.1 to 0.5 g/Nm^3
   - Dust emission load : 0.019 kg/hour

4. Cement Mill:
   - Exhaust gas volume : 0.2 to 0.4 Nm^3/kg of product
   - Temperature of exhaust gases : 100 oC
   - Dust burden : 200 to 400 g/Nm^3
   - Dust emission load : 2 Kg/hour

2.8.2.2 EMISSION OF SO_2, NO_X AND CO_2 FROM KILN

Sulfur dioxide may generate due to the sulfur content in the coke breeze. However, the alkaline nature of the materials provide for direct absorption of SO_2, thereby mitigating the quantity of SO_2 emissions in the exhaust stream.

Oxides of nitrogen are generated during fuel combustion by oxidation of chemically bound nitrogen in the fuel and by thermal fixation of nitrogen in the combustion air.

There will be generation of CO_2 due to calcining of lime stone. In the calcining process, $CaCO_3$ thermally decomposes to CaO and CO_2.

2.8.2.3 AIR POLLUTION CONTROL MEASURES

The major sources of pollution are particulate matter from the proposed cement plant.

The unit will install cyclone separators, bag filters and wet scrubber to control air pollutants. The stacks will be attached to the air pollution control equipments to disperse the air pollutants to the satisfactory levels. The details of proposed stack and pollution control equipments are presented in the following table-2.7 and table-2.8 respectively.

TABLE-2.7 DETAILS OF AIR POLLUTION CONTROL EQUIPMENTS

SR. NO.	SECTIONS	DUST CONTROL EQUIPMENTS
1.	Crushing and Raw Materials Silos	Cyclone Separator followed by reverse pulse jet type bag filter
2.	Raw Mill and blending silo	Cyclone Separator followed by reverse pulse jet type bag filter
3.	Noduliser	Reverse Pulse Jet Type Bag filter
4.	VSK	Cyclone separator and Wet Scrubber
5.	Clinker Crusher and cement mill feed hopper	Cyclone Separator followed by reverse pulse jet type bag filter
6.	Cement mill	Cyclone Separator followed by reverse pulse jet type bag filter
7.	Cement blending silo and packing section	Reverse pulse jet type bag filter

TABLE – 2.8 DETAILS OF STACK

NO. OF STACK	STACK ATTACHED TO	STACK HEIGHT(M)	STACK DIAMETER (M)	POLLUTION CONTROL EQUIPMENT
1.	Crushing Section	10	0.5	reverse pulse jet type bag filter
2.	Hopper	22	0.5	Reverse pulse jet type bag filter
3.	Raw Mill	30	0.8	Twin cyclone Separator followed by Reverse pulse jet type bag filter
4.	B/Silo	28	0.5	Reverse pulse jet type bag filter
5.	Cement Mill	30	0.8	Twin cyclone Separator followed by Reverse pulse jet type bag filter
6.	Kiln :VSK – 1 & VSK – 2	32*	0.5	Reverse pulse jet type bag filter

* Common Stack will be shared for two kilns.

The emission of particulate matters from all the stacks will be limited to 50 mg/Nm^3.

2.8.3 NOISE POLLUTION AND CONTROL SYSTEM

Extensive oiling and lubrication and preventive maintenance shall be carried out to reduce noise generation at source to the permissible limit. However, at places where noise levels may exceed the permissible limit, Earplugs will be provided to those working in such area.

2.8.4 LAND/SOIL POLLUTION AND CONTROL MEASURES

Solid Waste Generation is mainly from the pollution control equipments which shall be negligible but periodically recycled after the containers placed beneath the rotary valve of the respective dust collectors are adequately filled in.

2.9 GREEN BELT AND PLANTATION DETAILS

To maintain the ecological balance, authorities have proposed to develop green belt in and around the plant. Total green belt and plantation area shall be 33% of the total land. The plant having more Air Pollution Tolerance Index (APTI), dense canopy, fast growing and deep rooted shall be planted where ever possible in the industrial campus.

CHAPTER - 3

BASELINE ENVIRONMENTAL STATUS

CHAPTER – 3

BASELINE ENVIRONMENTAL STATUS

The baseline status of environmental quality in the vicinity of project site serves as the basis for identification, prediction and evaluation of impacts. The baseline environmental quality is assessed through field studies within the impact zone for various components of the environment, viz. air, noise, water, land and socio-economic. The baseline environmental quality has been assessed during October, 2008 to December, 2008) in a study area of 10 km radial distance from the project site. Location map of the project site with study area is given in figure-3.1.

Knowledge of baseline environmental status of the study area is useful for Impact Assessment Process of assessing and predicting the environmental consequences of the significant actions. Significant action depicts direct adverse changes caused by the action and its effect on the health of the biota including flora, fauna and human being, socio-economic conditions, current use of land and resources, physical and cultural heritage properties and biophysical surroundings. Baseline data generation of the following environmental attributes is essential in EIA studies.

1. Meteorology
2. Ambient Air Quality
3. Ambient Noise Quality
4. Surface and Ground water Quality
5. Soil Quality & Geological Features
6. Land use pattern
7. Biological Information
8. Socio-economic status survey

3.1 ESTABLISHMENT OF IMPACT ZONE

Deciding whether a proposed action is likely to cause significant adverse environmental effects is central to the concept and practice of EIA. Before proceeding for baseline data generation, it is important to know the boundary limits and framework, so that the data generated can be effectively utilized for impact assessment. In this context, delineate of impact zone plays an important role. Generally the impact zone for industrial actions is classified into three parts; Core Zone, buffer Zone and Unaffected Zone, as illustrated below. The area of impact zone invariably changes from project to project and depends on the nature and magnitude of activities.

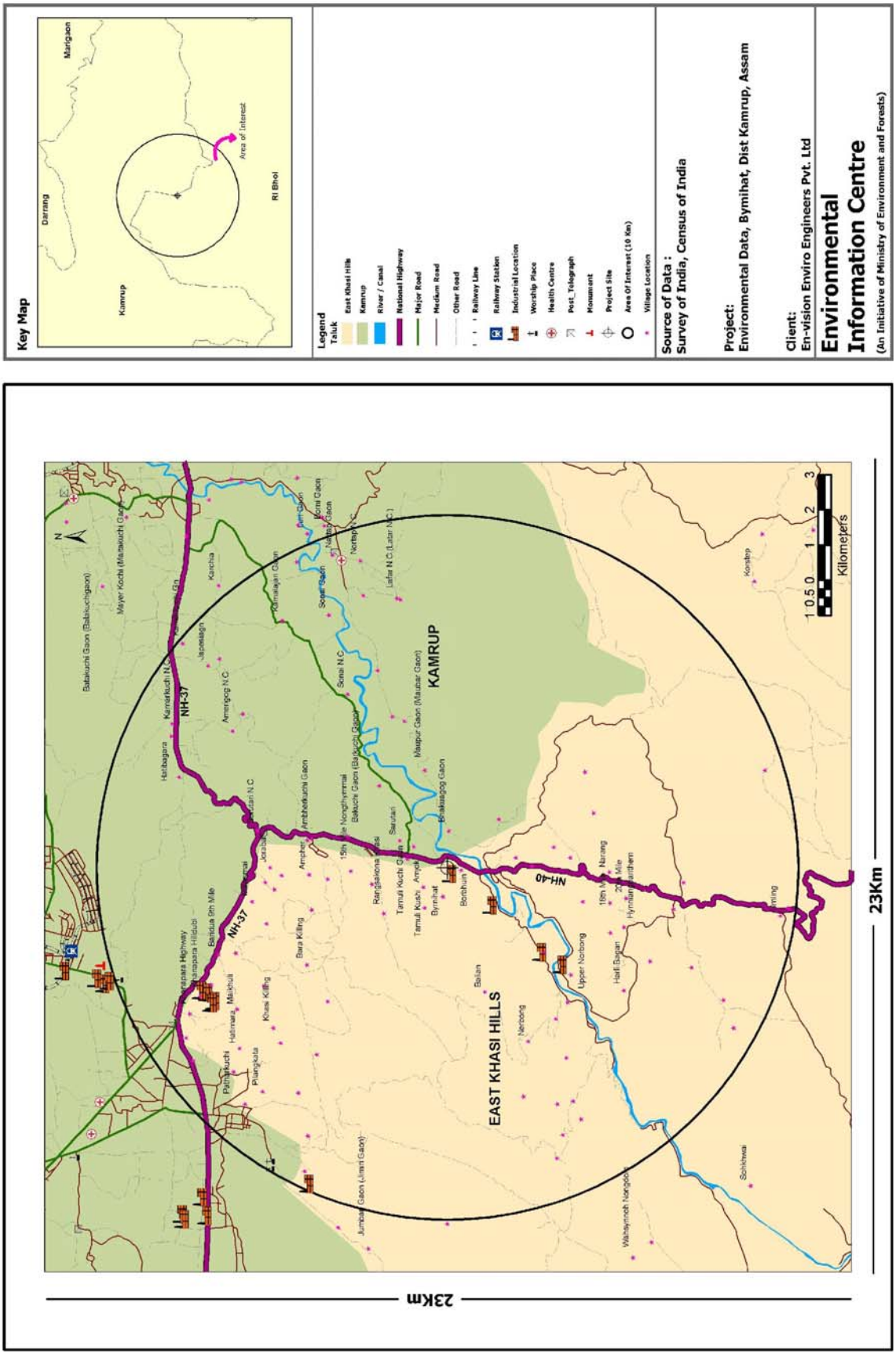
- Core Zone (Host and Proximate Area where the proposed activities is completed)- This area is closest to the activity where the background quality of environmental and human health is always at high risk. This involves risks due to steady state, transient and accidental release of pollutants, noise, increased traffic congestion and social stress. The immediate vicinity of the plant that is around 3 km radius is factual core zone in this case.

- Buffer zone (Moderately affected area)- Being a little away from the activity, the discharge pollutants need time lag to be transported to this area and gets attenuated/diluted to a considerable extent. However, the associated risk shall be real during brake-down, failure or upset conditions, and simultaneously with adverse meteorological and hydrological factors. Distance from 3 km to 7 km around the project site in the factual buffer zone in this case. This is based on the mathematical modeling study and air pollution dispersion pattern.

- Unaffected Zone- This area shall not be at risk of serious damage to life, health and property. Here the impact becomes small enough to become imperceptible and/or inconsequent and/or insignificant and normal life activities shall prevail without any disturbances due to the activity. Distance away from the 7 km buffer zone is the factually unaffected zone in this case.

While generating the baseline status of physical and biological environment of the study area, the concept of impact zone has been considered. The Impact zone selection is based on preliminary screening and modeling studies. For demography and socio-economics, block wise data has been collected and used for the assessment of impacts.

FIGURE - 3.1 LOCATION MAP OF THE PROJECT SITE WITH STUDY AREA



3.2 METEOROLOGY

Air borne pollutants is dispersed by atmospheric motion. Knowledge of these motions, which range is scale from turbulent diffusion to long-range transport by weather systems, is essential to simulate such dispersion and quality of impacts of air pollution on the environment. The purpose of EIA is to determine whether average concentrations are likely to encounter at fixed locations (Know as the receptor), due to the given sources (locations and rates of emission known), under idealized atmospheric conditions. It is imperative that one should work with idealized condition and all analysis pertaining to air turbulence and ambient air or noise pollution should be done with meteorological conditions, which can at best be expected to occur. The details of measurement technique, instruments, specification of measurement standards and accuracy of instruments are adopted from the Indian Standard: 8829-1978 "Guideline for micrometeorological technique in Air Pollution Studies." Care is taken to install the anemometer within a distance of six times the height of nearest vertical terrain elements (house, trees etc.) and height of 10 m from the average ground level of the fetch area. Meteorology data has been collected from the nearest IMD observatory located at Guwahati.

3.2.1 CLIMATE

The climate of the study area is humid and tropical. A hot and humid pre-monsoon from March to mid May, a prolonged southwest monsoon or rainy season from mid May to September, a pleasant post-monsoon or retreating monsoon from October to November and a cold pleasant winter from December to February are the characteristics of the general climate. Summer runs concurrently with the later part of the pre-monsoon season and continues throughout the monsoon season.

The four climatic seasons viz. pre-monsoon, monsoon, post-monsoon and winter could be considered as comprising of the following months:

Pre-monsoon	: March, April and May
Monsoon	: June, July, August and September
Post-monsoon	: October and November
Winter	: December, January and February

Sometimes, the monsoon commences in mid-May and ends in mid-September. Therefore, the boundaries between the seasons are not very rigid. The months October, November and December are considered to be representative study period**.**

3.2.2 TEMPERATURE DETAILS

The hottest months were May to September with mercury reaching 42ºC during June. The coldest months were December, January and February when temperature drops to 5ºC. The months, November and March, can also be quite cold in some years. During the other months, temperature was more or less moderate in nature and pleasant to bear.

3.2.3 WIND SPEED

The wind blown from NNE, NE and N sector is observed to be predominant and a typical diurnal shift in wind direction was not observed during study period. The wind rose diagram and stability class distribution prepared from data collected at site is shown in figure-3.2.

TABLE - 3.1 SITE SPECIFIC METEOROLOGICAL DATA (OCT-08 TO DEC-2008)

METEOROLOGICAL PARAMETER	MONTH OF YEAR 2008		
	OCTOBER	NOVEMBER	DECEMBER
Temperature (^{0}C)			
Min.	15	12	9
Max.	30	28	24
Avg.	23.3	21.6	19.8
Relative Humidity (%)			
Min.	22.0	21.0	23.0
Max.	85.0	86.0	84.0
Avg.	44.1	45.7	47.1
Wind Speed (m/s)			
Min.	0.0	0.0	0.0
Max.	5.4	4.3	4.0
Avg.	0.97	0.78	0.69

The winds from NE sector were observed to be predominant and a typical diurnal shift in wind direction was not observed during study period.
The wind rose diagram and stability class distribution processed by ISCST3 software from data collected at site is shown in figure-3.1A and figure-3.1B respectively.

FIGURE - 3.2A WIND ROSE DIAGRAM

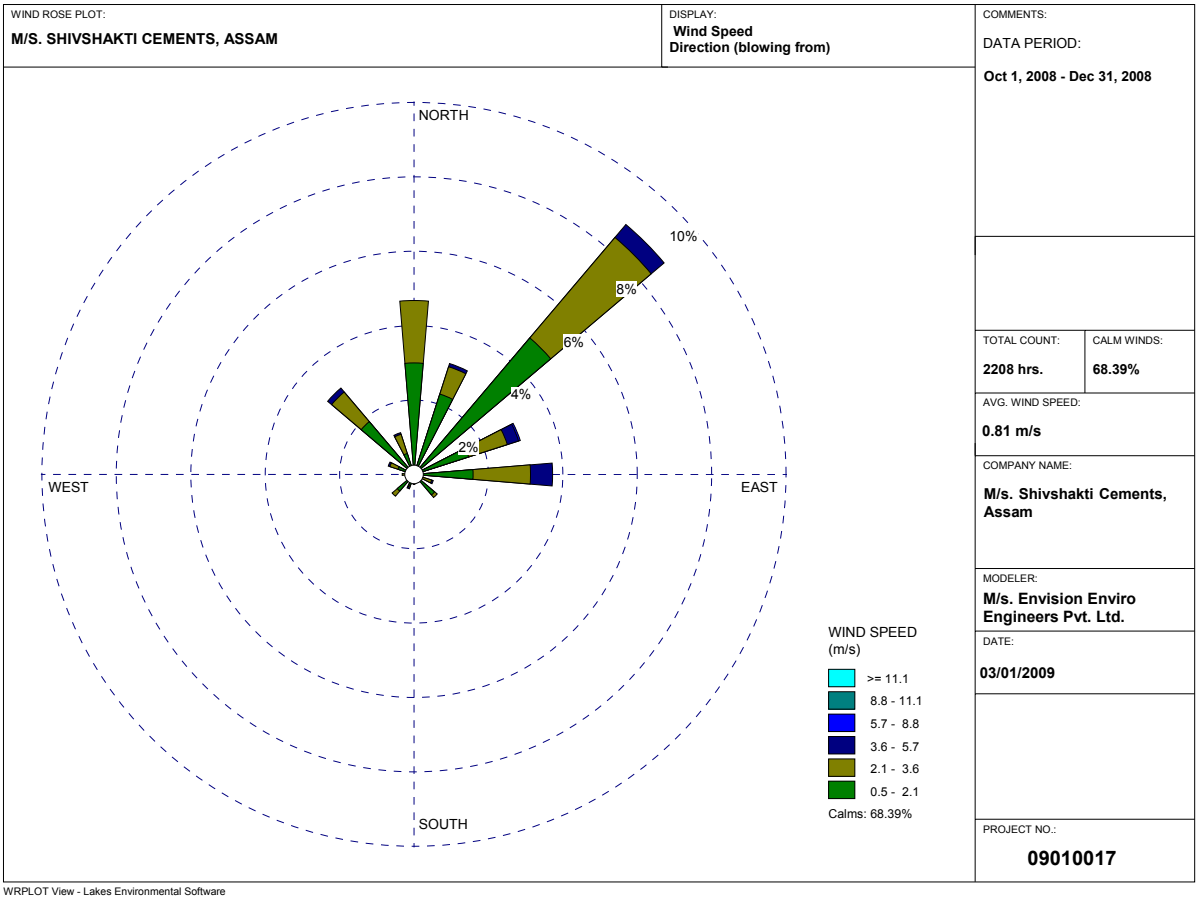
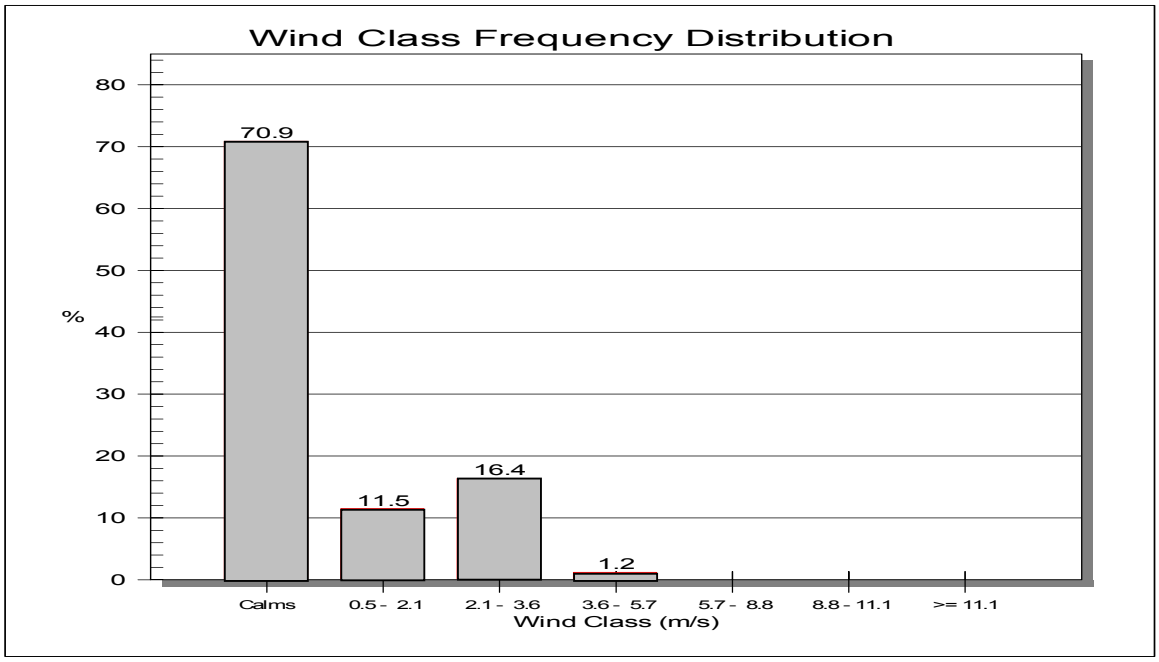


FIGURE - 3.2B STABILITY CLASS DISTRIBUTION



3.3 AIR ENVIRONMENT

3.3.1 DESIGN OF NETWORK FOR AMBIENT AIR QUALITY MONITORING LOCATIONS

The air quality status in the impact zone is assessed through a network of ambient air quality monitoring locations. The tropical climatic conditions mainly control the transport and dispersion of air pollutant during various seasons.

The baseline studies for air environment include identification of specific air pollutants prior to implementation of the project. The Rapid Environmental Impact Assessment (REIA) study requires monitoring of baseline air quality during one season. Accordingly, air quality monitoring was carried out in the winter season from October 1, 2008 to December 31, 2008. The baseline status of the air environment is assessed through a systematic air quality surveillance programme, which is planned based on the following criteria:

- Topography / terrain of the study area
- Regional synoptic scale climatologically normal
- Densely populated areas within the region
- Location of surrounding industries
- Representation of regional background
- Representation of valid cross-sectional distribution in downwind direction

3.3.2 RECONNAISSANCE

Reconnaissance was undertaken to establish the baseline status of air environment in the study region. Eight Ambient Air Quality Monitoring (AAQM) locations were selected based on guidelines of network sitting criteria. All AAQM locations were selected within the study area of 10 km radial distance from the project site.

3.3.3 METHODOLOGY FOR AMBIENT AIR QUALITY MONITORING

The ambient air quality monitoring was carried out in accordance with guidelines of Central Pollution Control Board (CPCB) of June 1998 and National Ambient Air Quality Standards (NAAQS) of CPCB of May 1994. Ambient Air Quality Monitoring (AAQM) was carried out at eleven locations during October 1st, 2008 to December 31st, 2008 for parameters such as Suspended Particulate Matter (SPM), Respirable Suspended Particulate Matter (RSPM), Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NOx). Sampling locations were selected from the study area of 10 km radial distance around the plant site. The monitoring was carried out 24 hours a day twice a week per location in the study area except the project site, where continuous monitoring was carried out. Twenty Six numbers of observations were taken at each monitoring location except the project site. The locations of the different stations with respect to its distance and direction from project site are shown in table-3.2 and figure-3.3 respectively.

The values for mentioned concentrations of various pollutants at all the monitoring locations were processed for different statistical parameters like arithmetic mean, minimum concentration, and maximum concentration and percentile values. The existing baseline levels of SPM, RSPM, SO_2 and NO_x are expressed in terms of various statistical parameters as given in tables-3.2 National ambient air quality monitoring standards are enclosed as **Annexure-1.**

TABLE - 3.2 DETAILS OF AMBIENT AIR QUALITY MONITORING LOCATIONS

SR. NO.	NAME OF VILLAGE	BEARING W.R.T. PROJECT SITE	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE (KM)	TYPE OF AREA
1.	Project Site A(1)	-	0	Industrial
2.	Tandu (A2)	E	0.6	Residential
3.	Lolung Moupur (A3)	NE	1.3	Residential
4.	Dhemai (A4)	S	1.6	Residential
5.	Ural (A5)	N	4.7	Residential
6.	Sonapur (A6)	S	4.5	Residential
7.	H. M. Cement (A7)	SW	5	Residential

3.3.4 BASELINE STATUS

The statistical interpretation of observed ambient air quality concentrations is presented in table-3.3. They represent the cross sectional distribution of the baseline air quality status of the study region.

The arithmetic mean and 98th percentile values of 24 hourly SPM at all the locations ranged between 122-187 $\mu g/m^3$ and 136.3-196.21 $\mu g/m^3$ respectively in the study period. Similarly, the arithmetic mean and 98th percentile values of RSPM varied in the range of 41-84 $\mu g/m^3$ and 44.5-107.1 $\mu g/m^3$ respectively. The SPM and RSPM concentrations at all the AAQM locations were primarily caused by local phenomena including vehicular activities and natural dust getting air borne due to man made activities and blowing wind.

The arithmetic mean and 98th percentile values of SO_2 at all the locations were observed to be in the range of 6.4-32 $\mu g/m^3$ and 7.3-52.01 $\mu g/m^3$ respectively. The arithmetic mean and 98th percentile values of NO_x at all the locations ranged between 4-14.2 $\mu g/m^3$ and 4.1-17.31 $\mu g/m^3$ respectively.

At all the ambient air quality monitoring locations, the 98th percentile values of SO_2 and NO_x were observed to be within limits.

