

Section

10.2.5

MUCK MANAGEMENT PLAN

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The construction would involve about 3,70,880 cum of soil excavation and 9,23,970 cum of rock excavation. About 60% of rock excavation is expected to be used for producing coarse and fine aggregate for concrete production and in fillings for developing areas for construction facilities. The total quantity of excavation in common soil and balance quantity of rock excavation would have to be disposed of in designated muck disposal areas. Thus, considering swell factors 0.63 for rock and 0.80 for common soil as adopted from CWC Guidelines and redeposit compaction factor of 83%, the total muck disposal to be disposed of is **716676 Cum** (see **Table 10.19**).

Table 10.19: Total quantity of muck to be disposed off

S. No.	Particulars	Soil	Rock
1	Total Excavation (Cum)	370880	923270
2	Less Used in Production of Aggregates (Cum)		553962
3	Balance To be Deposited (Cum)	378412	369308
4	Swell Factor, S	0.80	0.63
5	Re Deposition Factor, R	0.83	0.83
6	Quantity of Re deposits of Muck, (Q / S) x R, (Cum)	392602	486549
7	Balance Muck for Disposal at Muck Disposal Sites, cum	392602	324074
	Total muck to be disposed of (Cum)	716676	

Muck dumping plan involves careful selection of muck disposal site/s based upon environmentally sustainable guidelines, adopting suitable dumping methodology right from loading and transportation of muck from the excavation sites through 20T Rear Dumpers, management of dumping sites, and monitoring of muck disposal process to ensure minimum spillage during transportation, dumping, and compaction, and then finally rehabilitation of dumping sites through revegetation.

10.2.5.1 Criteria for Selection of Dumping Site

The following points were considered and followed for finalization of the area to be used as a dumping site:

- The dumping site was selected as close as possible to the project area to avoid long-distance transport of muck.
- Standard distance between each dumping site and from the High Flood Level is maintained as per condition of Statndard ToR, issued by MoEF&CC for Hydro Electric projects.
- The site is free from active landslides or creep and care has been taken that the site does not have a possibility of toe erosion and slope instability.

- The dumping site is either at a higher level than the flood level or is away from the river course so that the possibility of muck falling into the river is avoided.
- No active channel or stream is flowing through the dumping site.
- The site is far away from human settlement areas.

Keeping the above requirement, one muck disposal site has been identified downstream of the proposed powerhouse with a total area of 8.58 ha and capacity has been worked as 8,75,000 cum which is much more than the total quantity of muck to be disposed of (refer to **Figure 10.9**).

The area identified for dumping is planned on the banks of the nearest drainage and away from river HFL. The identified area is mostly gradually sloping near the riverbank. The drainage side bank of the area will be properly protected and stabilized with Gabions/ Retaining Walls of suitably designed sections (refer to **Figure 10.10**).

