

# ENVIRONMENTAL IMPACT ASSESSMENT

## **MINI CEMENT PLANT:200 TPD**

**PROPONENT:**

**VINAYAK CEMENT**

**Factory**

SORUTARI-VILLAGE  
SONAPUR CIRCLE.  
KAMRUP DISTRICT  
Assam

**Office**

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**CONSULTANT:**

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## PREFACE

M/s Vinayak Cement Limited (VC) has proposed to setup a Mini Cement manufacturing Unit. The proposed capacity of the company is 200 MT per day (200 TPD). The Unit location is proposed at Sorutari Village , Byrnihat Industrial Area, Byrnihat Grampanchayat, Sonapur Circle, Kamrup dist., of Assam state. The unit operates in the manufacture of cement. The process involves Crushing Section, Storage & Proportioning, Raw Milling Blending & Homogenization, Palletizing & Burning, Clinker/gypsum crushing, storage & proportioning Cement Milling and Storage & Packing.

In order to assess the likely impacts arising out of the proposed project, VC had appointed PARYAVARAN LABS (INDIA) LTD., HYDERABAD 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. It also examines the possible impact on the people, their home land or their livelihoods, or to other nearby developments.

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

HYDERABAD

DIRECTOR (Labs)

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## **1.0 GENERAL**

### **1.1 PREAMBLE**

M/s Vinayak Cement (VC) has proposed to setup a Mini Cement manufacturing Unit. The proposed capacity of the company is 200 MT per day (200 TPD). The Unit location is proposed at Sorutari Village , Byrnihat Industrial Area, Byrnihat Grampanchayat, Sonapur Circle, Kamrup dist., of Assam state. The unit operates in the manufacture of cement. The process involves Crushing Section, Storage & Proportioning, Raw Milling Blending & Homogenization, Palletizing & Burning, Clinker/gypsum crushing, storage & proportioning Cement Milling and Storage & Packing.

The total project cost will be around 750 lakhs. Out of it land, building and machinery cost will be 556 lakhs.

In order to assess the likely impacts arising out of the proposed project, VC had appointed PARYAVARAN LABS (INDIA) LTD., HYDERABAD 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. It also examines the possible impact on the people, their home land or their livelihoods, or to other nearby developments.

Baseline Data have been collected for the various environmental component such as air environment, water environment, land environment, noise environment and socio-economic environment during winter and are presented in this report along with prediction and evaluation of impacts of the proposed project activities. After predicting potential problems, the EIA identifies measures to minimize the problems (adverse impacts) that may arise due to

project and outlines ways to improve the project's suitability for its proposed environment.

**1.2. UTILITIES**

**1.2.1 POWER**

The total connected load is 600 KVA which is under HT limits. Proposed power shall be obtained from ASEB. However, One D.G sets of 250 KVA is also proposed to be installed in the scheme as a stand by to the ASEB connection

**1.2.2 WATER**

Total water requirement will be around 100 KLD for cooling + administrative purposes. It will be met by bore well within the project site.

WATER BALANCE

REQUIREMENT	CU.M/DAY
1. Cooling	95.0
2. Domestic (including garden)	5.0
Total	100.0

WASTE WATER	CU.M/DAY
1. Evaporation Losses	95.0
2. Sewage/effluent	4.0
3. Other losses	1.0
Total	100.0

**1.2.3 MANPOWER**

The regular manpower required for administration, and production purposes will be around 60.

## **1.3 SITE**

### **1.3.1 SITE SELECTION**

The Project site is located at Sorutari Village. 18 km from Digaru Rly. Station, and 2 kms from National High way No.40. Guwahati – Shillong. Guwahati is around 25 km away from the project site. The land falls under Sorutari Village , Byrnihat Industrila Area, Byrnihat Grampanchayat, Sonapur Circle, Kamrup dist., Assam

The company has acquired 24220 M<sup>2</sup> of land. As for transportation of goods, there is already existing black topped roads to the project site. This is quite adequate for the possible truck movement envisaged. Total trucks required will be for RM – 26 Nos, & for FG – 20. Total 46 per day.

### **1.3.2 SITE JUSTIFICATION**

The present site was selected based on environmental consideration and other factors, e.g.

1. Demand of the product
2. Not disturbing any prime agri - land
3. Easy to receive RM in fact one of the raw materials Coke is available from the nearby Coke Oven Plant.
4. Transport accessibility for RM & FG
5. Where environment impact should be low.
6. The cement is in demand in the North eastern India.
7. In order to avoid transportation (including RM) which involves a fair share of economy, the present set up was thought to be a viable one.
- 8.This industry does not need enormous amount of water.
- 9.The site has a connecting road and easy approachability.

#### **1.4 DESCRIPTION OF ENVIRONMENT**

The land falls under Sorutari Village , Byrnihat Industrial Area, Byrnihat Gram panchayat, Sonapur Circle, Kamrup dist., Assam bounded by 26° -45' North Latitude 94° -13" East Longitude. The average annual rainfall is 2634.8 mm. Predominant wind direction is NNE. Calm conditions are prevalent more. The minimum to maximum temperatures and Relative humidities of the region during the winter season are 11.5°C to 31°C and 51% to 93% respectively.

The area of interest for the EIA study is 10 KM radius with Sorutari as its centre. The study area overlaps mainly Sonapur Revenue Circle in Kamrup district. The Project site is about 150 M above mean sea level. The land around the proposed site is rural background. Base- line data on the socio-economic conditions of the villages within 10 KM radius indicates availability of basic amenities like hospitals, educational institutions public transport. Digari Railway station is about 18 KM and on Northeast side from the proposed VC site. Location map of the project area is Not available.

#### **1.5 SCOPE OF REIA**

The scope of REIA study includes a detailed characterisation of present environment in an area of 10 KM. radius of project site for environmental components viz. air, noise, water, land, biological and socio-economic. Under the scope of REIA it is envisaged: To assess the present status of air, noise, water, land, biological and socio-economic components of environment. To identify and quantify significant impacts of VC operations on environmental components. To evaluate the proposed pollution control measures To prepare Environmental Management plan (EMP) outlining additional control technologies to be adopted for mitigation of adverse impacts To delineate post-construction environmental quality monitoring program to be pursued by the VC.

## **1.6 METHODOLOGY FOR RAPID ENVIRONMENTAL IMPACT ASSESSMENT**

Keeping in view the nature and size of the VC and based on guidelines of Ministry of Environment and Forests, Government of India, and past experience of carrying out similar studies it was decided to cover an area of 10 Km. radius, from the centre of the VC compound. This region has been exhaustively covered for the purpose of environmental impact assessment studies. The work carried out is briefly reported below and is described in detail in the subsequent sections.

### **1.6.1 AIR ENVIRONMENT**

The existing ambient air quality (AAQ) status within the study region has been assessed through a monitoring network of 6 AAQ sampling stations during winter season. The monitoring network has been designed based on the available climatic normal of predominant wind directions and wind speed of the study region for winter season. The baseline ambient air quality status of the study region was monitored for Suspended Particulate Matter (SPM), and various gaseous pollutants like Sulphur dioxide (SO<sub>2</sub>) and Oxides of Nitrogen (NO<sub>x</sub>). Eight hourly sampling was carried out for SPM. All gaseous pollutants were sampled on four hourly basis. High Volume Samplers have been used for monitoring all air pollution parameters. Micro-meteorological data was also recorded on hourly basis using a manual weather station. Weather station for this purpose was installed project site.

### **1.6.2 NOISE ENVIRONMENT**

Noise Environment may cause an adverse effect on human being and associated environment including land, structures, domestic animals, wild life and natural ecological systems. Hence, noise survey was carried in and around the project site. Equivalent noise levels were measured using a precision noise

level meter, at residential areas, schools, hospitals, bus-stands and commercial centers etc. A total of 8 locations were covered within the 10 Km radial distance.

### **1.6.3 WATER ENVIRONMENT**

Information on water resources was collected during the study period. 6 water samples were collected from various locations within the 10 Km radial distance. The parameters of prime importance were selected under physical, chemical (inorganic and organic) and heavy metal groups. As the process does not generate any effluents waste water characterization has not been done.

### **1.6.4 LAND ENVIRONMENT**

Soil samples were collected from 5 villages, in order to assess the field infiltration rates and limitations of the soil for growth of appropriate plant species around the site. Plant species for development of green belt were identified taking into consideration the attenuation factors for air pollutants.

### **1.6.5 SOCIO-ECONOMIC ENVIRONMENT**

Baseline data for socio-economic and cultural environment is important in conducting EIA studies. Any developmental activity will bring about changes in socio-economic pattern. Data on demographic pattern, population characteristics, employment, income, mortality rate, health status, land use pattern, energy and fuel consumption, transport and recreation facilities were collected from neighboring villages. All the afore said environmental parameters will be used for identification, prediction and evaluation of significant impacts. Using the baseline data prediction of impacts of the project have been undertaken.

## 1.7 PROCESS DESCRIPTION:

VC is proposing to manufacture 150 TPD Ordinary Portland cement and 50 TPD of Pozzolano Portland cement. Total will be 200 TPD.

Main raw material used for manufacture of Clinker	Limestone - 95 to 98.5 % Aluminous Laterite- 1.5 to 5 %
Raw materials used for manufacture of 1. Portland Pozzolona Cement (PPC) 2. Ordinary Portland Cement (OPC) 3. Portland Slag Cement (PSC)	60% clinker+ 5 % gypsum+35% Flyash 90% clinker + 5% gypsum + 5% LS 45% clinker + 50% slag + 5% gypsum

### 1.7.1. RAW MATERIALS

Raw Material	Quantity/Day	Source
Limestone	272.00 MT	Nearby sources(N.C.Hills & Meghalaya)
Clay	034.00 MT	Nearby
Coke breez /coal	050.00 MT	Nearby (Assam & meghalaya)
Gypsum	008.00 MT	Nearby (Bhutan & rajasthan)

Limestone deposits of good grade suitable for cement manufacturing is spread over a large area stretching North Cachar District in Assam upto Jaintia Hills Districts and beyond in Meghalaya. Limestone deposits of good quality are being mined at different locations. The unit is will also be able to procure limestone from Umrangso in N.C. Hills and from Umsolong, Karbiaglong. Hence, the procurement of limestone [main raw material] will not be problem for the unit.

Coal is available abundantly in Meghalaya. The coal having high volatile matter would be devolatalised using Beehive Coke oven to reduce the volatile matter to less than 4% in a controlled atmosphere. Coke Breeze with low volatile matter is also available from various coke manufacturing units located in Assam and Meghalaya. Gypsum is available from Bhutan, Rajasthan on regular basis.

### **1.7.2 MANUFACTURING PROCESS OF PRODUCT**

The main operations involved in the manufacture of cement are crushing and grinding of raw material, burning and sintering of grind raw material to obtain clinker and grinding of clinker to produce cement.

There are two basic processes namely

- a) Wet Process and
- b) Dry Process.

a) Wet Process:

- ⇒ The limestone as raised from quarry, is transported to the crushing plants by means of tipping trucks/dumpers or railway wagons.
- ⇒ Limestone crushing is carried out in one, two or three stages according to the characteristics of raw materials. The limestone used in cement manufacture should have a crushed size ranging between 0 – 25 mms.
- ⇒ The crushed lime stone and the corrective materials, if any, and water, are introduced in to the grinding mill, by means of a gravimetric dozing device. The slurry obtained from the mill has about 33% moisture and is pumped in to correction tanks called slurry silos.
- ⇒ After correction, the slurry is fed to the rotary Kiln, at a uniform rate.
- ⇒ In the kiln, the slurry is subjected to physico-chemical modification and finally transformed in to chemical clinker.
- ⇒ The gypsum is crushed in a crusher to a size of 0 to 25 mm and conveyed to the gantry or hopper provided for storage.
- ⇒ The clinker together with the gypsum is introduced in to a finish grinding mill, which is fed by means of gravimetric dosing

devices. The cement thus produce is conveyed and stored in cement storage silos.

b) Dry Process:

- ⇒ The crushed raw meal from crushing plant is conveyed to raw meal grinding plant. The crushed raw meal is dried simultaneously in the grinding mill provided with cyclone separator. For drying, hot gases from kiln or from an auxiliary furnace meant for the purpose is introduced in the grinding circuit. The ground raw meal is conveyed pneumatically in to the homogenizing silos.
- ⇒ The corrected powder, properly homogenized is stored in storage silos to be fed to the rotary kiln, which is provided with suspension pre-heaters. After flowing through the heat exchanger and the kiln, the powder is transformed in to clinker at a temperature of about 1400°C. The hot clinker is cooled in the cooler and conveyed to the clinker storage.
- ⇒ The clinker grinding section and final storage of cement in silos are the same as in wet process.