FIGURE - 3.3 LOCATION OF AMBIENT AIR QUALITY MONITORING STATIONS

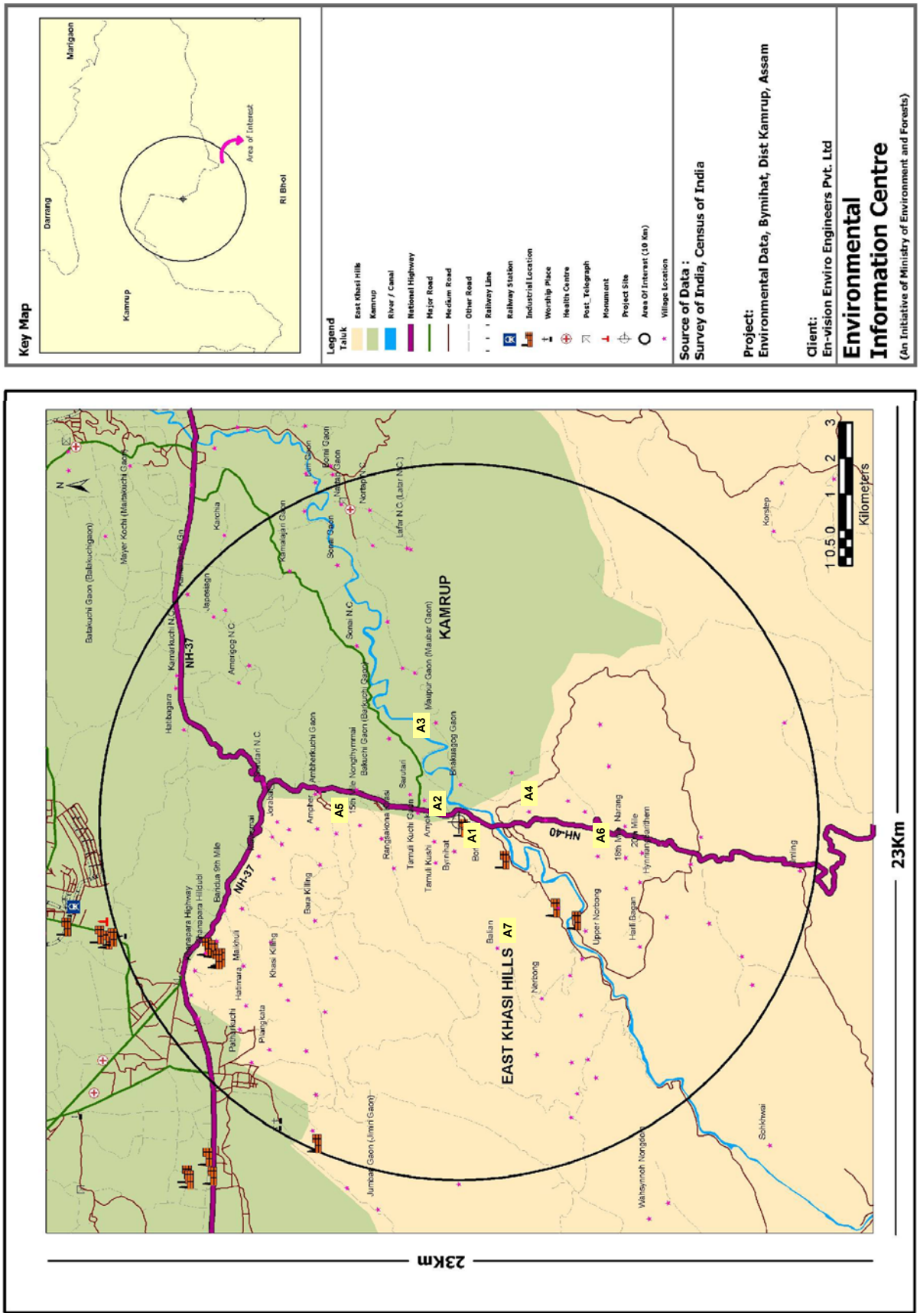


TABLE - 3.3 AMBIENT AIR QUALITY STATUS

Unit: µg/m^3 **Period: 24 Hours**

SR. NO.	SAMPLING LOCATION	SPM	RSPM	NO_X	SO_2
		AVERAGE (MIN-MAX)			
1.	Project Site A(1)	187 (180-198)	84 (72-102)	14 (10 - 18)	32 (21-53)
2.	Tandu (A2)	122 (110-138)	51 (48-64)	4 (3 - 8)	12 (10-16)
3.	Lolung Moupur (A3)	135 (124-158)	68 (51-108)	4.2 (2 - 5)	6.4 (5 - 8)
4.	Dhemai (A4)	132 (120-149)	52 (48-68)	4.2 (3 - 5)	8 (4 - 14)
5.	Ural (A5)	162 (152-191)	59 (53-71)	4.5 (3 - 7)	8 (6 - 12)
6.	Sonapur (A6)	135 (128-152)	41 (39-46)	5 (3 - 7)	12 (10 - 16)
7.	H. M. Cement (A7)	186 (178-196)	56 (53-64)	14.2 (11-19.4)	28 (23 - 42)
AMBIENT AIR QUALITY MONITORING STANDARDS (CPCB LIMIT)					
Industrial		100	200	80	80
Residential		150	500	120	120
Sensitive		75	100	30	30

TABLE - 3.3(CONT.) AMBIENT AIR QUALITY STATUS: 98th PERCENTILE

SR. NO.	SAMPLING LOCATION	98th PERCENTILE			
		SPM	RSPM	NO_X	SO_2
1.	Project Site A(1)	196.21	101.3	16.8	52.01
2.	Tandu (A2)	136.3	62.78	7.2	14.96
3.	Lolung Moupur (A3)	156.1	107.1	4.5	7.3
4.	Dhemai (A4)	147.42	67.2	4.1	13.21
5.	Ural (A5)	189.2	69.84	5.9	10.87
6.	Sonapur (A6)	150.23	44.5	5.89	14.65
7.	H. M. Cement (A7)	194.6	63.2	17.31	41.05

3.4 WATER ENVIRONMENT

3.4.1 SOURCE OF WATER

Water requirement shall be met through existing bore well within premises.

3.4.2 METHODOLOGY FOR WATER QUALITY MONITORING

Physico-chemical parameters have been analyzed to ascertain the baseline status existing surface water and ground water bodies. Samples were collected once during the study period in November, 2008. The details of surface and ground water sampling locations are given in table-3.4 and sampling locations of water quality monitoring are shown in figure-3.4. The Indian standard specification for drinking water is enclosed as Annexure-2 and CPCB standards of classification of inland surface water as Annexure-3. The physico-chemical characteristics of the different water samples are presented in the tables-3.5.

TABLE - 3.4 DETAILS OF GROUND AND SURFACE WATER MONITORING LACATIONS

SR. NO.	SAMPLING LOCATIONS	BEARING W. R.T. PROJECT SITE	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE (KM)
1.	Project site (GW1)	-	0
2.	Dhemai (GW2)	S	1.6
3.	Lolung Moupur (GW3)	NE	1.3
4.	Ural (GW4)	N	4.7
5.	Sonapur (GW5)	S	4.5
6.	H. M. Cement Ltd. (GW6)	S	4.5
7.	Project site River Water (SW1)	SW	0

GW= Ground water, SW= Surface water

FIGURE - 3.4 LOCATIONS OF WATER SAMPLING STATIONS

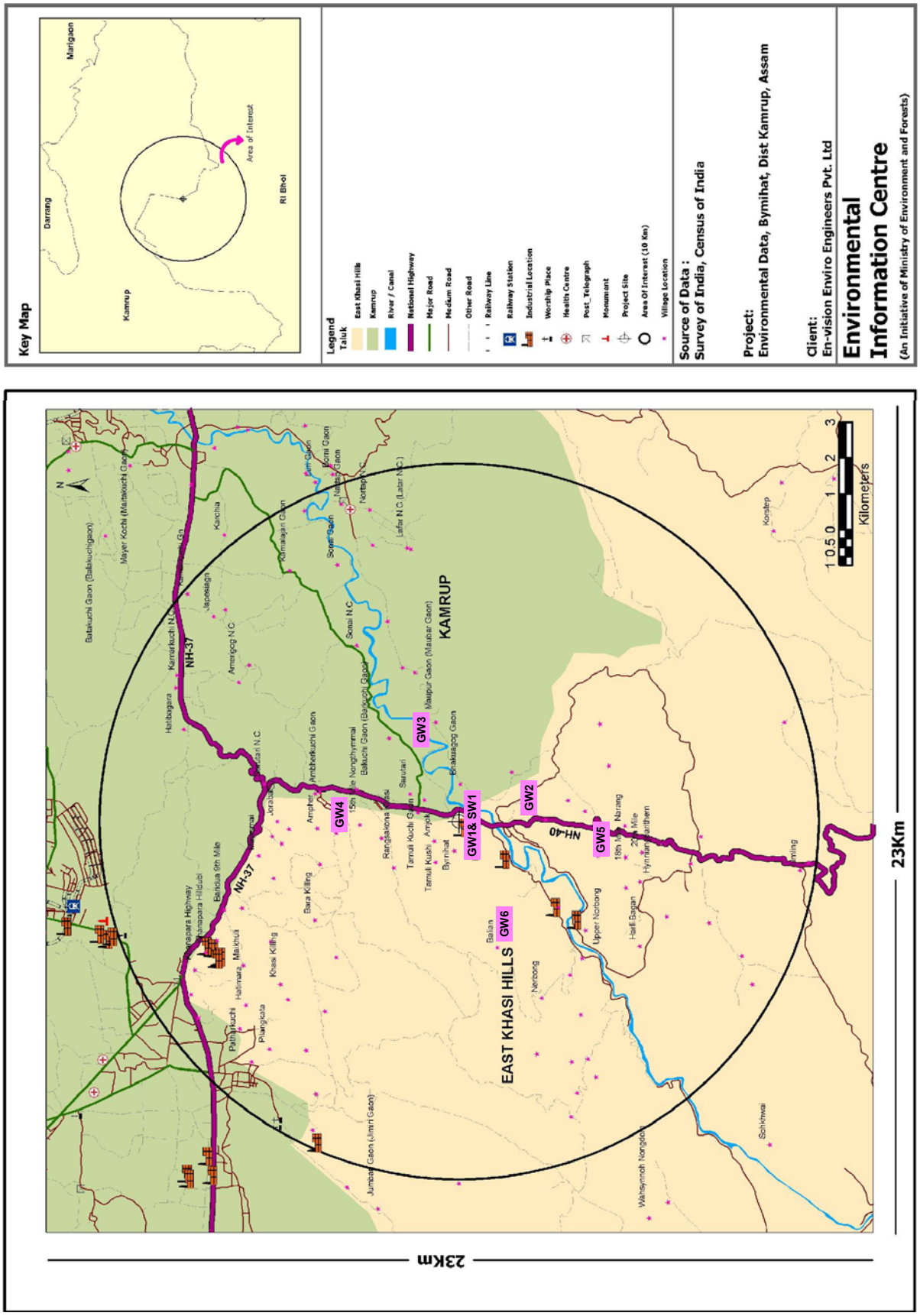


TABLE - 3.5 BASELINE WATER QUALITY

S. NO.	PARAMETERS	PROJECT SITE (GW1)	DHEMAI (GW2)	LOLUNG MOUPUR (GW3)	URAL (GW4)	SONAPUR (GW5)	H.M.CEMENT LTD. (GW6)	PROJECT SITE (SW1)
1.	pH	6.7	7.5	7.4	6.8	6.2	7.5	8.1
2.	Temp (^oC)	27	28	26	27	26	28	27
3.	SS (mg/l)	31	19	21	16	08	40	29
4.	TDS (mg/l)	440	520	560	556	436	564	738
5.	BOD_3 (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	08
6.	COD (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	35
7.	Oil & Grease (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	1.6
8.	Chlorides (mg/l)	200	195	210	245	135	209	225
9.	Sulphate (mg/l)	82	68	102	132	97	53	118
10.	C.H (as $CaCO_3$)	80	140	85	110	60	120	120
11.	M.H (as $CaCO_3$)	10	15	08	12	06	13	18
12.	Iron (mg/l)	0.43	0.40	0.35	0.35	0.51	0.50	0.91
13.	Copper (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	BDL
14.	Phosphates (mg/l)	ND	ND	ND	ND	ND	ND	ND
15.	Nitrates (mg/l)	ND	ND	ND	ND	ND	ND	ND
16.	Fluoride (mg/l)	ND	ND	ND	ND	ND	ND	ND
17.	Chromium (mg/l)	ND	ND	ND	ND	ND	ND	ND
18.	Cadmium (mg/l)	ND	ND	ND	ND	ND	ND	ND
19.	Nickle (mg/l)	ND	ND	ND	ND	ND	ND	ND
20.	Lead (mg/l)	ND	ND	ND	ND	ND	ND	ND
21.	Zinc (mg/l)	ND	ND	ND	ND	ND	ND	ND
22.	Cynides (mg/l)	ND	ND	ND	ND	ND	ND	ND
23.	Arsenic (mg/l)	ND	ND	ND	ND	ND	ND	ND

GW = Ground water, SW = Surface water, T.S.S. = Total Suspended Solids, T.D.S. = Total Dissolved Solids C.O.D. = Chemical Oxygen Demand, B.O.D. = Bio-logical oxygen Demand, BDL = Below Detectable Limit.

3.5 NOISE ENVIRONMENT

The objective of the noise pollution survey around the project site was to identify existing noise sources and to measure background noise levels. The study was carried out in the following steps:

- Reconnaissance
- Identification of noise sources and measurement of noise levels
- Measurement of noise levels due to transportation
- Community noise levels

3.5.1 RECONNAISSANCE

The details of location of background & transportation noise monitoring station are given in table-3.6, while the results of noise monitoring are given in table-3.7.

3.5.2 EQUIVALENT SOUND LEVELS OR EQUIVALENT CONTINUOUS EQUAL ENERGY LEVEL (L_{eq})

There is large number of noise scales and rating methods based on some sort of average of weighted average quantities derived from the detailed noise characteristics. Equivalent sound levels or Equivalent continuous equal energy level (L_{eq}) is a statistical value of sound pressure level that can be equated to any fluctuating noise level and forms a useful measure of noise exposure and forms basis of several of the noise indices used presently.

L_{eq} is defined as the constant noise level, which over a given time, expands the same amount of energy, as is expanded by the fluctuating level over the same time. This value is expressed by the equation:

$$L_{eq} = 10 \log \sum_{i=1}^{i=n} (10)^{Li/10} \times ti$$

Where, n = Total number of sound samples,

Li = The noise level of any i^{th} sample

ti = Time duration of i^{th} sample,

Expressed as fraction of total sample time

Leq has gained wide spread acceptance as a scale for the measurement of long term noise exposure. Hourly equipment noise levels in the identified impact zone are monitored for day and time separately using sound level meter. All the values are reported in Leq and in case of equipment noise, Sound pressure level are monitored 1.5 m away from the machine and assessed with respect to standard prescribed in factory Act.

3.5.3 METHODOLOGY FOR NOISE MONITORING

Noise standards have been designated for different types of area, i.e. residential, commercial, industrial and silence zones, as per 'The Noise Pollution (Regulation and Control) Rules, 2000, Notified by Ministry of Environment and Forests, New Delhi, February 14, 2000. Different standards have been stipulated for day time (6 am to 10 pm) and night time (10 pm to 6 am).

Ambient noise level monitoring was done at same locations where ambient air monitoring was carried out within a study area. The locations are away from the major roads and major noise sources so as to measure ambient noise levels. One day monitoring was carried out at all the locations November 2006. The frequency of monitoring was set at an interval of 15 seconds over a period of 10 minutes per hour for 24-hours. The observed Equivalent sound levels (Leq) values in dBA are given in table-3.7 for each monitoring location in distinguished form of day time (6 am to 10 pm) and night time (10 pm to 6 am).
All measurements were carried out when the ambient conditions were unlikely to adversely affect the results.

TABLE - 3.6 DETAILS OF LOCATION OF BACKGROUND & TRANSPOTATION NOISE MONITORING STATIONS

SR. NO.	NAME OF VILLAGE	BEARING W.R.T. PROJECT SITE	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE
1.	Project Site (N 1)	-	0
2.	Tandu (N2)	E	0.6
3.	Lolung Moupur (N3)	NE	1.3
4.	Dhemai (N4)	S	1.6
5.	Ural (N5)	N	4.7
6.	Sonapur (N6)	S	4.5
7.	H. M. Cement (N7)	SW	5
8.	National Highway 40 (NT1)	E	0.33
9.	National Highway 37 (NT2)	NW	5.5

TABLE - 3.7 BACKGROUND NOISE LEVELS

SR. NO.	LOCATION	CATEGORY OF AREA	Noise Level (Leq) in dBA (Day time) (0600 to 2100 hrs.)	Noise Level (Leq) in dBA (Night time) (2100 to 0600 hrs.)
1.	Project Site A(1)	Industrial	68 - 72	60 - 68
2.	Tandu (A7)	Residential	47.3 - 52	38.3 - 40.3
3.	Lolung Moupur (A6)	Residential	51 - 56	35.7 - 41
4.	Dhemai (A2)	Residential	46 - 49	36.6 - 40
5.	Ural (A3)	Residential	48.4 - 52	34.8 - 41.4
6.	Sonapur (A4)	Residential	44.7 - 49	33.2 - 39.3
7.	H. M. Cement (A5)	Residential	47.6 - 51.2	32.1 - 40.4

3.5.4 BASELINE NOISE LEVELS

The noise level measured in study area at different locations is given in table-3.7. The Project site is only pertaining in category of industrial area and the noise level was found 68-72 dBA in daytime and 60-68 dBA in nighttime. The noise levels varied in the residential area of the study area during day time [night time] in the range of 41-56 [32.1-41.4] dBA. The noise sources identified in industrial zone are vehicular traffic, industrial and commercial activities. CPCB recommendation for community noise exposure in different category of area (i.e. residential, commercial, industrial and silence zone) is enclosed as Annexure-4, while Damage risk criteria for hearing loss given by occupational safety & health administration (OSHA) is enclosed as Annexure-5. The observed noise levels were below the stipulated standards of CPCB.

3.5.5 NOISE LEVELS DUE TO TRANSPORTATION

Noise levels were also measured at four different locations in November, 2008. The equivalent noise level Leq (60 min average) measured at a distance of 10 m and 20 m from the edge of the road at each of the locations are presented in table-3.8. The monitoring locations are shown in figure-3.5.

TABLE - 3.8 NOISE LEVELS DUE TO TRANSPORTATION

SR. NO.	SAMPLING LOCATION	NOISE LEVEL IN dBA		TIME
		10 m FROM EDGE OF THE ROAD	20 m FROM EDGE OF THE ROAD	
1.	National Highway 40 (NT1)	65.5	61.1	Day
		61.4	60.5	Night
2.	National Highway 37 (NT2)	63.3	62.8	Day
		60.4	57.4	Night

3.5.6 COMMUNITY NOISE LEVELS

The communities close to the project site are not exposed to major noise sources. The commercial activities and transport apart from natural sources contribute to community noise levels. The noise levels close to project site were low and within the stipulated standards of CPCB for the respective designated areas.

3.6 LAND ENVIRONMENT

3.6.1 METHODOLOGY FOR SOIL MONITORING

Soil samples were collected from six different locations within the study area in November, 2008. The locations selected for collection of soil samples are presented in table-3.9.
The analysis results of soil samples collected from the study area given in table-3.10.

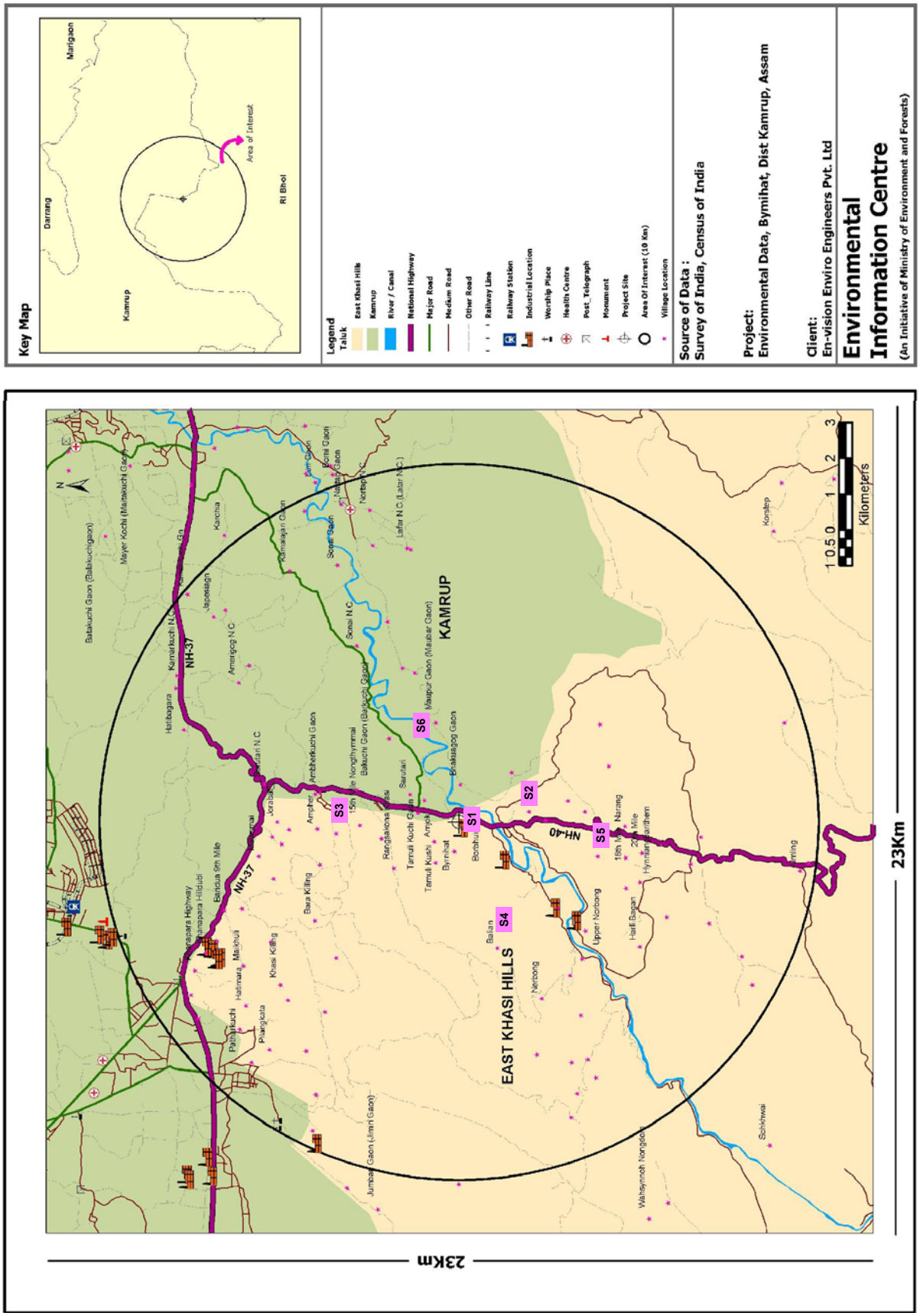
TABLE - 3.9 SAMPLING LOCATIONS: SOIL QUALITY

SR. NO.	SAMPLING LOCATION	BEARING W.R.T. PROJECT SITE	APPROXIMATE RADIAL DISTANCE FROM PROJECT SITE (KM)
1.	Project site (S1)	-	-
2.	Dhemai (S2)	S	1.6
3.	Ural (S3)	N	4.7
4.	H.M.Cement Ltd. (S4)	SW	5
5.	Sonapur (S5)	S	4.5
6.	Lolung Moupur (S6)	NE	1.3

TABLE - 3.10 PHYSICO-CHEMICALS CHARACTERISTICS OF SOIL

SR. NO.	PARAMETERS	PROJECT SITE (S1)	DHEMAI (S2)	URAL (S3)	H.M.CEMENT LTD. (S4)	SONAPUR (S5)	LOLUNG MOUPUR (S6)
1.	Porosity (%)	49.2	46	35	46	32	42
2.	W.H.C. (%)	51.4	48.3	37.4	48.9	37.4	45
3.	Bulk Density (gm/cm^3)	1.23	1.19	1.33	1.29	1.30	1.22
4.	pH	8.3	7.8	7.0	7.9	7.2	8.3
5.	Organic Carbon (mg/kg)	0.55	0.69	1.62	0.63	1.32	0.90
6.	Organic Matter (mg/kg)	0.95	1.31	2.79	0.82	1.39	1.21
7.	Nitrogen (mg/kg)	0.032	0.075	0.083	0.043	0.075	0.080
8.	Phosphate (mg/kg)	0.091	0.10	0.12	0.081	0.18	0.13
9.	Potassium (mg/kg)	0.82	0.07	0.09	0.95	0.07	0.08
10.	Magnesium (mg/kg)	0.31	0.38	0.52	0.24	0.61	0.35
11.	Iron (mg/kg)	0.72	0.90	0.68	0.77	0.64	0.81
12.	Zinc (mg/kg)	0.038	0.045	0.041	0.031	0.040	0.035
13.	Lead (mg/kg)	BDL	BDL	BDL	BDL	BDL	BDL
14.	Chromium (mg/kg)	0.11	0.074	0.068	0.10	0.052	0.084
15.	Calcium (mg/kg)	474	523	270	510	290	612
16.	Sodium (mg/kg)	1900	620	400	1520	560	700
17.	Manganese (mg/kg)	526	551	315	540	343	671

FIGURE - 3.5 LOCATIONS OF SOIL SAMPLING STATIONS



3.7 SOCIO - ECONOMIC ENVIRONMENT

An assessment of socio - economic environment forms an integral part of an EIA study. Therefore, baseline information for the same was collected during the study period. The baseline socio - economic data collected for the study region, has been identified for the four major indicators viz. demography, civic amenities, economy and social culture. The baseline status of the above indicators is compiled in forthcoming sections.

