CHAPTER-7

ENVIRONMENTAL MANAGEMENT PLAN

7.1 INTRODUCTION

This section discusses the management plan for mitigation/abatement of adverse environmental impacts and enhancement of beneficial impacts due to mining. The EMP has been designed within the framework of various Indian legislative and regulatory requirements on environmental and socio-economic aspects.

7.2 AIR QUALITY MANAGEMENT

Mitigative measures suggested for air pollution control are based on the baseline ambient air quality monitoring data. From the point of view of maintenance of an acceptable ambient air quality in the region, it is desirable that air quality should be monitored on a regular basis to check it vis-à-vis the standards prescribed by CPCB and in cases of non-compliance, appropriate mitigative measures shall be adopted.

Per the results of ambient air quality monitoring data, the background concentrations of SPM, SO_2, CO and NO_x are within the stipulated CPCB standards for most of the samples. The proposed mining operations and related activities are expected to add to the levels of air borne particulates. However, the addition of gaseous pollutants due to the proposed activities is expected to be relatively low, as predicted in Section-6.5.

7.2.1 Controlling Dust Levels

Dust would be generated during mining, crushing operations, and also during handling and transportation of the material. The suggested control measures are :

Mines

- Dust suppression systems (water spraying) to be adopted at
    - Faces/sites while loading;
    - Use of sharp teeth for shovels;
- Dust extraction systems to be used in drill machines;
- Use of sharp drill bits for drilling holes and drills with water flushing systems (wet drilling), to reduce dust generation.

Stock-piles

- Mist sprays will be provided at appropriate places for preventing dust pollution during handling and stockpiling of shale.

Haulage

- Regular water spraying on haulage roads during transportation of shale by water sprinklers.
- Transfer points shall be provided with appropriate hoods/chutes to prevent dust emissions.
- Dumping of shale should be done from an optimum height (preferably not too high) so as to reduce the dust blow.

Crusher

- Crusher will be provided with Bag Filters to arrest any dust emission. The dust emission level will be kept within the prescribed standard of 150 mg/Nm3.
- Water sprinkling system will be provided to check any fugitive emissions from the crushing operation.

Belt Conveyor

- Close conduit type conveyor belt will be used for transportation of crushed material to Cement plant at Chattak, Bangladesh. The belt and idlers to be maintained in proper condition so as to avoid spillage of material and prevent any fugitive emissions.

7.2.2 Controlling CO Levels

The concentration of CO in the ambient air was below detectable limits at all the air quality monitoring locations. Expected increase in the CO concentration is very low as CO emissions from mining operations are less compared to other pollutants. Heavy and light vehicles are the major sources of CO in the mine. All vehicles and their exhausts would be well maintained and regularly tested for pollutants concentration.

7.2.3 Controlling NO_x Levels

NO_x emissions in the mine mainly occur during blasting operations. The main reasons for NO_x emissions are :

- Poor quality of explosives having large oxygen imbalance. This may be due to :
  - Manufacturing defect;
  - Use of expired explosives in which ingredients have disintegrated.
- Incomplete detonation, which may be due to low Primer to column ratio.

However, no blasting would be required in the mining operations. The only other source of NO_x would be due to vehicular emissions.

7.2.4 Occupational Health & Safety Measure to Control Dust Inhalation

All the above precautions would be adopted to prevent dust generation at site and to be dispersed in the outside environment. However, for the safety of workers at site, engaged at the strategic locations/dust generation points like drills, loading & unloading points, crushing etc, dust masks would be provided. Dust masks would prevent inhalation of RPM thereby reducing the risk of lung diseases and other respiratory disorders. Regular health monitoring of workers and nearby villagers in the impacted area (~1 km from the core zone) will be carried out by LMMPL.

7.3 NOISE POLLUTION CONTROL

The ambient noise level monitoring carried out in and around the proposed mine shows that the ambient noise levels are well within the stipulated limits of CPCB.

Within an operational mine, major noise sources are operation of mine machineries and equipment, crushing units and belt conveyor. Noise generation may be for an instant, intermittent or continuous periods, with low to high decibels.

To keep noise generation in control, latest sophisticated technology and equipment have been considered. Drills, loaders, dumpers etc with larger capacities possibly will be acquired to reduce the number of operational units at a time, thereby reducing the noise generating sources.

The equipment systems will include cabins to ensure that the operators and other work persons, in and around the operating equipment, have comfortable work stations. To keep the ambient noise levels within the permissible limits of 75 dB(A), the following measures should be adopted :

- Innovative approaches of using improvised plant and machinery designs, with in-built mechanism to reduce sound emissions like improved silencers, mufflers and closed noise generating parts.
- Procurement of drill, loaders and dumpers and other equipment with noise proof system in operator's cabin.
- Confining the equipment with heavy noise emissions in soundproof cabins, so that noise is not transmitted to other areas.
- Regular and proper maintenance of noise generating machinery including the transport vehicles and belt conveyors, to maintain the noise levels.
- Siting of mine colony, buildings and other infrastructure away from the noise sources with the probability of sound waves being directed towards them being least.
- Provision would be made for noise absorbing pads at foundations of vibrating equipment to reduce noise emissions.

Pyrkan village is the nearest habitat located at about 1.0 km away from the mine area. The noise generation from the mine may be of concern to the inhabitants.

