SUMMARY ENVIRONMENTAL IMPACT ASSESSMENT

FOR

ISLAM CEMENT PROJECT

IN THE

PEOPLE'S REPUBLIC OF BANGLADESH

July 1995

ABBREVIATIONS

EIA	-	Environmental Impact Assessment
ICL	-	Islam Cement Limited
IGC	-	Islam Group of Companies
JGTDS	-	Jalabad Gas Transmission and Distribution System Ltd.
SEIA	-	Summary Environmental Impact Assessment

WEIGHTS AND MEASURES

dBA	-	decibels-acoustic
^{o}C	-	degree Centigrade
km	-	kilometer
m	-	meter
mg/l	-	milligram per liter
mm	-	millimeter
ug/Nm^3	-	micrograms per normal cubic meter

GLOSSARY OF TECHNICAL TERMS

BOD	-	biochemical oxygen demand
COD	-	chemical oxygen demand
NO_x	-	nitrogen oxide
pH	-	log hydrogen ion molal concentration
SO_2	-	sulfur dioxide
TSP	-	total suspended particulate

NOTES

(i) In this Report, “ton” refers to metric ton.

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A. Introduction

1. At present, Bangladesh has to import 1.5 millions tons per year of portland cement out of a total consumption of 2.0 million tons per year. Although there are five cement plants operating in the country, only the Chhatak Cement Plant is producing cement from basic raw materials. The plant has a capacity of 270,000 tons per annum. The other four cement plants are primarily grinding and bagging cement clinker imported from India and the neighboring countries. Bangladesh depends on imports for 87 percent of its cement needs. Cement price is highly dependent on the transport and handling cost, and the cost of cement in Bangladesh is 60-70 percent higher than the world market price. Cement availability is a serious constraint to the development of basic infrastructure in Bangladesh. To attract more investment in cement, the Bangladesh Government has opened the sector to private investors.

2. Islam Group of Companies (IGC – the Borrower), has extensive investment in the real estate and construction industry in Bangladesh and has decided to establish a dry process cement factory (the Project) near Chhatak, Sunamgonj to produce 0.6 million tons per year of grey portland cement. The environmental impact of a cement manufacturing plant is classified by the Bank under category A, as such a plant could cause serious environmental problems if proper mitigation measures are not in place. IGC has retained Envirocare (Pvt) Ltd to prepare the environmental impact assessment (EIA) and the summary environmental impact assessment (SEIA). The Bank's environment specialist visited the Project site on Mary 4-6, 1995 to verify critical aspects of the EIA report. Pursuant to the Bank's guidelines, the SEIA is circulated to the Bank's Board of Directors 120 days prior to loan approval. The main EIA report is available at the Project office on request. The EIA report was submitted to the Department of Environment of Bangladesh on 2 June 1995 and approval is expected in August 1995. This SEIA is prepared by IGC and has not been evaluated and assessed by the Bank. The Bank's assessment of the Report and evaluation of the environmental impacts related to the Project will be included in the documentation presented to the Board at the time the Project is considered for approval.

B. Project Description

1. Raw Material Supply

3. The main raw materials needed to manufacture cement are limestone, clay, gypsum and fuel. To produce 600,000 tons per year of cement, 846,000 tons of limestone, 192,960 tons of clay and 32,000 tons of sandstone will be needed. The Project will utilize low sulfur natural gas for fuel. When the Indian subcontinent was partitioned, Bangladesh was carved from the delta and Himalayan foothills. Bangladesh has no commercial limestone or sandstone deposits although large deposits are available just across the Indian border. The limestone and sandstone will be purchased from Meghalaya, India, approximately 17 kilometers (km) from the Project site. The Meghalaya limestone deposit is estimated at 2166 million tons and has an unconfirmed reserve of another 180 million tons. Limestone and sandstone will be transported by a 17-km long aerial ropeway from Meghalaya to the plant site. Clay will be obtained near the northern boundary of the plant site. Gypsum is a waste material in the manufacture of phosphoric acid fertilizer, and at present there is an oversupply of this form from the Chittagong Fertilizer Factory.