3.7.1 POPULATION DATA

On an average, Taluka Kamrup has population density of about 579 persons per sq. km. (2001 Census data). Village wise demographic data of the region of interest is given in the table-3.11. While population details (i.e. population distribution, population density and sex ration) of the study area, and District Kamrup are given in table-3.12 and graphical representation is given in figure-3.6.

TABLE - 3.11 POPULATION DATA AS PER CENSUS – 2001

S.No.	Village Name	No. of Household	Total Population	Total Male	Total Female	Population <06 years	Male<06 years	Female<06 years
1.	Barapathar	30	133	71	62	32	16	16
2.	Pilangkata	121	618	321	297	65	35	30
3.	Jorbhung(A & B)	50	228	135	93	43	33	10
4.	Patharkuchi	59	392	197	195	45	28	17
5.	Hatimara	61	393	199	194	57	30	27
6.	Maikhuli	81	455	235	220	96	48	48
7.	Koinadhara	10	64	34	30	4	2	2
8.	Lalmati	56	287	158	129	61	37	24
9.	Khanapara Highway	151	948	481	467	136	64	72
10.	Khanapara Hilldubi	60	313	152	161	60	26	34
11.	Baridua 8th Mile	50	263	132	131	56	23	33
12.	Baridua 9th Mile	290	1532	856	676	275	144	131
13.	Baridua 10th Mile	17	64	53	11	6	2	4
14.	Pahamkmiedum	44	209	105	104	40	22	18
15.	Mawsmai	115	720	378	342	111	60	51
16.	Nongthymmai Garo	76	426	219	207	97	47	50
17.	Khasi Killing	60	335	177	158	70	33	37
18.	Umdem	16	84	48	36	12	8	4
19.	Umnowe	24	124	69	55	24	14	10
20.	Umdoba	53	268	141	127	59	25	34
21.	Chota Killing	16	85	42	43	23	12	11
22.	Bara Killing	59	307	160	147	58	28	30
23.	Jorabat	78	326	224	102	26	14	12
24.	Jolbir	37	205	94	111	41	17	24
25.	Model Village	28	127	64	63	16	9	7
26.	Ampher	111	446	246	200	84	44	40
27.	Amphanggiri	38	191	102	89	33	10	23
28.	15th Mile Nongthymmai	188	1012	532	480	235	111	124
29.	Nongkylla Khasi	39	186	99	87	32	17	15
30.	Rangsakona Khasi	65	369	169	200	99	47	52
31.	Amjok	161	833	451	382	162	91	71
32.	Tamuli Kushi	127	594	312	282	104	49	55
33.	Byrnihat	98	538	274	264	107	55	52
34.	Upper Balian	56	258	129	129	58	19	39
35.	Balian	71	310	170	140	64	34	30
36.	Kongkhatkhuli	6	40	19	21	7	4	3
37.	Santipur	48	249	136	113	52	30	22
38.	Panitola Damsite	28	128	75	53	18	9	9

S.No.	Village Name	No. of Household	Total Population	Total Male	Total Female	Population <06 years	Male<06 years	Female<06 years
39.	Umtrew Colony	39	103	67	36	15	8	7
40.	Pahamsohbar	11	45	14	31	18	4	14
41.	Nerbong	108	503	283	220	75	35	40
42.	Dehal	52	276	145	131	55	30	25
43.	17th Mile	48	270	142	128	53	28	25
44.	18th Mile	93	508	269	239	124	62	62
45.	19th Mile	19	91	51	40	14	9	5
46.	Harli Bagan	108	539	279	260	110	53	57
47.	Hynniangbarithem	99	631	344	287	108	57	51
48.	Hynniangbarilum	40	218	109	109	47	19	28
49.	Upper Bagan	23	165	50	51	32	17	15
50.	Kongripara	38	209	103	106	60	28	32
51.	Umdu	50	263	135	128	64	34	30
52.	Umladoh	17	62	30	32	15	8	7
53.	Umling Soil Conservation	13	42	23	19	11	5	6
54.	Umling	208	1037	514	523	224	119	105
55.	Sohpu	7	54	33	21	15	9	6
56.	20th Mile	95	474	257	217	111	56	55
57.	Narang	65	381	203	178	75	37	38
58.	Umdap Rngi	20	129	60	69	28	13	1559
59.	Umjong	28	159	75	84	35	19	16
60.	Ranghona	23	161	88	73	32	20	12
61.	Lum Nongthymmai	36	203	103	100	36	18	18
62.	Shakai Kuna	36	214	106	108	53	27	26
63.	Umdap Dumu	26	149	73	76	27	15	12
64.	Umling Lambrang	41	236	112	124	59	27	32
65.	Daka Pathar	8	36	21	15	1	0	1
66.	Woksikathem	18	100	57	43	15	7	8
67.	Matchokgre	21	127	72	55	22	14	8
68.	Borbhuin	110	472	256	216	82	40	42
69.	Bolbhalu	26	125	67	58	25	16	9
70.	Rubber Ghuli	10	48	25	23	13	8	5
71.	Upper Norbong	75	393	204	189	67	35	32
72.	Joyna Bil	29	157	82	75	34	15	19
73.	Umsarang	36	165	79	86	37	16	21
74.	Bojora N.C.	33	157	85	72	33	14	19
75.	Kamarkuchi N.C.	86	303	177	126	46	24	22
76.	Japesiagn	314	1699	876	823	239	121	118
77.	Kamarkuchi Gn	302	1513	784	729	241	124	117
78.	Amerigog N.C.	572	2802	1630	1172	433	221	212
79.	Upper Tapesia N.C.	31	160	86	74	26	15	11
80.	Tapesia N.C.	1	5	2	3	1	1	0
81.	Karchia N.C.	11	56	27	29	13	4	9
82.	Kamalajari Gaon	206	1312	692	620	169	82	87
83.	Sonai Gaon	163	1197	607	590	180	97	83
84.	Morang Dala	24	139	72	67	25	13	12
85.	Sarutari	93	744	443	301	66	33	33
86.	Tamuli Kuchi Gaon	256	1182	639	543	202	103	99
87.	Ambherkuchi Gaon	113	596	318	278	131	63	68
88.	Sonai N.C.	72	421	205	216	77	37	40
89.	Moragdala N.C.	34	189	80	109	20	7	13

S.No.	Village Name	No. of Household	Total Population	Total Male	Total Female	Population <06 years	Male<06 years	Female<06 years
90.	Sorutari N.C.	90	464	241	223	86	44	42
91.	Ambher N.C.	32	153	86	67	36	20	16
92.	Bakuchi Gaon	181	1132	601	531	187	105	82
93.	Bhakuagog Gaon	61	343	176	167	52	24	28
94.	Nartap Gaon	133	777	384	393	124	60	64
95.	Lofar Gaon	36	282	139	143	28	7	21
96.	Dhami Gaon	42	272	133	139	39	22	17
97.	Maupur Gaon	59	364	190	174	58	32	26
98.	Aperikala Gaon	26	139	68	71	13	4	9
99.	Phokuwagog Gaon	10	42	22	20	9	5	4
100.	Nortap N.C.	54	308	159	149	34	19	15
101.	Lafar N.C.(Latar N.C.)	64	383	191	192	88	46	42
102.	Dhemay N.C.	35	195	99	96	20	7	13
103.	Maupur N.C.	26	132	75	57	23	14	9
104.	Hatibagara	109	653	357	296	84	48	36

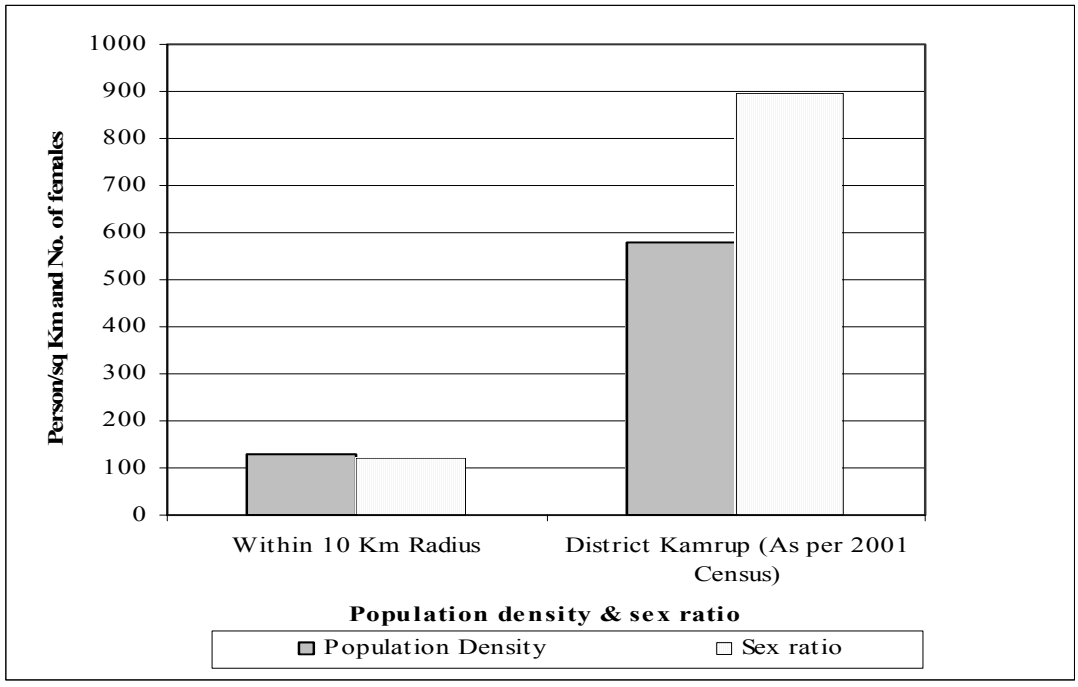
(Courtesy: Environmental Information Centre, New Delhi)

TABLE - 3.12 POPULATION DENSITIES AND SEX RATIO

NAME	POPULATION (PERSONS)	POPULATION DENSITY (PERSON / SQ. KM.)	SEX RATIO (NO. OF FEMALES PER 1000 MALES)
Within 10 Km Radius	40919	130.3153	121
District Kamrup (As per 2001 Census)	2515030	579	894.25

(Courtesy: Census Dept., GOI)

FIGURE - 3.6 GRAPHICAL REPRESENTATION POPULATION DENSITY AND SEX RATIO



3.7.2 LITERACY DATA

The literacy rate is a major factor, which influences the socio-cultural condition of a particular place. Details of literacy data as per 2001 Census of the study area is given in table-3.13. Literacy rate data as per 2001 Census, in within 10 km radius of project site, district Kamrup is given in table-3.14, while graphical representation is shown in figure-3.7.

TABLE - 3.13 LITERACY DATA OF THE STUDY AREA AS PER CENSUS – 2001

Sr. No	Village Name	Population Literate	Male Literate	Female Literate	Population Illiterate	Male Illiterate	Female Illiterate
1.	Barapathar	29	19	10	104	52	52
2.	Pilangkata	542	283	259	76	38	38
3.	Jorbhung(A & B)	19	11	8	209	124	85
4.	Patharkuchi	283	151	132	109	46	63
5.	Hatimara	214	123	91	179	76	103
6.	Maikhuli	304	171	133	151	64	87
7.	Koinadhara	45	25	20	19	9	10
8.	Lalmati	135	82	53	152	76	76
9.	Khanapara Highway	748	396	352	200	85	115
10.	Khanapara Hilldubi	113	64	49	200	88	112
11.	Baridua 8th Mile	149	82	67	114	50	64
12.	Baridua 9th Mile	848	541	307	684	315	369
13.	Baridua 10th Mile	47	41	6	17	12	5
14.	Pahamkmiedum	157	80	77	52	25	27
15.	Mawsmai	477	274	203	243	104	139
16.	Nongthymmai Garo	280	153	127	146	66	80
17.	Khasi Killing	164	99	65	171	78	93
18.	Umdem	70	40	30	14	8	6
19.	Umnowe	39	25	14	85	44	41
20.	Umdoba	93	60	33	175	81	94
21.	Chota Killing	42	25	17	43	17	26
22.	Bara Killing	150	89	61	157	71	86
23.	Jorabat	260	192	68	66	32	34
24.	Jolbir	142	71	71	63	23	40
25.	Model Village	98	53	45	29	11	18
26.	Ampher	328	187	141	118	59	59
27.	Amphanggiri	93	65	28	98	37	61
28.	15th Mile Nongthymmai	518	307	211	494	225	269
29.	Nongkylla Khasi	127	72	55	59	27	32
30.	Rangsakona Khasi	162	83	79	207	86	121
31.	Amjok	508	294	214	325	157	168
32.	Tamuli Kushi	332	201	131	262	111	151
33.	Byrnihat	346	183	163	192	91	101
34.	Upper Balian	64	46	18	194	83	111
35.	Balian	129	83	46	181	87	94
36.	Kongkhatkhuli	18	9	9	22	10	12
37.	Santipur	86	51	35	163	85	78
38.	Panitola Damsite	57	40	17	71	35	36
39.	Umtrew Colony	75	55	20	28	12	16
40.	Pahamsohbar	8	2	6	37	12	25

Sr. No	Village Name	Population Literate	Male Literate	Female Literate	Population Illiterate	Male Illiterate	Female Illiterate
41.	Nerbong	325	213	112	178	70	108
42.	Dehal	87	54	33	189	91	98
43.	17th Mile	110	66	44	160	76	84
44.	18th Mile	198	101	97	310	168	142
45.	19th Mile	34	19	15	57	32	25
46.	Harli Bagan	357	203	154	182	76	106
47.	Hynniangbarithem	378	210	168	253	134	119
48.	Hynniangbarilum	124	68	56	94	41	53
49.	Upper Bagan	37	20	17	64	30	34
50.	Kongripara	42	22	20	167	81	86
51.	Umdu	130	66	64	133	69	64
52.	Umladoh	15	10	5	47	20	27
53.	Umling Soil Conservation	6	6	0	36	17	19
54.	Umling	612	320	292	425	194	231
55.	Sohpu	11	9	2	43	24	19
56.	20th Mile	238	147	91	236	110	126
57.	Narang	60	41	19	321	162	159
58.	Umdap Rngi	43	23	20	86	37	49
59.	Umjong	71	34	37	88	41	47
60.	Ranghona	88	47	41	73	41	32
61.	Lum Nongthymmai	142	79	63	61	24	37
62.	Shakai Kuna	107	57	50	107	49	58
63.	Umdap Dumu	50	24	26	99	49	50
64.	Umling Lambrang	89	52	37	147	60	87
65.	Daka Pathar	13	9	4	23	12	11
66.	Woksikathem	42	28	14	58	29	29
67.	Matchokgre	77	46	31	50	26	24
68.	Borbhuin	308	182	126	164	74	90
69.	Bolbhalu	10	8	2	115	59	56
70.	Rubber Ghuli	19	11	8	29	14	15
71.	Upper Norbong	196	131	65	197	73	124
72.	Joyna Bil	32	23	9	125	59	66
73.	Umsarang	52	37	15	113	42	71
74.	Bojora N.C. (Bazbra N.C.)	77	51	26	80	34	46
75.	Kamarkuchi N.C.	130	92	38	173	85	88
76.	Japesiagn	1046	609	437	653	267	386
77.	Kamarkuchi Gn	876	506	370	637	278	359
78.	Amerigog N.C.	1720	1106	614	1082	524	558
79.	Upper Tapesia N.C.	93	55	38	67	31	36
80.	Tapesia N.C.	3	1	2	2	1	1
81.	Karchia N.C.	22	14	8	34	13	21
82.	Kamalajari Gaon	841	487	354	471	205	266
83.	Sonai Gaon	397	220	177	800	387	413
84.	Morang Dala	67	42	25	72	30	42
85.	Sarutari	226	149	77	518	294	224
86.	Tamuli Kuchi Gaon	706	437	269	476	202	274

Sr. No	Village Name	Population Literate	Male Literate	Female Literate	Population Illiterate	Male Illiterate	Female Illiterate
87.	Ambherkuchi Gaon	330	206	124	266	112	154
88.	Sonai N.C.	252	137	115	169	68	101
89.	Moragdala N.C.	117	59	58	72	21	51
90.	Sorutari N.C.	240	134	106	224	107	117
91.	Ambher N.C.	78	48	30	75	38	37
92.	Bakuchi Gaon	660	383	277	472	218	254
93.	Bhakuagog Gaon	182	110	72	161	66	95
94.	Nartap Gaon	413	241	172	364	143	221
95.	Lofar Gaon	180	108	72	102	31	71
96.	Dhami Gaon	186	98	88	86	35	51
97.	Maupur Gaon	112	70	42	252	120	132
98.	Aperikala Gaon	82	48	34	57	20	37
99.	Phokuwagog Gaon	16	11	5	26	11	15
100.	Nortap N.C.	189	111	78	119	48	71
101.	Lafar N.C.(Latar N.C.)	113	72	41	270	119	151
102.	Dhemay N.C.	116	73	43	79	26	53
103.	Maupur N.C.	54	39	15	78	36	42

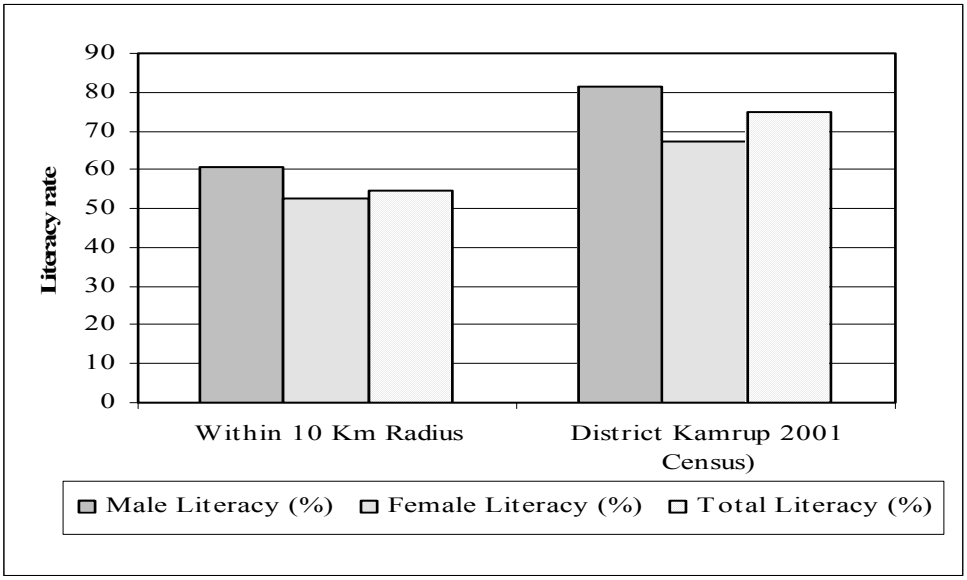
(Courtesy: Census Dept., GOI)

TABLE - 3.14 LITERACY RATE

Name	Male Literacy (%)	Female Literacy (%)	Total Literacy (%)
Within 10 Km Radius	60.68	52.36	54.53
District Kamrup (As per 2001 Census)	81.24	67.31	74.69

(Courtesy: Census Dept., GOI)

FIGURE - 3.7 GRAPHICAL REPRESENTATION OF LITERACY RATE



3.7.3 OCCUPATIONAL STRUCTURE

In economic development of the region its geographical location, natural resources, business and employment, industries and manpower play vital role. Table - 3.15 provides the occupational patterns in all villages falling within the area of interest.

TABLE - 3.15 OCCUPATIONAL STRUCTURE OF THE STUDY AREA (2001 DATA)

S. NO.	Village Name	Total Work Population	Main Worker Population	Main Cultivator Population	Main Household Population	Main Other Population	Marginal Worker Population
1.	Barapathar	38	29	3	0	23	9
2.	Pilangkata	155	152	42	2	108	3
3.	Jorbhung (A & B)	142	94	0	0	51	48
4.	Patharkuchi	100	77	24	0	53	23
5.	Hatimara	159	142	47	0	83	17
6.	Maikhuli	133	111	8	0	102	22
7.	Koinadhara	11	11	2	0	8	0
8.	Lalmati	74	59	47	0	6	15
9.	Khanapara Highway	165	165	4	1	159	0
10.	Khanapara Hilldubi	90	72	29	1	36	18
11.	Baridua 8th Mile	84	80	3	0	77	4
12.	Baridua 9th Mile	646	588	61	15	433	58
13.	Baridua 10th Mile	49	49	0	0	49	0
14.	Pahamkmiedum	99	99	23	0	76	0
15.	Mawsmai	292	288	42	0	242	4
16.	Nongthymmai Garo	105	77	35	0	21	28
17.	Khasi Killing	120	108	42	6	54	12
18.	Umdem	16	16	16	0	0	0
19.	Umnowe	36	33	24	0	8	3
20.	Umdoba	82	82	22	0	56	0
21.	Chota Killing	40	40	38	0	2	0
22.	Bara Killing	100	98	34	1	62	2
23.	Jorabat	177	176	2	2	170	1
24.	Jolbir	98	98	66	1	31	0
25.	Model Village	70	70	61	0	9	0
26.	Ampher	166	165	0	0	165	1
27.	Amphanggiri	108	108	6	0	102	0
28.	15th Mile Nongthymmai	505	354	133	88	120	151
29.	Nongkylla Khasi	73	61	24	0	34	12
30.	Rangsakona Khasi	121	118	26	1	91	3
31.	Amjok	303	225	57	8	143	78
32.	Tamuli Kushi	205	198	9	2	187	7
33.	Byrnihat	148	146	23	0	122	2
34.	Upper Balian	165	147	23	1	37	18
35.	Balian	190	162	14	0	121	28
36.	Kongkhatkhuli	28	24	0	0	0	4
37.	Santipur	153	137	95	0	4	16
38.	Panitola Damsite	72	32	13	0	13	40
39.	Umtrew Colony	49	44	0	0	44	5

S. NO.	Village Name	Total Work Population	Main Worker Population	Main Cultivator Population	Main Household Population	Main Other Population	Marginal Worker Population
40.	Pahamsohbar	23	23	23	0	0	0
41.	Nerbong	383	169	68	0	101	214
42.	Dehal	82	82	8	0	71	0
43.	17th Mile	132	124	71	3	31	8
44.	18th Mile	257	235	203	1	6	22
45.	19th Mile	55	32	4	0	15	23
46.	Harli Bagan	191	172	11	3	89	19
47.	Hynniangbarithem	256	223	90	0	39	33
48.	Hynniangbarilum	139	95	82	0	10	44
49.	Upper Bagan	42	40	17	0	4	2
50.	Kongripara	105	51	32	0	0	54
51.	Umdu	133	131	123	0	8	2
52.	Umladoh	42	41	0	8	0	1
53.	Umling Soil Conservation	27	27	0	0	27	0
54.	Umling	502	422	137	1	139	80
55.	Sohpu	20	19	16	0	1	1
56.	20th Mile	308	231	82	6	33	77
57.	Narang	222	129	72	4	14	93
58.	Umdap Rngi	60	56	47	0	8	4
59.	Umjong	94	94	90	1	3	0
60.	Ranghona	82	64	60	0	1	18
61.	Lum Nongthymmai	88	60	32	1	9	28
62.	Shakai Kuna	107	107	102	0	5	0
63.	Umdap Dumu	80	76	57	2	3	4
64.	Umling Lambrang	102	97	76	0	6	5
65.	Daka Pathar	36	23	19	0	0	13
66.	Woksikathem	27	25	17	0	8	2
67.	Matchokgre	58	54	1	0	53	4
68.	Borbhuin	163	159	33	5	108	4
69.	Bolbhalu	74	54	40	0	11	20
70.	Rubber Ghuli	29	24	18	0	1	5
71.	Upper Norbong	112	107	24	1	60	5
72.	Joyna Bil	59	49	18	0	6	10
73.	Umsarang	68	63	2	0	4	5
74.	Bojora N.C. (BazbraN.C.)	50	18	1	3	14	32
75.	Kamarkuchi N.C.	132	127	18	2	107	5
76.	Japesiagn	699	288	99	5	177	411
77.	Kamarkuchi Gn	598	488	75	6	389	110
78.	Amerigog N.C.	1002	888	6	24	858	114
79.	Upper Tapesia N.C.	84	56	16	3	32	28
80.	Tapesia N.C.	1	1	0	0	1	0
81.	Karchia N.C.	14	13	0	1	11	1
82.	Kamalajari Gaon	539	337	125	9	194	202
83.	Sonai Gaon	616	118	49	2	59	498
84.	Morang Dala	86	74	67	1	6	12

S. NO.	Village Name	Total Work Population	Main Worker Population	Main Cultivator Population	Main Household Population	Main Other Population	Marginal Worker Population
85.	Sarutari	471	470	9	13	448	1
86.	Tamuli Kuchi Gaon	363	350	30	20	235	13
87.	Ambherkuchi Gaon	239	223	72	5	143	16
88.	Sonai N.C.	166	138	79	3	54	28
89.	Moragdala N.C.	53	49	20	2	16	4
90.	Sorutari N.C.	149	138	6	5	127	11
91.	Ambher N.C.	63	60	16	3	24	3
92.	Bakuchi Gaon	659	264	156	0	79	395
93.	Bhakuagog Gaon	88	68	33	12	13	20
94.	Nartap Gaon	272	268	74	1	187	4
95.	Lofar Gaon (Luter Gaon)	172	82	58	1	12	90
96.	Dhami Gaon	103	90	68	3	19	13
97.	Maupur Gaon	163	136	118	3	13	27
98.	Aperikala Gaon	69	42	36	0	6	27
99.	Phokuwagog Gaon	23	16	12	0	4	7
100.	Nortap N.C.	123	77	42	1	23	46
101.	Lafar N.C.(Latar N.C.)	85	70	67	0	2	15
102.	Dhemay N.C.	84	45	40	1	4	39
103.	Maupur N.C.	45	45	38	6	1	0

(Courtesy: Environmental Information Center, New Delhi)

3.8 LAND USE PATTERN

Land use, in general, reflects the human beings activities on land, whereas the word land cover indicates the vegetation, agricultural and artificial manmade structures covering the land surfaces. Identification and periodic surveillance of land uses and vegetation covers, in the vicinity of any developmental activity is one of the most important components for an environmental impact assessment, which would help determine the impact of the project development activity on the land use pattern.