7.3.1 Occupational health and Safety Measures to Control Exposure to Noise

To protect the workers from exposure to high levels of noise, following measures would be adopted :

- Provision of protective devices like ear muffs/ear plugs to workers who cannot be isolated from the source of high intensity noise, e.g. blasting.
- Confining the noise by isolating the source of noise as discussed above.
- Reducing the exposure time of workers to the higher noise levels by shift management.

7.4 CONTROL OF GROUND VIBRATION & FLY ROCKS/BOULDERS

As no blasting phenomena would be involved, there would be no major ground vibrations that would need to be controlled.

7.5 LAND MANAGEMENT

Land degradation is one of the major adverse impacts of open cast mining in the form of excavated voids and also in the form of waste dumps. Land reclamation plan must, therefore, be implemented simultaneously with the mining activities.

7.5.1 Land Reclamation

One of the requirements of MMIRD Act, 1957 is to ensure simultaneous reclamation of land along with other mining operations. To reduce the time gap between land excavation and reclamation, yearwise programme of excavation including shale, top soil and OB has to be charted out.

Land degradation is one of the major adverse impacts of opencast mining. Any effort to control adverse impacts would be incomplete without an appropriate land reclamation strategy.

The first step in a successful reclamation programme is to decide the post reclamation land use. In this case it is considered appropriate to convert the land under a cover of dense vegetation, keeping in view the following :

- Area is rich in vegetation and further plantation would match with the existing environment;
- Trees absorb CO_2, contribute oxygen, purify the air, conserve the soil and prevent its erosion. Trees promote precipitation and add to stabilization of slopes;

Keeping the above in view, the land reclamation shall be carried out with an emphasis on plantation. At any point of time the area under disturbance shall be kept at minimum. This shall be achieved by ensuring reclamation of excavated area concurrently with mining activities by reducing the gap between the first damage (mining) and the first repair (reclamation) to the bare minimum.

The disturbed land including the area disturbed due to excavation, dumping, construction of haul roads, ramps, structures etc would be fully reclaimed before finally abandoning the mine. The reclamation process shall take :

- One year for grading and top soil spreading;
- Another four years for landscaping and stabilization of plantation.

Thus the area shall be fully reclaimed within five years of completion of mining operations.

During post mining period, in the mine area all the disturbed areas will be reclaimed before decommissioning/abandoning the mine, excluding the buildings meant for garages, office, magazine etc; which will be left as such to be later used as social infrastructures (school, health centre, etc) by the population in the vicinity. The belt conveyors, crushing plant and material handling system will be dismantled and reclaimed.

Soil Conservation Measures

To prevent soil erosion and wash-off of dump-fines from freshly excavated benches and dumps following measures shall be adopted :

- Garland drains will be provided around the mine wherever required to arrest any soil from the mine area being carried away by the rain water;
- Toe drains with suitable baffles will be provided all along the toe of the soil dumps to arrest any soil from the dump slopes being carried away by the rain water;
- Special local stone paved chutes and channels will be provided, wherever required, to allow controlled descent of water, especially from the top of the slope along to the foothills;
- Bench levels will be provided with water gradient against the general pit slope, to decrease the speed of storm water and prevent its uncontrolled descent.
- Gully formations, if any, on sides of the benches shall be provided with check dams of local stone or sand filled bags. The inactive slopes will be planted with bushes, grass, shrubs and trees after applying top soil to prevent soil erosion;
- Loose material slopes will be covered by plantation by making contour trenches at 2 m interval to check soil erosion both due to wind and rain;
- Retaining walls (concrete or local stone) will be provided, around the stockpile or wherever required, to support the benches or any loose material as well as to arrest sliding of loose debris.

7.6 AFFORESTATION PLAN

Under the afforestation plan for the LMMPL Mining Project, it is proposed to develop a green belt of 25 m wide green belt all along the limestone and shale mining area. The implementation for development of green belt will be of paramount importance as it will not only add up as an aesthetic feature, but also act as a pollution sink.

The species to be grown in the areas should be dust tolerant and fast growing species so that a permanent green belt is created. Currently the proposed land has very sparse tree growth intercepted with blank areas.

The main aim of the plantation of the mined out areas is to stabilize the area to protect it from rain and wind erosion. The working area shall contain fine particles resulting in erosion of land when these get airborne. Stabilisation against wind erosion is therefore a must.

To stabilize the slopes, proper berms shall be left/built along the bench edges. The bench area shall then be prepared for plantation by spreading/utilizing the top soil segregated and stacked separately.

Apart from the green belts and aesthetic plantation for eliminating fugitive emissions and noise control, all other massive plantation efforts shall be decided and executed with the assistance and co-operation of the local community. Based on the community needs the afforestation would mainly aim at :

- Protection of soil erosion
- Plantations or fuel wood blocks to meet the energy requirements.

The plantation of any of the above or combination of the above will be decided in consultation with the local community.

Recommended Plant Species

Relevant forest authority would be consulted for successful reclamation/ afforestation programme. The plant species which are indigenous, fast growing, spreading roots, broad leaf base etc would be selected for plantation/afforestation with focus on the mine problems discussed so far. Monoculture would be avoided as it is not only expensive to maintain but is also vulnerable to diseases, pests and climatic changes. Some of the recommended species are :

- *Duabanga grandiflora*
- *Erythina stricta*
- *E. indica*
- *Holarrhena antidysentrica*
- *Sterculia villosa*
- *Dillenia indica*

- *Gmelina arborea*
- *Toona ciliata*
- *Zanthoxylum sp*
- *Albezzia procera*
- *Bauhinia purpurea*
- *Castonopsis sp*