**Selection of Manufacturing Process:**

The wet process has a wide range of application in cement manufacture in the following cases :

- i) When the raw materials has a high degree of moisture.
- i) When the raw material requires beneficiation by floatation process.
- ii) Where the minor constituents in the raw materials such as chlorides, alkalis, SO<sub>3</sub> and phosphorous are beyond the limits specified for the day process.

The dry process is used in cement manufacturing:

- i) When the raw materials are of suitable quality.

- ii) When the cost of fuel is high and economy in fuel consumption is essential.

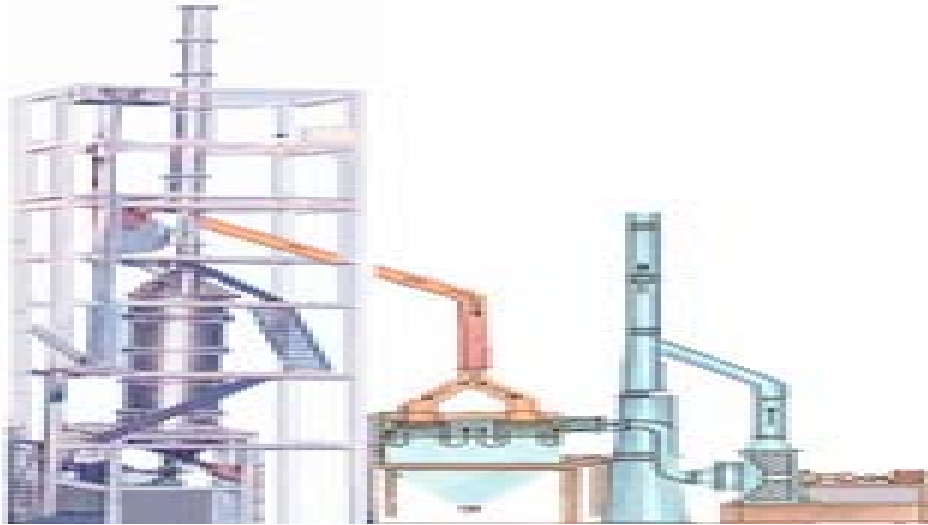
Presently, wet process of manufacture of cement is uneconomical in view of the high fuel consumption. The dry process technology is therefore, widely preferred, due to saving in the fuel cost. And hence for the proposed mini cement plant, the dry process of cement manufacture with suspension pre-heater is recommended to produce cement of various qualities. In this case it has to be ensured that the limestone available is suitable for manufacturing cement by dry process with suspension pre- heater system The Firm has proposed to adopt the Dry process of manufacturing for its unit instead of Wet Process as the later is more expensive in respect of fuel consumption. The VSK technology under the Dry Manufacturing Process has wide use because of its low fuel consumption and cost effectiveness. A photograph of VSK Technology of manufacturing cement is shown as under:



VSK technology is based on black metal process in which all the raw materials namely limestone, clay, fuel (coke breeze, coal or any low volatile

coal) and other corrective materials are introduced to a fineness of about 10% retained on 170 mesh, and thoroughly homogenized. The raw meal is formed into nodules of 8-10 mm size by addition of water in a pan nodulizer rotating at a suitable speed and inclination. These nodules are fed into Vertical Shaft Kiln lined with suitable refractory inside, through a rotary feeder, which also distributes the nodules evenly on bed. As the material passes down in the kiln, it is dried heated and burnt into clinker. The clinker is then cooled and discharged from the kiln by a rotary grate at the bottom of the kiln through a triple air lock discharge device or Gamma ray controlled material block tube system. The combustion air provided by a roots blower to the kiln also serves the purpose of cooling the clinker (to about 60 degree C) and thus avoids wastage of heat. The clinker then passes into a cement mill where it is ground with about 2% gypsum (preferably of about 85% purity) to produce cement.

VSK technology is approved by Industrial development bank of India (IDBI) and is modern day answer for cost effective production and a boon for the developing countries. The plant is well equipped with the appropriate pollution control device at every transfer point to ensure dust free operation. It is environment friendly. The flue gases from kiln are treated in a special wet scrubber for cleaning before releasing into the atmosphere designed and developed by National Productive council (A govt. of India undertaking) with the expertise of German Scientists. How does the technology maintain the balance in the environment is shown in the following model chart:



VSK Technology- its features and benefits:

#### **Unique Features**

- Exceeds rated capacity.
- Superb cement quality.
- Use of alternate raw materials like Lime-Kankar, Murl-Lime, Sea Corals, Sea Shells etc.
- Use of alternative Fuels like SLV- Coal, lignite, Petroleum coke etc

#### **Benefits**

- Low Installed cost.
- Less Power Consumption.
- Ample fuel saving.
- Shorter gestation period.
- Easy in operation.
- Negligible Maintenance.
- Trouble free Technology.

Salient Features
<ul style="list-style-type: none"> <li>▪ Incorporating secondary crusher optimizes raw material crushing mainly Limestone.</li> <li>▪ Introducing energy efficient Ball Mill System for reducing Power consumption.</li> <li>▪ Better Kiln design to prevent radiation loss.</li> <li>▪ Improved Rotary grate design for smooth and trouble free operation.</li> <li>▪ Preference to Bucket elevator in place of high power consuming Air lifts.</li> </ul>

The manufacturing process basically comprises of the following operations.

- Crushing of limestone and other raw materials to size of minus 20mm.
- Proportioning of raw mix and fuel based on raw mix design.
- Grinding of raw mix to a fineness of 90% passing 170 mesh.
- Blending of ground raw mix to a desired level.
- Preparation of nodules by addition of water to raw meal in a pan type noduliser.
- Calcimining, sintering, burning and cooling in vertical shaft kiln.
- Grinding clinker and gypsum in ball mill to fineness of 3000 Baline or as per requirement.
- Packing the cement in bags.

**Process Flow Diagram :**



**Brief Manufacturing Process:**

- 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 noduliser 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 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.

<b>Plant Detail</b>				
<b>Raw Mill Section:-</b>	Capacity	Size	Motor in HP	
Jaw Crusher	40 MT/h		40	
Belt Conveyer	20 MT/h		3	
Hummer Mill	30 MT/h		40	
Elevetor	20 MT/h		5	
Raw Mill Hopper				
a) Lime Stone Hopper		5m X 5m X 7 X 2Nos.		
b) Clay		5m X 5m X 7 X 1No.		
c) Cock Brize		5m X 5m X 7 X 1No.		
Jaw Crusher	20 MT/h		10	
Elevetor No.2	20 MT/h		5	
Computer Weighing Scale	3 MT/h		2	
Elevetor No.3	20 MT/h		5	
Ratched feeder	15 MT/h		2	
Raw Mill Hopper		3m x 3m x 6m		
Raw Mill (Ball Mill)	20 MT/h	dia=2.2m,L=7.5, Thickness=16mm,25mm & 36mm, Liner Mg Steel	250	
Elevetor No.4	20 MT/h		5	
<b>Blending Section:-</b>	120 MT	4m x Dia=4m x 2 Nos.	30	for Blending Blower
Store Hopper	200 MT	5m x 6m x 7m		
<b>Kiln Section:-</b>				
Screw Feeder	20 MT/h		5	
Elevetor No.5	20 MT/h		5	
Elevetor No.6	20 MT/h		5	
Surge Silo	50 MT	4m x3m x4m x 2Nos		
Screw Feeder	10 MT/h	2 Nos.	3	
Nuddlizer	10 MT/h	Dia=2.4, Rpm=24 x 2Nos	10	
Rottery Van Feeder	10 MT/h	2 Nos.	2	
VSK Kiln	100	Dia=2.4 xL=9.5m x 2Nos	7.5 x 2	for Kiln drive
Chimni		Dia=1.1m x H=120' (from G.L.) x 2 Nos.		



## **2.0 PRESENT ENVIRONMENTAL STATUS**

### **2.1 AIR ENVIRONMENT**

The ambient air quality status with respect to the specific (identified) pollutants across the study zone of 10 km radial distance from the plant site during pre-project conditions will form the base line information over which the predicted impacts due to the proposed project can be superimposed to find out the net (final) impacts (post-project scenario) on air environment. If the final impacts due to the proposed project are known at the planning stage of the project, a viable Environmental Management Plan (EMP) can be prepared based on impact assessment for the air environment. The baseline status of the ambient air quality can be assessed through a scientifically designed ambient air quality monitoring network. The design of monitoring network in the air quality surveillance programme has to be based on the following considerations:

1. Meteorological conditions on synoptic scale
2. Topography of the study area
3. Representation of regional background levels
4. Representation of core zone
5. Representation of cross sectional distribution in the upwind and downwind directions
6. Influence of the existing sources, if any, are to be kept at minimum.

#### **2.1.1 RECONNAISSANCE**

The proposed Project of VC is located at The land falls under Sorutari Village , Byrnihat Industrial Area, Byrnihat Grampanchayat, Sonapur Circle, Kamrup dist., Assam state. A circular area of 10 km radius was identified as study zone for base line data collection based on previous experience of carrying out EIA studies. The area represents mostly rural environment. Different air pollution parameters like Suspended Particulate Matter (SPM), Sulphur dioxide

(SO<sub>2</sub>) and Oxides of Nitrogen (NO<sub>x</sub>) have been identified for assessment of existing air quality status.

### **2.1.2 . METEOROLOGY**

Meteorology of the study zone plays an important role in air pollution studies. The prevailing micrometeorological conditions at the proposed project site will regulate the dispersion and dilution of air pollutants in the atmosphere. The predominant wind directions and wind speed at the core zone will decide the direction and distance of the mostly affected zone from proposed activity. The meteorological station was set up in a open place free from obstructions at about 2.5 m above ground level to study the wind pattern. The twenty four hourly duration was from 10 hours to 10 hours (next day) during Post monsoon.

#### **WIND PATTERN DURING 10-10 HOURS (FINAL AVERAGE)**

The predominant wind directions was NNE with percentage frequencies of 25.1% of the total time. The other wind directions were N, and NE with percentage frequencies of 9.3% and 4.1%.of the total time respectively . The most dominant wind direction was NNE in which wind speeds of 0-5 km/hr, 5-10 km/hr and 10-15 km/hr were recorded for 5.4%, 15.5% and 4.2%. of the total time respectively. During the study period More percentage of Calm conditions prevailed for 61.5% of the total time.

The maximum and minimum temperatures recorded during the study period were 11.5 deg. C and 31 deg. C respectively. The relative humidity recorded during the study period ranged between 51% and 93% .

The twenty four hourly wind rose data is given in Table 2.1.1.

**Table 2.1.1**

WIND ROSE DATA

Direction	0 - 5 kmph	5 - 10 kmph	10 - 15 kmph	>15 kmph	Total
N	5.1%	4.2%			9.3%
NNE	5.4%	15.5%	4.2%		25.1%
NE	2.7%	1.5%			4.1%
Calm	64.3%				61.5%
					100.0%

### 2.1.3. DESCRIPTION OF SAMPLING LOCATIONS

PROJECT SITE: The Station was selected to determine present air quality at the project. The sampler was fixed at 3.0 M height.

SORUTARI Village: This location is 1.0 KM from the core zone in the W direction. The Station was selected to determine present air quality at the Nearest point. The sampler was fixed at 3.0 M height.

TAMULKUCHI Village: This location is 3.0 KM from the core zone in the NNE direction. The Station was selected to determine present air quality at the Upwind direction nearby point. The sampler was fixed at 3.0 M height.

MARUKDULA: This location is about 2.0 KM from the core zone in the E direction.. The sampler was fixed at a height 3 M above the ground level and free from obstructions.

TANDU: This location is about 1.5 KM from the core zone in the SSW direction. The station was selected to know one of the nearest Downwind villages concentrations in the area.

BYRNIHAT: This location is about 5.0 KM from the core zone in the S direction. The station was selected to know one of the downwind villages concentrations in the area.

Locations with their distance and direction from the project site is shown in table 2.1.2..