3.8.1 AREA UNDER DIFFERENT LANDUSE

The land use classification of Kamrup district under the respective classifications is as follows

a. Geographical Area - 4, 34, 500 ha.

b. Net Cultivated area. -1,81,608 ha

c. Forest Area. -1, 16,694 ha.

d. Fallow Land. - 7,110 ha.

e. Land not available for cultivation. - 89,542 ha.

f. Others. -1, 08,000 ha.

g. No.of Tea Gardens. - 15 Nos.

h. Area under Tea Cultivation. - 3,660 ha

i. Total tea production. -7, 72,640 kg.

j. Overall land utilization. - 1,304

3.9 BIOLOGICAL ENVIRONMENT

This site falls in the nearly exotic scenic beauty of the Umtru river and the Morokdola Forest Reserve area and has got an equable climate raining almost all round the year resulting in highly pleasant humid climatic type. Temperature as well as rainfall in the area is quite normal. The vegetation cover is of the evergreen type which is deciduous in nature.

The vegetation in Byrnihat area varies from evergreen to semi-evergreen deciduous forest. The Morokdola Forest Reserve is sparsely populated by many species of tall trees as shrubs. The dominant species available in the forest area are Shorea Robusta (Sal), Careya Arborea (Kumbhir), Lagerstraemia (Ajar), Schima Wallichi (Makori sal), Gmelina (Gumhar), Shorea Assamica (Makai), Engelhardtia (Lewa), kydia calycina (Ketra), Teak, Gamariso on and so forth. Further there is presence of white flowers, Strobilanthes with blue flowers, Mussenda with white or yellow leaf like sepal, Heimskieldia with red flowers adorn the forest cover of the area as undershrubs and shrubs.

3.10 CROPPING PATTERN OF THE REGION

Major crop of the study area is Rice, Wheat, Jute, and Maize.

3.11 INFRASTRUCTURE FACILITIES AVAILABLE IN STUDY AREA

Infrastructure resource base of the surveyed villages with reference to education, medical, water resources, post and telegraph, communication and power supply. There are 103 villages within study area of 10 km radius of plant site. Significant observations with respect to availability of amenities in study area are given in following table-3.16.

TABLE- 3.16 AMENITIES IN THE STUDY AREA

S. No.	Village	Total Area	Educational	Medical	Power Supply	Drinking Water	Communication
1.	Tandu	42	Primary	-	E	Tube well, River	Kaccha road, Pucca road
2.	Mikir Mohpur	56	Primary	-	E	River	Kaccha road, Pucca road
3.	Dhemal	62	-	-	E	Tube well River, pond	Kaccha road, Pucca road
4.	Sonaigaon	78	Primary	-	E	Tube well River, pond	Kaccha road, Pucca road
5.	Tamulikuchi	88	Primary	-	E	Tube well River, pond	Kaccha road, Pucca road
6.	Lalung Mohpur	32	-	-	E	Tube well River, pond	Kaccha road, Pucca road

CHAPTER – 4

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

CHAPTER – 4

ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 IDENTIFICATION OF IMPACTS

Various sources of pollution with respect to wastewater, the flue gas / process emission, hazardous waste and noise generation along with their qualitative and quantitative analysis as well as measures taken to control them are discussed herein with details. The network method was adopted to identify potential impact, which involves understanding of cause-condition-effect relationship between an activity and environmental parameters. This method involves the "road map" type of approach to the identification of second and third order effect. The basic idea is to account for the project activity and identify the type of impact that could initially occur followed by the identification of secondary and tertiary impacts.

Identified potential impacts for the various components of the environment, i.e. air, noise, water, land and socio-economic, are presented in Figure 4.1. It should be noted that in these illustrations the lines are to be read as "might have an effect on".

FIGURE - 4.1 IMPACT NETWORK ON AIR ENVIRONMENT

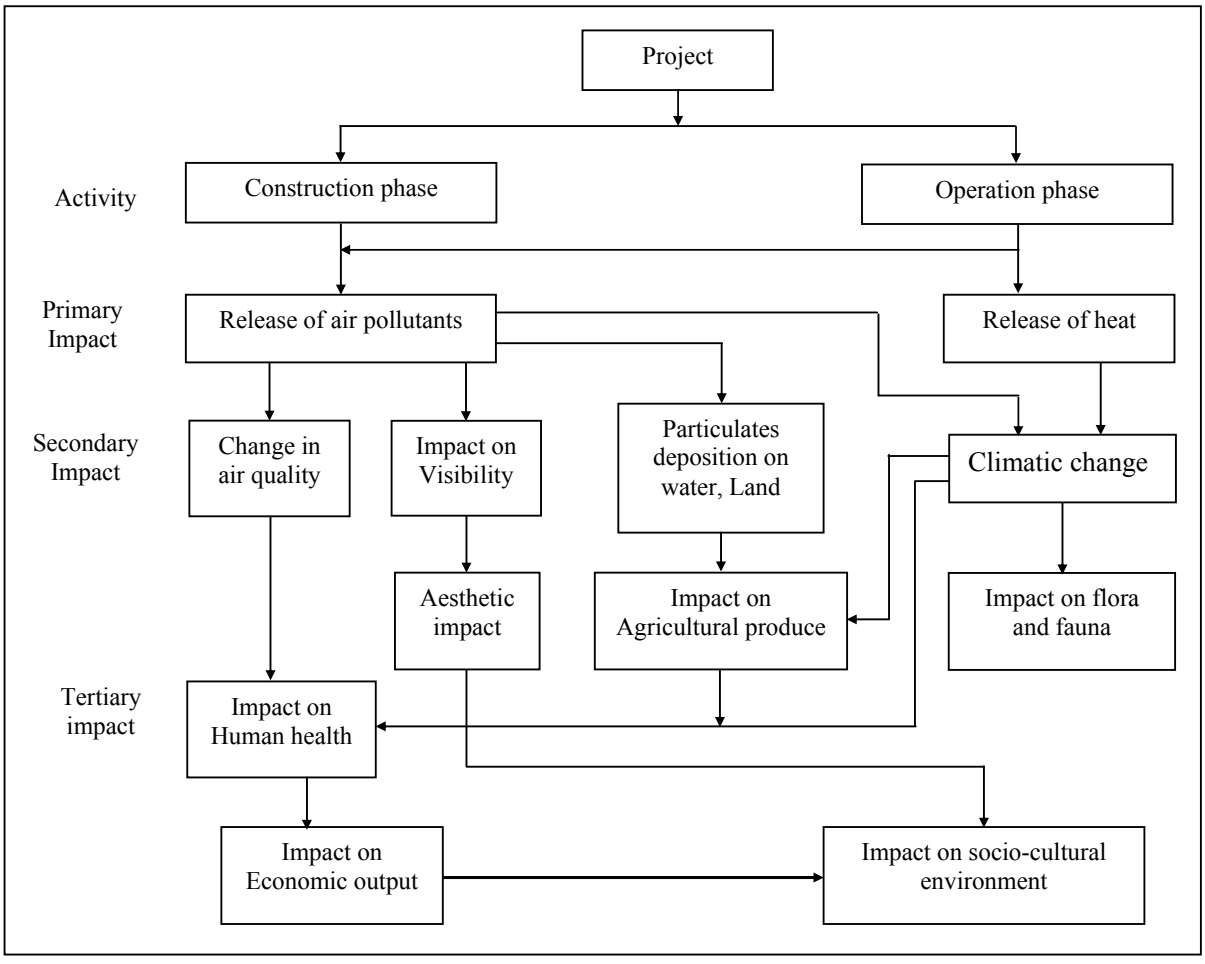


FIGURE - 4.1(CONT.) IMPACT ON WATER ENVIRONMENT

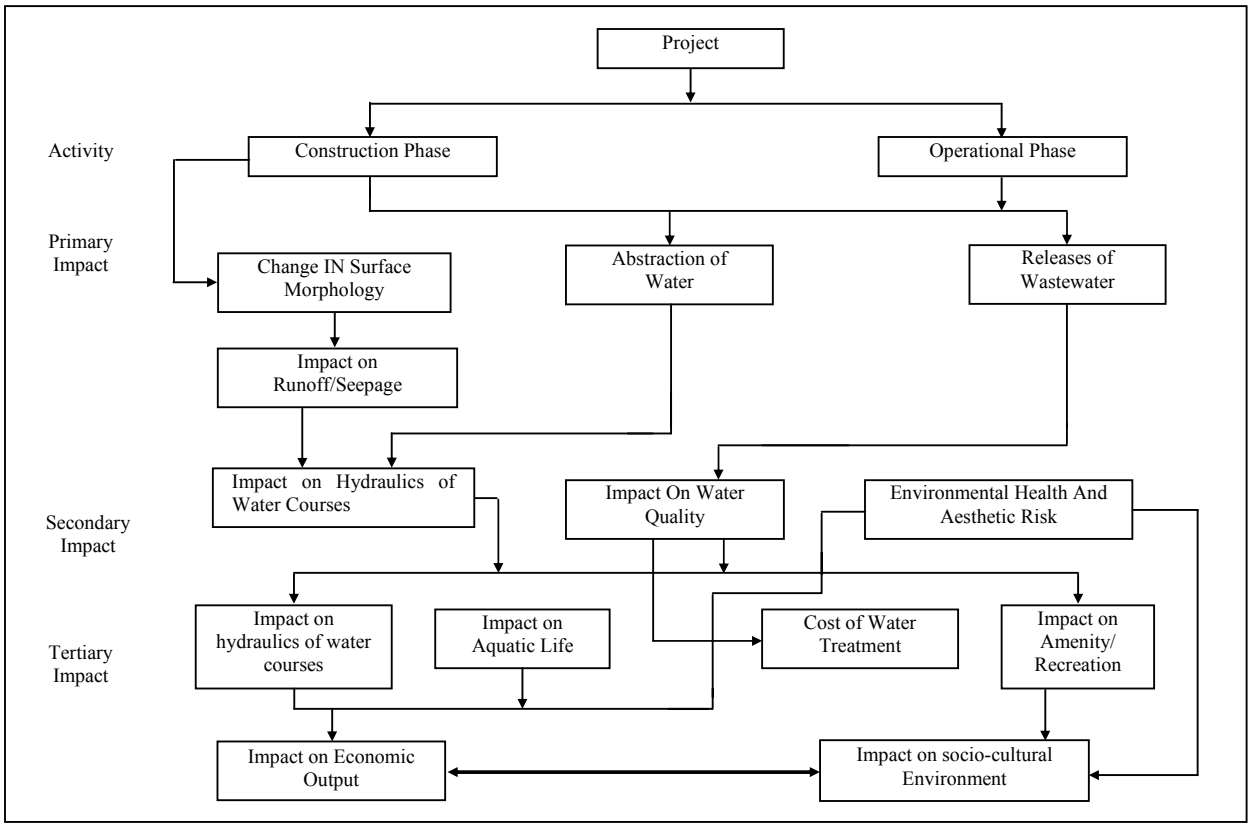
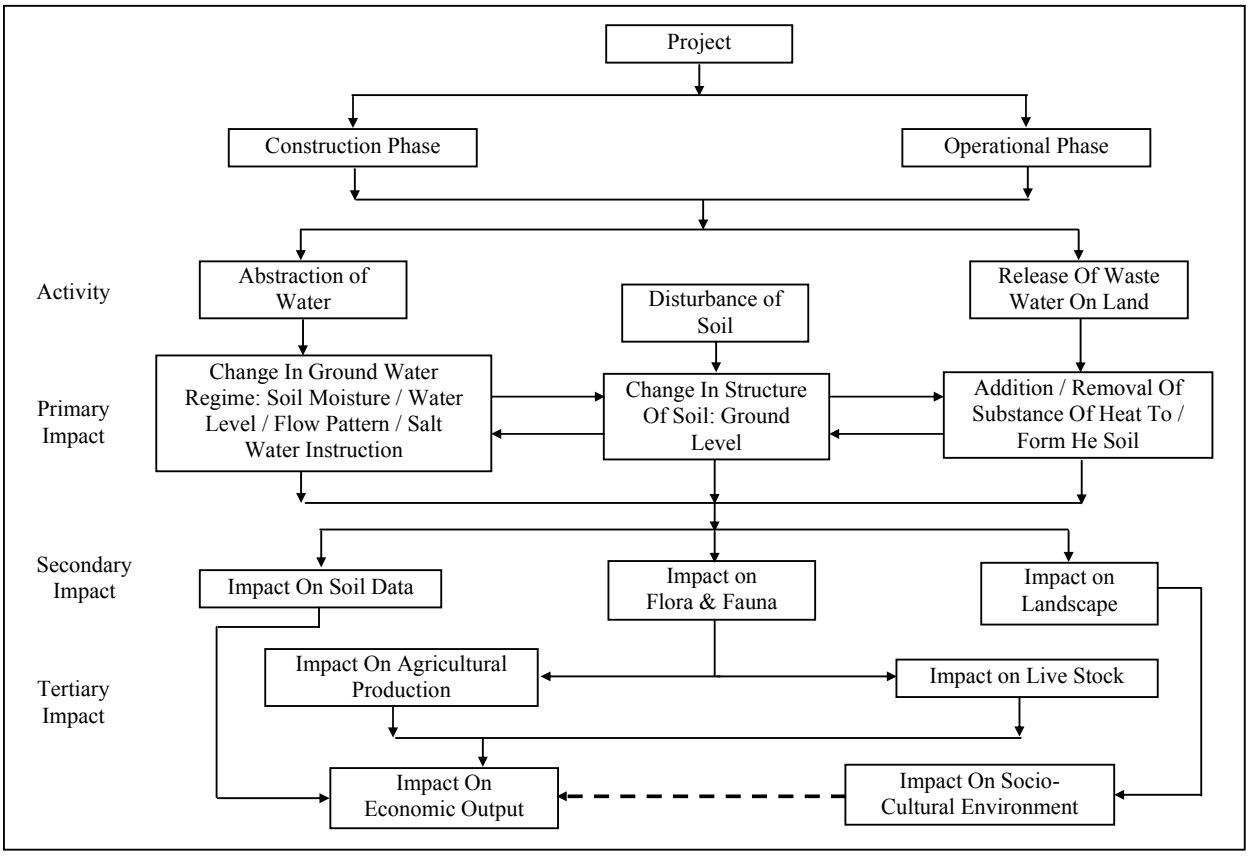


FIGURE - 4.1(CONT.) IMPACT ON GROUND WATER ENVIRONMENT



FIGUER - 4.1 (CONT.) IMPACT ON NOISE ENVIRONMENT

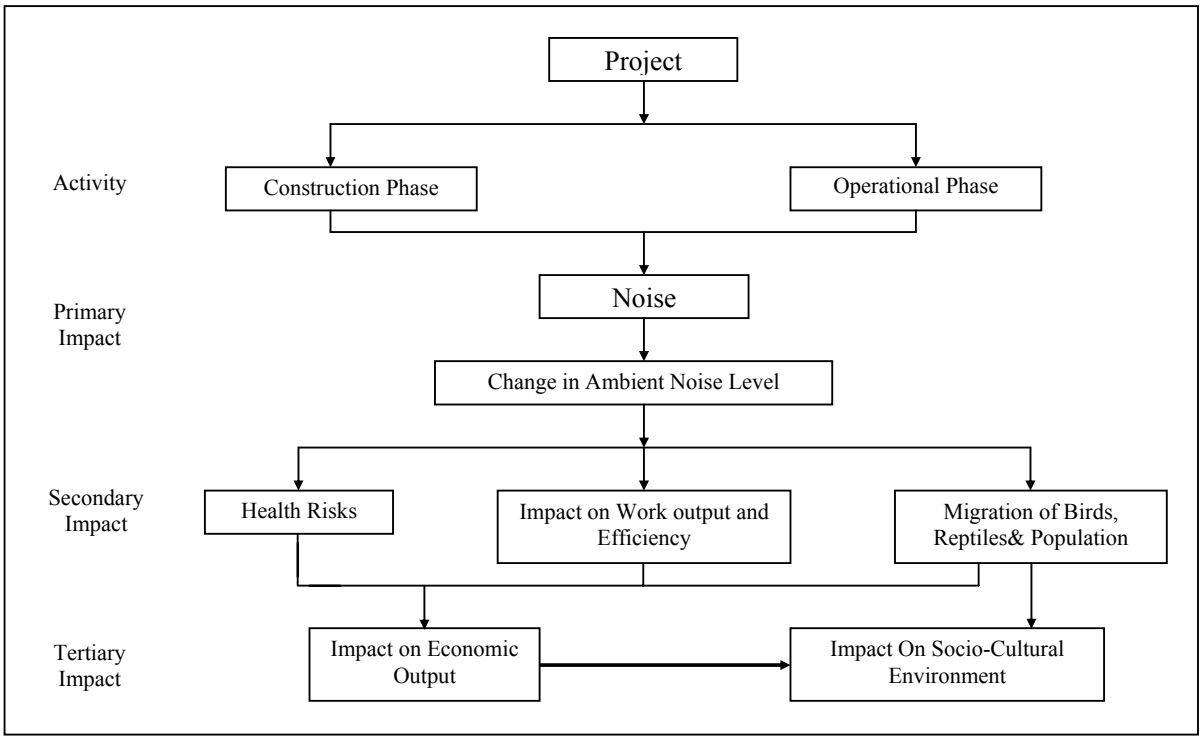


FIGURE - 4.1(CONT.) IMPACT ON LAND ENVIRONMENT

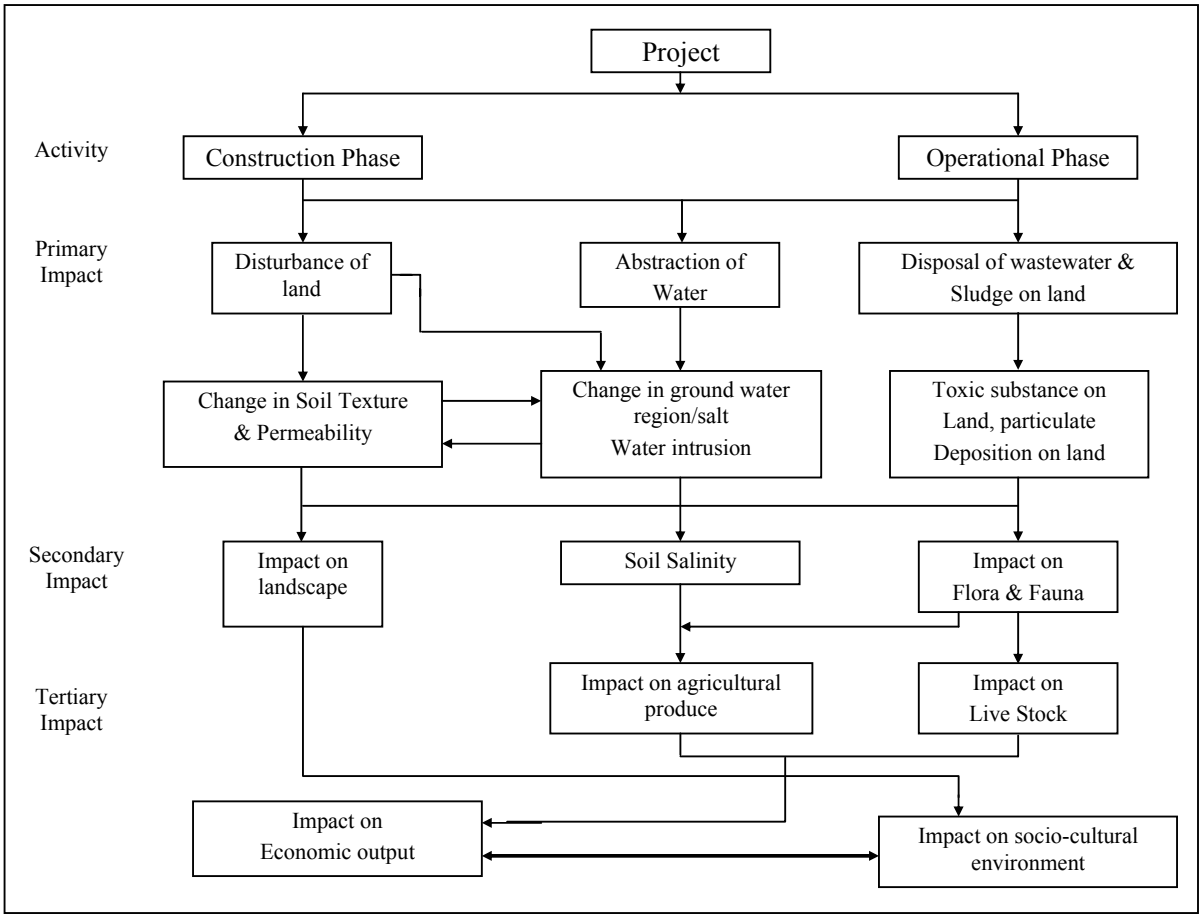
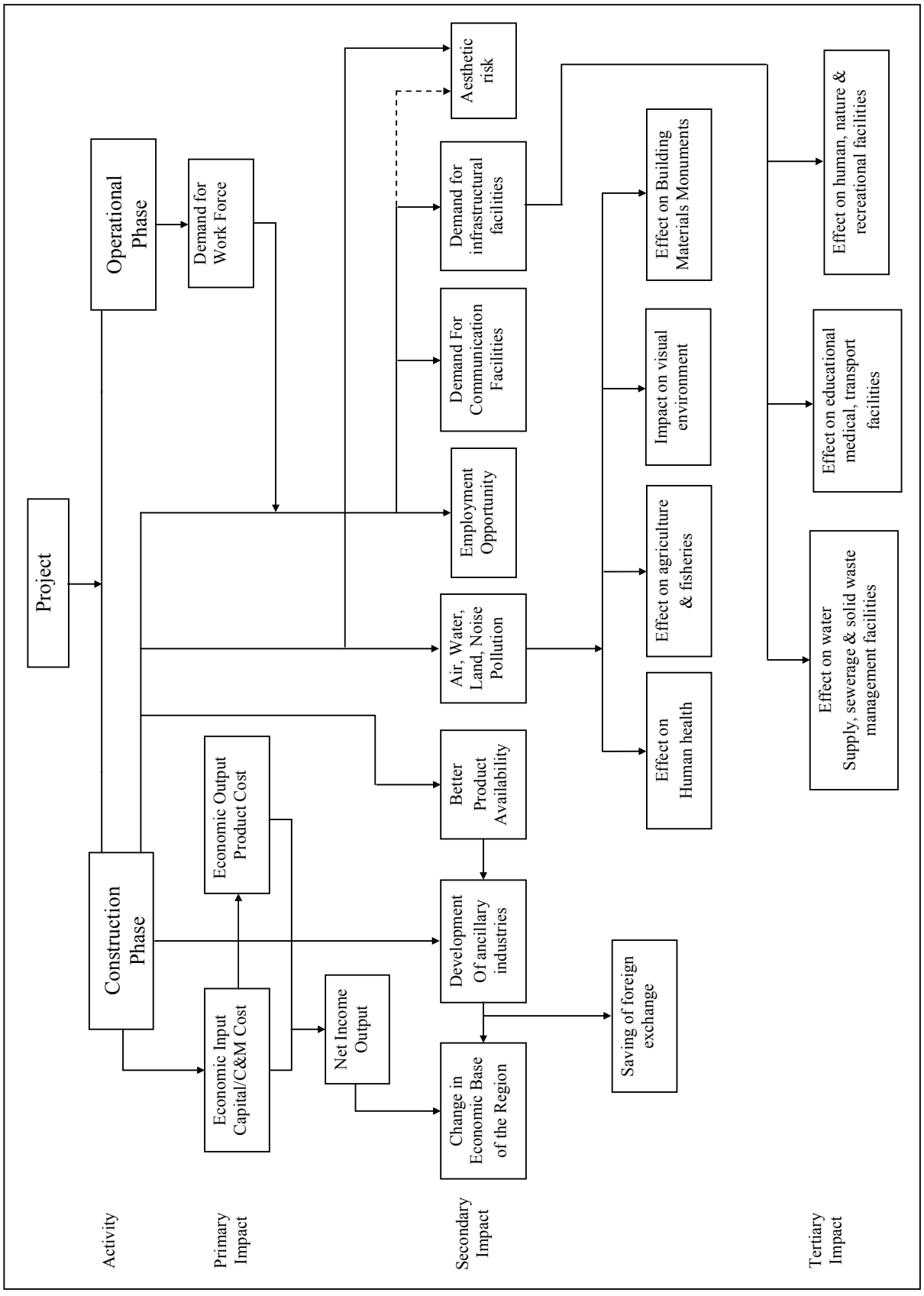


FIGURE - 4.1(CONT.) IMPACT NETWORK ON SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT



4.2 PREDICTIONS AND EVALUATION OF IMPACTS

An impact can be defined as any change in physical, chemical, biological, cultural and/or socioeconomic environment that can be attributed to activities related to alternatives under study for meeting the project needs. Impact methodology provides an organized approach for prediction and assessing these impacts.
Scientific techniques and methodologies based on mathematical modeling are available for studying impacts of various project activities on environmental parameters.
The nature of the impacts due to said project activities are discussed here in detail. Each parameter identified in the proceeding chapter, is singularly considered for the anticipated impact due to various activities listed. The impact is quantified using numerical scores 0, 1, 2, 3, 4 and 5 in increasing order of activity. In order to assess the impact accurately, each parameter is discussed in detail covering the following:

1) Project activities likely to generate impact
2) Quantification and prediction of impact

4.2.1 WATER ENVIRONMENT

With respect to water environment three aspects are generally considered in Rapid EIA, the raw water availability, consumption and wastewater generation that will be disposed. The first priority in water quality assessment is to maintain and restore the desirable level of water quality in general.