4. The limestone mines are supplying cement plants and small-scale lime producers in Bangladesh and in India. While IGC intends to buy into one of the mines to guarantee long-

term limestone supply, IGC may buy limestone from other sources, depending on the market prices. In selecting the limestone mines, IGC has required the mines to provide proof that their mining operations have complied with all safety and environmental regulations, laws, and standards required by Government of India. Lam Mawshun Minerals Private Ltd. of India, one of the major mines in Meghalaya and a potential limestone and sandstone supplier to the Project, has submitted a copy of the No Objection Certification of their mining operation issued by the Ministry of Environment and Forest of India on 15 June 1995.

5. The project will require approximately 71 million normal cubic meters (Nm^3)[1] annually. The natural gas has an average heating value of 9200 kilocalories/Nm^3. The natural gas will be supplied by Jalabad Gas Transmission and Distribution System Limited (JGTDS) 200 millimeter which has gas pipeline along the southwest border of the plant site. A new 200 mm-diameter gas pipeline will be laid by JGTDS to be used exclusively for the Project if the present 150-mm-diameter pipeline is insufficient. The new gas pipeline will use the existing right-of-way owned and maintained by JGTDS. The Project site is within the Chhatak gas field, which has a proven gas reserve of 110 billion m^3. Petro Bangla, the developer of the Chhatak gas field, has confirmed that the natural gas will be available during the whole economic life of the Project. The natural gas from Chhatak field contains 97.9 percent iso butane, 1.8 percent n-butane, 0.2 percent nitrogen, and traces of carbon dioxide and other hydrocarbons.

6. Water will be supplied from the Surma River, which is about 200 meters (m) from the plant site. Water will be pumped to a settling tank to remove coarse particles, and a coagulant (primarily alum) will be added to remove the turbidity. After removing the turbidity the water will be disinfected with chlorine. The water demand is estimated at 150 m^3/hour or 3600 m^3/day. The water will be used to cool the bearings, and for the power plant and domestic consumption. The minimum flow at the Surma River is 714 m^3/second or 2.6 million m^3/hour.

2. Civil Works and Process Equipment

7. A ropeway tram carrier with a capacity of about 2000 tons/bucket will be constructed to bring the limestone from the quarry in India to the Project site. The ropeway will have 160 pillars spaced 100 m apart. The pillar base will be 1.2 m by 1.2 m. The pillar height will be 5-8 m, depending on the terrain and obstructions. The buckets will be fully closed to prevent spillage. The ropeway route will follow the alignment of existing roads and pathways in India and Bangladesh. In Bangladesh, the 7.5 km-long route will transverse rice fields and crop lands.

8. Cement production involves the grinding of the limestone, sandstone, and clay to the required size and consistency. To minimize energy use, the raw materials are preheated. The mixture is then fired in the kiln calciner where the limestone, clay, and sandstone form a clinker. The clinker is ground and gypsum is added to control the hardening period of the cement. The ground clinker and gypsum mixture is then ready for marketing as portland cement. Portland cement is bagged and stored in the warehouse. The process flow diagram is shown in Appendix 1.

B. Description of the Environment

[1] A standard cubic meter is 1 m^3 of gas at 1 atmosphere pressure and 9 points degrees centigrade.

1. Land Use

9. The Project will occupy 46 hectares of land in Chhatak Bazar, Sylhet, on the northern side of the Surma River. The Chhatak Bazar township is linked with the rest of the country by roads, a railway, and the Surma River. Although the Roads and Highways Authority of Bangladesh normally does not allow a truck to carry more than 8 tons in most roads and bridges in the area, a number of industries have been built because of the proximity to energy, raw materials and access to almost all the major urban centers through the Surma River. The main industries within a 10-km radius of the project site are the Chhatak Cement Plant, Sylhet Pulp and Paper, and (Korean) Cement Plant. A number of lime factories using primitive kilns, rock crushing and washing facilities, and rock pile or storage are also found in the area. Most of the urban centers in Bangladesh are located in the delta region where construction materials such as rocks and sand are scarce. Those materials are purchased from India or quarried from nearby hills. The areas surrounding the factories are primarily cultivated with rice and vegetables. The land uses and Project vicinity are shown on the map (Appendix 2).