#### **2.1.4. EXISTING AMBIENT AIR QUALITY**

At Project site, SPM values ranged between 92 and 151 ug/cu.m. RSPM values ranged between 22 and 41 ug/cu.m. SO<sub>2</sub> and NO<sub>x</sub> values did not exceed 8 and 11 ug/cu.m respectively. At Sorutari, SPM values ranged between 87 and 145 ug/cu.m. RSPM values ranged between 20 and 38 Ug/cu.m. SO<sub>2</sub> and NO<sub>x</sub> values did not exceed 7.5 and 12 ug/cu.m respectively. At the site Tamulkuchi SPM values ranged between 105 and 162 ug/cu.m. RSPM values ranged between 23 and 44 Ug/cu.m. SO<sub>2</sub> and NO<sub>x</sub> values at this site did not exceed 11 and 16 mg/cu.m respectively.

At Marukdula site SPM values were between 89 and 148 ug/cu.m. RSPM values ranged between 18 and 36 Ug/cu.m. SO<sub>2</sub> and NO<sub>x</sub> values at this site did not exceed 8.5 and 15 Ug/cu.m respectively. At site Tandu SPM values ranged between 107 and 164 ug/cu.m. RSPM values ranged between 22 and 42 Ug/cu.m. SO<sub>2</sub> and NO<sub>x</sub> values at this site did not exceed 10 and 15.5Ug/cu.m respectively. At the site Byrnihat SPM values ranged between 117 and 169 ug/cu.m. RSPM values ranged between 25 and 46 Ug/cu.m. SO<sub>2</sub> and NO<sub>x</sub> values at this site did not exceed 11.5 and 18 Ug/cu.m respectively. SPM, SO<sub>2</sub> and NO<sub>x</sub> values at the various sites in the study zone are given in Tables 2.1.2

- 2.1.5

**TABLE 2.1.2** Details of Air monitoring locations

Location	Direction	Distance from core zone (Km)
1. Project Site	--	
2. Sorutari	W	1.0
3. Tamulkuchi	NNE	3.0
4. Marukdula	E	2.0
5. Tandu	SSW	1.5
6. Byrnihat	S	5.0

**TABLE 2.1.2** EXISTING AMBIENT SPM LEVELS WITHIN THE STUDY ZONE

The following values are expressed in Ug/cu.m

Sampling Location	Minimum observation	Maximum observation
1. Project Site	92	151
2. Sorutari	87	145
3. Tamulkuchi	105	162
4. Marukdula	89	148
5. Tandu	107	164
6. Byrnihat	117	169

**TABLE 2.1.3** EXISTING AMBIENT RSPM LEVELS WITHIN THE STUDY ZONE

The following values are expressed in Ug/cu.m

Sampling Location	Minimum observation	Maximum observation
1. Project Site	22	41
2. Sorutari	20	38
3. Tamulkuchi	23	44
4. Marukdula	18	36
5. Tandu	22	42
6. Byrnihat	25	46

**TABLE 2.1.4****EXISTING AMBIENT SO<sub>2</sub> LEVELS WITHIN THE STUDY ZONE**

The following values are expressed in Ug/cu.m

Sampling Location	Minimum observ- -ation	Maximum observ- -ation
1. Project Site	6.5	08
2. Sorutari	06	7.5
3. Tamulkuchi	8.5	11
4. Marukdula	07	8.5
5. Tandu	7.5	10
6. Byrnihat	09	11.5

**TABLE 2.1.5****EXISTING AMBIENT NO<sub>x</sub> LEVELS WITHIN THE STUDY ZONE**

The following values are expressed in Ug/cu.m

Sampling Location	Minimum observ- -ation	Maximum observ- -ation
1. Project Site	07	11
2. Sorutari	08	12
3. Tamulkuchi	10	16
4. Marukdula	8.5	15
5. Tandu	09	15.5
6. Byrnihat	11	18

## 2.2 NOISE ENVIRONMENT

The physical description of sound concerns its loudness as a function of frequency. Noise in general is sound which is composed of many frequency components of various loudness distributed over the audible frequency range. Various noise scales have been introduced to describe, in a single number, the response of an average human being to a complex sound made up of various frequencies at different loudness levels. The most common and heavily favored of these scale is the weighted decibel (dBA). This scale has been designed to weigh the various components of noise according to the response of the human ear.

The impact of noise sources on surrounding community depends on: Characteristics of the noise sources (instantaneous, intermittent or continuous in nature). It is well known that a steady noise is not as annoying as one, that is continuously varying in loudness.

The time of day at which noise occurs, for example loud noise levels at night in residential areas are not acceptable because of sleep disturbance. The location of the noise source, with respect to noise sensitive land use, which determines the loudness and period of noise exposure. The environmental impact of noise can have several effects varying from Noise Induced Hearing Loss (NIHL) to annoyance depending on loudness of noise levels. The existing status of noise levels within the study zone, a primary requirement of impact assessment studies, has been undertaken through reconnaissance, identification of existing noise sources, land use pattern and monitoring of baseline noise levels.

### **2.2.1 RECONNAISSANCE**

The Project site is located at Sorutari Village. 18 km from Digaru Rly. Station, and 2 kms from National High way No.40. Guwahati – Shillong. Guwahati is around 25 km away from the project site. The land falls under Sorutari Village , Byrnihat Industrial Area, Byrnihat Grampanchayat, Sonapur Circle, Kamrup dist., Assam. More Trucks and cars are expected to add to the main noise generated by process operations and machinery of the proposed plant.

### **2.2.2. COMMUNITY NOISE**

The ambient noise level is characterised by significant variations above a base or a residual noise level. The residual noise level is that level below which the ambient noise does not seem to drop during a given time interval and is generally caused by unidentified distant sources. It is approximately 44 dBA. It differs in rural and urban areas. At night its level is low due to fewer noise events. The annoyance that people experience depends upon the number of noise events that occur during a time interval. A noise rating development by United States Environmental protection Agency (USEPA) for specification of community noise from all sources is the day night sound level, Ldn it is similar to a 24 hours equivalent sound level except that during the night time period , which extends from 10.00 p.m. to 7.00a.m., a 10 dBA weighting penalty is added to account for the fact that noise at night when people are trying to sleep is judged more annoying than the same noise during the day time. The Ldn for a given location in a community is calculated from an hourly equivalent sound level during day time (Ld) and during night time (Ln).

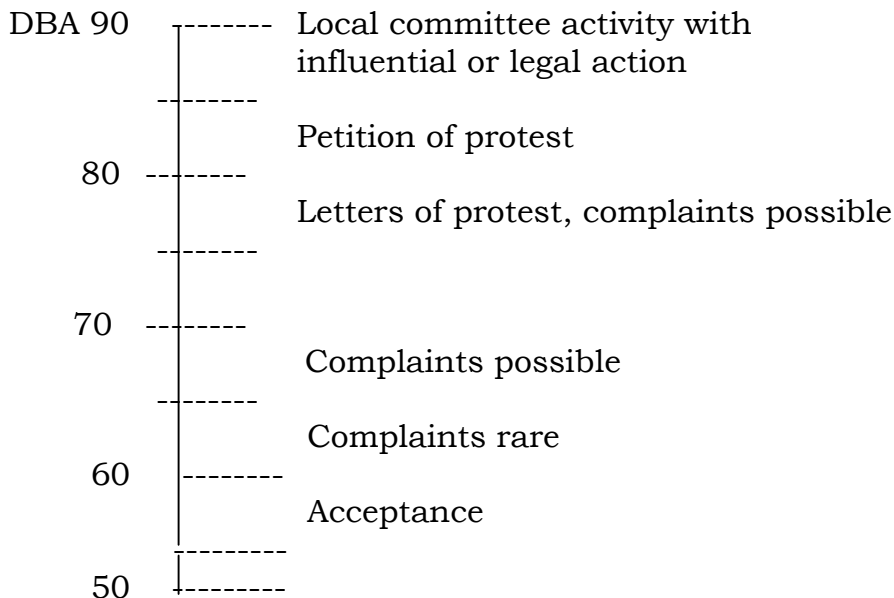
### 2.2.3. EXISTING NOISE LEVELS

An assessment of equivalent day-night levels in and around 10km radius from the core zone reveal that noise levels range from 37 to 63 dBA which can be assumed to be the existing baseline status. After commissioning of the VC plant may also not have any impact on either present noise level status. These results indicate that the existing status of the study zone are within the community acceptable noise levels (Ldn of 50-60 dBA). A normalized outdoor Ldn of about 50 to 60 dBA with a mean of 55 dBA would result in no community reaction. The data shown in Fig 2.2.1 suggests that wide spread complaint can be expected when the normalized Ldn reaches about 65 dBA. The sampling locations for noise monitoring in Table 2.2.1.

The equivalent day-night noise sources are given in Table 2.2.2.

FIGURE 2.2.1

Trend of public reaction to peak noise near residences



**TABLE 2.2.1**

Details of Noise monitoring locations

Location	Direction	Distance from core zone (Km)
1. Project Site (Centre)	--	
2. Project Site (Gate)	--	
3. Project Site (South)	--	
4. Sorutari	W	1.0
5. Tamulkuchi	NNE	3.0
6. Marukdula	E	2.0
7. Tandu	SSW	1.5
8. Byrnihat	S	5.0

**TABLE 2.2.2**

EQUIVALENT DAY-NIGHT NOISE LEVELS IN THE STUDY AREA

Location	Equivalent levels		
	Day	Night	Day-Night
1. Project Site (Centre)	35	29	37
2. Project Site (Gate)	36	30	38
3. Project Site (South)	35	29	37
4. Sorutari	42	34	43
5. Tamulkuchi	45	37	46
6. Marukdula	40	32	41
7. Tandu	48	42	50
8. Byrnihat	63	53	63

## **2.3 WATER ENVIRONMENT**

Studies on Water Environment aspects of ecosystem is important for Environmental Impact Assessment to identify sensitive issues and take appropriate action by maintaining ecological homeostatis in the early stages of development of the project. The objective of this report is to define the present environment in which the proposed action is to occur, to evaluate all possible eventualities, to ensure that all the negative impacts are minimized, and to demonstrate that the proposed project has been appropriately announced to all interested parties to give due consideration to their concerns.

### **2.3.1 BASELINE DATA**

#### LOCATION:

The study area encompasses 10 km radial distance with project site as its centre. The study area mainly falls under Sonapur Circle of Kamrup District of Assam state.

#### RAIN FALL

The principle source of water, whether surface or ground water, is precipitation. Rainfall thus assumes more significance and is the single most important factor which controls the water availability of the area. The area where the VC unit is receives rainfall mainly from NE. The average rainfall in the area is to 2634.8 mm (2003).

#### RECONNAISSANCE SURVEY

The water resources in the study area may be classified into two major categories.

1. Surface water resource
2. Ground water resource

Both surface and ground water resources are ample in the study area. The state authorities have also provided tap water system and tube wells fitted with hand pump for the drinking water. 6 Ground water samples were analyzed to understand the factors governing the terrestrial and aquatic flora and fauna.

### SURFACE WATER RESOURCE

There are few ponds which cater to the need of the villages. It has been observed that these ponds are rich in aquatic growth and are generally used for washing of cattle and clothes.

### GROUND WATER RESOURCES

Ground Water resources is ample in the study area. Every village has a few of the bore wells. The state authorities have also provided tube wells fitted with hand pump for the drinking water requirements of villages in the study area. Presently the drinking water needs are met from the protected water supply schemes.

### **2.3.2 WATER QUALITY ASSESSMENT**

The water quality assessment of the ground water sources was carried out to assess the water quality impacts. Sampling locations for assessment of water quality and the details of the sampling points are given in Table 2.3.1

### **2.3.2.1 PHYSICO - CHEMICAL CHARACTERISTICS**

Selected Physico-chemical and biological parameters have been studied for projecting the pre-project water quality status in and around the core zone. To determine the water quality individual samples were collected from each station and analysed for parameters such as Hardness, Alkalinity, Conductivity, nutrient demand, inorganic substance, heavy metals etc. The water quality data are given in Tables 2.3.2 -2.3.3

### **2.3.3. BIOLOGICAL COMPONENTS - GENERAL OBSERVATION**

#### AQUATIC VASCULAR PLANTS

Vascular plants which are partially or totally submerged in water all the year round are rooted in or affixed to the substratum. Aquatic vascular plants in the study area are restricted to only lentic system. Members of Hydrocharitaceae, potamogetaceae and Nymphaeaceae are the important phanerogams located in the area. Among cryptogams azolla and marsillia are common.