4.2.1.1 CONSTRUCTION PHASE IMPACTS AND MITIGATION MEASURES

As company will be constructing various facilities so construction phase impacts will be anticipated. During Construction**,** drainage pattern and water supply system of overland water flow will be somewhat changed for the site preparation activities. Potential impacts may be on surface water quality during this phase could arise from dust emissions (from vehicles and disturbance of soil) such Suspended solids can be controlled by sprinkling water and by employing enclosures to construction area to allow the particles to settle down, prior to discharge. There would be no significant effect on water quality and quantity during construction phase.

4.2.1.2 OPERATION PHASE IMPACTS AND MITIGATION MEASURES

Water requirement shall be met from ground water using bore well located within the existing campus. The details of water consumption are given in table - 2.5 of Chapter-2.
The total domestic waste water generation from the proposed activities shall be 2.5 KL/Day which will be treated through septic tank and disposed off through local drain. As no water is required in the manufacturing process and therefore no industrial wastewater will be generated.
Thus, it can be concluded that there will not be any significant adverse impact on the water environment.

4.2.2 AIR ENVIRONMENT

4.2.2.1 CONSTRUCTION PHASE IMPACTS AND MITIGATION MEASURES

Generally Construction phase involves Site cleaning, Excavation, Construction, Erection or Installation of equipment & machinery, Transportation, Material Handling. Dust will be the main pollutant affecting the ambient air quality of the surrounding area during the construction phase.
During excavation, care shall be taken that the excavator will not release the sand from higher elevation. The Pilling of sand will be done uniformly and proper storage will be maintained to avoid dusting because of wind.
Fume generation will be there due to welding and allied activities; this impact will be negligible and restricted to project site. The workers would be trained to use welding shields and use safer practice.
Motor vehicle transportation (to, from and around the site) particularly the traffic of tracks at the site, material movement into the site will introduce particulates and other exhaust gases into the local ambient air and there is some likelihood that during the construction period local air quality may be temporarily affected by these emissions.
However, these activities will be intermittent and hence, significant adverse impact is low.
Providing suitable surface treatment to ease the traffic, flow and regular sprinkling of water will reduce the fugitive dust generation significantly.

4.2.2.2 OPERATION PHASE IMPACTS AND MITIGATION MEASURES

The cement plant handles large quantities of solids viz., limestone, clay, cock breeze, iron dust, clinker and cement, which are subjected to various dust generating operations like crushing, grinding, transfer, packing, etc. These operations generate large quantities of fugitive dust, which would otherwise disperse into the work zone atmosphere and plant surroundings. To control the dispersion of fugitive dust, all crushers and transfer points will be provided with dust extraction system consist of hoods, ducting, bag house ID fans and exhaust ducts. The dust extraction system brings down the particulate matter concentration in the exhaust air to approximately 50 mg/Nm.

The dispersion of pollutants in the atmosphere is a function of several meteorological parameters viz. temperature, wind speed and direction, mixing depths, inversion level, etc. A number of models have been developed for the prediction of pollutant concentration at any point from an emitting source. The Industrial Source Complex – Short Term (ISCST3) dispersion model is a steady-state Gaussian plume model. It is most widely accepted for its interpretability. It gives reasonably correct values because this obeys the equation of continuity and it also takes care of diffusion, which is a random process. For the present study, this model is used for the prediction of maximum ground level concentration (GLC).

The air emission at Shivshakti can be considered to be mainly suspended particulate matter (SPM) with a considerable proportion being respirable particulate matter. The site specific and monitored details considered for input data for the software "ISC-AERMOD View" by Lakes Environmental, Canada for prediction of impact on air environment are given in table-4.1.

The site-specific hourly meteorological data measured at site is given in table-3.1. In order to conduct a refined air dispersion modeling using ISCST3 and ISC-PRIME short-term air quality dispersion models, the site specific hourly meteorological data measured at site is pre-processed using the U.S. EPA PCRAMMET and U.S. EPA AERMET programs. Before starting air dispersion modeling with ISC-AERMOD View, a building downwash analysis using BPIP View was done. BPIP View is a graphical user interface designed to speed up the work involved in setting up input data for the U.S. EPA Building Profile Input Program (BPIP) and Building Profile Input Program – Plume Rise Model Enhancements (BPIP-PRIME).

The air pollution caused by the gaseous emissions from a single or small group of stacks is a local phenomenon. Its impact will occur at a distance ranging from within the immediate vicinity of the stack to several kilometers away from the stack. Maximum ground level concentration will occur within this range. All plumes at more downwind distances from the source by stack emission become diluted by diffusion in the ambient atmosphere, that concentrations of pollutants become negligible. The maximum ground level concentration for different parameters is given in table-4.2. Equal concentration contour plots for PM, SO_2, and NOx are given in figure-4.1.

TABLE - 4.1 DETAILS OF EMISSION FROM STACKS

SR. NO.	OPERATING PARAMETER	UNIT	SOURCE OF EMISSION		
			RAW MILL STACK	VSK STACK	CEMENT MILL STACK
1.	Stack height	meter	30	32	30
2.	Stack diameter at top	meter	0.8	0.5	0.8
3.	Flue gas exit velocity	m/s	9	9	9
5.	Emission concentration PM SO_2 NOx	 mg/Nm^3 ppm ppm	 50* - -	 50* 100# 50#	 50* - -
6.	Flue gas temp.	^0K	50	50	50
7.	Ambient temp.	^0K	32	32	32
8.	Wind Speed	m/s	0.81	0.81	0.81

* Limit as per CREP guidelines, # Permissible limit of APCB

FIGURE - 4.2 EQUAL CONCENTRATION CONTOUR PLOT FOR SPM

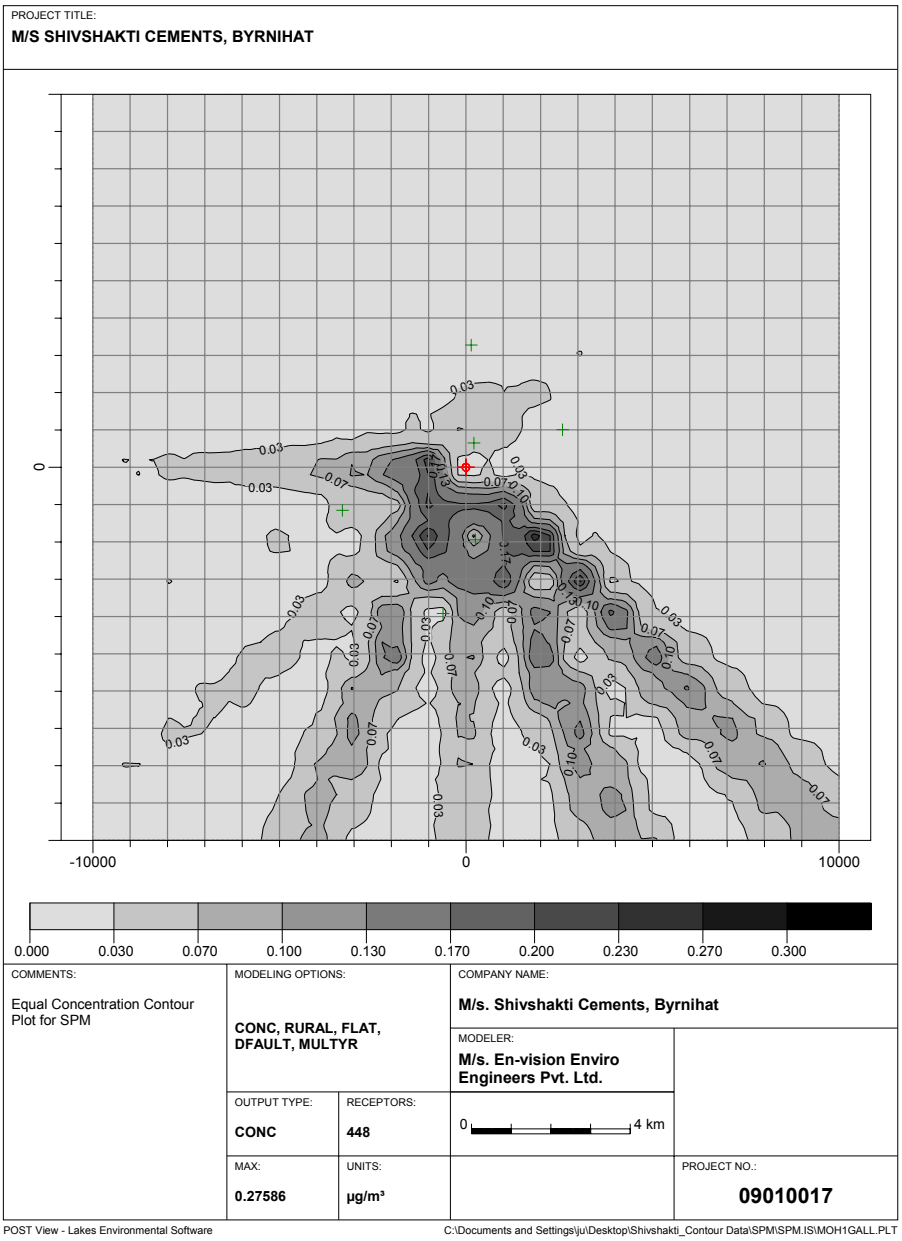


FIGURE - 4.2 EQUAL CONCENTRATION CONTOUR PLOT FOR SO_2

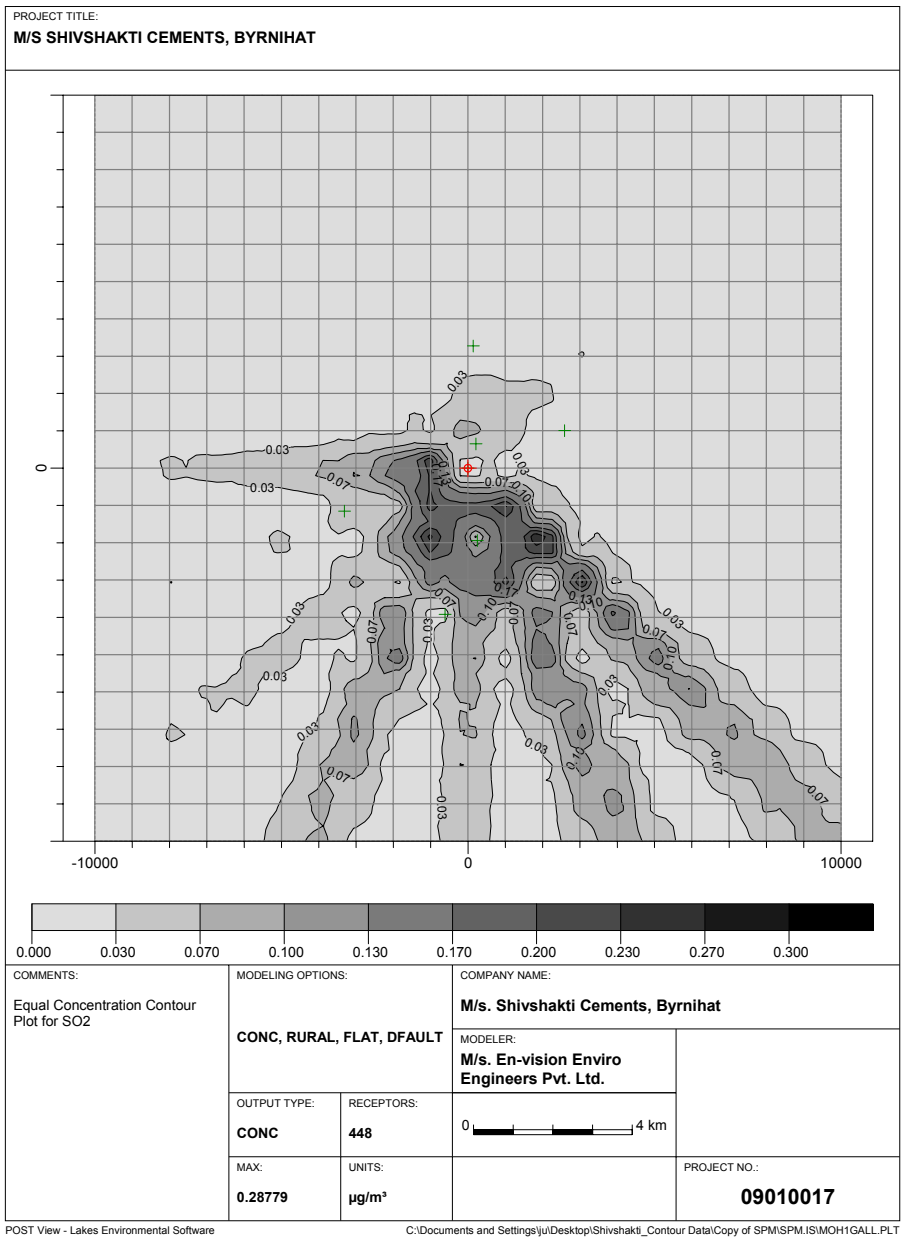


FIGURE - 4.2 EQUAL CONCENTRATION CONTOUR PLOT FOR NOx

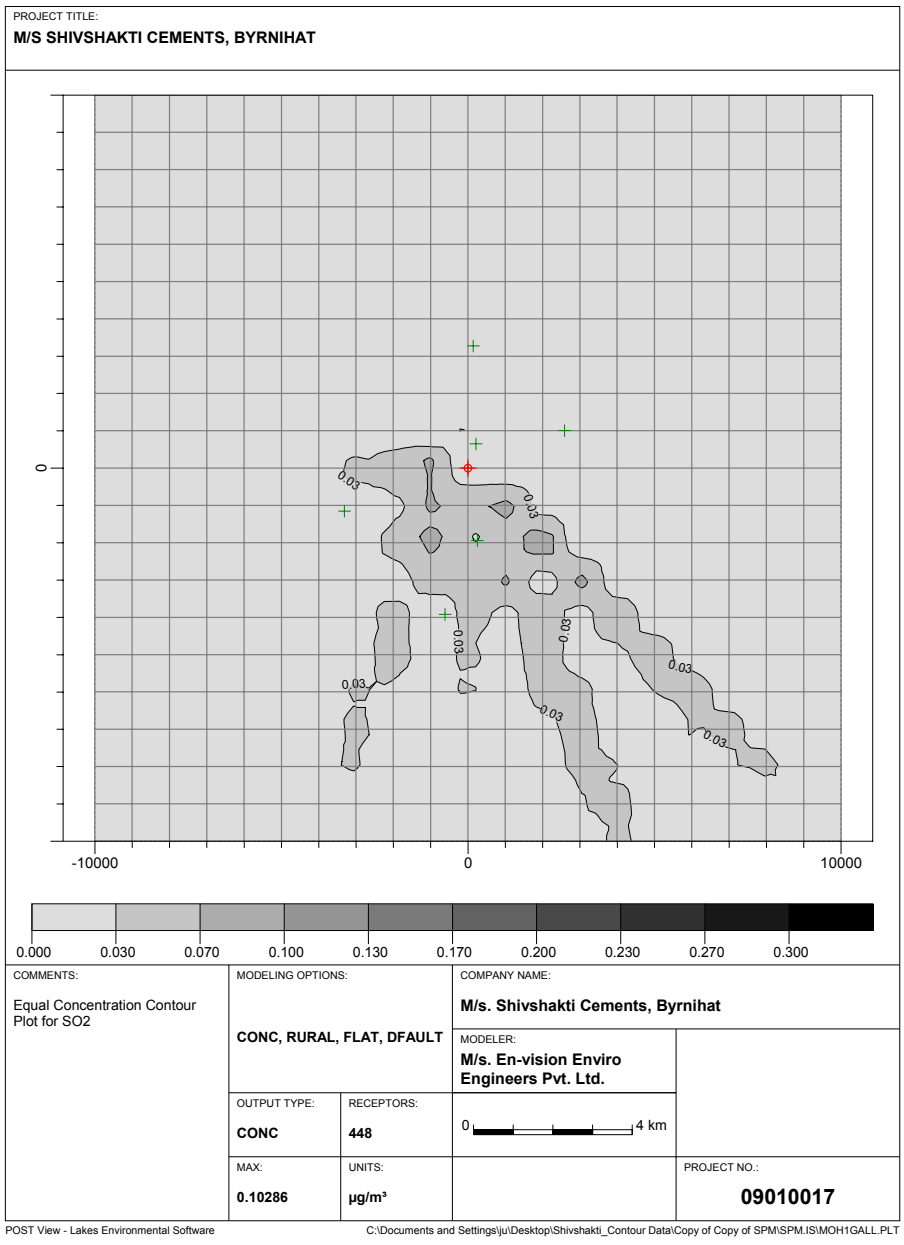


TABLE - 4.2 SUMMARY OF ISCST3 MODEL OUTPUT FOR PM, SO_2 AND NO_X

SR. NO.	LOCATIONS	CO-ORDINATES (X, Y)	MAXIMUM CONCENTRATION		
			SPM ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
1.	Project Site (A1)	(0 , 0)	0.00000	0.00000	0.00000
2.	Tandu (A2)	(215.8 , 647.5)	0.03647	0.04433	0.01585
3.	Lolung Moupur (A3)	(2589.9 , 1007.2)	0.00796	0.00770	0.00275
4.	Dhemai (A4)	(251.8 , -1942.4)	0.03204	0.03175	0.01135
5.	Ural (A5)	(143.9 , 3273.4)	0.01712	0.02353	0.00841
6.	Sonapur (A6)	(-611.5 , -3920.9)	0.01153	0.01120	0.00400
7.	H. M. Cement (A7)	(-3309.4 , -1151.1)	0.05934	0.06067	0.02168

TABLE - 4.2 (CONT.) SUMMARY OF ISCST3 MODEL OUTPUT FOR PM, SO_2 AND NO_X

SR. NO.	X, Y CO-ORDINATES	MAXIMUM CONCENTRATION		
		PM ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
1.	(-2000 , -2000)	0.27586	-	-
2.	(-2000 , -2000)	-	0.28779	-
3.	(-2000 , -2000)	-	-	0.10286

TABLE - 4.3 PREDICTED AMBIENT AIR QUALITY FOR SPM, SO_2 AND NO_X

Unit: $\mu g/m^3$ Avg. Period: 24 hours

SR. NO.	SAMPLING LOCATION	SPM	NO_X	SO_2
		AVERAGE		
1.	Project Site (A1)	187	14	32
2.	Tandu (A2)	122.0365	4.04433	12.01585
3.	Lolung Moupur (A3)	135.008	4.2077	6.40275
4.	Dhemai (A4)	132.032	4.23175	8.01135
5.	Ural (A5)	162.0171	4.52353	8.00841
6.	Sonapur (A6)	135.0115	5.0112	12.004
7.	H. M. Cement (A7)	186.0593	14.26067	28.02168

Ground level concentrations calculated for proposed project activities are superimposed on existing ambient air quality monitoring results and combined values (table-4.3) are found within permissible National Ambient Air Quality Standards except few locations.

4.2.3 FUGITIVE EMISSION AND CONTROL MEASURES

The cement plant handles large quantities of materials like limestone, sand, clinker and cement which are subjected to various dust generating operations like crushing, grinding, transfer etc. The unit will install air pollution control equipments to control particulate matter emissions. Fugitive emissions from the proposed plant would be significant as there will be air pollution due to activities like raw materials handling, crushing, transfer points of materials, packing of product and movement of vehicles. These operations generate large quantity of dust. Specific instances of fugitive dust generation may include dust blown by wind from the raw-materials stockpile, dust caused by vehicular traffic within the factory, dust leakage from conveyors, conveyor transport points, storage hoppers and packers etc, Good housekeeping, proper maintenance, wetting of dusty areas, use of enclosed storage wherever feasible etc., would considerably reduce fugitive dust.

For the purpose of effective prevention and control of fugitive emissions, the Shivshakti shall implement following:

- The storage shall be done under covered shed.
- Storage area shall be clearly earmarked.
- The silo vent shall be provided with a bag filter system to vent out the air borne fine.
- Enclosure shall be provided for all the unloading operations.
- Water shall be sprayed on the material prior and during unloading.
- All transfer points shall be fully enclosed.
- Airborne dust shall be controlled.
- All roads shall be paved on which movement of raw materials or products will take place.
- Regular sweeping of roads shall be carried out to minimize emissions.
- Preventive measures shall be employed to minimize dust build up on road.
- Conveyors shall be provided with conveyor cover.
- Maintenance of air pollution control equipment shall be done regularly.
- All the workers shall be provided with disposable dust mask.
- Green belt will be developed around the plant to arrest the fugitive emissions.
- Regular training shall be given to the personnel operating and maintaining fugitive emissions control systems.
- The industry shall take records to document the specific control actions taken.

Environmental Guidelines for Prevention and control of fugitive emissions from cement plants are given in Annexure-6.
The Shivshakti Cement will follow CREP Guidelines as specified by CPCB and control fugitive emissions from all the raw material and products storage and transfer points.

4.2.4 SOIL ENVIRONMENT

4.2.4.1 SOURCE OF SOIL POLLUTION

Construction activities like excavation, construction material handling & storage, construction waste disposal etc. are main sources of soil pollution.

4.2.4.2 IMPACT AND MITIGATION MEASURES

The impact of air, water and solid waste pollution on soil causes direct/indirect effect on soil. As all necessary air pollution control steps will be provided and based on the results of the dispersion model for the ground level concentrations of various pollutants after the commissioning of the proposed project, there will not be any adverse impact of air pollution on soil. It may be noted that there will not be any industrial effluent generation as no water is required in the manufacturing process. Thus, there will not be any impact on soil due to water.
All necessary control steps will be provided for handling, storage and disposal of solid waste generated from the plant. Thus, there will not be any significant impact of solid waste on the soil environment.

4.2.5 NOISE ENVIRONMENT

4.2.5.1 CONSTRUCTION PHASE IMPACT

During construction, construction equipment, including dozer, scrapers, concrete mixers, generators, vibrators and power tools, and vehicles will be the major noise sources. Construction noise is difficult to predict because the level of activity will constantly change. Most of construction activities are expected to produce noise level within the prescribed limit. The noise generated from various sources will be of short duration. Therefore, no significant impact is envisaged on the construction force.

4.2.5.2 OPERATION PHASE IMPACT

The impact of noise depends mainly on the characteristic of the noise generating sources, topography and atmospheric conditions. Vehicular movements during operation phase for loading/unloading of raw and finished materials and other transportation activity may increase noise level. The noise generating sources will be enclosed with acoustic proof material to cut down the noise levels. Further, green belt will be developed in & around the proposed plant. So, the significant adverse impact of noise will be minimized.
Noise level in and around the plant site were measured. These values represent status of Noise levels, which is given in table-3.7 of Chapter-3.