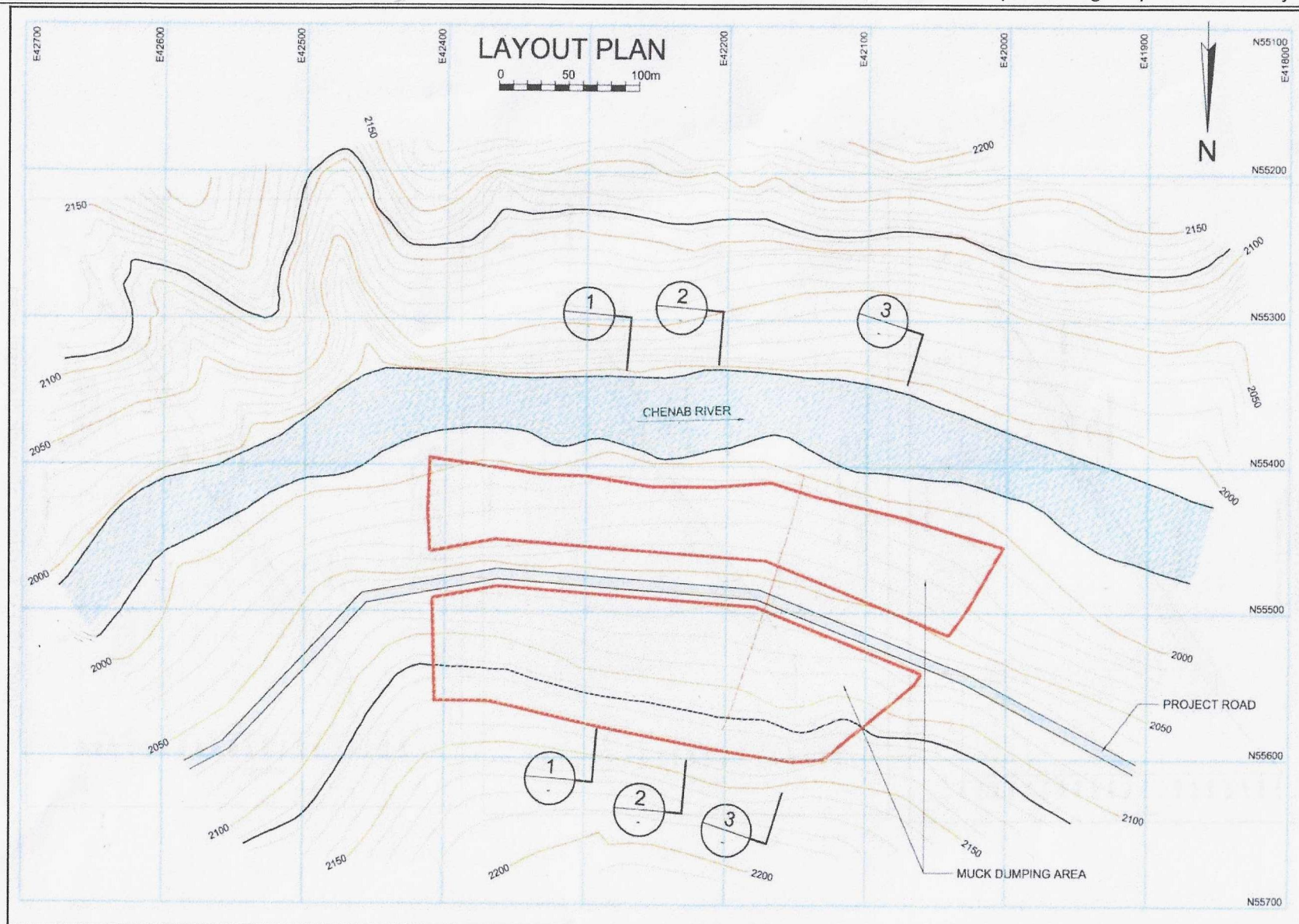


Figure 10.10: Layout of Muck Disposal area

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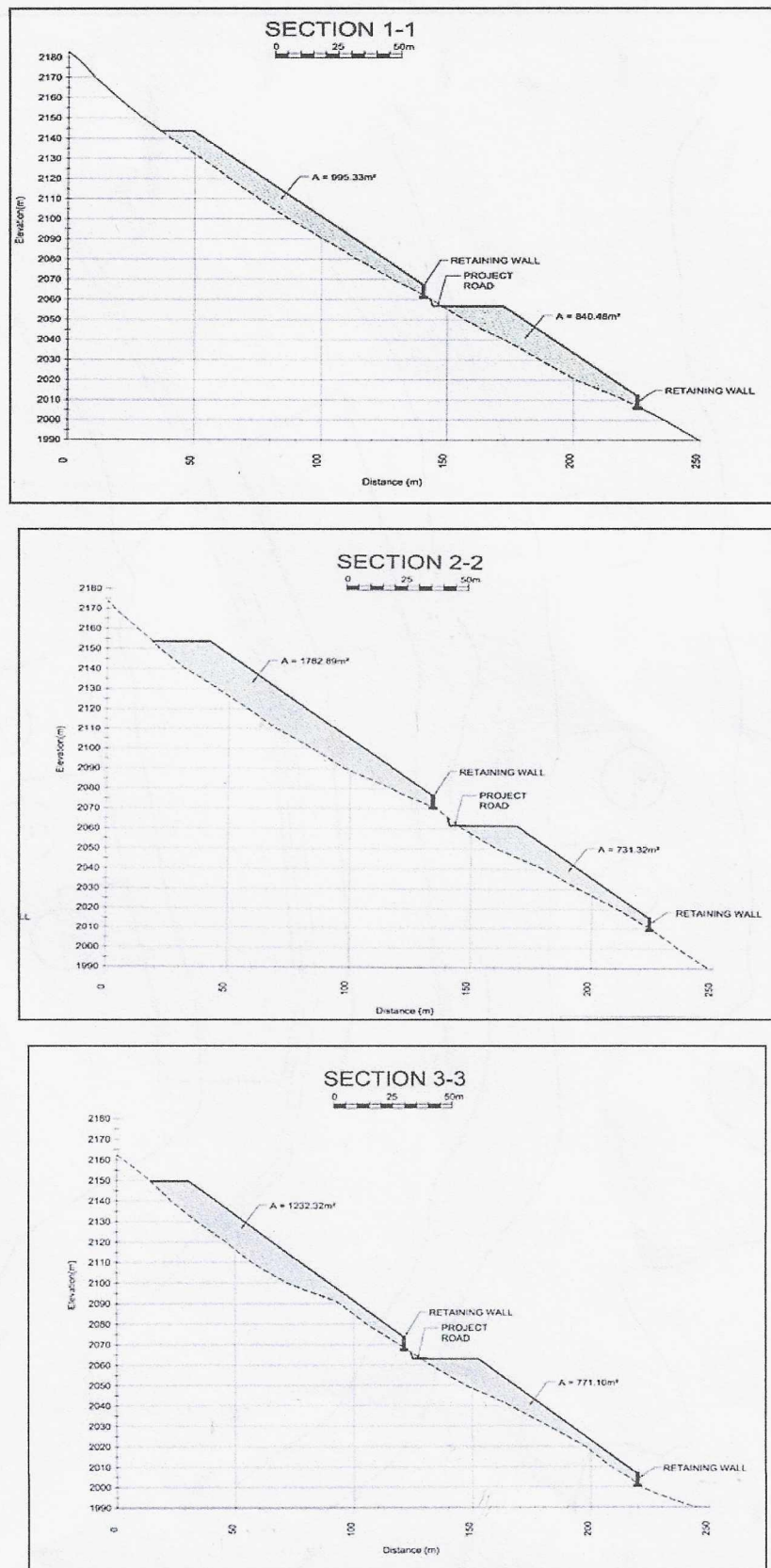


Figure 10.11: Sections of muck disposal area

10.2.5.2 Preparation of Muck Dumping Site

The muck that needs disposal would be piled at \emptyset (angle of repose) between 30° and 36° at the proposed dumping sites. For this, the slopes would be broken up by creating benches across the slope. This will be done to provide stability to the slopes and to provide ample space for planting trees, which would further help in holding and consolidating the material stacked at different sites. The description regarding the stabilization of the stacked material along the proposed roads has been discussed in the following paragraphs.

The dumping of muck shall be done in stages by allowing it to consolidate/settle through the monsoon, compacting the dumped muck with Bulldozer movement. The zoning of the dump will be done judiciously to ensure the stability of the 30° slope under all superimposed conditions.

10.2.5.3 Methodology of Dumping

The main objectives of the process of muck dumping and restoration of the muck disposal site are:

- to protect and control soil erosion.
- to create greenery in and around the muck disposal area.
- to improve and develop the site into a recreational site, if feasible.
- to ensure maximum utilization of muck for construction purposes.
- to develop the muck disposal sites/ dumping yards to blend with the surrounding landscape; and
- to minimise damages due to the spoilage of muck in the project area.