#### PHYTOPLANKTON

Planktons are those which are freely suspended in water and are possibly aided in this by limited ability to move. Having suitable temperature and light regime in the region phytoplanktons are flourishing. Among the phytoplanktons members of chlorophyceae are dominating in all the samples. Algae which can utilize the nitrogen dissolved in water as starting material for their photosynthesis are Blue green algae. Some algae species have the capacity to produce and eventually release toxic metabolites. The species Microcystis is one of such alga however not located in the sample.

#### **2.3.4. OTHER AQUATIC ANIMALS**

Among the orthopodes mayfly larvae, caddis larvae, and culex larvae are very common. Similarly among annelids, leaches and earthworms among reptiles water snakes, among vertibrates frogs and fishes are also common.

#### **2.3.5 ENUMERATION OF FLORA AND FAUNA**

##### MACROPHYTES:

Fam : Potamogetaceae

Perfoliates

Fam : Ceratophyllaceae

Ceratophyllum

Fam : Nymphaeaceae

Nelumbia nucifera

Fam : Hydrocharitaceae

Vallisneria spiralis and Hydrilla verticillata

Fam : Naidaceae

Nais minor

##### PTERIDOPHYTES

Azolla and Marcellia

##### MICROPHYTES

A). Phytoplankton

Fam : Cyanophyceae

Pharmedium and Oscillatoria

Fam : Euglenophyceae

Euglena

Fam : Chlorophyceae

Hydrodictyon, Cosmarium, Pediastrum and Scenedesmis.

Fam : Bacillariophyceae

Cyclotella and Melocira

## B) ZOOPLANKTON

Phylum : Protozoa

Paramacium and Holotrichia

Phylum : Porifera

Carvospongilla lapidosa and Radiospongilla hemiphydatis.

Phylum : Coelentrata Not seen

Phylum : Oligochaeta

Anlophorus and Nais

Rotifera: Filina longiseta, Branchionus angularis and

B.rubens

Cladocera: Moina micrura, Mophonosoma sarsi, Copepoda

and Mesocyclops sp.

Insecta Nepa and Gerris

Mollusca Melonoides scarba and Viripara bengalensis.

### 2.3.6 WATER BALANCE

The Water requirement will be 100 cu.m/day. This water requirement will be met by bore wells. The major water consumption is in the cooling and domestic. The process does not generate any effluent and mainly of the waste water is from the sanitation units. The water balance is given in Table 2.3.4

**TABLE 2.3.1.**

#### WATER SAMPLING LOCATIONS

Location	Direction	Distance from core zone (Km)
1. Project Site	--	
2. Sorutari	W	1.0
3. Tamulkuchi	NNE	3.0
4. Marukdula	E	2.0
5. Tandu	SSW	1.5
6. Byrnihat	S	5.0

**TABLE 2.3.2****WATER QUALITY DATA**

Parameters	Project Site Sorutari	Tamulkuchi	
1. pH	7.15	7.17	7.12
2. Temperature ( C)	28	29	28
3. Turbidity (NTU)	09	12	07
4. Specific conductance (micromho/cm)	534	526	578

The following results are expressed in mg/l

5. Total Solids	135	131	117
6. Total Dissolved Solids	126	122	109
7. Total Alkalinity as CaCO <sub>3</sub>	72	65	67
8. Total Hardness as CaCO <sub>3</sub>	69	67	71
9. Calcium as CaCO <sub>3</sub>	51	46	48
10. Magnesium as CaCO <sub>3</sub>	18	21	23
11. Chlorides as Cl	16	14	14
12. Sulphates as SO <sub>4</sub>	25	22	21
13. Nitrates as NO <sub>2</sub>	0.9	0.7	0.6
14. Sodium as Na	17	16	16
15. Potassium as K	04	04	05
16. Fluoride as F	0.06	0.07	0.06
17. Arsenic as As	<0.002	<0.002	<0.002
18. Selenium as Se	<0.005	<0.005	<0.005
19. Cadmium as Cd	<0.002	<0.002	<0.002
20. Copper as Cu	<0.020	<0.020	<0.020
22. Lead as Pb	<0.03	<0.03	<0.03
23. Zinc as Zn	0.024	0.023	0.020
24. Mercury as Hg	<0.005	<0.005	<0.005
25. Chromium as Cr	<0.005	<0.005	<0.005
26. Total Nitrogen	0.05	0.08	0.05
27. Total phosphorous	1.15	1.11	1.12
28. Manganese as Mn	<0.005	<0.005	<0.005
29. Cyanide as CN	Nil	Nil	Nil
30. Free Residual Chlorine	Nil	Nil	Nil
31. Dissolved Oxygen	6.1	6.0	6.2

**TABLE 2.3.3****WATER QUALITY DATA**

Parameters	Marukdula	Tandu	Byrnihat
1. pH	7.25	7.12	7.14
2. Temperature ( C)	28	28	29
3. Turbidity (NTU)	10	12	08
4. Specific conductance (micromho/cm)	546	524	535

The following results are expressed in mg/l

5. Total Solids	118	115	119
6. Total Dissolved Solids	105	98	107
7. Total Alkalinity as CaCO <sub>3</sub>	74	72	78
8. Total Hardness as CaCO <sub>3</sub>	70	71	67
9. Calcium as CaCO <sub>3</sub>	45	40	39
10. Magnesium as CaCO <sub>3</sub>	25	31	28
11. Chlorides as Cl	18	21	19
12. Sulphates as SO <sub>4</sub>	26	28	25
13. Nitrates as NO <sub>2</sub>	0.7	0.7	0.6
14. Sodium as Na	22	25	21
15. Potassium as K	04	04	05
16. Fluoride as F	0.04	0.03	0.03
17. Arsenic as As	<0.002	<0.002	<0.002
18. Selenium as Se	<0.005	<0.005	<0.005
19. Cadmium as Cd	<0.002	<0.002	<0.002
20. Copper as Cu	<0.020	<0.020	<0.020
22. Lead as Pb	<0.03	<0.03	<0.03
23. Zinc as Zn	0.026	0.024	0.024
24. Mercury as Hg	<0.005	<0.005	<0.005
25. Chromium as Cr	<0.005	<0.005	<0.005
26. Total Nitrogen	0.04	0.04	0.05
27. Total phosphorous	1.25	1.18	1.20
28. Manganese as Mn	<0.005	<0.005	<0.005
29. Cyanide as CN	Nil	Nil	Nil
30. Free Residual Chlorine	Nil	Nil	Nil
31. Dissolved Oxygen	5.9	6.0	6.1

**TABLE 2.3.4**

**WATER BALANCE**

REQUIREMENT	CU.M/DAY
1. Cooling	95.0
2. Domestic (including garden)	5.0
Total	100.0

WASTE WATER	CU.M/DAY
1. Evaporation Losses	95.0
2. Sewage/effluent	4.0
3. Other losses	1.0
Total	100.0

## **2.4 LAND ENVIRONMENT**

### **2.4.1 INTRODUCTION**

Studies on land and biological aspects of ecosystem is important for environment impact assessment to identify sensitive issues and take appropriate action by maintaining ecological homeostasis in the early stages of development of the increased productive capacity of project. The objective of this report is to define the present environment in which the proposed action is to occur to evaluate all possible eventualities, to ensure that the proposed increased productive capacity has been appropriately announced to all interested parties so that their concerns can be considered.

### **2.4.2 BASELINE DATA**

#### LOCATION :

The study area encompasses 10 KM radial distance with Project Site as its centre. The project area of interest covers mainly Sonapur Circle of Kamrup District of Assam state.

#### PHYSICAL SETTING:

The climate, geology, soil and irrigation have been described since they have direct or indirect effects on vegetation.

### **2.4.3 METHODOLOGY**

For Land Environment studies 5 villages were selected for physico\_chemical and biological parameters of soil. Location of selected sampling sites at different villages and their distance from core zone is given in Table 2.4.1 and Fig 2.4.1 Meticulous attention was paid to collect adequate amount of

composite soil samples for analysis and packing samples in dependable, water proof containers and marking the samples accurately and distinctly and brought to the laboratory for chemical analysis. Soil fertility information was obtained by counting the number of earthworms in a 25 cm X 25 cm quadrant. A preliminary reconnaissance was made to get a general picture of the flora and fauna. Fresh plant species were collected from field by trained biologists and later identified. Tentative fauna is noted with the help of local information and personal assessment. At times professional judgment was used to overcome the field deficiency.

### SOIL ANALYSIS

For land environment studies 5 villages were selected to understand the physico-chemicals and biological properties of the soil. The major soils of this area may be categorized into Red soils comprising heavy loams. Physico-chemical properties of soils (Texture, infiltration, Cation Exchange Capacity, organic matter and moisture), soil biological parameters studied for impact Identification. In this area, soil is predominantly Red Soil in nature. The moisture content is generally higher in all areas. The porosity (water holding capacity in soil) is generally high. On the basis of chemical properties, soil is slightly alkaline in nature with pH ranging between 7.0. to 7.5 (Table 2.4.2).

Infiltration rate (Table 2.4.3) ranges between 1.6 cm/hr to 2.5 cm/hr. The number of earthworms present in the quadrant is also a measure of soil fertility status (Table 2.4.4.).

#### **2.4.4. ECOSYSTEM (BIOTIC COMPONENTS:)**

It is an integrated unit that contains both animals and plants whose survival is dependent on biotic and abiotic distribution of organisms and its physical setting the study area can be classified into crop land, terrestrial and aquatic ecosystems. However, in the present chapter 'Land Environment' deals with

crop and terrestrial ecosystems, while aquatic ecosystem have been described in the earlier chapter 'Water Environment'. In order to understand the factors governing the system both abiotic (physical setting) and biotic factors (flora and fauna) have been described.

### VEGETATION STATUS

The site for the proposed cement factory has been used for agricultural activities. Residential areas are in the foothill areas, covered with cultivated horticultural crops and other useful domesticated plants. Low wetlands support growth of many weeds belonging to grass family (Poaceae), Polygonaceae and other aquatic groups. Annual and perennial weeds are quite common in the residential areas and under the rubber plantation.

It is, thus, clear that the original natural vegetation is now completely changed due mainly to human activities and that naturally growing flora mainly includes herbaceous weeds, which occupy ground vegetation.

The health of the plants, in general, appears to be good. Judging from the yield of certain horticultural crops in the area, it may be said yield of most of the crops is almost normal.

The rubber tree also performs very well in the area (in terms of vegetative growth).

### FLORAL COMPOSITION

A quick survey of plants in and around the site, reveals the following floral composition.

#### Commercial Crop

Rubber plant (*Hevea brasiliensis*) occupies the hills in the NE side and is the well established large tract of vegetation. The tree is also seen as a small strip in the hills on the west.

#### Horticultural Crop in the Residential Area

- i) *Artocarpus integrifolia* (Jackfruit)
- ii) *Mangifera indica* (Mango)
- iii) *Cocos nucifera* (Coconut)
- iv) *Areca catechu* (Areca nut)
- v) *Psidium guajava* (Guava)
- vi) *Citrus* spp.
- vii) *Musa* spp. (Banana)
- viii) *Tamarindus indica* (Tamarind)
- ix) *Bambusa* sp. (Bamboo)

#### Timber Trees :

- i) *Tectoma grandis* (Sagoon)
- ii) *Shorea robusta* (Sal)

#### Shrubs and Trees :

- i) *Eupatorium odoratum*
- ii) *Ageratum conyzoides*
- iii) *Mikania scandens*
- iv) *Lantana camara*
- v) *Solanum* sp.
- vi) *Scoparia dulcis*
- vii) *Amaranthus* sp.
- viii) *Polygonum hydropiper*
- ix) *Polygonum* sp.
- x) *Oxalis* sp.
- xi) *Evolvulus* sp.

- xii) Euphorbia hirta
- xiii) Scirpus sp.
- xiv) Digitaria sp.
- xv) Heliotropium indicum
- xvi) Mimosa pudica
- xvii) Cynodon dactylon
- xviii) Imperata cylindrica

#### Cryptogams

Four species of ferns and 5 species of lichens were recorded in this quick survey.

#### TERRESTRIAL FAUNA

Although some fauna are easily seen, many species are highly secretive, often hidden from view. Those species are both secretive and occur at low densities are extremely difficult to census. So, dividing the area into blocks and counting the number of individuals in each can make total count of species.