10. The Project site and Chhatak Cement are on the other side of the Surma River from Chhatak township. As there is no bridge across the Surma River, the Project site, Chhatak Cement, and villages across from the township depend on the river for transportation.

2. Physical Environment

11. The area has a subtropical climate with maximum temperature range from 25-31^{o}C and minimum temperature range of 13-25 ^{o}C. December to February are the cold months while April to August are the hot and humid. The morning humidity varies from 83 percent in March to 96-97 percent for most of the rest of the year. The area is affected by the southwest monsoon, which normally starts in May and ends in September. June is the wettest month with an average precipitation of 1,370 mm, while November and December are the driest months, with an average precipitation of 6-7 mm. Almost 80 percent of the total rainfall (5900 mm) takes place during the monsoon season. Because of the funnel-shape formation of the land mass in the upper portion of the Bay of Bengal where Bangladesh is located, cyclones often have disastrous effects. The Project site is close to the Himalayan foothills, and it is not affected by the damaging storm surges created by the cyclones.

12. The prevailing wind direction is southeasterly and easterly from January to March and northeasterly from April to December. The wind speed is 4 to 8 m/second.

13. Despite the two cement plants, one pulp and paper factory, and a number of small-scale lime producers, the air quality in the area is relatively good. Chhatak Cement plant has an electrostatic precipitator and bag filters for dust control and the other cement plant is operating intermittently because of technical problems. The 24-hour average concentration for major air pollutants of concern are as follows: sulfur dioxide (SO_2) was 2-4 ug/Nm^3; total suspended particulate (TSP) was 26-38 ug/Nm^3, and nitrogen oxides (NO_x) was 3-4 ug/Nm^3. The air quality compares favorably with the proposed ambient air quality standard in Bangladesh, which sets the 24 hour average concentration of SO_2 at 120 ug/Nm^3, NO_x at 100 ug/Nm^3, and TSP at 100 ug/Nm^3.

14. Sylhet Pulp and Paper Mill uses a series of lagoon ponds to treat its industrial wastes. The effluent discharge still contains biochemical oxygen demand (BOD) of 255 milligram per

liter (mg/l), pH of 7.4-8.4 and suspended solids of 341 mg/l. However, the Surma River dilutes the wastes so that the river quality is relatively unpolluted. The BOD concentration in the river is less than 10 mg/l, and the dissolved oxygen concentration is above 13 mg/l. The suspended solids in the river water is relatively high at 207 mg/l because of soil erosion caused by improper land cultivation. Chhatak Cement Plant wastewater discharge, which is primarily cooling water, contains very little organic materials, with a BOD of less than 5 mg/l and suspended solids concentration of less than 20 mg/l.

15. The prevailing noise level in the area varies from 45 decibels-acoustic (dBA) during the day to 35 dBA at night, which is typical of rural noise levels. There is no major noise source in the Project site.

16. The Project area is part of the geological formation covering the whole northeastern Bangladesh. The area is primarily composed of raw sandy and silty alluvial deposits usually stratified either from the surface or below the cultivated topsoil. Typical of the Himalayan foothills, the area is subject to earthquakes, although their strength and frequency has not been established due to lack of suitable equipment.

3. Biological Environment

17. There is hardly any forest in Sylhet Province. An official survey place the forest land at 3 percent of the total land area, but the area could be much smaller. Flora consists of various type shrubs, herbs and other agricultural crops. In summer most of the cultivable areas are planted with vegetable or the land is left fallow. Fish stocks have been depleted by over fishing. Common freshwater fishes in this region are *cirrhinus reba, labeo bata, silonia, pangasium,* and *badis badis.* Historically, tigers and jackals lived the forest of the Sylhet, but they are no longer present. Domesticated animals such as goats, cow, ducks, and chickens are the main fauna in the area.