4.2.5.3 MITIGATION MEASURES

Adequate noise control measures such as mufflers, silencers at the air inlet/outlet, anti vibration pad for equipment with high vibration, earmuff and earplugs to the operators etc. are provided. However, the existing and proposed green belt and plantation area will help to reduce noise. The adverse impact on occupationally exposed workers will not be envisaged, as noise protection devices will be provided as suggested in EMP.

4.2.6 SOLID WASTE GENERATION AND DISPOSAL METHOD

Solid waste generation and its disposal method are given in following table-4.4.

TABLE - 4.4 HAZARDOUS WASTE GENERATION AND DISPOSAL METHOD

SR. NO.	NAME OF WASTE	CATEGORY NO.	QUANTITY GENERATION	METHOD OF STORAGE & DISPOSAL METHOD
1.	Spent/ used oil	5.1	15 ltrs./month	Collection, storage, transportation, sold to MOEF authorized re-processors.

4.2.7 ENVIRONMENTAL HAZARD

Raw materials shall be transported by road and shall be stored in the plant premises. This report is prepared with the consideration of hazards and care shall be taken for all aspects of environmental hazards. The project proponent shall consider all the safety aspects in planning, designing and operation of the plant as per standard practices. Hence, no adverse impact on this account is anticipated.

4.2.8 HOUSING

Any permanent demand on existing housing facilities is considered as permanent impact. No township is constructed or proposed. Enough number of dwellings is available in nearby towns and villages for accommodating extra workforce. On neighboring towns or villages, the impact on this account is minimal.

4.2.9 ECOLOGY

The impact due to operation of the project and its activities on the ecological parameters like natural vegetation, cropping pattern, fisheries and aquatic life, forests and species diversity could be summarized as below.

4.2.9.1 NATURAL VEGETATION

The proposed expansion activities shall be within industrial premises. There will not be any cutting of the plantation at the site. The industry will develop a green belt on the surrounding periphery.
Since the effluents and emissions generated from the project activities shall be treated and disposed as per the EMP provisions, adverse impact over any of the ecological components of the environment is reduced to minimum.

4.2.9.2 CROPS

Since, the proposed activities shall be on a non-agricultural land, it shall not alter the crop production of the area. Further, the necessary environmental protection measures have been planned under EMP e.g. air pollution control systems shall be designed to take care of even emergency releases of the gaseous pollutants and regular environmental surveillance shall be done, so as not to have any short-term or cumulative effect on the crops and the natural vegetation of the area.

4.2.9.3 FISHERIES AND AQUATIC LIFE

Only waste water i.e. sewage waste water 2.5 KL/day will be generated which will be discharged to local drain. Thus, it can be concluded that there will not be any significant adverse impact on the water environment. Hence no adverse impact of proposed project is envisaged.

4.2.9.4 AESTHETIC ENVIRONMENT

The proposed activities and plantation will enhance the aesthetic environment.

4.2.9.5 DEMOGRAPHY, ECONOMICS, SOCIOLOGY AND HUMAN SETTLEMENT

M/s Shivshakti Cements will give direct employment. In addition to direct employment; indirect employment shall generate ancillary business to some extent for the local population. There is a positive effect due to improved communication and health services, which have lead to economic prosperity, better educational opportunities and access to better health and family welfare facilities. There has been a beneficial effect on human settlement due to employment opportunities. There shall be no displacement of any population in plant area. Hence, there is no permanent impact on this account.

The increasing industrial activity will boost the commercial and economical status of the locality up to some extent.

4.2.9.6 FOREST, NATIONAL PARKS / SANCTUARIES

There is no reserved forest, national park or sanctuary within 10 km radius of the plant. There shall be no impact on the same.

4.2.9.7 PLACES OF ARCHAEOLOGICAL/HISTORICAL/RELIGIOUS/TOURIST INTEREST

There is no place of archaeological, historical, religious or tourist interest within the study area i.e.10 km radius of plant site. Hence, there shall be no impact on places of interest.

TABLE - 4.5 POTENTIAL IMPACTS & MITIGATIVE MEASURES

ACTIVITY	ENVIRONMENTAL ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	MITIGATING MEASURES
Air Resources			
Site excavation, grading; and offloading of construction materials at the site	Dust	• Adverse Human health • Impaired visibility • Legal non –compliance • Nuisance	Water the ground before excavation
	Emissions from construction equipment such as bulldozers, graders, concrete mixers and compactors including: Particulates, CO_2,SO_X & NO_X	• Legal non –compliance • Adverse Human health • Greenhouse effect • Acid rain • Smog	• Use of respirators by workers • Engine tune-up • Establish inspection program for equipment
Water Resources			
Site excavation, grading; & offloading of construction materials at the site	Dust	Nuisance	Water the ground
Factory operation	Sewage disposal	• Ground water contamination • Surface water contamination	Sewage water to be discharged to septic tank
	Solid waste disposal	• Ground water contamination through leaching • Surface water contamination through run off	Contract a licensed solid waste recycler or re-processor

ACTIVITY	ENVIRONMENTAL ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	MITIGATING MEASURES
Geological Resources:			
Site excavation, grading; & offloading of construction materials at the site	Oil and material spills	Soil contamination	• Spill control procedures • Training
Biological Resources (Biodiversity):			
Excavation	Removal of soil and vegetation	Loss of vegetation and habitat to some animals (fauna)	Landscaping incorporating Grass cover, Plants, Flowers
Socio-economic Activities			
Land use:			
Construction of the factory	Non – compliance with regulatory and legal requirements	Change of land use pattern	Comply with regulatory and legal requirements
Economic Activity: All the significant impacts are positive. No mitigation measures are necessary.			
Community Services:			
Construction process	Water usage	Increased demand for water from local sources	Implement appropriate water conservation measures
Construction process	Electricity usage	Increased demand for electricity from the utility company	Implement appropriate energy conservation measures
Factory Operation			Conduct annual energy audits
Transportation:			
Construction activities	Transportation of construction materials to the site	Damage to roads	All vehicles delivering bulk materials to the site not to exceed recommended weight limit and comply with traffic rules
General Category:			
Construction at the site	Visual change	Perception of historical perspective of the area by stakeholders	Landscaping incorporating Grass cover, Plants, Flowers
Health & Safety:			
Construction Phase:			
Excavation, grading and concrete mixing	Dust	• Adverse human health • Legal compliance • Nuisance	• Safety procedures • Personal protective equipment • Use of water sprays
	Noise		Personal protective equipment- ear protectors.
Operation Phase			
Factory operation	Fire	Loss of life and property	• Fire prevention equipment to be provided • Equipment inspection & service program • Training of staff on fire management • Provide &Label fire escape routes

ACTIVITY	ENVIRONMENTAL ASPECT	POTENTIAL ENVIRONMENTAL IMPACT	MITIGATING MEASURES
	Dust	Respiratory ailments	• Use of personal protective gear Use of water sprays at temporary storage piles • Use of covers on trucks to prevent air entrainment & spillage during hauling • Cleaning of trucks and covers after unloading each load • Use of covered or enclosed conveyors, crushers and material transfer points. • Site landscaping and planting of tree belts to prevent soil erosion and to reduce wind velocity
	Noise	Adverse human health	• Use of personal protective equipment – ear protectors • Inspection and maintenance programme on equipment • Annual noise level measurement • Use of suitable enclosures • Identification of noise hazardous areas and labeling as appropriate
	Use of equipment subject to statutory inspection	• Injury to users • Damage to the equipment	Inspection & Maintenance programme
	• Sewage disposal / overflow • Solid waste disposal	• Ground water contamination • Surface water contamination	• Sewage & waste water to be discharged to septic tank • Contract a licensed solid waste transporter

4.3 MATRIX REPRESENTATION

The potential impacts during construction and operation phases are presented in the form of a matrix in table-4.4 and 4.5. Construction activities will include only production facilities. The quantification of impact is done using numerical scores 0 to 5 as per the following criteria.

Score	Severity criteria
0	No impact
1	No damage
2	Slight/ Short-term effect
3	Occasional reversible effect
4	Irreversible/ Long-term effect
5	Permanent damage

The scores for various parameters and activities are presented in table-4.6 & 4.7.

4.3.1 CUMULATIVE IMPACT CHART

The total negative impact of various activities on any one parameter is represented as a cumulative score and the cumulative scores of various parameters are given in the form of a cumulative impact chart. Any particular parameter having an individual score greater than 4 or cumulative score of 20 implies serious effects due to the project and calls for suitable mitigation measures.

It is evident from the matrices that the resultant impact is beneficial to the local population and due to export (and import substitution) the resultant impact is beneficial to our country.

TABLE - 4.6 IMPACT IDENTIFICATION MATRIX (CONSTRUCTION PHASE)

Activities During Operation Phase	Air Quality	Noise & Odor	Water Quality	Soil	Flora	Fauna	Aesthe-tics	Socio-Economic Status	Cultural	Health & Safety
Site Cleaning	✓	✓	✓	✓	✓	✓	✓	-	-	✓
Excavation	✓	✓	-	✓	✓	✓	✓	-	-	✓
Construction	✓	✓	✓	✓	-	-	✓	-	-	✓
Equipment Installation	✓	✓	-		✓	✓	-	-	-	✓
Transportation	✓	✓	-	✓	✓	✓	-	-	-	✓
Material handling	-	-	-	-	✓	-	-	-	-	✓
Employment	✓	-	-	-	-	-	-	✓	✓	✓
Green belt development	✓	✓	✓	✓	✓	✓	✓	-	-	✓

TABLE - 4.6 (CONT.) ENVIRONMENTAL IMPACT MATRIX (CONSTRUCTION PHASE)

Activities During Operation Phase	Air Quality	Noise & Odor	Water Quality	Soil	Flora	Fauna	Aesthe-tics	Socio-Economic Status	Cul-tural	Health & Safety
Site Cleaning	2	1	1	2	1	1	1	0	0	2
Excavation	2	1	0	0	1	1	2	0	0	2
Construction	2	2	1	2	0	0	2	0	0	2
Equipment Installation	2	2	0	0	0	1	0	0	0	2
Transportation	2	2	0	1	2	2	0	0	0	2
Material handling	0	0	0	0	2	0	0	0	0	2
Employment	2	0	0	0	0	0	0	2	2	2
Green belt development	2	1	1	1	1	1	1	0	0	2

TABLE - 4.8 CUMULATIVE IMPACT CHART

ENVIRONMENTAL PARAMETER	TOTAL CUMULATIVE SCORE
Air Quality	14
Noise and Odour	9
Water Quality	3
Soil	6
Flora	7
Fauna	6
Aesthetics	6
Socio Economic Status	2
Cultural	2
Health & Safety	16

TABLE - 4.7 IMPACT IDENTIFICATION MATRIX (OPERATION PHASE)

Activities During Operation Phase	Air Quality	Noise & Odor	Water Quality	Land Requi-rement	Infrast-ructure	Env. Hazards	Terres-trial Ecology Land-use	Socio-Economic Status	Aquatic Ecology	Resource Depletion
Water Requirement	-	-	✓	-	✓	-	-	✓	✓	✓
Raw material storage/Handling	✓	✓	✓	✓	✓	✓	✓	-	✓	✓
Gaseous/ fugitive Emissions	✓	-	-	-	✓	✓	-	✓	-	-
Product Storage/ Handling	✓	-	-	✓	✓	-	-	-	✓	-
Shutdown/ Startup	✓	✓	✓	-	✓	✓	-	-	-	✓
Equipment Failures	✓	✓	✓	-	✓	✓	-	-	-	-
Plant Operations	✓	✓	✓	✓	✓	✓	-	✓	-✓	✓
Transportation	✓	✓	-	-	✓	✓	-	✓	-	-
Medical & Other Needs	-	-	-	✓	-	-	-	✓	-	-
Resource Consumption	✓	✓	✓	✓	✓	-	✓	-	-	✓

TABLE - 4.7 (CONT.) ENVIRONMENTAL IMPACT MATRIX

Activities During Operation Phase	Air Quality	Noise & Odor	Water Quality	Land Requi-rement	Infrast-ructure	Env. Hazards	Terres-trial Ecology Land-use	Socio Economic Status	Aquatic Ecology	Resource Depletion
Water Requirement	0	0	2	0	1	0	0	2	1	1
Raw material Storage/ Handling	1	2	1	1	1	2	1	0	1	2
Gaseous/ Fugitive Emissions	2	0	0	0	1	2	0	1	0	0
Product Storage/ Handling	1	0	0	2	1	0	0	0	1	0
Shutdown/ Startup	1	2	1	0	1	2	0	0	0	2
Equipment Failures	2	2	1	0	2	2	0	0	0	0
Plant Operations	1	2	1	1	1	2	0	2	1	2
Transportation	2	2	0	0	1	2	0	2	0	0
Medical & Other Needs	0	0	0	1	0	0	0	2	0	0
Resource Consumption	1	1	2	2	1	0	1	0	0	3

TABLE - 4.8 (CONT) CUMULATIVE IMPACT CHART

ENVIRONMENTAL PARAMETER	TOTAL CUMULATIVE SCORE
Air Quality	19
Noise and Odour	16
Water Quality	10
Land Requirement	11
Infrastructure	12
Environmental Hazards	15
Terrestrial Ecology / Land use	3
Socio Economic Status	11
Aquatic Ecology	5
Re-source Depletion	6

CHAPTER - 5

ENVIRONMENTAL MANAGEMENT PLAN

CHAPTER – 5

ENVIRONMENTAL MANAGEMENT PLAN

5.1 BACKGROUND

Environment Management is basically resource management and environment planning similar to development planning. M/s. Shivshakti Cements shall adopt a comprehensive Environmental Management Plan (EMP) which will cover several environmental protection measures, not only for abatement of environmental pollution resulting from the project, but also for the improvement in the ambient environment. The various components of the EMP are outlined in subsequent sections.

5.2 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN

The main objectives in formulating the Environmental Management Plan are,

- To treat all the pollutants i.e. effluent, air emission & waste, which contribute to the degradation of environment with appropriate technology.
- To comply with all the regulations stipulated by central/state pollution control boards related to air emission and liquid effluents discharge as per Air & water pollution control laws.
- To handle hazardous waste as per Hazardous Waste (Management and Handling) Amended Rules, 2003.
- To encourage, support and conduct development work for the purpose of achieving environmental standards and to improve methods of environmental management.
- To promote further forestation in the surrounding areas of the plant.
- To create good working conditions (devoid of air & noise pollution) for employees.
- To reduce fire and accident hazards.
- Perspective budgeting and allocation of funds for environmental management expenditure.
- Dissemination of technological solution on commercial basis to interested parties.
- Continuous development and search for innovative technologies for better environment.
- To adopt cleaner production technology.
- To comply Corporate Responsibility for Environmental Protection (CREP).

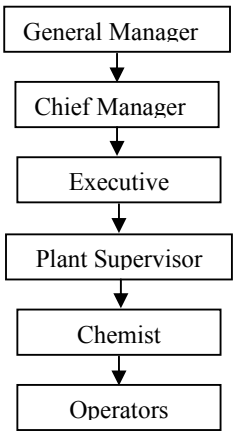
5.3 ENVIRONMENTAL MANAGEMENT CELL (TEAM)

Apart from having an environmental management plan, it is also necessary to have a permanent organizational set up charged with the task of ensuring effective implementation. In this effect, M/s. Shivshakti Cement has assigned responsibilities to officers from various disciplines to co-ordinate the activities concerned with management and implementation of environment control measures.

An Organogram of Environment management is shown in figure-5.1. Basically, this department undertakes the monitoring of environmental pollution level by measuring stack emissions, ambient air quality, water and effluent quality, Noise level, etc., either departmentally or appointing external agency whenever a Cement will continue the regular monitoring in future to ensure that pollution is limited below prescribed limits and to take corrective action by either providing new equipment or improving the performance of existing pollution control equipment. In case the monitored results of environment pollution are found to exceed the prescribed limits, remedial actions are taken through the concerned plant authorities. The actual operation and maintenance of pollution control equipments of each department is under respective department heads.

The Environmental, Occupational health and Safety department is also looking after for preparation of environment statement, carrying out environment audit, preparation of Water Cess Return and various consent applications and renewal under water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981 as well as application for authorization and its renewal under Hazardous Waste (Management and Handling) Amended Rules, 2003 under Environment Protection Act, 1986.

FIGURE - 5.1 AN ORGANOGRAM OF ENVIRONMENT MANAGEMENT CELL



5.4 GREEN BELT DEVELOPMENT PLAN

As per CPCB's guidelines 33% area shall be developed as per green belt out of total area. Tree plantation is one of the effective remedial measures to control the Air pollution and noise pollution. It also causes aesthetics and climatologically improvement of area as well as sustains and supports the biosphere. It is an established fact that trees and vegetation acts as a vast natural sink for the gaseous as well as particulate air pollutants due to enormous surface area of leaves. It also helps to attenuate the ambient noise level. Plantation around the pollution sources control the air pollution by filtering the air particulate and interacting with gaseous pollutant before it reaches to the ground. Tree plantation also acts as buffer and absorber against accidental release of pollutants.

Each plant shows different air pollution tolerance level depending upon numbers of factors. Air Pollution Tolerance Index (APTI) is calculated as under,

$$APTI = A \frac{(T + P) + R}{10}$$

Where,

A ⟶ Ascorbic Acid content mg/gm of dry weight
T ⟶ Total chlorophyll in mg/gm of fresh weight
P ⟶ pH of leaf extract
R ⟶ Relative water content in %

The plant having more APTI is more tolerant to air pollution and preferred for plantation.

In Green belt area about 1000 tree per acre of land as prescribed by State Pollution Control Board shall be planted.

The selection of tree species suitable for plantation at the industry shall be governed by guiding factors as stated below

- The trees should be tolerant to air pollutants present in the area
- The trees should be able to grow and thrive on soil of the area, be evergreen, inhabitant, having minimum of leaf fall.
- The trees should be tall in peripheral curtain plantation and with large and spreading canopy in primary and secondary attenuation zone.
- The trees should posses extensive foliar area to provide maximum impinging surface for continued efficient adsorption and absorption of pollutants.
- The trees should be fast growing and indigenous and should maintain ecological, land and hydrological balance of the region.
- It is also recommended to plant few trees, which are sensitive to air pollution, as air pollution indicator.
- It is also recommended to carry out extensive plantation within premises.

TABLE - 5.1 ENVIRONMENTAL MANAGEMENT PLAN

PROJECT PHASE	ASPECT	ACTION	TIME FRAME
Construction phase	Fall Hazard during operation at high level	Provide safety harnesses, scaffolding & Personal protective equipment	Before and during construction
	Falling objects from high level	Provide helmets	
	Dust	Water the ground before and during excavation	Before excavation for civil works
	Noise	• Use of ear protectors by workers • Recondition engine exhaust systems • Engine tune-up • Establish inspection program for equipment	
	Emissions	• Use of respirators by workers • Recondition engine exhaust systems • Establish inspection program for equipment	
	Sanitation	Provide temporary sanitary facilities	
	Wastewater & sewage discharge	Discharge to septic tanks	During Factory operation
	Storage and handling materials	Train the workers on safe handling procedures	During construction
	Accumulation of waste oil	Provide labeled containers for waste oil	
	Disposal of waste oil	Identify a licensed contractor to recycle oil	
Construction and operational phases	Emergency response	Keep a record of the public emergency service telephone numbers including: Police, Fire brigade, Ambulance services (ii) Document an emergency response procedure (iii) Train staff on emergency response	During construction and operation phases
	Compliance with legal & regulatory requirements	Refer to relevant policy, legal and administrative framework and	
	Environmental audits	To be carried out against the environmental management plan and the mitigation plan in this report.	Once a year.
Occupancy (Operation) phase	Fire protection	Ensure fire fighting equipment are inspected semi-annually	During operation phase
	Disposal of solid waste	Appoint a licensed waste transporter	Prior and during operation phase
	Use of equipment subject to statutory inspection	Statutory Inspection	
	Noise	Noise level measurements	
	Dust	Dust level measurement	During design phase of the project by site management

PROJECT PHASE	ASPECT	ACTION	TIME FRAME
Occupancy (Operation) phase	Dust	▪ Regular water addition to unpaved roads used by trucks ▪ Use of water sprays at temporary storage piles ▪ Use of covers on trucks to prevent air entrainment & spillage during hauling ▪ Cleaning of trucks and covers after unloading each load ▪ Storage of cement in enclosures	During operation phase
		Use of covered or enclosed conveyors, crushers and material transfer points	During design phase
		Medical examination for employees	During operation phase
		Site landscaping and planting of tree belts to prevent soil erosion and to reduce wind velocity	During construction phase

This environmental management plan may not be exhaustive. However, the project proponent is at liberty to make any improvements that may result in mitigating the identified environmental impacts

5.5 OCCUPATIONAL HEALTH AND SAFETY PROGRAM FOR THE PROJECT

Health hazards associated with the occupation are called occupational hazards. In Cement industry the major sources of emission are:

1. Cooler Section: Total Dust or Suspended Particulate Matter.
2. Raw Mill Section: Total Dust or Suspended Particulate Matter.
3. Kiln Section: Suspended Particulate Matter, SO2, NOx.
4. Cement Grinding Unit: Total Dust or Suspended Particulate Matter.

All precautions would be taken to avoid foreseeable accident like spillage, fire and explosion hazards and to minimize the effect of any such accident and to combat the emergency at site level in case of emergency. Some of the preventive safety measures to minimize the risk of accident with respect to Technical Safety, Organizational Safety and Personal Safety are listed below:

- The factory will take all reasonably practicable measures to minimize the risk of such accident in compliance with the legal obligation under the relevant safety.
- All building plans and installations are as per relevant acts and duly approved by competent government authorities.
- Process and Equipment will be designed by qualified and experienced professionals and fabricated to applicable national / international codes with stage wise inspection.
- Safety features such as fire extinguisher and suitable Personal Protective Equipment (PPE) shall be provided. Regular operations and testing of fire extinguishers shall be carried out.
- Periodic inspection and testing of pressure vessels, equipment, machineries and equipment handling hazardous substances.
- Training of workers and Staff for fire fighting, work permit system, first aid, safe handling of hazardous chemicals and integrating safety, in all activities.
- Accident / Incident reporting system and information of employees about the same for better awareness.
- Site Main Controller system to oversee Safety during week – ends and to organize help quickly.
- Suitable notices / boards displayed at several locations indicating appropriate hazards warning as well as DOs and DON'T for ensuring operational and personal Safety for information of workers / staff and visitors.

For the safety of the workers, personal protective equipments like hand gloves, helmets, safety shoes, goggles, aprons etc. & Ear protecting devices like earplugs/earmuffs will be provided. Nose mask will be provided at places, where there is possibility of dust generation.

5.6 PROPOSED SCHEDULE OF ENVIRONMENTAL MONITORING

Monitoring is one of the most important components of a management system. Continuous monitoring needs to be carried out for regulatory permit requirements, environmental effects and performance of EMP implementation. Environmental monitoring programme is a vital process of any management plan of the development project. This helps in assessing the potential problems that resulting from the proposed project, changes in environmental conditions and effectiveness of implemented mitigation measures.

TABLE – 5.2 ENVIRONMENTAL MONITORING PLAN

SR. NO.	AREA OF MONITORING	SAMPLING LOCATIONS	PARAMETERS TO BE ANALYSED	FREQUENCY OF SAMPLING
1.	Stack Emission	Each Stack	As per consent of APCB	Once in a Season
2.	Ambient Air Quality	Within plant	As per consent of APCB	Once in a Season
		Outside Plant		Once in a Season
3.	Noise	Within plant	Sound Pressure Levels (Leq) during day and night times.	Once in a Season
4.	Occupational Health	New employees	Pr-Employment Examination (History, Weight Thorophysical Examination, Blood and urine test, Blood Pressure, X-ray, ECG, Vision test, Lung function test	One time
		Working in plant	Periodic Medical Checkup	Yearly
5.	Use of resources	Work Zone	Efficient use	Monthly

CHAPTER - 6

RISK ANALYSIS AND DISASTER MANAGEMENT PLAN

CHAPTER – 6

RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

6.1 INTRODUCTION

Industries have a wide variety of process involving consumption, production and storage of chemicals. The condition that contributes to the danger, by these chemicals, are when these chemicals are not kept/stable at normal pressure and temperature. Hence these chemicals are kept at/or high pressure and temperatures; the gases are liquefied by refrigeration to facilitate storage in bulk quantities. Under these circumstances, it is essential to achieve and maintain high standards of plant integrity through good design, management and operational controls. Given the large quantities of potentially hazardous materials which are handled daily without incident, it is clear that the controls and safeguards which have been developed by the industry are effective. However, accidents do occur and these can cause serious injury to employees or to the public, and damage to property. Most disastrous events like the Bhopal tragedy have emphasized the need to address both on-site and off-site safety. The public concern at such events invariably leads to call for additional control at national and international levels. It is against this background that the various Section and Rules under the Environment Protection Act, 1986, the Factories Act, 1948 and other Acts specify the requirements for a safe and reliable working of an industry. These require carrying out various studies and analysis to assess and mitigate hazards prevalent in the factory in line with the above goal of safe and reliable working. These are more commonly known as "Risk Assessment Studies". This chapter explains the basis of Risk Assessment and its objectives.