A faunistic Checklist of the study area is presented below :

#### Amphibians

1. Bufo melanostictus
2. Pelobates leucomystax
3. Emphyetis cyanophlyetis

#### Reptiles

1. Gikko geeko
2. Hemidactylus broki
3. H. frenatus
4. Calotes versicolour
5. Naju naju

#### Mammals

1. Rattus rattus
2. Mus musculus
3. Canis aureus
4. Maccaca assmensis
5. M. multa

6. *Muntiacus muntjak*

Birds

1. *Ardea grayii*
2. *Bubulcus ibis*
3. *Azdea alba*
4. *Egzetta intermedia*
5. *E. garzetta*
6. *Allcedo attlis*
7. *Streptopelia chineusis*
8. *Picus myzmeophoneus*
9. *Cozvus splendens*
10. *Passer domesticus*
11. *Acridotheres tristis*

Mollusca

1. *Acatium fulica fulica*
2. *Physa* sp.

Others

1. *Musca domestica*
2. *Culex* sp.
3. *Hemicozulia asitica*
4. *Apis cerana indica*
5. *A. dezsata*
6. *Carcinus* sp.
7. *Pheretima posthuma*
8. *Pieris brassicae*
9. *Eureua hecabe*.

The study area is not a habitat for endangered species. The faunistic species as reported by the local people are mostly of Schedule IV and V categories. A few species like common Jungle cat and Indian dog come under Schedule II category of Indian Wild Life Act are sometimes observed in the eastern part of the Buffer zone. The core area is free from any faunistic species.

## Terrestrial ecosystem Flora

The study area is covers industrial, urban, and agriculture oriented.

**TABLE 2.4.1**

### SAMPLING LOCATIONS FOR SOIL QUALITY

Location	Direction	Distance from core zone (Km)
1. Sorutari	W	1.0
2. Tamulkuchi	NNE	3.0
3. Marukdula	E	2.0
4. Tandu	SSW	1.5
5. Byrnihat	S	5.0

**Table 2.4.2  
Data of Soil Sampling Analysis**

Sl.	Parameter	Sorutari	Tamul kuchi	Maruk dula	Tandu	Byrnihat
1.	PH	7.0	7.0	7.2	7.15	7.5
2.	Electrical Conductivity ( $\mu\text{mho/cm}$ )	465	460	457	459	464

3.	Texture	Red Loam	Red Loam	Red Loam	Red Loam	Red Loam
4.	Gravel ( % )	11.5	10.8	11.2	10.5	9.5
5.	Sand ( % )	22.0	21.8	23.5	22.3	23.0
6.	Silt ( % )	66.5	67.4	65.3	67.2	67.5
7.	Available Nitrogen(mg/100gm)	26.8	23.0	22.7	25.6	26.3
8.	Available Potassium(mg/100g m)	5.6	5.3	5.7	5.2	5.5
9.	Available Phosphorus(mg/100 gm)	6.2	6.3	6.5	6.6	6.3
10.	Exchangeable Calcium (mg/100gm)	21.5	20.9	21.2	20.9	21.4
11.	Exchangeable Magnesium (mg/100gm)	11.3	11.5	11.2	10.8	10.5
12.	Exchangeable Sodium (mg/100gm)	4.6	5.2	4.9	5.5	5.2

**TABLE 2.4.3**

INFILTRATION RATE OF SOIL

S.No.	Name of the site	Infiltration rate cm/hr
1.	Sorutari	1.8
2.	Tamulkuchi	2.1

3. Marukdula	2.5
4. Tandu	1.9
5. Byrnihat	1.6

-----

**TABLE 2.4.4**

NUMBER OF EARTHWORMS IN 0.25 SQ.M QUADRANT

Quad. no.	Project Site	Kamarkuchi
1	6	5
2	5	4
3	4	6
4	4	6
5	5	5
Density =	4.8	5.2

-----

## **2.5.SOCIO ECONOMIC ENVIRONMENT**

### **2.5.1. INTRODUCTION**

Any developmental activity will influence the Socio Economic conditions of the population in the region and thus the Quality Of Life (QOL). Socio Economic survey is necessary in EIA report preparation to predict the changes on the social and economic status. Hence base line data for demographic

characteristics, occupational status, education, health and amenities existing in the project area have been studied as per MOE&F guidelines.

### **2.5.2. BASE LINE DATA**

Detailed Socio economic survey within 10 km radius of the VC site has been carried out to assess the pre project status.

### **2.5.3. LOCATION**

The land falls under Sorutari Village, Byrnihat Industrial Area, Byrnihat Grampanchayat, Sonapur Circle, Kamrup dist., Assam state. The Project site is about 150 M above mean sea level. The land around the proposed site is mixed with main Industrial development. Base-line data on the socio-economic conditions of the villages within 10 KM radius indicates availability of basic amenities like hospitals, educational institutions public transport. Digari Railway station is about 18 KM from the proposed VC site. Following parameters have been selected for socio economic profiles:

#### POPULATION

Population of mainly Sonapur Revenue Circles in the study area are covered.

#### OCCUPATION STATUS

Cultivators: The person who is engaged in either as employer, single worker or family worker in cultivation of land owned or institutions for payment in money,

kind or share. Agricultural labourers: Person working in others land for wages in money or share have been treated as agricultural labourers. The male and female workers of this category are present in the study area

### HEALTH FACILITIES

As per the 2001 Census reports, health facilities in the study area are shows that there are Primary Health Centres and other private dispenseries and first aid centres are existing.

### IRRIGATION:

The area is having two main cropping seasons viz,. Kharif.

### POWER AND ENERGY

Firewood, and LPG gas are the chief sources of cooking fuel. Firewood is mainly used in rural sector which indicates the rural atmosphere and restricted to lower income groups. All the villages are having electricity connections given for domestic and agricultural.

### EDUCATION

The Illiteracy is high among females out of the total illiterates. The coming up of VC factory in this area will help in increasing literacy as well as educational standards. Educational facilities and Social welfare hostels.

### TRANSPORT

National Highway No.40 which passes 2 km away from the project site on the southern side. Most of the villages are connected with black top roads.

OTHER INDUSTRIES

Industrial development is observed in the study area. Other industries like cement and Coke oven Factory, steel factories etc are also found in the study area.

EMPLOYMENT

Increase in number of semi and non-skilled employees will boost the local economic structure.

AMENITIES

Existing amenities in the study area are shown in table 2.5.1.

**TABLE 2.5.1**

AMENITIES EXISTING IN THE STUDY AREA

CIRCLES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sonaapur	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	y	Y	Y	Y

- 
- |                     |                           |
|---------------------|---------------------------|
| 1. code number      | 9. Secondary school       |
| 2. Police station   | 10. High school           |
| 3. Police outpost   | 11. Junior college        |
| 4. R.T.C.Bus stop   | 12. Degree college        |
| 5. Private bus stop | 13. I.T.I                 |
| 6. Post office      | 14. Primary health centre |
| 7. Telegraph        | 15. Govt. hospital        |
| 8. Primary school   |                           |

N - indicate amenity is absent

Y - indicate amenity is present

# Data is based on mandal reports

### **3.0 PREDICTION OF IMPACTS**

Many scientific techniques and methodologies are available to predict impact on physico-ecological environment. Mathematical models attempt to qualitatively describe the cause and effect relationship between sources of pollution and different elements of the environment viz. air, noise, water etc.

#### **3.1. PREDICTION OF IMPACT ON AIR ENVIRONMENT**

In the Proposed VC unit there are no major stacks Only process vents are present. Among process vents only one stack will be provided for Kiln (120 feet height). As there are no boilers air quality simulation models need not be used. Only vents attached to dust collection systems where collected dust is recycled into the process are present. The impact on air quality due to automobile emission has been predicted to be insignificant because the anticipated increase in vehicular movement (46 trucks per day) due to the proposed project is marginal. The impact of these emissions will be limited to a very short distance. The roads from the nearby towns to the plant site are tar roads and hence the fugitive emissions due to vehicular traffic will be insignificant.

The use of the generators is very occasional and as such the impact of its emissions on the air quality will be insignificant. The impacts, if any, will be limited to a very short distance and will also be very occasional. Existing ground level concentrations of ambient air quality monitoring and static air volume sampling also was undertaken as a reference.

### **3.2 PREDICTION OF IMPACT ON NOISE ENVIRONMENT**

Prediction of potential impacts on noise environment from the proposed project is as important as other components of the environment. The impacts of noise depends mainly on the characteristic of the noise generating sources, topography and atmospheric conditions.

The main Noise generating sources are Generators and compressors. Both the sources are enclosed with acoustic proof material to cut down the noise levels. So the impact of noise is minimized.

Present Noise levels of the study area are shown in table 2.2.2. Due to the proposed project there will not be any significant increase in Noise levels. Only number of vehicles may increase.

### PREDICTION OF IMPACT ON OCCUPATIONAL HEALTH

Equivalent sound level averaged over 8 hours, is used to describe the exposure of noise in work places. The damage risk criteria for hearing as enforced by OSHA (Occupational Safety and Health Administration) and several other organizations to reduce hearing loss, stipulated that noise levels up to 90 dBA are acceptable for 8 hours exposure per day. Exposure to impulses or impact noise should not exceed 140 dBA (Peak acoustic pressure) exposure to 10,000 impulses of 120 dBA are permissible per day.

Taking into account the prominent sources of noise and increase of vehicles, predictions have been made by taking the total of noise levels and considering it as noise levels due to one source at the centre of VC. Most of the levels at the boundary of the proposed factory will be around 55 dBA. There will be no impact of factory/VC on places more than 150m from centre of the complex.

### **3.3 PREDICTION OF IMPACT ON WATER ENVIRONMENT**

The proposed VC plant requires water 100 cu.m/day. Total required water will be met by bore wells within the factory premises. Cooling requires 95 cu.m/day of water will be totally consumed. Domestic washing requires 5 cu.m/day. There is no discharge of effluents and as such no effluent treatment

plant is envisaged by the project authorities. However a septic tank followed by soak pit will be constructed to receive the sewage wastes.

Sufficient ground water is available in and around the project site. One number of rain water harvesting pits are provided within the plant area to recharge ground water which will be a positive impact to the water environment. The details of rain water harvesting pits are further addressed in EMP.

### **3.4 PREDICTION OF IMPACT ON LAND ENVIRONMENT**

Solid waste generated from pollution control systems like bag filters will be recycled into the process and no disposal on to the land. So there will not be any load on land. There is no discharge of liquid effluents on to the land.

### **3.5 PREDICTION OF IMPACT ON SOCIO ECONOMIC ENVIRONMENT**

Prediction of the socio-economic impacts of VC would be totally a positive main due to the employment opportunities to the skilled and un-skilled of the local villages. Also Health, educational facilities and communication by roads, will be improved which will be positive impact to the socio-economic environment.

The proposed project activities will improve the general environment by planting more number of trees through a planned green belt development which will improve Aesthetic value of the region.

On the whole the project will have a favorable ranking with the local inhabitants and will be looked upon as a blessing for development of the area.

## **4.0 ENVIRONMENTAL EVALUATION SYSTEM**

### **4.1 INTRODUCTION**

For the evaluation of quality of the environment subsequent to the project implementation, value functions for selected parameters have been developed

through a weighting scale check list adopting the Battelle Environmental Evaluation System (BEES). The check list consists of parameters identified for this project. Parameters have assigned importance weights by an interdisciplinary team of experts based on usage of the ranked pair wise comparison technique. The resultant importance weight points (Parameters Importance Units PIU) are presented in Fig.4.1 by numbers adjacent to all parameters on right hand side. Higher the number, greater the relative importance.

Because of the proposed project there will be negligible change in the Environmental Evaluation System.

Impact scaling in the BEES has been accomplished through the use of functional relationship of identified factors. Functional relationships refer to graphical means or transforming factor measurements (baseline or predicated value) into subjective evaluations. An index is obtained in Environmental Impact Units (EIU) for each alternative and baseline environmental conditions (i.e. EIU with project and EIU without project). The EIU without project has further been evaluated for with Environmental Management plan (EMP) and without EMP.

$$EIU_j = \sum_i (EQ)_{ij} (PIU)_i$$

where  $(EIU)_j$  = Environmental impact units for jth alternative

$(EQ)_{ij}$  = Environmental quality scale for ith factor and jth alternative.