4. Socioeconomic Environment

18. The Sylhet population is highly mobile and accounts for most of the Bangladeshi people residing or working abroad. Almost all families have relatives working in the Middle East, Malaysia, or Europe. Thus, despite the low productivity of the farm lands, Sylhet is able to maintain a higher standard of living than most urban centers of Bangladesh. The houses in Sylhet are well maintained and built.

19. The province has a literacy rate of 30 percent, which is much higher than the national average of 25 percent. The high literacy rate is encouraged by family members who have been able to find foreign employment. Although the province has a good university, technical colleges, teacher's college, and high schools, a number of Sylhet students are studying in Dhaka or outside of Bangladesh. Even graduates from the local university and colleges often work outside of Sylhet because of the very limited employment opportunities in the area. Aside from the civil service, the major employers in the area are the Chhatak Cement Plant and Sylhet Pulp and Paper Mill. Most of the residents are working in agriculture, trading, and transport.

20. The Project site is serviced by a raised unpaved road connecting Chhatak Cement Factory and Dewrabazar village. The unpaved road runs along the southern boundary of the Project site parallel to the northern bank of the Surma River. The Surma River is navigable throughout the year. During the summer months, barges carrying up to 800 tons of cargo

navigate the river, which is the main transport and communication link to the Project site from other urban centers in Bangladesh.

21. Sylhet Pulp and Paper Mill across the Surma river from the Project site, is served by a railway system. The maximum allowable capacity of a railway wagon is 19 tons. The Railway Authority plans to expand its services to industries.

22. The average household size in Chhatak is 6.0 persons. The nearest settlement to the Project site is Chhatak township, directly across the Surma River from the Chhatak Cement Plant. A small settlement has also developed along the Surma River beside the Chhatak Cement Plant. The main occupation in the area is farming, trading, and skilled and unskilled labor.

D. Anticipated Environmental Impacts and Mitigating Measures

23. The potential impacts of the Project will result from (i) construction and operation of the ropeway; (ii) on-site storage of the crushed limestone, sandstone and gypsum; (iii) dust from grinding and mixing of raw material; (iv) dust and combustion by-products from the calciner; (v) dust from clinker grinding and bagging; (vi) wastewater used for bearing cooling, and sewage discharge from staff housing and offices; (vii) disposal of solid wastes; and (viii) dislocation of the farmers tilling the 46 hectares of rice land.

24. The crushed limestone and sandstone will be transported inside closed buckets to prevent loss of materials, dust, and spills. Enclosure is important as spillage from the ropeway could be hazardous to people working underneath. There are no scenic areas or areas of historical interest along the ropeway route. The buckets will be sprayed with water to control fine dust particles prior to unloading into the storage area. The storage area will contain sufficient crushed limestone and sandstone for at least 30 days of plant operation. The crushed limestone and sandstone stockpile will be provided with water spray to control the dust. Limestone and sandstone will be purchased from India, at 10-15 percent higher than the price would be if the materials were quarried within the plant site, as is done at most cement plants. As ICL is paying a premium for those raw materials, control of raw material losses is a primary consideration in controlling the fugitive dust. Trees will be planted around the stockpile area to serve as windbreaks.

25. The sandstone and clay will be crushed on site to 7.5 centimeters size prior to transfer from the stockpile area to conveyor belts and crushers, the limestone and additives will be sprayed with water to prevent dust emission. The crushing operation will be carried out in an enclosed room with air pressure maintained by a large exhaust fan. The exhausted air will pass through a cyclone to remove the dust. The crushed limestone and additives will be weighed and the correct portion fed to a raw mill to reduce the particle size to 90-1000 microns. The raw mill will operate as a closed cycle, to reduce carry-over dust emission. The raw mill room will be also enclosed and the exhausted air will be treated in a cyclone in a similar manner as the crushers. As a contingency measure, sufficient space is left in the cyclone area for installation of additional cyclones in series or bag filters if the emission exceeds 100 mg/Nm^3 as provided for in the interim Bangladesh emission standard for TSP. Similar mitigating measures will be implemented in the clinker grinding and bagging area to remove the TSP.