6.2 OBJECTIVE OF THE STUDY

The main objectives of the Risk Assessment Studies are as given below:

1) To define and assess emergencies, including risk impact assessment.
2) To control and contain incidents.
3) To safeguard employees and people in vicinity.
4) To minimize damage to property and environment.
5) To inform the employees, the general public and the authority about the hazards / risk assessed, safeguards provided, residual risk if any and the role to be played in them in the event of emergency.
6) To be ready for mutual aid if need is arise to help neighboring unit. Normal jurisdiction of an OEP in the own premises only, but looking to the time factor in arriving the external help or off - site emergency plan agency, the jurisdiction must be extended outside the extent possible in case of emergency occurring outside.
7) To inform authorities and mutual aid centers to come for help.
8) To affect rescue and treatment of casualties. To count injured.
9) To identify and list any death.
10) To inform and help relatives.
11) To secure the safe rehabilitation of affected areas and to restore normalcy.
12) To provide authoritative information to the media.
13) To preserve records, equipments, etc., and to organize investigation into the cause of emergency and preventive measures to stop its recurrences.
14) To ensure safety of the workers before personnel re - enter and resume work.
15) To work out a plan with all provisions to handle emergencies and to provide for emergency preparedness and the periodical rehearsal of the plan.

6.3 PHILOSOPHY AND METHODOLOGY OF RISK ASSESSMENT

Major hazard installations have to be operated to a very high degree of safety; this is the duty of the management. In addition, management holds a key role in the organization and implementation of a major hazard control system. In particular, the management has the responsibility to

i. Provide the information required to identify major hazard installations;

ii. Carry out hazard assessment;

iii. Report to the authorities on the results of the hazard assessment;

iv. Set up an emergency plan;

v. Take measures to improve plant safety.

In order to fulfill the above responsibility, the Management must be aware of the nature of the hazard, of the events that cause accidents and of the potential consequences of such accidents. This means that in order to control a major hazard successfully, the Management must have answers to the following questions:

a. Do toxic, explosive or flammable substances in our facility constitute a major hazard?

b. Which failures or errors can cause abnormal conditions leading to a major accident?

c. If a major accident occurs, what are the consequences of a fire, an explosion or a toxic release for the employees, people living outside the factory, the plant or the Environment?

d. What can Management do to prevent these accidents from happening?

e. What can be done to mitigate the consequences of an accident?

The most appropriate way of answering these questions is to carry out a hazard or risk assessment study, the purpose of which is to understand why accidents occur and how they can be avoided or at least mitigated. A properly conducted assessment will therefore

i. Analyze the existing safety concept or develop a new one;

ii. Identify the remaining hazards; and

iii. Develop optimum measures for technical and organization protection in event of an abnormal plant operation.

6.4 IDENTIFICATION OF HAZARDS

6.4.1 MAJOR HAZARDS

Hazard is the associated term with material, which is a measure or the likely hood of the damage to human working with, or studying the material in question. All the probable potential hazardous is classified under different heads.

1) Fire hazards
2) Toxic gas release hazards
3) Explosion hazards
4) Corrosion hazards

6.4.1.1 FIRE HAZARDS

Since the Stone Age term 'fire' is associated with fear. It is very dangerous if occurs in uncontrolled manner. It should be clearly understood that when a liquid is used having flash point below the normal ambient temperature, it could, in suitable circumstances, liberate a sufficient quantity of vapour to give rise to flammable mixtures with air.

6.4.1.2 TOXIC HAZARDS
Toxic substances affect in three ways by ingestion, absorption & inhalation.

6.4.1.3 EXPLOSION HAZARDS
Release of energy in a rapid and uncontrolled manner gives rise to explosion.

6.4.1.4 CORROSION HAZARDS
Corrosion is a chemical reaction-taking place at the surface of metal.

6.4.2 HAZARD IDENTIFICATION
M/s, Shivshakti Cements is planning to set a cement plant which will not be using any chemicals, liquid fuel or gases. Even the fuel i.e. coke breeze will be burnt in the kiln and not in any boiler system. Thus, the risk related to manufacturing is almost negligible. Nevertheless, the following steps are proposed to be implemented.

- Setting-up of a system to inform employees, public and authorities in case of any undue accident or happening.
- Arrange for medical aid centers being informed immediately incase of such an event.
- Provide training to specific company personnel in first aid as well as preliminary rescue operations.
- Nominate a person to inform and help relatives incase of such a happening and to ensure that authorative information is handed over to the media.
- Organization of an investigative team to study the accident and to record the same to avoid repetition of such an accident in future.
- Carry out rehearsals so that personnel are acquainted with their responsibilities and steps that they have to follow.

Process Hazard Safety Management
Process Safety Management is a new discipline covering all aspects of risk and involving the identification, assessment and control of hazards in process facilities.

Process Safety Management System integrates all aspects of risks in a facility and puts them under the control of a management system. By establishing a heightened awareness of the safety impacts of technology, personnel and the management, the system provides a dynamic environment for continual improvement.

Since Shivshakti is proposing cement manufacturing unit which will not be using any chemicals, liquid fuel or gases. Thus, the risk related to manufacturing is almost negligible.

Following Process Safety Management System is adopted by the company to prevent any process hazard:

- Skill Supervisor
- Process Safety Information
- Operating Procedures
- Fire proof electricity fitting
- Earthing Bonding
- Proper MOC selection
- Transportation of raw materials safely
- Process automation with safety lock

6.5 DISASTER MANAGEMENT PLAN

6.5.1 INTRODUCTION

An emergency is said to have arisen when operators in the plant are not able to cope up with a potential hazardous situation i.e. loss of control of an incident causes the plant to go beyond its normal operating conditions, thus creating danger. When such an emergency evolves, chain of events affect the normal working within the factory area and / or which may cause injuries, loss of life, substantial damage to property and environment both inside and outside the factory and a DISASTER is said to have occurred.
The various steps involved in the process of Disaster Management can be summarized as:

(1) Minimize Risk Occurrence (Prevention)

(2) Rapid Control (Emergency Response)

(3) Effectively Rehabilitate Damaged Areas (Restoration)

Disaster Management Plan is evolved by careful scrutiny and interlinking of:

(a) Types and causes of disaster.

(b) Technical know – how.

(c) Resource availability.

6.5.2 OBJECTIVES OF PLAN

This plan is developed to make best possible use of resources to:

- Rescue the victims and treat them suitably.
- Safeguard others (evacuating them to safer places).
- Contain the incident and control it with minimum damage.
- Identify the persons affected.
- Preserve relevant records and equipment needed as evidence incase on an inquiry.
- Rehabilitate the affected areas.

6.5.3 IDENTIFICATION OF MAJOR HAZARDS

· Fire Hazard.

6.5.4 SCOPE OF PLAN

The plan will set into action immediately after a fire occurs inside the plant. However, fire hazard will be restricted to fuel storage area only and hence no major disaster is envisaged.

6.5.5 BASIS OF PLAN

M/s. Shivshakti Cements will prepare an onsite emergency plan. The basic guidelines of the plan are as given below:

1) Informative brochure on emergency will be distributed to each staff member of the plant and telephone numbers of key personnel to be contacted during an emergency will be placed at all the operator placement point in the plant.

2) Shivshakti Cements will have a direct tele-link service line with the Central Control Room as well as nearest Fire Station in case of severe emergency.

3) Workers would be trained regularly on fire hazard drill, which will be organized once in a month by the safety and fire department.

4) Various locations would be covered with fire hydrant systems that would be tested and put into operation in such a manner that it remains operational during emergency.

5) 24 hours vehicle for service and in – plant first aid emergency kit would be provided.

6.5.6 POST DISASTER ANALYSIS AND EVALUATION

When an emergency is over, it is desirable to carry out a detailed analysis of the causes of the accident to evaluate the influence of various factors involved and to propose methods to eliminate or minimize them in future. Simultaneously, the adequacy of the disaster preparedness plan will be evaluated and any short comings will be rectified.

6.5.7 THE AVAILABILITY, ORGANIZATION, AND UTILIZATION OF RESOURCES FOR EMERGENCIES

In order to maintain emergency response capability, certain facilities must be kept in a state of readiness, and sufficient supplies and equipment must be available. Typical examples are:

- Emergency Operation Centres
- Communication equipment
- Alarm systems
- Personal Protection Equipment
- Fire fighting facilities, equipment and supplies
- Spill and vapour release control equipment and supplies
- Medical facilities, equipment and supplies
- Monitoring systems
- Transportation systems
- Security and access control equipment

It is the responsibility of the Plant Management to ensure that the appropriate equipment and materials are available to respond to their very hazard – specific emergencies at the facility.

One of the most important objectives of emergency planning is to create a response organization structure capable of being deployed in the shortest possible time during an emergency. Command and control of an emergency condition encompasses the key management functions necessary to ensure safeguard of the health and safety of employees, as well as the public living in the vicinity. These primary functions are summarized as follows:

a) Detection of the emergency condition

b) Assessment of the condition

c) Classification of the emergency

d) Mitigation of the emergency conditions

e) Notification to management personnel

f) Notification to local, state and governmental agencies

g) Activation and response of the necessary onsite and off – site support personnel

h) Continuous assessment and reclassifications, as necessary

i) Initiation of protective actions

j) Aid to affected personnel

k) Recovery and re-entry

The key personnel shall be nominated with special responsibility according to the laid down procedures and to make the best use of available resources. The key personnel are as under:

- Alarm Raiser
- Incident Controller
- Site Main Controller
- Essential Workers
- Other key personnel.

The responsibilities of the above key personnel are as described below:

6.5.7.1 ALARM RAISER

Any person who notices any abnormal incident of hazardous nature will raise an alarm to make people aware of the scenario. His responsibilities are:

(1) As soon as he notices any incident, he will first inform to his superior and co –worker.

(2) If the hazard is minor, he will try to prevent by using internal resources.

(3) If the incident of hazard is major, raise the siren or press the emergency siren button provided at various places in the buildings.

6.5.7.2 INCIDENT CONTROLLER (IC)

His responsibilities include:

1. As soon as the sound of siren or bell is heard, he will arrive at the site of incident.
2. Take the charge of the scene of the incident.
3. To assess the scale of emergency. If the emergency is minor, he will start to activate on – site plan.
4. As per the incident, direct the essential workers to prevent it by using extinguishers in case of fire; by covering the liquid spillage by sand or suitable material in case of liquid spillage.
5. Direct the shut down of the plant or part of the plant and evacuate the plant personnel to assembly point.
6. Direct all operations within the affected areas with the following priorities.
   (a) Secure the safety of personnel.
   (b) Minimum damage to plant, property and environment.
   (c) Minimize loss of material.
7. To search for casualties.
8. To brief Site Main Controller and keep informed of development of situation.
9. To preserve evidence that will be necessary for subsequent inquiry into the cause of the emergency and concluding preventive measures.

6.5.7.3 STE MAIN CONTROLLER (SMC)

He is the head authority of the Organization. He will have over all responsibility for directing operation and calling for outside help from emergency control centre.
The Site Main Controller shall wear White helmet for his easy identification. The responsibilities and duties of the Site Main Controller include:

(1) Relieve the Incident Controller of his responsibilities of over all charge of Main Control.

(2) On consultation with Incident Controller and other key personnel, decide about the type of emergency.

(3) To ensure that key personnel are called in.

(4) To continuously review and assess possible developments to determine the most probable cause of events.

(5) To direct the safe closure of the plant and evacuate the plant in consultation with the Incident Controller and other key person.

6.5.7.4 ESSENTIAL WORKERS (EW)

As soon as the Essential Workers hear the emergency siren or any emergency brought to the knowledge, they will first report to the Incident Controller. The team of Essential Workers trained in fire fighting and first –aid will be made available in the factory round the clock in all shifts.

Their responsibilities include:

(1) To fight fire till a fire brigade takes the charge.

(2) To help the fire brigade and mutual aid teams.

(3) To do emergency engineering work like isolation of equipment, materials, process, providing temporary by-pass line for safe transfer of materials, urgent repairs and replacement, electrical work etc.

(4) To provide emergency services like power, water, lighting, instruments, equipment etc.

(5) To move equipment, special vehicles and transport to or from the scene of incident.

(6) To provide first aid and medical help.

(7) To carry out atmospheric tests and pollution control.

6.5.7.5 OTHER KEY PERSONNEL

Other key personnel are required to provide advice and to implement the decisions taken by the Site Main Controller in the light of information received on the situation from the site emergency.
The responsibilities and duties of key personnel include:

(1) SAFETY:

The Safety Officer / Supervisor will carry out the following:

(a) To provide necessary equipment like Fire Fighting Equipment (FFE) and Personal Protective Equipment (PPE).

(b) To accompany Factory Inspector during investigations of the emergency.

(c) To train workers / supervisors in safety and safe operating procedures.

(d) To assist the Site Main Controller, Incident Controller in preparing a brief report of the incidents.

(2) ASSEMBLY POINTS:

The Assembly Points for gathering non – essential workers / persons will be fixed and will be clearly marked as per the wind direction.

(3) FIRE CONTROL ARRANGEMENTS:

Fire fighting trained personnel will be made available in all the shifts. The responsibilities and duties include:

(a) To fight the fire with available internal Fire Fighting Equipment.

(b) To provide Personal Protective Equipment to the team.

(c) To cordon the area and inform Incident Controller or Site Main Controller about the development of emergency.

(d) To trained personnel (Essential Workers) to use Personal Protective Equipment and Fire Fighting Equipment.

(4) MEDICAL ARRANGEMENT:
The responsibilities and duties include:

(a) To provide first aid to the affected persons, and, if necessary, send them to hospitals for further treatment.

(b) To keep a list of blood groupings ready and updated.

(5) TRANSPORT AND EVACUATION ARRANGEMENT:
For transportation of people, company's vehicles, cars, rickshaws etc. will be utilized.
The hazards in the proposed cement plant is mainly associated with cement production phases and results in the form of dust, noise and fire.

The main hazards during the transportation and storing of material are:

- The airborne dust created during the storage of material
- The conveyor belts during their normal operation as well as during their maintenance

In order to reduce the risk from airborne dust:

- To use dust suction systems
- To implement the necessary procedures for the routine cleaning of the settled dust

In material transport systems there are moving parts that are a constant source of hazard for any person working near these conveyors during normal operation or during the maintenance activities. For the safe operation of material transportation systems all the necessary guards are applied to isolate the moving parts. Additionally where personnel is working at a short distance from the guards, emergency stops are provided within short distance of these operators.

During the normal operation of the transportation systems:

- The removal of guards by unauthorized personnel must be prevented.
- Any maintenance work during the operation of the transportation systems must be avoided.
- Removing material during the operation of the conveyors must be avoided.
- The cleaning of overflows during operation must be avoided unless the cleaning is done by the conveyor operative.
- The use of unauthorized passageways either over or under the transportation systems must be avoided because there is the risk of personnel getting trapped by the conveyor or overflowing material can fall from height.
- The overhead bridges must be clean in order to minimize the possibility of the tripping and falling of the personnel performing the checks on the conveyor belts.
- Any intervention on the conveyor belt overload systems must be done by authorized personnel.

CHAPTER - 7

PROJECT BENEFITS

CHAPTER – 7

PROJECT BENEFITS

7.1 INTRODUCTION

India is the world's second largest producer of cement after China with industry capacity of over 200 million tonnes (MT). With the boost given by the government to various infrastructure projects, road network and housing facilities, growth in the cement consumption is anticipated in the coming years.

7.2 PHYSICAL INFRASTRUCTURE

As a proposed project is a new project, all the major physical infrastructure is development shall take place, which will improve the existing infrastructure scenario.

7.3 EMPLOYMENT OPPORTUNITIES

Skilled and unskilled manpower will be needed. This will temporarily increase the employment opportunity. Secondary jobs are also bound to be generated to provide day-to-day needs and services to the work force. This will also temporarily increase the demand for essential daily utilities in the local market.

The manpower requirement for the proposed project will generate some permanent jobs and secondary jobs for the operation and maintenance of plant. This will increase direct / indirect employment opportunities and ancillary business development to some extent for the local population. This phase is expected to create a beneficial impact on the local socio-economic environment.

The project will benefit the people living in the neighboring villages by giving preference to them in relation to direct employment associated with the various project activities. Construction and operation phase of the proposed project will involve a certain number of laborers. There is a possibility that local people will be engaged for this purpose. The operation phase will involve a number of skilled and unskilled workers. There is a possibility that local people will be engaged for this purpose to the extent possible and hence improve the existing employment scenario of the region.

Delivery of building materials will create Job creation to drivers and turn boys.

7.4 INDUSTRIES

The required raw materials and skilled and unskilled laborers will be utilized maximum from the local area. The increasing industrial activity will boost the commercial and economical status of the locality, to some extent.

7.5 ECONOMIC ACTIVITY

Due to general construction activities, casual labour shall be hired and locally available raw materials like sand, cement, etc., shall be used and as a result of these activities like sand harvesting, quarrying activities etc. shall be promoted and so indirectly the business opportunities will be there.

Thus due to proposed cement plant there shall be overall growth & development of area, increased employment, improvement in infrastructure and growth of downstream industries.

CHAPTER - 8

SUMMARY AND CONCLUSION

CHAPTER – 8

SUMMARY AND CONCLUSION

This EIA study report has been prepared following submission of form- I and pre-feasibility report to the Ministry of Environment and Forests (MoEF). The project proponent is M/s. Shivshakti Cements, Guwahati, Assam.

The proponent intends to set up a 200 TPD Clinker and/or Cement manufacturing plant at15th Mile, G. S. Road, N. H. No.: 40, Village Byrnihat, Taluka Sonapur, Dist. Kamrup - 782 482, Assam where they already have one cement manufacturing unit in the name of M/s. Mahashakti Cements. The location of plant is considered based on availability of infrastructure facilities and careful evaluations of other inter related factors. The location is supposed to be most favorable, where raw materials, power, fuel, man power are already available or can be developed at minimum cost: -

The complete manufacturing process of cement involves mining; crushing, and grinding of raw materials (principally limestone and clay); calcining the materials in a rotary kiln; cooling the resulting clinker; mixing the clinker with gypsum; and milling, storing and bagging the finished cement In this regard, the manufacturing process at the proposed site will entail the following stages:

a) Clinker transportation, unloading, conveying and storage

b) Transportation, storage and crushing of the clinker and gypsum

c) Grinding of materials in the cement mill

d) Cement storage and bulk loading

e) Cement packing, loading and storage

The project is envisaged to create employment opportunities to 49 people. M/s. Shivshakti Cements has appointed En-vision Enviro Engineers pvt. Ltd , to carry out an Environmental Impact Assessment study of the project and prepare an EIA study report As per EIA Notification 2006, the proposed project falls under category B, 3(b) Cement Plant (<1 million tonnes/annum production capacity The purpose of conducting an EIA study is to identify potential positive and negative environmental impacts associated with the proposed project and provide recommendations on how to take advantage of the positive impacts on one hand and how to mitigate the negative environmental impacts on the other.

The EIA team carried out the EIA study using a combination of methods including ground surveys, one season monitoring, studying existing literature on statutory and collecting data from secondary sources like IMD, Ahmedabad and Environment Information Centre (EIC). The potential environmental impacts identified are classified into the following categories: Impacts on Air resources, water resources, ecological resources, biodiversity, and socio-economic environment.

Mitigation measures have been developed in respect of the significant negative environmental impacts which if taken will make the proposed project viable. In addition, the EIA team has developed an environmental management plan, which should be adopted in order to ensure that the mitigation process is successful.

CHAPTER - 9

CONSULTANT ENGAGED

CHAPTER – 9

CONSULTANT ENGAGED

En-vision Enviro Engineers Pvt. Ltd. is a consulting, engineering and equipment supplier firm delivering exceptional service and quality to public and private clients in India. En-vision is working with zeal in the field of environmental engineering for more than 11 years. En-vision has a vision of supporting and being a part of development that is sustainable to our environment.

Environmental Impact Assessment for M/s. Shivshakti Cement for said project was conducted by En-vision and following members of En-vision family were involved;

Mr. Nihar Doctor: He possesses Bachelor's degree in Civil Engineering and Master's Degree exclusively in the specialized field of structural Engineering as well as Environmental Engineering. Presently he is holding the position of Director in Envision Enviro Engineers Pvt. Ltd. He is having fourteen years experience in Environmental Engineering field.

Mr. Kunhal Shah: He possesses Bachelor's degree in Civil Engineering and Master's Degree exclusively in the specialized field of Environmental Engineering. Presently he is holding the position of Director in Envision Enviro Engineers Pvt. Ltd. He is having fourteen years experience in Environmental Engineering field.

Dr. J.C. Vyas: He possesses Bachelor's degree in Civil Engineering, Master's Degree and Doctorate degree in structural Engineering. He is working with Envision Enviro Engineers Pvt. Ltd as a Technical Advisor. He has thirty seven years experience in the same field.

Mr. Shwetang Patel: He is M.Sc in Environmental Science. He is working as an Environmental Scientist. He has four years experience in the same field.

Mr. Jignesh Patel: He is M.Sc in Materials Science. He is working as an Environmental Scientist and has two years experience in the same field.

Mr. Gyanendra Singh: He is B.E in Chemical Engineering. He has two years experience and working as a Chemical Engineer in Envision Enviro Engineers Pvt. Ltd.

Mr. Abhijit Roy: He is B.E in Mechanical Engineering and M.Tech in Energy Management. He is a certified Energy Auditor and working with Envision Enviro Engineers Pvt. Ltd as an Energy Manager. He has two year experience.

Mrs. Neelima Roy: She is M.Sc in Environmental Science and M.Phil in Energy and Environment. She is working as an Environmental Scientist and has two year experience.

Miss Tasneem Motorwala: She is B.E in Civil Engineering and M.Tech in Environmental Engineering. She is working as an Environmental Engineer and has 2 years experience.

Mrs. Nirali N. Vaidya: She is D.E in Civil Engineering. She has 13 years experience and is working as a Civil Engineer.

Mr. Bhavin Dumasia: He is D.E in Civil Engineering. He has 13 years experience and is working as a Civil Engineer.

Miss. Kiran Panchal: She is B.E in Chemical Engineering. She is working as a Chemical Engineer and has 3 years experience.

Dr. Diksha Achal Vashi: She is M.Sc and Doctorate in Organic Chemistry. She has one year experience and working as a Senior Lab Incharge

Miss Krupali Damani: She is M.Sc in Botany. She has 3 year experience

Mr. Bharat Patel: He is B.Sc in Chemistry and working as a Senior Chemist. He has ten years experience in the same field.

ANNEXURE

ANNEXURE - I

NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) (1994)

Pollutants	Time-weighted average	Concentration in Ambient Air			Method of measurement
		Industrial Areas	Residential, Rural & other Areas	Sensitive Areas	
SulphurDioxide (SO_2)	Annual Average*	80 µg/m^3	60 µg/m^3	15 µg/m^3	- Improved West and Geake Method - Ultraviolet Fluorescence
	24 hours**	120 µg/m^3	80 µg/m^3	30 µg/m^3	
Oxides of Nitrogen as (NO_2)	Annual Average*	80 µg/m^3	60 µg/m^3	15 µg/m^3	- Jacob & Hochheiser Modified (Na-Arsenite) Method
	24 hours**	120 µg/m^3	80 µg/m^3	30 µg/m^3	- Gas Phase Chemiluminescence
Suspended Particulate Matter (SPM)	Annual Average*	360 µg/m^3	140 µg/m^3	70 µg/m^3	- High Volume Sampling, (Average flow rate not less than 1.1 m3/minute).
	24 hours**	500 µg/m^3	200 µg/m^3	100 µg/m^3	
Respirable Particulate Matter (RPM) (size less than 10 microns)	Annual Average*	120 µg/m^3	60 µg/m^3	50 µg/m^3	- Respirable particulate matter sampler
	24 hours**	150 µg/m^3	100 µg/m^3	75 µg/m^3	
Lead (Pb)	Annual Average*	1.0 µg/m^3	0.75 µg/m^3	0.50 µg/m^3	- ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	1.5 µg/m^3	1.00 µg/m^3	0.75 µg/m^3	.
Ammonia1	Annual Average*	0.1 mg/ m^3	0.1 mg/ m^3	0.1 mg/m^3	.
	24 hours**	0.4 mg/ m^3	0.4 mg/m^3	0.4 mg/m^3	.
Carbon Monoxide (CO)	8 hours**	5.0 mg/m^3	2.0 mg/m^3	1.0 mg/ m^3	- Non Dispersive Infra Red (NDIR)
	1 hour	10.0 mg/m^3	4.0 mg/m^3	2.0 mg/m^3	Spectroscopy
*	Annual Arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.				
**	24 hourly/8 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not on two consecutive days.				

