

**Proposal for Diversion of Forest land For Earth material and Muck cut Disposal in
“Rehabilitation and Up-gradation to 2-Lane with Paved Shoulder of NH-510
(Singtam-Tarku-Rabongla-Legship-Gyalshing)(Design Chainage from Km 33+600
to Km 58+840) in the State of Sikkim in EPC Mode-(Package-IV)”**

MUCK MANAGEMENT PLAN

1. INTRODUCTION

A large quantity of muck which mainly contains Earth material and Soil cut, is expected to be generated as a result of construction of roads, etc. Muck generated from excavation of any project component is required to be disposed in a planned manner so that it takes a least possible space and is not hazardous to the environment. The muck disposal sites cause increased sedimentation in the rivers (though insignificant compared to natural sedimentation) and totally spoils the visual aesthetics of the area. It is of prime importance that these sites will have to be rehabilitated as soon as the disposal sites are full.

2. SOIL CUT GENERATIONS


Based on the geological nature of the rocks and engineering properties of the soil, a part of the muck generated can be used as construction material. The balance needs to be suitably disposed. Normally, muck is disposed in low-lying areas or depressions. Trees, if any, are cut before muck disposal, however, shrubs, grass or other types of undergrowth in the disposal at sites perish. The Earth material and Soil cut disposal sites will be suitably stabilized on completion of the muck disposal.

- Earth material and Soil cut disposal can lead to impacts on various aspects of environment. Normally, the land is cleared before Earth material and Soil cut disposal. During clearing operation trees are cut, but undergrowth perishes as a result of disposal.
- In many of the sites, Earth material and Soil cut is stacked without adequate stabilization measures. In such a scenario, the muck moves along with runoff and creates landslide like situations. Many a times, boulders/large stone pieces enter the river/water body, affecting the benthic fauna, fisheries and other components of aquatic biota.
- The increased vehicular movement near disposal sites lead to adverse impacts on ambient air quality as well. However, increase in vehicular traffic is not significant to cause major impact on ambient air quality.
- Normally Earth material and Soil cut disposal is done at low lying areas, which gets filled up due to stacking of Earth material and Soil cut. This can sometimes affect the natural drainage pattern of the area leading to accumulation of water or partial flooding of some area which can provide ideal breeding habitat for mosquitoes.

Thus, it is necessary to develop a proper muck disposal plan for amelioration of above referred impacts.

3. SOIL CUT DISPOSAL SITES:-

The total excavation quantity likely to be generated at the project will be around 12.13 lakh cum. Approximately 30% of generated muck i.e. 3.64 lakh cum will be used as Construction material and remaining 8.49 lakh cum (including 40% swelling factor and over break) will be disposed off at four muck disposal sites. However, the capacity of the three dumping sites is 15.35 lakh cum, the details of which are as under in table:


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Sl. No	Dumping Site	Location	Area (in Ha)	Capacity (in cum)	Latitude	Longitude
1	MD-1	39+100	0.35	35000	27°28'03.9"	88°33'98.9"
2	MD-2	39+400	3.28	900000	27°28'12.4"	88°32'42.8"
3	MD-3	Tingmoo Road	2.15	600000	27°27'92.7"	88°29'63.6"
		Total -	5.78	1535000		

4. MANAGEMENT MEASURES


As mentioned earlier, a large quantum of muck is expected to be generated. A part of Earth material and Soil cut is proposed to be utilized as a construction material for various project appurtenances. The balance is proposed to be disposed at the designated site. Earth Material and Soil cut generated from excavation of any project component is required to be disposed in a planned manner so that it takes a least possible space and is not hazardous to the environment. In the hilly area, dumping is done after creating terraces thus usable terraces are developed. The overall idea is to enhance/maintain aesthetic view in the surrounding area of the project in post-construction period and avoid contamination of any land or water resource due to muck disposal. Suitable retaining walls shall be constructed to develop terraces so as to support the muck on vertical slope and for optimum space utilization. Loose muck would be compacted layer wise. The muck disposal area will be developed in a series of terraces of boulder crate wall and masonry wall to protect the area/muck from flood water during monsoons. In-between the terraces, catch water drain will be provided. The terraces of the muck disposal area will be ultimately covered with fertile soil and suitable plants will be planted adopting suitable bio-technological measures.

The basic aim and objectives of the muck management plan are to:

- protect these areas from soil erosion
- develop these areas by afforestation
- develop them into parks, gardens etc.
- utilize the maximum quantity of muck for development of infrastructure of the project
- develop these areas in harmony with the landscape of the project area.

Various activities proposed as a part of the management plan are given as below:

- Land acquisition for muck dumping sites
- Civil works (construction of retaining walls, boulder crate walls etc.)
- Dumping of Earth Material
- Leveling of the area, terracing and implementation of various engineering control measures e.g., boulder, crate wall, masonry wall, catchwater drain.
- Spreading of soil
- Application of fertilizers to facilitate vegetation growth over disposal sites.


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- Application of fertilizers to facilitate vegetation growth over disposal sites.

For stabilization of muck dumping areas following measures of engineering and biological measures have been proposed

Engineering Measures

- Wire crate wall
- Boulder crate wall
- R.C.C
- Catch water Drain

Biological Measures

- Plantation of suitable tree species and soil binding species
- Plantation of ornamental plants
- Barbed wire fencing

Earth material and Soil cut generally lacks nutrients and therefore, are difficult to re-vegetate. However, if no attempts to vegetate the slopes are made, the muck could slide lower down during rain and may eventually wash off the check dams also. Since, top soils are not available in large quantities in Himalayas, it may not be possible to apply a thin layer of soil over the muck. Bio-fertiliser technique developed by National Environmental Engineering Research Institute (NEERI) can be adopted in the proposed project. NHPC has successfully used this technique in Uri hydroelectric project. Similar approach can be utilized in the proposed project as well. In this process, the unused excavated material is piled and stacked with proper slopes at the designated muck disposal sites. The slopes are broken up by creating benches across them. This is done to provide stability to the slopes and also to provide ample space for planting of trees that would further help in holding and consolidating biotechnological approach. The traditional methods of afforestation of these areas would be supplemented with the use of fungus, i.e. Vesicular Arbuscular Mycorrhizae (VAM) and nitrogen fixing bacteria that form partnership with plant roots. These grow on plant roots and provide water and nutrition especially phosphorus to plants at faster rate. The seeding of plants would be inoculated with VAM and nitrogen fixing bacteria before planting. It has been found that plants inoculated with bio-fertilizers grow at faster rate especially in the medium where the soil/rock is devoid of nutrients. The Afforestation with suitable plant species shall be done. About 5000-7000 trees shall be planted in entire dumped area.


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TOPOSHEET NO.
78-A-7/3

MD-2 @ 39+400

MD-1 @ 39+100

MD-3 Tingmoo Road

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