26. The homogenized mixture of fine limestone, sandstone, and clay particles will undergo preliminary drying and initial chemical reaction in the preheater using the exhaust

from the calciner. This operation cools the calciner exhaust gas to 350 ^{o}C. Prior to discharge into the atmosphere, the calciner exhaust gas will pass through an electrostatic precipitator to remove the particulates. The designer and equipment supplier have guaranteed that TSP in the exhaust gas stream after the electrostatic precipitator will be less than 70 mg/Nm^3, which is less than the Bangladesh emission standard of 100 mg/Nm^3 for TSP. The flue gas sulfur dioxide will be undetectable, as sulfur is very low and almost undetectable in the natural gas fuel. The carbon monoxide concentration in the exhaust gas is expected to be low as natural gas undergoes almost complete combustion in the calciner. Assimilation of the exhaust emission will be further facilitated after discharge in a 30-m tall stack.

27. The maximum TSP concentration from the Project's emission was calculated using the Gaussian Plume model. The model predicted a maximum daily average concentration of 50 ug/Nm^3 of TSP at 800 m from the plant smokestack in the worst expected conditions. When added to the existing condition, the maximum daily concentration is expected to go up to 100 ug/Nm^3 from the present level of 50 ug/Nm^3. While the Project will cause a 100 percent increase in TSP level, this concentration is still within the ambient air quality standard of 500 ug/Nm^3 used in Bangladesh. SO_2 was not calculated, as the natural gas fuel contains only a trace concentration of sulfur.

28. As is typical of sub-tropical and tropical clay subjected to monsoon rains, the soil around the Project site is acidic, with a pH from 4 to 5. Zinc and other essential metals are easily leached out. Farmers are adding lime and zinc oxysulfate to the soil. The residual alkaline emission from the exhaust gas is not expected to cause any serious problem to the surrounding rice fields. During the EIA study, the team visited the rice fields around the Chhatak Cement Plant and found no perceptible impact of the cement plant's operation.

29. Rejected products and raw materials will be backfilled in the clay quarry area within the Project site. This will reduce the materials required in the future to rehabilitate the clay quarry. Although the clay quarry is a 50 m high hill, it is expected that the quarry operation will be carried out to a depth of 50 m below the ground. The rejected products are normally clinker, discarded insulating materials from the calciner, and impurities in the limestone and sandstone. The dust from the crushers and grinder will be recycled into the manufacturing process stream.

30. A reversible jet bag type dust collector will be provided for venting the silo and control bin. The exhaust from the vents is expected to be less than 100 mg/Nm^3. ICL has stipulated a supplier guarantee of 50 mg/Nm^3 or less of TSP in the emission.

31. The wastewater used for cooling the ball bearings and process equipment will be treated in an oil separator. The volume is estimated at 1000 m^3 per day. Approximately 1600 m^3 of water will be used to control dust from the limestone and sandstone stockpile, to control dust in the conveyor belt, and to wash the ropeway boxes. The wastewater from this source will be treated in a sedimentation tank to remove suspended solids. During plant operation, ICL will study the viability of recovering the settled solids as additional raw materials. During the dry season, the water (after sedimentation) will be used to irrigate the green areas. Domestic wastewater from the township will be mixed with the pretreated cooling water for further treatment in a facultative pond. The combined wastewater discharge from the cooling water (1000 m^3/day) and domestic sewage (1000 m^3/day) is estimated at 2000 m^3/day. The effluent after treatment in the facultative pond will contain BOD of less than 30 mg/l and suspended solids of less than 20 mg/l after removal of the algal mass.