Note:

1. National Ambient Air Quality Standards: The levels of air quality necessary with an adequate margin of safety to protect the public health, vegetation and property
2. Whenever and wherever two consecutive values exceeds the limit specified above for the respective category, it would be considered adequate reason to institute regular/continuous monitoring and further investigation
3. The above standards shall be reviewed after five years from the date of notification

ANNEXURE – II

INDIAN STANDARDS/SPECIFICATIONS FOR DRIINKING WATER IS: 10500-1991

SR NO.	SUBSTANCES OR CHARCTER-ISTICS MAX	REQUIREME-NT (DESIRABLE LIMIT)	UNDESIRABLE EFFECTS OUT-SIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN ABSENCE OF ALTERNATE SOURCE	METHOD OF TEST CI REF OF IS: 3025	REMARKS
ESSENTIAL CHARACTERISTICS						
1	Colour, Hazen unit	5	Above this, consumer acceptance decreases	25	4 of 3025, 1983	Extended upto 25 only if toxic substances are not suspected in absence of alternate Source.
2	Odour		Unobjectionable	-	5 of 3025,1983	a. Test cold and when heated b. Test at several dilutions
3	Taste		Agreeable	-	-	Test to be conducted only after safety has been established
4	Turbidity, NTU	5	Above this, consumer acceptance decreases	10	8	Test to be conducted only after safety has been established
5	pH Value	6.5-8.5	Beyond this range the water will affect the mucous membrane and/or water supply system	No relaxation	8	-
6	Total Hardness mg/L (as $CaCO_3$)	300	Encrustation on water supply structure and adverse effects on domestic use	600	-	-
7	Iron (as Fe), mg/L	0.3	Beyond this limit,, taste/appearance are affected has adverse effect on domestic uses and water supply structures & promotes iron bacteria	1.0	32 of 3025, 1964	-
8	Chlorides (as Cl^-) mg/L	250	Beyond this limit taste, corrosion and palatability are affected	1000	32 of 3025	-
9	Residual free chlorine, mg/L	0.2	-	-	26 of 3025, 1986	To be applicable only when water is chlorinated tested at consumer end, when protection against viral infection is required it should be min 0.5 mg/L

ANNEXURE - II (CONT.)

SR NO.	SUBSTANCES OR CHARCTER-ISTICS MAX	REQUIREME-NT (DESIRABLE LIMIT)	UNDESIRABLE EFFECTS OUT-SIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN ABSENCE OF ALTERNATE SOURCE	METHOD OF TEST CI REF OF IS: 3025	REMARKS
DESIRABLE CHARACTERISTICS						
10	Dissolved Solids, mg/L	500	Beyond this palatability decrease and may cause gastrointestinal irritation	2000	16 of 3025	
11	Calcium (as Ca) mg/L	75	-	200	40 of 3025, 1984	
12	Copper (as Cu), mg/L	0.05	Astringent,taste discoloration of pipes, fittings and utensils will be caused beyond this	1.5	36 of 3025, 1964	
13	Manganese (as Mn), mg/L	0.1	Astringent ,taste discoloration of pipes, fittings and utensils will be caused beyond this	0.3	35 of 3025,1964	
14	Sulphate (as SO_4^{-2}), mg/L	200	Beyond this causes gastrointestinal irritation when magnesium or sodium are present	400	24 of 3025, 1986	May be extended upto 400 provided (as Mg) does not exceed 30 mg/l
15	Nitrate (as NO_3^-), mg/L	45	Beyond this methaemoglo-binemia	100	-	-
16	Fluoride (as F^-), mg/L	1.0	Fluoride may be kept as low as possible. High fluoride may cause fluorosis	1. 5	23 of 3025, 1964	-
17	Phenolic substances mg/L (as C_6H_5OH)	0.001	Beyond this, it may cause objectionable taste and odour	0.002	54 of 3025	
18	Mercury (as Hg), mg/L	0.01	Beyond this, the water becomes toxic	No relaxation	See note mercury ion analyzer	To be tested when pollution is suspected
19	Cadmium (as Cd), mg/L	0.01	Beyond this the water becomes toxic	No relaxation	See note mercury ion analyser	To be tested when pollution is suspected
20	Selenium (as Se) mg/L	0.01	Beyond this the water becomes toxic	No relaxation	28 of 3025, 1964	To be tested when pollution is suspected
21	Arsenic (As), mg/L	0.05	Beyond this the water becomes toxic	No relaxation	37 of 3025, 1988	To be tested when pollution is suspected

ANNEXURE - II (CONT.)

SR NO.	SUBSTANCES OR CHARCTER-ISTICS MAX	REQUIREME-NT (DESIRABLE LIMIT)	UNDESIRABLE EFFECTS OUT-SIDE THE DESIRABLE LIMIT	PERMISSIBLE LIMIT IN ABSENCE OF ALTERNATE SOURCE	METHOD OF TEST CI REF OF IS: 3025	REMARKS
22	Cyanide (CN^-), mg/L	0.05	Beyond this the water becomes toxic	No relaxation	27 of 3025, 1986	To be tested when pollution is suspected
23	Lead (Pb), mg/L	0.05	Beyond this the water becomes toxic	No relaxation	See note 86	To be tested when pollution plumbosolvenc y is suspected
24	Zinc (as Zn), mg/L	5	Beyond this limit it can cause astringent taste and an opalescence in water	15	39 of 3025,1964	To be tested when pollution is suspected
25	Anionic detergents mg/L (as MBAS)	0.2	Beyond this limit undesirable taste and odour after Chlorination takes place	1.0	Methylene blue extraction method	To be tested when pollution is suspected
26	Chromium (as Cr^{+6}), mg/L	0.01	May be carcinogenic above this limit	0.05	28 0f 3025	To be tested when pollution is suspected
27	Polynuclear aromatic hydrocarbons, mg/L	-	May be carcinogenic	-	28 of 3025,1964	To be tested when pollution is suspected
28	Mineral Oil, mg/L	0.01	Beyond this limit undesirable taste and odour after Chlorination takes place	0.03	Gas chromatogra phic method	To be tested when pollution is suspected
29	Pesticides mg/L	Absent	Toxic	0.001	58 of 3025, 1964	-
30	Radioactive materials					
	a. Alpha emitters Bq/L	-	-	0.1	-	-
	b. Beta emitters pci/L	-	-	1.0	-	-
31	Alkalinity (as $CaCO_3$), mg/L	200	Beyond this limit taste becomes unpleasant	600	13 of 3025,1964	-
32	Aluminum (as Al), mg/L	0.03	Cumulative effect is reported to cause dementia	0.2	31 0f 3025,1964	-
33	Boron (as B), mg/L	1	-	5	29 of 3025,1964	-

Note: Atomic absorption spectrophotometric method may be used.

ANNEXURE - III

CLASSIFICATION OF INLAND SURFACE WATER (CPCB STANDARDS)

SR NO.	CHARACTERISTICS	A[@]	B[@]	C[@]	D[@]	E[@]
1	Dissolved Oxygen (mg/L), Min	6	5	4	4	-
2	Biochemical Oxygen Demand (mg/L), Min	2	3	3	-	-
3	Total Coliform Organisms, MPN/100 ml, Max.	50	500	5000	-	-
4	Total Dissolved Solids (mg/L), Max	500	-	1500	-	2100
5	Chlorides (as Cl^-), mg/L, Max.	250	-	600	-	600
6	Colour, Hazen units, Max	10	300	300	-	-
7	Sodium absorption ratio, Max	-	-	-	-	26
8	Boron (as B), mg/L, Max	-	-	-	-	2
9	Sulphates (as SO_4^{-2}), mg/L, Max.	400	-	400	-	1000
10	Nitrates (as NO_3^-), mg/L, Max	20	-	50	-	-
11	Free Ammonia (as N), mg/L, Max	-	-	-	1.2	-
12	Conductivity at 25°C, micromhos/cm, Max	-	-	-	1.0	2.25
13	pH value	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.0-8.0
14.	Arsenic (as As), mg/L, Max	0.05	0.2	0.2	-	-
15	Iron (as Fe), mg/L, Max	0.3	-	50	-	-
16	Fluorides (as F), mg/L, Max	1.5	1.5	1.5	-	-
17	Lead (as Pb), mg/L, Max	0.1	-	0.1	-	-
18	Copper (as Cu), mg/L, Max	1.5	-	1.5	-	-
19	Zinc (as Zn), mg/L, Max	15	-	15	-	-

* : If the Coliform count is found to be more than the prescribed tolerance limits, the criteria for coliforms shall be satisfied if not more than 20 percent of samples show more than the tolerance limits specified, and not more than 5 percent of samples show values more than 4 times the tolerance limit. Further, the feacal coliform should not be more than 20 percent of the coliform.

ANNEXURE - IV

CPCB RECOMMENDATIONS FOR COMMUNITY NOISE EXPOSURE (1989)

CATEGORY OF AREA	Leq (dBA) (DAYTIME) (0600 TO 2100 HRS)	Ldn (dBA) (NIGHT TIME) (2100 TO 0600 HRS)
Industrial Area	75	70
Commercial Area	65	55
Residential Area	55	45
Silence Zone	50	40

ANNEXURE - V

DAMAGE RISK CRITERIA FOR HEARING LOSS OCCUPATIONAL SAFETY& HEALTH ADMINISTRATION (OSHA)

MAXIMUM ALLOWABLE DURATION PER DAY (HOURS)	NOISE LEVEL (SLOW RESPONSE) dBA
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or Less	115

ANNEXURE - VI

ENVIRONMENTAL GUIDELINES FOR PREVENTION AND CONTROL OF FUGITIVE EMISSIONS FROM CEMENT PLANTS

ENVIRONMENTAL GUIDELINES FOR PREVENTION AND CONTROL OF FUGITIVE EMISSIONS FROM CEMENT PLANTS

For achieving effective prevention and control of potential fugitive emission sources in cement manufacturing plants, specific requirements along with guidelines have been evolved. In order to establish proper management practices, requirements such as Operation and Maintenance aspects, trained manpower and documents & records to be maintained are also prescribed. In addition, general guidelines are also evolved for the sources otherwise not specified.

1.1 Requirements for Prevention and control of fugitive emission for various Potential Sources

For the purpose of effective prevention and control of fugitive emissions, the cement industry is required to implement the following for the sections mentioned:

1. Unloading Section (Limestone, Coal & other relevant material)

Sr. No.	Control Measures to be Provided	Guidelines
1.	Enclosure should be provided for all unloading operations, except wet materials like gypsum	The enclosures for the unloading sides could be flexible curtain type material covering up to height of dumpers discharge from the roof.
2.	Water shall be sprayed on the material prior and during unloading	A dust suppression system should be provided to spray water. The amount of water sprayed should preferably be optimized by employing proper design of spray system. Suitable systems may be adopted to reduce the problems like choking, jamming of the moving parts.

2. Material Handling Section (Including Transfer Points)

Sr. No.	Control Measures to be Provided	Guidelines
1.	All transfer point locations should be fully enclosed.	The enclosures from all sides with the provision for access doors, which shall be kept, closed during operation. Spillages should be periodically removed.
2.	Airborne dust at all transfer operations / points should be controlled either by spraying water or by extracting to bag filter.	Either water spray system should be provided for suppressing the air borne dust or dry extraction cum bag filter with adequate extraction volume.

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3.	Belt conveyors should preferably be closed.	This will avoid wind blowing of fines.

3. Coal Storage Section

Sr. No.	Control Measures to be Provided	Guidelines
1.	Coal yard / storage area should be clearly earmarked.	A board should be erected to display the area earmarked.
2.	The pathways in coal yard for vehicle movement should be paved.	Proper pathways with entry and exit point should be provided.
3.	Accumulated dust shall be removed / swept regularly and water the area after sweeping.	Any deposits of dust on the concrete roads should be cleaned regularly by sweeping machines.
4.	Coal other than coal stock pile should preferably be stored under covered shed.	Where ever blending activity is carried out by chaining in open ground, covered shed should be provided to reduce the fine coal dust getting airborne. The enclosure walls shall cover minimum three sides up to roof level.
5.	The coal stock pile should preferably be under covered shed for new plants.	The enclosure should be from three sides and roof so as to contain the airborne emissions.
6.	Instead of dust extraction cum bag filter system, If dust suppression measure is used, following additional control measures should be provided.	
a	Wetting before unloading.	Coal should be sufficiently moistened to suppress fines by spraying minimum quantity of water, if possible.
b	Spray water at crusher discharge and transfer points.	Water spray should also be applied at crusher discharge and transfer points.

4. Clinker Cooler Section

Sr. No.	Control Measures to be Provided	Guidelines
1.	Air borne fines extracted from clinker cooler shall be separated and sent to last possible destination directly, if possible.	The possibilities especially in new cement plant may be explored for the following: The unit may need to add on / install necessary provisions for separating fine particulates from the clinker cooler ESP collection. Fines separation may be achieved by passing collected dust through cyclone, the fines escaping cyclone to be separated, cyclone collection (coarse particles) could be

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		recycled. The fines shall be recycled to the last possible destination (like clinker day silo) suitable or safely disposed.

5. Clinker Stock Piles Section

Sr. No.	Control Measures to be Provided	Guidelines
1.	In new cement plant, clinker should be stored preferably in silo.	Bag filter may be provided before venting out the gases.
2.	Clinker should be stored in closed enclosure covered from all sides and should have a venting arrangement along with a bag filter.	The enclosures should have a venting arrangement located at transfer point where clinker is dropped to the stockpile. The extraction / venting should be sufficient enough. Clinker stockpile access door should be covered by mechanical gate or by flexible rubber curtain. The access doors shall be kept closed at all possible times.
3.	The dust extracted and captured in bag filter should be avoided to feed back / recycled to the clinker stockpile, if possible.	Extracted dust should be captured in bag filter and the collected dust should be avoided to feed back to the clinker stockpile, if layout permits. It may be recycled at last possible destination i.e., cement mill section through suitable arrangement, if possible.
4	Generally open storage of clinker should be avoided. Only in case of emergency clinker should be stored in open with following control measures.	
5.	Area for open storage of clinker should be clearly earmarked.	After earmarking the open storage area of clinker, a board should be erected to display the area earmarked.
6.	Provide cover on openly stored clinker.	During the period when the openly stored clinker is inactive, it should be covered fully by HDPE or tarpaulin type sheets to prevent wind blowing of fugitive dust.
7.	Provide windbreak walls or greenbelt on three sides of open stock piles	Install three sided enclosures, which extend to average height of the stockpile, where ever feasible.
8.	Provide partial enclosure for retrieving area.	Flexible type wind breaking enclosure should be provided covering the clinker retrieval area as wind barrier to prevent dust carry over by wind. The enclosure could be of lightweight material like moulded plastic material or similar, which could be dismantled / assembled and shifted from one place to other.
9.	The travel path of pay loaders should be paved and frequently	Travel areas path used by the front – end pay loader shall be paved with concrete. It should

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	swept.	be regularly swept by high efficiency vacuum sweeper to minimize the material build – up.
10.	Provide loading of clinker by pay loaders into trucks / trailers be carried out in an enclosure vented to a bag filter.	The possibilities especially in new cement plant may be explored for the following: An enclosure fitted with bag filter could be located at the most central place adjacent to the clinker storage area. The pay loader moves to the fixed loading area from one end of the enclosure and the truck/trailer enters the enclosure from other end.

6. Storage of Limestone, Gypsum, Flyash and other additives:

Sr. No.	Control Measures to be Provided	Guidelines
1.	The storage should be done under covered shed.	The enclosure walls shall cover minimum two sides up to roof level.
2.	Dry fly ash shall be transported by closed tankers. In case of wet fly ash trucks may be used for transportation.	Flyash shall be pumped directly from the tankers to silos pneumatically in closed loop or mechanically such that fugitive emissions do not occur.
3.	Dry Fly ash shall be stored in silos only.	The silo vent be provided with a bag filter type system to vent out the air borne fines.
4.	Flyash in the dry form should be encouraged and in wet form should be discouraged. In case wet flyash is to be used, it may be stored in open temporarily for the purpose of drying with necessary wind break arrangement to avoid wind carryover of fly ash. The fly ash should be removed immediately after drying.	If possible, the dry flyash should be sent to closed silos. Otherwise, flyash should be transported through closed belt conveyors to avoid wind carryover of flyash.

7. Cement Packing Section:

Sr. No.	Control Measures to be Provided	Guidelines
1.	Provide dust extraction arrangement for packing machines.	The packing machines should be equipped with dust extraction arrangement such that the packing operation is performed under negative pressure. The dust may be captured in bag filters.
2.	Provide adequate ventilation	Adequate ventilation for the packing hall

	for the packing hall.	should be provided for venting out suspended particulate thereby ensuring dust free work environment.
3.	Spillage of cement on floor shall be minimized and cleared daily to prevent fugitive emissions.	The spilled cement from the packing machine should be collected properly and sent for recycling. The spilled cement on the shop floor should be swept by vacuum sweeping machines periodically. Proper engineering controls to prevent the fugitive emissions may include arrangements like providing guiding plate, scrapper brush for removing adhered dust on cement bag etc.
4.	Prevent emissions from the recycling screen by installing appropriate dust extraction system.	The vibratory screen provided for screening/ recycling spilled cement should be provided with a dust extraction arrangement to prevent fugitive emission from that section.

8. Silo Section :

Sr. No.	Control Measures to be Provided	Guidelines
1.	The silo vent be provided with a bag filter type system to vent out the air borne fines.	The bag filter should be operated and maintained properly, especially the cleaning of bags to avoid pressurization of silos thereby causing fugitive emissions from leakages etc.

9. Roads:

Sr. No.	Control Measures to be Provided	Guidelines
1.	All roads on which vehicle movement of raw materials or products take place should be paved.	The paved roads should be maintained as paved at all times and necessary repairs to be done immediately after damages to the road if any.
2.	Limit the speed of vehicles.	Limit the speed of vehicle to 10 Km/h for heavy vehicles with in the plant premises to prevent the road dust emissions.
3.	Employ preventive measures to minimize dust build up on roads.	Preventive measures include covering of trucks and paving of access areas to unpaved areas.
4.	Carry out regular sweeping of roads to minimize emissions.	Mitigative controls include vacuum sweeping, water flushing.

1.2 Requirement of Maintaining Documentation and Records:

The industry shall maintain records to document the specific dust control actions taken and maintain such records for a period of not less than two years and make such records available to the regulatory authorities upon request. In addition documents of technical specifications of the control system and O&M guidelines should also be maintained. (Refer Appendix A1 for details of documents and records to be maintained)

1.3 Requirement of trained Manpower:

- The industry shall employ or contract a "dust control officer" who shall be available on site during working hours and should have authority to expeditiously employ sufficient dust mitigation measures to ensure control of fugitive emissions especially in abnormal circumstances. *A suitably qualified person could be designated to operate as dust control officer. But, he should be provided necessary training and should be aware of operational, maintenance aspects. He should be responsible for proper control of fugitive emissions. Environmental Officer may act as a Dust Control Officer.*

- Regular training should be given to the personnel operating and maintaining fugitive emissions control systems on the operational and maintenance aspects and record keeping responsibility.

1.4 Operation and Maintenance Requirement for all Dust Extraction cum Bag filter Systems:

- A "U"-tube manometer (of minimum 400 mm length) shall be fixed at all bag filters. It shall be connected with inlet and outlet side of the bag filter through flexible rubber tubes. Coloured water should be filled to zero level mark for proper visibility of the pressure drop across bag filter.

- The minimum dust extraction volume should be based on the guidelines for ventilating various sources as per industrial ventilation hand book guidelines

- Un-interrupted supply of dry compressed air at desired pressure should be always ensured for pulsejet cleaning type bag filter.

- The flow rate and static pressure at the bag filter inlet should be monitored at least quarterly and recorded to ensure appropriate functioning of the bag filter installed.

- A sampling platform, portable and access ladder shall be provided at the final stack to carry out stack monitoring (in main stacks). Final emission should not exceed the prescribed standard.

- In systems where water is also spread, it should be ensured that water does not get carried over/sucked to the bag filter. The details such as bag house

specifications, layout drawing, operation and maintenance guidelines are to be maintained.

- The details such as bag house specifications, layout drawing, operation and maintenance guidelines are to be maintained.

1.5 Operation and maintenance Requirements for all Dust Suppression Systems:

- Basic details/specifications of the dust suppression systems installed at various locations should be maintained. The information should contain the quantity of water sprayed in LPH, number of nozzles, type of nozzles, desired water pressure, details of suppliers of spares, pipeline diagram, system layout etc.

- A fine mesh micro filter should be installed for filtering suspended solids from water prior to pumping to the nozzles to prevent choking of nozzles thereby ensuring proper sprays.

- A pressure gauge and water flow meter shall be installed at major source for on-line measurements and a record be maintained for quantity of water sprayed.

1.6 SPM Concentration Standard for Assessing Effectiveness of Control Measures Adopted:

- The effectiveness of prevention cum control measures provided for controlling fugitive emissions from any source shall be said to be satisfactory, provided the SPM concentration, measured at 10 metre distance (from the enclosure wall housing the emission source or from the edge of the stockpiles/pavement area) in downwind direction shall not exceed 2000 microgram per cubic metre and 5000 microgram per cubic metre for coal yard /coal stock pile and rest other area respectively. These standards are for one year period and will be reviewed after one year. In cases where SPM concentrations exceed the prescribed limit, necessary corrective measures in terms of improving the controls shall be taken and action taken records of improvements carried out be maintained.

- The measurement shall be carried out by High Volume / Respirable type samplers as per standard method prescribed by CPCB/BIS, covering at least 4 hours duration (240 minutes) during normal working hours with normal production rate of the operation / source being monitored on quarterly basis.

1.7 General Guidelines (For areas not otherwise specified):

Apart from the specific guidelines provided above for some specific sections/areas, for all other fugitive dust emitting areas, following general guidelines would apply.

ANNEXURE – VI (CONT.)

- The industry should prevent fugitive emission from all active operation and storage piles, such that the emissions are not visible in the atmosphere beyond the boundary line of the emission source.

- The Industry shall conduct active operations by utilizing the applicable best available control measures to minimize the fugitive dust emission from each fugitive dust source type within active operation.

- Except for Gypsum and Clinker, all storage piles should be kept in moist condition by spraying water at regular intervals for controlling fugitive emission, wherever possible

- The operation of the pay loaders shall be slow down whenever the average wind speed is high exceeding 50 km/h, which may cause fugitive emission.

- All storage silos shall be vented to bag filters, which should have proper bag cleaning arrangement so as to avoid choking of filter bags, thereby to avoid pressurization of silos.

- Regular inspection at a pre-determined frequency be carried out of all fugitive dust control system and records be maintained of such inspection and corrective action taken if any.

Appendix A.1

A 1: List of Documents & records to be maintained for fugitive dust control

Title of Record to be maintained	Frequency of Recording	Information to be recorded
Documents:		
List of Fugitive Emission Management Systems (FEMS) installed	To be up-dated once in a year	Location of FEMS, marked on process flow diagram, Identity Number, Type of FEMS, Year of installation, Operating Status
Technical Specifications of FEMS installed		
Specification of Dust suppression system	As and when installed/modified	Locations of controlling emissions, Identity Number, Supplier Name, Date of Commissioning, Pump HP, flow rate in LPM, Pressure in kg/cm^2, Nozzles type, numbers, LPM, O&M instruction from supplier.
Specification of Dust Extraction cum APCD	As and when installed/modified	Location of system installed, Identity Number, Name of system supplier, date of commissioning, flow rate in m3/hr, Time, flow m^3/hr, static pressure mmWc, velocity m/sec, Current Drawn by ID fan motor, operation & maintenance instruction from supplier.
Capacities of Closed Storages	Annually	For coal, limestone, clinker, gypsum, cement, additives, flyash, Dimensions, bulk density, Tons
Capacities of Open Storages	Annually	For coal, limestone, clinker, gypsum, additives, flyash, Dimensions, bulk density, Tons
Records		
Replacement of Damaged filter bags	As and when replaced	Number of Bags replaced, Date, Bag filter Identification number
Measurement of flow rate static pressure at bag filter inlet	Once a month	Bag filter Number, Date of monitoring, Time, flow m^3/hr, static pressure mmWc, velocity m/sec, Current Drawn by ID fan motor Name of the person
Stack Monitoring of bag filters stack, where ever monitoring is feasible	Quarterly	Bag filter Number, Date of monitoring, Time, Measured Data in m^3/hr and mmWc, Dust concentration in mg/Nm^3

ANNEXURE – VI (CONT.)

Operational Details of Dust Suppression System	Once in a month	Quantity of material handled, Quantity of water sprayed, number of operational nozzles, water pressure at filter inlet and outlet, details of damaged nozzles and replacements,
Road Sweeping record	Daily	Road location swept, date, running hours of sweeping machines
Quantity of coal in open storage, if any	Quarterly	Inventory of Existing storage, add on, retrieved on quarterly basis, Date
Quantity of clinker in open storage, if any	Quarterly	Inventory of Existing storage, add on, retrieved on quarterly basis, Date
Corrective actions taken for improving controls	As and when	Details of modifications carried out, level of reduction in SPM achieved