10.2.5.3.1 Transportation of Muck

The generated muck will be carried in dumper trucks covered with heavy-duty tarpaulin properly tied to the vehicle in line with international best practices. All precautionary measures will be followed during the dumping of muck. All dumpers will be well maintained to avoid any chances of loose material/soil falling during the transportation. All routes will be periodically wetted with the help of sprinklers before the movement of dump trucks. Dumping would be avoided during the high-speed wind, so that suspended particulate matter (PM_{10} and $PM_{2.5}$) levels could be kept under check. For this SPM levels need to be monitored during transportation. Further, dumping will be avoided if there is heavy traffic in the area. After the dumping, the surface of dumps will be sprayed with water with the help of sprinklers and then compacted.

The cycle time of 20T Rear Dumpers for loading and transportation of muck is given below.

Cycle time of 20 T Rear Dumper is as follows:

Activity	Time taken (min.)
Spotting time	1.0
Loading time	6.7
Transportation @ 20 kmph for 3.5 km	10.5
Unloading	1.0
Return @ 25 kmph	8.4
Total	27.6

Based upon the varying cycle time of 20T Rear Dumpers at different excavation sites and their distance from the disposal site appropriate pollution management will be devised. The Standard practices of pollution abatement and control will be enforced through the contractor.

For **716676** m³ of muck, about 72000 truck trips will be required for muck transportation from point of generation to disposal site. This will be done over a period of 4 years; therefore for 300 working days per annum, about 60 trips per day will be required for disposal of muck.

10.2.5.3.2 Retaining Walls/ Stone Filled Wire Crates

Suitable retaining walls shall be constructed prior to dumping of muck, and terraces would be developed to support the muck on a 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 with retention walls. The terraces of the muck disposal area will be ultimately covered with fertile soil, and suitable plant species will be planted adopting suitable biotechnological measures.

For stacking of dumped material, concrete reinforced retaining walls are proposed to be built before dumping any material onto the sites (refer to **Figure 10.10**). In addition, leveling would also be done after dumping the material on every cycle and simultaneously improving the drainage of the disposal site.

All the approach roads from various project excavation sites to the dumping site will be constructed by employing the methodology recommended by Border Roads with minimal environmental damage. The methodology consists in developing the formation width is half cutting and half-filling, so that the materials obtained from cutting are utilised in filling. The excavation on the hillside will be done to get a stable slope for the materials encountered. At places breast wall, gabion walls shall be done in natural slope to retain filled material, particularly where there is the problem of retaining the hill slope.

A retaining wall and gabion structure shall be constructed to retain filled material. To minimize the environmental damage, construction materials like stones, sand, etc., required for the construction of the road will be obtained mostly from the excavated material. In the streams, box culverts will be provided to prevent the erosion of the Nala bed. In addition, stone/concrete work on the downstream area will also be provided at vulnerable places to minimize erosion.

The total area for the dumping of muck is **8.58 ha** which can accommodate more than **8.75 lakh** cum though the estimated muck to be disposed of is **7.17** lakh cum. At least two retaining walls are required to be built to accommodate the muck as a road traverse through the middle of the proposed dumping site. These retaining walls are proposed to be located at about 30.0m distance from the highest flood level. The total length of retaining walls proposed to be

constructed along the river would be more than 1000 running meters. The height of these retaining walls including MSE wall panels will be approximately 10 m.

The retaining wall shall comprise 100 m thick PCC M10 base, RR Masonry blocks embedded in cement concrete (M10), and pressure relief holes at an angle of 50° for 1000 cc of discharge/drain holes of 50 cm provided for drainage.