32. To control the impact of noise from the process equipment, especially the crushers and grinders, the following mitigating measures will be in place: (i) spacing between noise sources and between noise sources and operators will be regulated, (ii) structure-borne transmission will be reduced by using resilient mountings to isolate the source, (iii) imbalances and vibrations will be corrected by preventive maintenance, and (iv) ear defenders will be provided to appropriate operators.

1. Biological

33. The Project will displace 46 hectares of rice field and the corresponding ecological system. Aside from the cultivated rice, the rice field is host to a variety of insects, fish, freshwater crustaceans, birds, and weeds. As long as the pollution control equipment is properly operated and maintained, the ecological system in the surrounding rice fields will be maintained. Disruption of the biological environment will be compensated by the development of the green areas with the project site.

2. Socioeconomic Aspects

34. Initial site selection was based on the nearby availability of the main raw materials such as limestone, sandstone, clay, and fuel. The final site selection was based on the ownership pattern of the land. As mentioned earlier, a number of families in Sylhet are working in Dhaka or abroad. A number of IGC employees own land in the area and have offered their land for the Project. As the Government considers the Project to be of high priority, the other land will be acquired through a Government notification. The landowners will be paid according to prices to be set by the Government. ICL will provide on-the-job training for unskilled and semi-skilled workers during the construction period. These workers who performed well will be retained during the Project operation. ICL will also initiate a training and marketing program for tenants who can not be employed in the cement plant. There are no houses within the Project site and hence no relocation is needed. Thirty families will lose land.

35. The Project is expected to contribute positively to the economic development of the country by providing an essential ingredient for the construction of the nation's infrastructure.

E. Alternatives

36. The alternative to the Project is for Bangladesh to continue importing cement. While this option would avoid the residual impact of the Project in Bangladesh, in global terms, the emissions would be higher as additional energy would be required to transport the final product to Bangladesh from distant sources. While the farmers in the Project site will be dislocated, the high dependence on imported cement has caused greater social impact on the country by constraining the development of basic social infrastructure such as roads, water supply, hospitals, schools, houses, and ports, which needs large quantities of cement. The provision of such basic infrastructure in Bangladesh will be less expensive if the Project is implemented.

37. In the development of the process equipment, pollution control was given very high priority. For example, the Project opted to use a ropeway system to transport the limestone and sandstone from India, rather than roads. The ropeway system will require only 840 square meters of land, while a 17-km roadway would require 20 hectares.

F. Cost-benefit Analysis

38. The difference between the cost of producing the product locally versus importing it is a direct and quantifiable Project benefit. To calculate the benefit, the price of the inputs was converted to international prices to eliminate distortions from subsidies, such as in the price of the natural gas used for fuel. The costs of all the pollution control equipment, operation and maintenance of that equipment, and the procurement of the monitoring equipment are included in the Project cost. Detailed breakdown of the pollution control equipment and mitigating measures is given in Appendix 3. The economic rate of return of the Project was calculated at 18.7 percent. The net present value of foreign exchange savings over the entire life of the project is estimated at $120.2 million discounted at 10 percent per annum. In addition, the Project has non-quantifiable benefits such as the supply of essential construction materials for development of basic infrastructure, employment opportunities in Chhatak for 400 people, and an additional 1000 new employment opportunities in downstream industries such as distribution, transport, manufacturing jute bags, and equipment maintenance.

G. Institutional Requirement and Environmental Monitoring Program

39. The Project cost includes the procurement of equipment to analyze stack emission, ambient air quality, noise, and water quality. Ambient air quality and the stack emission will be monitored once every three months for TSP, carbon monoxide, SO_2, and NO_4. The wastewater effluent from the facultative pond will be analyzed monthly for BOD, COD, pH, suspended solids, alkalinity, hardness, and turbidity. While ICL will maintain an analytical laboratory for analysis, possibly Bangladesh University of Engineering and Technology, Department of Environment, or Envirocare Bangladesh. The Department of Environment will also conduct surprise inspection from time to time to confirm compliance with its standards.