$(PIU)_i$  = Parameters importance units for ith factor

The identified parameters have been distributed in four major categories, viz. Ecology, Environmental pollution Aesthetics and Human Interest. The resultant numerical evaluation has been described as under:

## 4.2 ECOLOGY

The impacts on natural vegetation and species diversity will be not affected as there will not be clearance of site is required because of the proposed project. However proper identification of the project area for the activity is justified, hence a positive effect Table 4.1)

### **4.3 ENVIRONMENTAL POLLUTION**

There will be no process disposals from the proposed project and the domestic waste is being disposed into a septic tank. The air quality of the study area will not be affected much. Hence the effects will be slightly on the negative side as shown in Table 4.1. There are no other industrial emission sources in the study area. The proposed factory is planning to install dust control systems with recycling arrangement for the process emissions. This facility will be sufficient to control the total dust emissions. So there is no significant effect due to the proposed action. Lastly, noise level slightly rise due to increased transportation is found to be negative, however impact of this rise will be minor.

### **4.4 AESTHETICS**

Topographic character of this area will not charged due to the proposed project. The development of green-belt around the VC compound will enhance diversity of vegetations but slightly effect visual quality. The composite effect of the proposed project has an overall positive impact aesthetically. The "with" and "without" changes aesthetic category is presented in Table 4.1.

### **4.5 HUMAN INTEREST**

The impact on health due to the project is negligible but the health status will improve due to increased income structure by increase in employment opportunities as well as the improvement in medical facilities by private

medical practitioners. Employment and transportation facility will improve due to the proposed action. The respective scores for all Human Interest parameters are presented in Table 4.1.

#### 4.6 OVERALL IMPACT EVALUATION

The net environmental impact due to activity of VC plant at Sorutari as indicated by ecology is positive. It is attributed to green belt development and land use. The net impact on environmental pollution is negative. The negative impact is mainly due to the slight rise in levels of air pollutants. The human interest parameters show encouraging positive impact due to better job opportunity, transportation, medical facilities. Over all impact is therefore positive from the proposed VC plant. Table 4.1)

**TABLE 4.1**

OVERALL ENVIRONMENTAL EVALUATION

---

Parameters	A	B	C	D	C-B	D-B	D-C
------------	---	---	---	---	-----	-----	-----

---

Ecology	400	280	270	290	-10	+10	+20
Environmental pollution	200	175	170	180	-5	+5	+10
Aesthetics	200	180	177	182	-3	+2	+5
Socio-economic	200	190	195	198	+5	+8	+3
<hr/>							
Total	1000	825	812	850	-13	+25	+38
<hr/>							

- A - Weight (PIU)
- B - Without project (EIU)
- C - With project : Without EMP (EIU)
- D - With project : With EMP (EIU)
- C-B - Change without EMP (EIU)
- D-B - Change with EMP (EIU)
- D-C - Net change in EIU due to EMP

PIU - Parameter Importance Units  
 EIU - Environmental Impact Units

## **5.0 ENVIRONMENT MANAGEMENT PLAN**

Vinayak Cement Limited (VC) has proposed to setup the plant on about 24220 M<sup>2</sup> of land. The Project site is located at The land falls under Sorutari Village, Byrnihat Industrial Area, Byrnihat Grampanchayat, Sonapur Circle, Kamrup dist., Assam state. Digari Rly. Station- 18 k.m. and National High way No.40-

2 km. Guwahati is 25 km away from the project site.. The land falls under Sorutari village, Sonapur Revenue Circle, Kamrup District of Assam state.

An environmental management plan (EMP) is prepared to minimise those adverse impacts. It also examines the possible impact on the people, their home land or their livelihoods, or to other nearby developments.

## **5.1 CONSTRUCTION PHASE.**

In the present project the potential for environmental pollution during construction phase is more and control of pollution is of considerable importance.

The following factors require control during construction phase.

### **5.1.1 SITE PREPARATION**

Leveling of site will be required as the site has ups and downs within the boundary of the site.

### **5.1.2 SANITATION**

The construction site will be provided with sufficient and suitable toilet facilities for workers to allow proper standards of hygiene. These facilities will preferably be connected to a septic tank and maintained to ensure minimum environmental impact. Another alternative would be to provide pit latrine of pour-flush type.

### **5.1.3 NOISE**

Though the noise effect on the nearest inhabitants due to construction activity will be negligible VC will adopt noise protection devices like ear muffs for onsite workers using high noise equipment.

#### **5.1.4 CONSTRUCTION EQUIPMENT & WASTE**

Both gasoline and diesel powered construction vehicles will properly be maintained to minimise smoke in the exhaust emissions. The vehicle maintenance area will be located in such a manner to prevent contamination of surface and ground water sources by accidental spillage of oil. Unauthorised dumping of waste oil will be prohibited. Wastes will be disposed off at an approved dump.

#### **5.1.5 STORAGE OF HAZARDOUS MATERIAL**

The following hazardous materials if used for site preparation and construction activity, they will be stored as per international standards.

i) Painting materials.

#### **5.1.6. SITE SECURITY**

Construction site is a potential hazardous environment. To ensure that the local inhabitants and stray cattle are not exposed to these hazards the site will be secured by fencing and manned entry points.

### **5.2 POST CONSTRUCTION PHASE**

#### **5.2.1 AIR POLLUTION**

The air pollutants from the proposed VC will be very minimal. The ambient air quality levels will be within the standards laid down by Central Pollution Control Board (CPCB). The exhaust/ventilation fans will be adequately chosen taking into account the area of the premises.

## **5.2.2 EMISSION DETAILS**

### **5.2.2.1 EMISSION SOURCES**

The major sources of emission from the proposed activity are

1. CRUSHING SECTION - Total dust or Suspended particulate matter
2. RAW MILL SECTION - Total dust or Suspended particulate matter
3. KILN SECTION - Suspended Particulate matter, SO<sub>2</sub> and NO<sub>x</sub>.
4. CEMENT MILL - Total dust or Suspended particulate matter.
5. Standby Power Supply - Suspended Particulate matter, SO<sub>2</sub> and NO<sub>x</sub>.

(DG sets)

### **STANDBY POWER SUPPLY SYSTEM - DG SETS**

In the proposed DG Sets, high speed diesel (HSD) oil will be used. Hence negligible quantity of SPM, SO<sub>2</sub> & NO<sub>x</sub> will be generated during the combustion process. So there is no need of any pollution control equipment. But The stack shall be provided as per the standard stack height calculations. DG Set shall be installed in an acoustic enclosure as per Assam State Pollution Control Board norms.

### **5.2.2.2. STACK HEIGHTS**

The following formula, recommended by Central Pollution Control Board has been used to compute the stack height.

### **STACK HEIGHTS**

<b>Based on Suspended Particulate matter emission rate</b>	<b>Based on KVA rate</b>
$H = 74 (Q_s)^{0.27}$	$H = h_t + \text{sqrt}(kva)$
H = Theoretical height of Proposed stack in mts.	H = Theoretical height of proposed stack in mts.
$Q_s$ = Emission rate of Particulate Matter in T/hr	H <sub>t</sub> =Roof height in mts.

**HAMMER MILL:-**

420 cfm (714 m<sup>3</sup>/hr) (3H.P.)  
(Cyclone separator with Multi cyclone collector)

**RAW MILL:-**

1280 cfm (2175 m<sup>3</sup>/hr) (5H.P.)  
Rivers pulse-jet bag filter system

**CEMENT MILL :-**

1280 cfm (2175 m<sup>3</sup>/hr) (5H.P.)  
Rivers pulse-jet bag filter system

**KILN :-**

820 cfm (1393 m<sup>3</sup>/hr) (7.5 H.P.) output 100 mm dia chimney.  
Impingement plate crabbers i.e. water pollution control system  
with 4000 cfm twin lobe rotary compressor.

**HAMMER MILL:-**

Based on the above formula, the height of the chimney has been estimated as 6.27 m but considering outlet emission of the Cement feeding, but it is proposed to install a tall stack of 7 m height to exhaust the emissions.

$$Q_s = 714 \times 150 / 1000 \times 1000 \times 1000$$

$$= 0.0001071 \text{ T/Hr}$$

$$(Q_s)^{0.27} = 0.085$$

$$\text{Stack height} = 0.085 \times 74 = 6.27 \text{ m}$$

$$\text{Provided height} = 7 \text{ m from ground level}$$

### **RAW MILL:-**

Based on the above formula, the height of the chimney has been estimated as 8.47 m but considering outlet emission of the Raw mill, but it is proposed to install a tall stack of 9 m height to exhaust the emissions.

$$Q_s = 2175 \times 150 / 1000 \times 1000 \times 1000$$

$$= 0.000326 \text{ T/Hr}$$

$$(Q_s)^{0.27} = 0.1145$$

$$\text{Stack height} = 8.47 \text{ m}$$

$$\text{Provided height} = 9 \text{ m from ground level}$$

### **CEMENT MILL :-**

Based on the above formula, the height of the chimney has been estimated as 8.47 m but considering outlet emission of the Raw mill, but it is proposed to install a tall stack of 9 m height to exhaust the emissions.

$$Q_s = 2175 \times 150 / 1000 \times 1000 \times 1000$$

$$= 0.000326 \text{ T/Hr}$$

$$(Q_s)^{0.27} = 0.1145$$

$$\text{Stack height} = 8.47 \text{ m}$$

Provided height = 9 m from ground level

**KILN :-**

**SO<sub>2</sub> Emissions:**

**SO<sub>2</sub>** emissions of the kiln are influenced by the combined of the raw mill kiln, where considerable amount of SO<sub>2</sub> generated in the kiln process gets absorbed in the raw material (about 80%). Details SO<sub>2</sub> emissions are below

Total Coal/coke Breese consumptions in the plant	: 50 TPD
Sulfur content in coal	: 0.8%
Total sulfur dioxide generated	: 34 kg/hr
sulfur dioxide absorbed by Clinker (80%)	: 27.2 kg/hr
sulfur dioxide emission from kiln stack (20%)	: 6.8 kg/hr
	: 1.88 gm/sec

From the above computation, it can be observed that due to firing of 50 t/day of coal in the proposed plant, about 34 Kg/hr of SO<sub>2</sub> will be generated. Of the generated SO<sub>2</sub>, 80 % is absorbed by the clinker and 20 % is released as emission.

Based on SO<sub>2</sub> generation stack height has been calculated using the formula will be 25 meters height. But Kiln height will be 27 meters. The company will be providing two stacks with 9 meters height from the top of the kiln will be provided.

**OXIDES OF NITROGEN CEMENT PLANT KILN**

In order to control NO<sub>x</sub> emission of kiln, an automatic kiln control system will be installed for maintaining constant burning conditions in kiln thereby reducing the NO<sub>x</sub> emission. NO<sub>x</sub> will also be controlled by reducing the quantity of emissions by lowering the excess air factor to a value, which is compatible with

oxidizing emissions of burning. The average NO<sub>x</sub> emissions from the kiln stacks has been reported to be around 500 mg/Nm<sup>3</sup>, which corresponds to a maximum emission rate of 3.5 kg/ton of clinker produced.

VC's proposed clinker production will be 190 TPD. It has been estimated that around 27.7 kg/hr of NO<sub>x</sub> will be generated from kiln during calcination process and correspondingly the NO<sub>x</sub> emission rate will be about 7.7 g/sec.

### 5.2.2.3 CO<sub>2</sub> EMISSIONS

#### CEMENT PLANT KILN

CO<sub>2</sub> emissions of the kiln are due to decomposition CaCO<sub>3</sub> into CaO and CO<sub>2</sub>, where considerable amount of CO<sub>2</sub> generated in the kiln process. Details of emission of Carbon dioxide in the kiln is given below:

Typical Material Balance for 1 Tonne of clinker using Indian Coal as a Fuel			
Input		Output	
Material	Quantity (Kgs)	Material	Quantity (Kgs)
Lime Stone	1432	Clinker	1000
Coal	200	CO <sub>2</sub>	838.18
Other Additives	29	SO <sub>x</sub>	BDL
Air (kiln)	1114	NO <sub>x</sub>	0.02
Air (cooler)	1500	PM (kiln)	0.12
		Dust in cooler	0.12
		Air-Exit (kiln+cooler)	2436.5
Total	4275	Total	4274.94

Using material balance calculations we get 190 TPD of clinker from 272 TPD limestone from which we get about 159 t/day of CO<sub>2</sub>.

$$\text{CO}_2 \text{ GENERATION} = 159 \text{ TPD} = 1.840 \text{ kg/SEC}$$

#### STANDBY POWER SUPPLY SYSTEM - DG SETS

The Stack height is determined based on the KVA of the DG set. The following formula, recommended by Central Pollution Control Board has been used to compute the stack height.