10.2.5.3.3 Compaction

Compaction is an engineering measure, which would reduce bulk density of the muck thereby optimising the use of muck disposal area and would make it suitable for the plantation and other biological measures. The top surface would be leveled and graded to make the alternative use. The muck will be spread in layers of 500-700 mm thick layers. The top surface would be leveled and graded to make the alternative use. On top, a layer of soil would be spread to make the land suitable for plantation. The total cost for the process of compaction is Rs. 50.00 lakh.

The total financial outlay for the retaining walls and compaction is Rs.605.27 lakh, and the breakup is given in Table 10.20.

Table 10.20: Estimated Cost of retaining walls construction

S. No.	Particular	Volume (cum)	Rate in Rs. per cum	Amount (Rs. in lakh)
1	Earthwork for foundation	20000	712	142.40
2	Cement concrete for retaining wall (M15)	2000	5332	106.64
3	R.R. Masonry (1:6)	4400	4529	199.27
4	Stone filled wire crates	4000	2674	109.96
5	Compacting and land leveling, etc.	Lumpsum	--	50.00
	Total			605.27

10.2.5.3.4 Fencing

After rehabilitation of muck, the dumping areas need protection for some time from disturbing by human and domestic animals. For this reason, fencing over the muck deposits is required. Barbed wire strands with two diagonal strands, clamped to wooden/ concrete posts placed at a 3m distance are proposed around the dumping piles. Project authorities will establish temporary wind barriers around 3 sides of dumps in nearby settlement areas.

10.2.5.3.5 Biological Measures

Vegetation cover controls the hydrological and mechanical effects on soils and slopes. Therefore, biological measures to stabilize the loose slope are essential. Top surfaces and slopes of all dumping areas would be left with a total area of about 8.58 ha. These areas will be treated for plantation. To implement the biological measures in dumping areas the following activities would be considered. The biological measures include the following:

i) Soil treatment

Muck dumped at the site is not nutrient-rich as it is excavated from tunnels and other structures. To make it suitable for the plantation it will be enriched through bio-treatment. The work plan will be formulated for the re-vegetation of the dumping sites through an Integrated Biotechnological Approach.

ii) Plantation

The selected species will be planted after their nurseries have been developed for catchment treatment plan implementation. Nearly 1-2 years old saplings would be used for the plantation. The plantation can be carried out in lines across the slopes. Grass and herb species would be used in the interspace of tree species. It will help in providing the continuous chain of support in retaining debris, reinforcing soil, and increasing the infiltration capacity of the area.

After the process of compaction total area of about 8.58 ha will be available for the plantation and the same shall be used for Plantation/ Greenbelt Development. About 8,500 saplings will be planted at the dumping site. The afforestation with suitable plant species of high ecological and economic value which can adapt to local habitat will be undertaken with 800-850 plants per ha depending upon the canopy cover required after consultation with the state Forest Department. However, a list of plant species has been given later in the chapter from which species recommended by the Forest Department can be selected. The estimated cost of biological measures is given in **Table 10.21**.

Table 10.21: Estimated Cost of biological measures

S. No.	Particulars	Quantity	Rate (in Rs.)	Amount (Rs. in lakh)
1	Rolling of Muck	Lump-sum		40.00
2	Pitting (size: 0.45 m x 0.45 m x 0.45 m)	8,500 pits	35.00/pit	2.98
3	Manure and soil filling in pits	8,500 pits	5.00/pit	0.42
4	Raising of plants (including nursery cost, manure, transport, etc.)	8,500 pits	25.00/plant	2.13
5	Fencing, maintenance, watering, transport, etc.	Lump-sum		20.00
	Total			65.53

10.2.5.4 Financial Outlay

The estimated cost of the muck management plan is **Rs. 670.80 lakh** (see **Table 10.22**).

Table 10.22: Financial outlay for the muck management plan

S. No.	Particulars	Amount (Rs. in lakh)
1	Engineering measures	605.27
2	Biological measures	65.53
	Total	670.80