40. Once a year, ICL will submit to the Bank (i) a compilation of all the monitoring results; (ii) a highlight of the activities related to plant safety and the environment of the quality control unit; and (iii) if the plant has been cited for violation of safety and environment standards or regulations, a certification from the relevant Government authorities that the defect has been corrected or an acceptable plan of action is in place to correct the defect.

41. The Manager of the Plant's Quality Control Unit is responsible for compliance with safety and environmental standards and regulations. The Manager reports directly to the Managing Director in Dhaka on all practices that in his opinion will affect the Project's compliance with safety and environmental regulations. The plant engineer is responsible for maintenance of the safety and pollution control equipment. The Quality Control Manager will operate independently from the plant manager. The Quality Control Unit will be staffed with at least two licensed chemists and one safety engineer.

H. Public Participation

42. ICL, in compliance with the Government regulation, has conducted a series of public meetings on the Project, especially with persons who will be affected by the land acquisition, and farmers and landowners of the surrounding properties. The main public meeting, on 14 May 1995, was held at the ICL office in Dhaka, was presided over and called for by Thanna (Chhatak administrator). The minutes of the meeting are available at the Project office upon request. During the meeting, the Project, its benefits to the community and to the nation, mitigating measures in place to protect the environment, the land acquisition process, and

measures ICL is taking to provide alternative employment to displace farmers were discussed.

I. Conclusion and Recommendation

43. The Project will provide cement below the current market price and will increase the quantity of cement available in the market. Thus, the Project will assist the development of important infrastructure in Bangladesh. The main environmental impacts of the Project are the conversion of 46 hectares of rice field for the Project site and the dust emissions from the manufacturing process. As long as the pollution control equipment is properly installed and ICL maintains social responsibility for the displaced farmers, the residual impacts of the Project can be maintained at an acceptable level.

Appendix 1: ISLAM CEMENT LIMITED - Manufacturing Process Diagram

Appendix 2: Location Map of Islam Cement Factory, Chhatak, Sylhet

Appendix 3: Mitigating Measures

Sl. No.	Department	Bag Dust Filter		ESP		Cooling Tower		Sewerage		Smoke Stack.	
		Nos.	Cost USD	Nos.	Cost USD	Nos.	Cost USD	Nos.	Cost USD	Nos	Cost USD
Pollution Control											
1.	Crusher	1	31,000	-	-	-	-	-	-	-	-
2.	Raw Material Storage	2	53,000	-	-	-	-	-	-	-	-
3.	Raw Grinding-cum-kiln	1	22,000	1	1,406,250	-	-	-	-	1	78,000
4.	Raw meal Storage	5	69,000	-	-	-	-	-	-	-	-
5.	Phytoprocessing & Clinkerization	-	-	1	781,250	1	218,750	-	-	1	39,000
6.	Clinker Storage	1	19,000	-	-	-	-	-	-	-	-
7.	Cement Grinding	2	137,000	1	390,625	-	-	-	-	1	39,000
8.	Cement Storage and Packing	1	13,000	-	-	-	-	-	-	-	-
9.	Transfer Point (cartridge type)	20	93,750	-	-	-	-	-	-	-	-
10.	General (plant and colony)	-	-	-	-	-	-	1	95,000	-	-
	Subtotal	**33**	**437,750**	**3**	**2,578,125**	**1**	**218,750**	**1**	**95,000**	**3**	**156,000**
	Grand Total Pollution Control										**3,485,625**
Monitoring Equipment											
	Air pollution										120,000
	Noise pollution										5,000
	Water pollution										15,000
	Subtotal										**140,000**
Social Measures											
	Training and social projects										500,000
	Land compensation										3,000,000
	Subtotal										**3,500,000**
	Total Mitigating Measures										**7,125,625**

Source: ERCOM Engineers Pvt. Ltd.