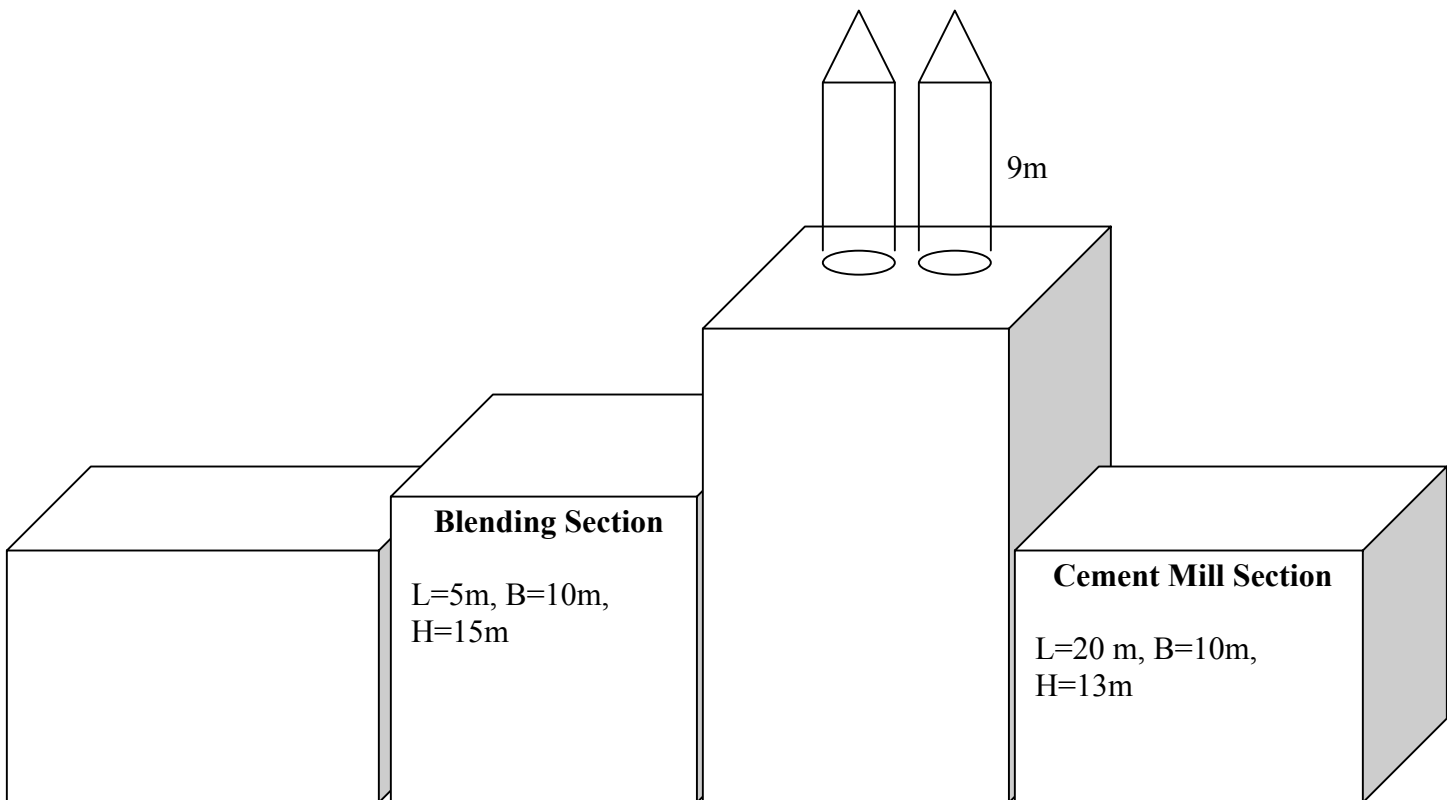
$$H = ht + 0.2 (\text{root KVA})$$

H = Theoretical height of proposed stack in mts

ht = Roof height in mts

1. Based on the above formula, the stack height works out to be 7.8 m. However, VC will install a tall stack of 10 m height from the ground level for 250 KVA DG Set.

## Process section wise sizes:



### AIR POLLUTION SOURCES & CONTROL MEASURES

In the proposed Mini cement plant suitable pollution control equipments shall be selected which will ensure that the emission levels are maintained below the prescribed units. i.e. All the pollution control equipment in the proposed cement

plant is designed for an out let emission of less than 50 mg/m<sup>3</sup> of Suspended particulate matter.

**HAMMER MILL:-**

420 cfm (714 m<sup>3</sup>/hr) (3H.P.)

(Cyclone separator with Multi cyclone collector or pulse-jet bag filter system)

(shown in Fig.5.2.1)

**RAW MILL:-**

1280 cfm (2175 m<sup>3</sup>/hr) (5H.P.)

Rivers pulse-jet bag filter system

(shown in Fig.5.2.1)

**CEMENT MILL :-**

1280 cfm (2175 m<sup>3</sup>/hr) (5H.P.)

Rivers pulse-jet bag filter system

(shown in Fig.5.2.1)

**KILN :-**

820 cfm (1393 m<sup>3</sup>/hr) (7.5 H.P.) output 100 mm dia chimney.

Impingement plate crabbers i.e. Air wet washer system

with 4000 cfm twin lobe rotary compressor.

(shown in Fig.5.2.2)

FIG. 5.2.1

BAG FILTER TYPE DUST COLLECTOR

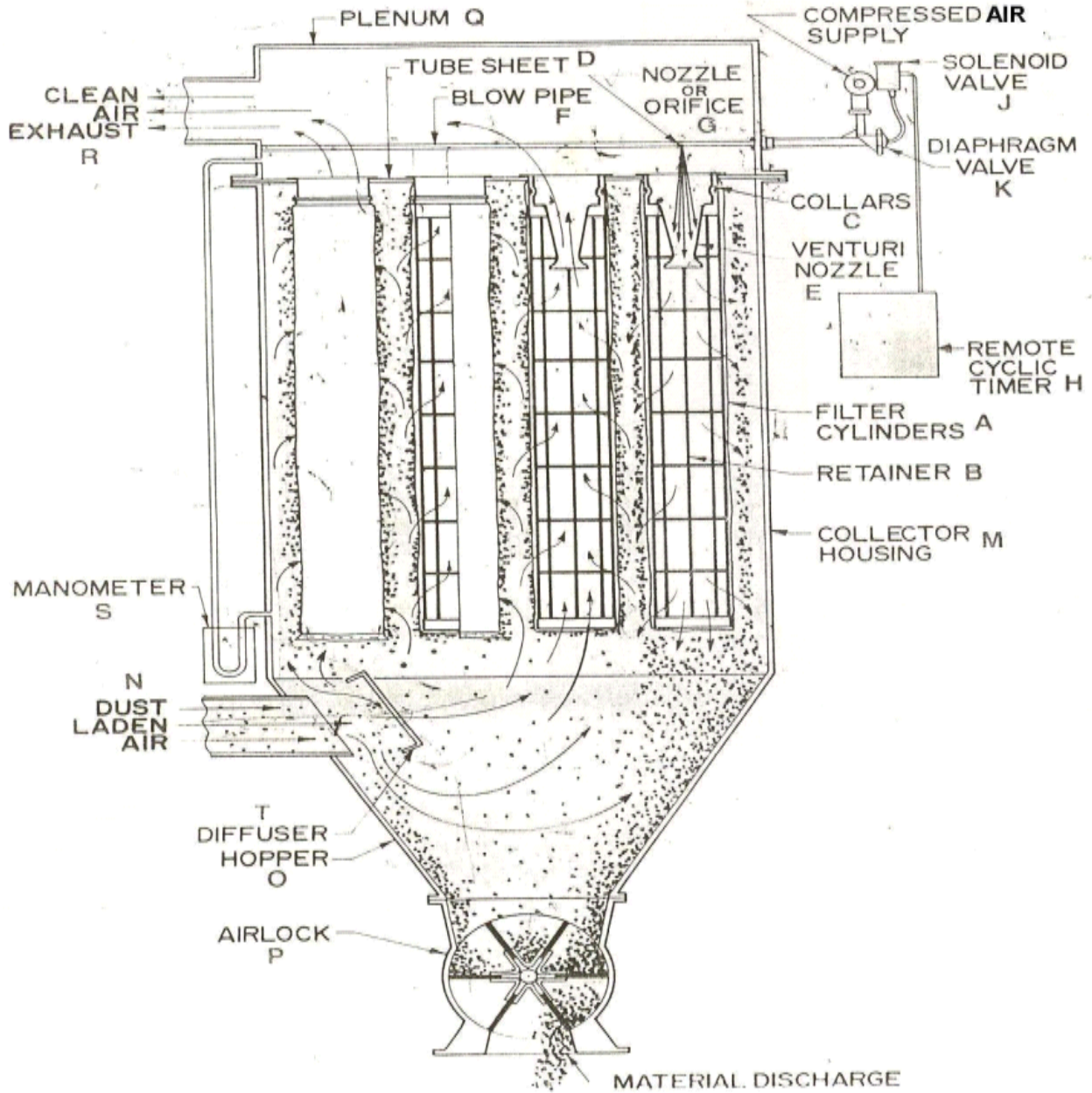
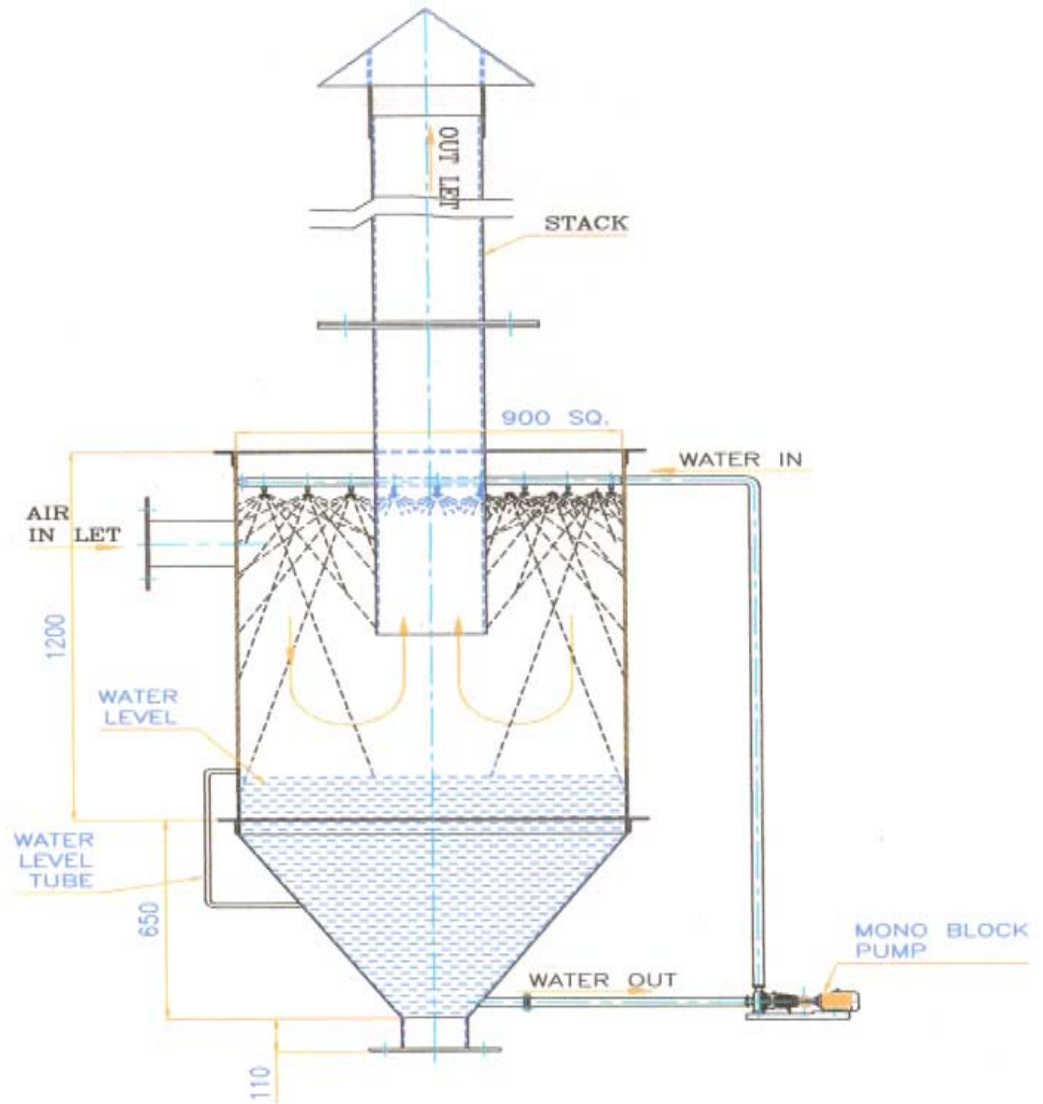


FIG. 5.2.3  
AIR WET WASHER



DE1/2

## **5.2.2 NOISE**

The VC is procuring Compressors and Generators with acoustic enclosures

## **5.2.3 WATER ENVIRONMENT**

### **5.2.3.1 WASTE WATER**

There will be no waste water generated due to the process. The sanitary waste is diverted into a septic tank followed by soak pit.

### **5.2.3.2 RAIN WATER HARVESTING**

Based on available data on roof area - 1 nos. rain harvesting pits have been envisaged, to ensure charging of ground water. Pits will be made with gravel and sand filled in as filtering media.

## **RAIN WATER HARVESTING CALCULATIONS**

Rain water yield (litres per year) = Roof area (m<sup>2</sup>) X annual rainfall (mm) X run-off coefficient X filter efficiency

Roof Area = Width X length of roof

The run-off coefficient = allows for the slope of the roof and water loss through wind, evaporation and the ability of roofing material to hold onto water.

Typical run-off coefficients:

For pitched tiled/AC Sheet roofs - approx.0.75

For flat roofs - approx. 0.5

Filter efficiency =

Down pipe from roof = 90% efficient

Underground filter = 85% efficient

**For BCPL site**

Roof Area = 800 m<sup>2</sup>

Annual rain fall = 1760 mm

$$800 \times 0.75 \times 0.9 \times 1760 = 950400 \text{ litres}$$
$$= 950 \text{ m}^3$$

**To Calculate the required tank size**

A proven and workable rule-of-thumb sizes the tank to store 5% of the annual rainwater yield. This has been shown to give a reliable optimum tank size. For our plant the storage tank required would be:

$$5\% \text{ of } 950 \text{ m}^3. = 47.5 \text{ m}^3$$

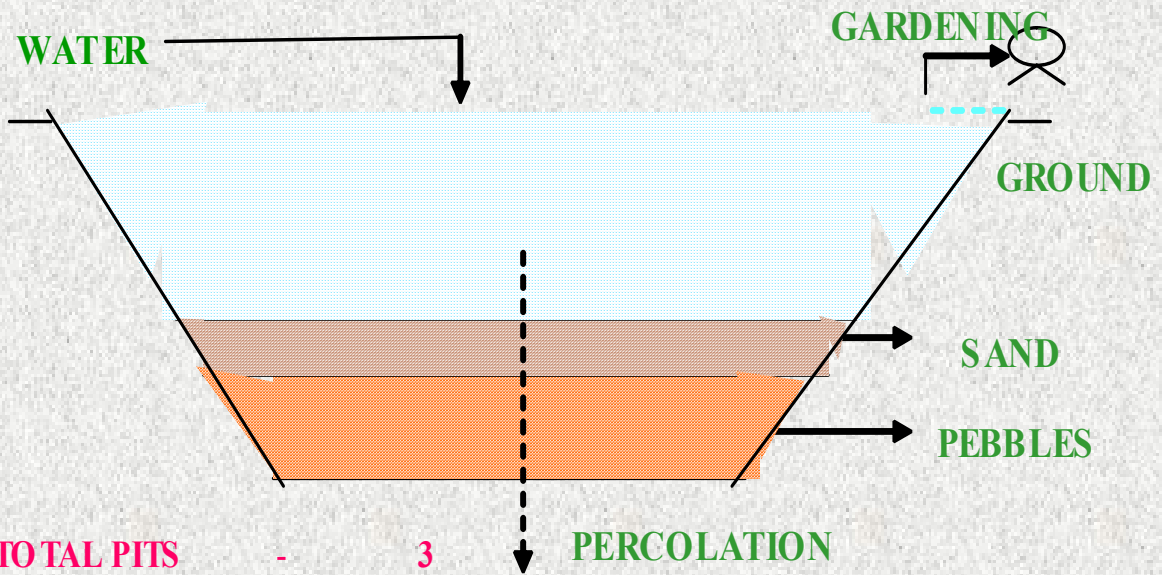
It is wise to select a tank slightly larger as there is always some dead space at the top of the tank; also the bottom 20 cm or so is never used.

TANK SIZES: 4.0M X 5.0M X 3.0M(MWD) in 1 no.

**Total Rain water harvesting pits = 1**

RAIN WATER HARVESTING PITS ARE SHOWN IN ANNEXURE - 2

# GROUND WATER RECHARGING PLAN



<b>TOTAL PITS</b>	-	<b>3</b>
<b><u>DIMENSIONS</u></b>		
<b>LENGTH</b>	-	<b>5.0 M</b>
<b>UPPER WIDTH</b>	-	<b>5.0 M</b>
<b>LOWER WIDTH</b>	-	<b>4.5 M</b>
<b>DEPTH</b>	-	<b>2.0 M</b>

#### **5.2.4. SOLID WASTE MANAGEMNT**

**Solid Waste Generation** is mainly from the pollution control equipments which is negligible but Periodically recycled after the containers placed beneath the rotary valve of the respective Dust Collectors are adequately filled in.

#### **5.3 GREEN BELT DEVELOPMENT**

To maintain the ecological balance VC authorities are planning to develop green belt around the plant. Green belt recommendations around the VC will be evolved as per CPCB norm for noise pollution control, balancing eco-environment, soil erosion /protection, economic sustenance and aesthetics. The scenario of planting arrangement and size will be based on the optimum use of available land. Based on the agro-climatic conditions of the region, location of proposed plant and physico-bio-chemical properties of the soil strata in addition to the nature of pollutants and their rate of dispersion, it is suggested to develop green belt around the plant. Plants suitable to abate the pollution have been identified to be local plants.

The plant authorities have proposed to plant a green belt in the front half portion as well as within the boundary of the land acquired. The remaining area around the plant with lawns and other plants. In addition to the green-belt planted around the project, roadside plantation will also be required within the project. Green belt development plan.

The tree plantation is based on the following principles

- The plant should be fast growing
- It should have thick canopy cover
- It should be perennial and evergreen
- It should have large leaf area index
- It should be indigenous
- It should be efficient in absorbing pollutants without significant effects on plant growth.

## **SUGGESTED PLANT SPECIES FOR GREEN BELT DEVELOPMENT IN AND AROUND VC**

Scientific name

---

Large (L)

*Madhuca indica*

*Mangifera indica*

*Dalbergia sisso*

*Casuarina equisetifolia*

*Azardirachta indica*

Medium (M)

*Pongamia pinnata*

*Casia fistuta*

*Bouganin villeda*

*Vitex nigundo*

*Bauhibia pirpuria*

*Casia ariculata*

*Cestrum diurnum*

*Casia bifora*

*Pulcharima*

*Casia javanica*

Fishtail palm

Bamboo

Milling tona

Jamun

Thuja

*Callidora*

*Catharanthus roseus*

*Hibiscus rosasineusis*

*Buteaa monosperma*

*Tecoma staus*

---

## SUGGESTED PLANT SPECIES FOR ROAD SIDE PLANTATIONS

---

Scientific name  
-----

Casuarina equisetifolia  
Bauhinia purpurea  
Azadirachta indica  
Casia fistula  
Ficus religiosa

---

The company has proposed to set up its new unit in 24220 Sq.m. of land.

Land usage breakup for the new unit is

Total area	24220 Sqm
Built up area	4000 Sqm
Storage/stock yard +Roads	10000 sqm
Green belt	10220 sqm

### **5.4 POST PROJECT MONITORING**

The project authorities are planning to setup Safety and Environmental cell which will be headed by an expert who reports directly to the Chief of the group. The Safety and Environmental activities of the project will be monitored by this cell.

VC authorities will be adopting ambient air quality monitoring atleast once in a month. A weather station for wind speed, direction, temperature and rainfall will be installed within the premises of VC. Stack emission monitoring will also be taken place monthly once.

#### **5.4.1 AIR MONITORING PLAN as proposed to be implemented**

Stack Emission (for SPM,SO <sub>2</sub> & NO <sub>x</sub> )	Monthly (for each stack)
Ambient Air Monitoring (at 3 locations within the site,	Monthly (for each station)

## **LABORATORY EQUIPMENT**

•	Stack Kit	-	1
•	Ambient Air (RDS)	-	3
•	Anemo Meter	-	1
•	Wind Direction	-	1
•	Relative Humidity	-	1
•	Noise Meter	-	1
•	Electronic Weighing Balance	-	1

## **5.4.2 PERSONAL PROTECTIVE EQUIPMENT**

### **POTENTIAL AREAS WITH RELEASE OF Dust :**

#### REGULAR PROCESS AREAS

The areas where Dust handling is involved are mentioned below. The workers working in these areas shall be provided with Nose masks made of cotton clothing material.

#### OTHER OCCASIONAL MAINTENANCE AREAS

In the areas such as Bag Filter cleaning, Dust Collector, BOD maintenance etc, workers will be provided with 3M masks. This activity will be occasional.

## **EXPENDITURE ON ENVIRONMENTAL MANAGEMENT PLAN**

SL	ITEM	RsinLakhs
<b>CAPITAL EXPENDITURE:</b>		
1	Air Pollution control equipment like ID fans, Bag Filters, s connected to cement, Flyash & Fibre handling systems (main equipment) including stacks.	15.00
3	Sewage Treatment for Domestic waste water.	2.00
4	Emission Monitoring equipment at sources and ambient air quality in the vicinity) and laboratory.	5.00
5	Green belt development.	3.00
6	Establishment of Environment cell and Environmental Monitoring.	5.00
7	Total Capital Expenditure	30.00
<b>RECURRING EXPENDITURE:</b>		
8	Recurring expenditure on environmental management cell and on pollution control systems	4.00

**BUDGET FOR PROPOSED WELFARE MEASURES**

<b>SL</b>	<b>ITEM</b>	<b>INVESTMENT, RS IN Lakhs</b>
1	School & Education	1.00
2	Medical Services	1.00
3	Roads Development	1.00
4	Community Development	1.00
5	Supporting Self-help groups	1.00
	Total	5.00

# SUMMARY AND CONCLUSION

## I. Production and Process management

1. The technology chosen and machinery selected are energy efficient and environment friendly.
2. Plant designed to meet all the standard norms of State and Central pollution Control Boards and MOE&F .
3. Noise levels designed at less than 90 dBAs as per OHS standard of 90 dBs of 8 hours exposure at work Environment

## II. Pollution control equipment proposed

1. Pulse Jet bag filters For all Emission Sources.
2. Stack monitoring of SPM, SOX and NOX
3. Annual maintenance budget provided @ Rs.4.00 Lakhs.

## III. Material handling and storage

1. All spillages and deposits on structures will cleaned up promptly using vacuum cleaners or vacuum system.
2. Automatic devices and control systems will be used.
3. Traffic areas, including roads and areas with regular vehicle movement, will be paved with a suitable road-way covering and be kept clean constantly
4. Boundary of the plant will be surrounded with thick plantation.
5. Thick plantation along the unpaved haul road is will also be provided.

#### IV. Environment management

1. Evolving environment policy.
2. Utmost importance will be given to occupational health and safety.
3. Socio-economic development
4. Encouraging and creating opportunities for self employment
5. Infrastructure strengthening and development
6. Environmental Policy to ensure overall eco-friendly plant
7. Environmental management cell for regular reviews and ensuing correct implementation of policy.

VC strongly believes in the concept of eco friendly industrialization as per standards prescribed by the State and Central Pollution Control Boards. Apart from eco -friendly operations, various socio economic development activities will be undertaken to bring about overall socio economic improvements in the areas.

Hence the project may be accorded environmental clearance.