



CHAPTER – 6

MUCK DISPOSAL PLAN

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6 MUCK DISPOSAL PLAN

6.1 GENERAL

For construction of different components of the project, substantial surface and underground excavation in over burden and rock for barrage intake structure, intake tunnel, desilting chambers, silt flushing tunnel, headrace tunnel, surge shaft, pressure shaft, powerhouse and tailrace tunnel would be required. The excavation shall result in large quantity of excavated material i.e. muck which have to be evacuated, disposed off and roller compacted or laid on mild slopes pari-passu with the excavation work to such designated areas where the muck piles do not substantially interfere with either environment / ecology or the river flow regime and do not cause turbidity impairing the quality of water. The disposal of muck has to be scientifically planned keeping in view the economic aspects necessitating nearness to the muck generating component of work, which understandably reduce the travel time of dumpers, causeless interference to surface flow and ground water aquifer and disposition of habitation.

Based on the quantities of surface and underground excavation including 10% over break a muck management plan, therefore, has been formulated to manage the disposal of muck and restore such areas from further degradation of the environment. During construction of the project, huge quantities of excavation will be carried out from the underground and surface components and shall be dumped in designated areas to provide stable slopes. The quantity of muck to be disposed has been worked out on the basis of 63% swell factor for rock and 83% for overburden.

6.2 QUANTITY OF MUCK GENERATED AND ITS CONSUMPTIVE USE

Total quantity of muck / debris, generated due to the project, shall be 3,52,586 cum which shall amount to 483674cum with swell factor. Out of the total muck generated 3,32,492 cum shall be utilised on project work leaving 1,75,893 cum to be dumped with 20% compaction at designated sites. It is proposed to utilize about 68.7% of the excavated material as construction material for back fill, shotcreting and for construction of various project components. The balance 31.3% shall have to be disposed off away from sites so as to make available the site clear for construction activities. The muck shall be properly roller compacted and dumped on slopes and treated to mix and match with the surrounding environment with least change in landscape.



Table 6-1: Abstract of Muck Generated and its Disposal

Project Component	Quantity of muck/debris generated (cum)		Quantity of muck due to swell factor (cum)		Estimated quantity of muck/debris required considering 38% losses (cum)		Balance quantity of muck/debris (cum)		Effective Muck to be dumped (cum) (with 20% compaction)	Name of the dumping site as shown in the plan	Capacity of the dumping site (cum)
	Rock	Soil	Rock (63%)	Soil (83%)	Rock	Soil	Rock	Soil			
River Diversion		47,533		57269					45815		
Barrage, Desilting	30240	73,427	48000	88466	195995	63468			19999		
Intake, Feeder Tunnel	1399	77,710	2221	93626	10179				74901		
HRT	80348		127536		32886				0		
Adits	23467		37249		1752				0		
Surge Shaft	5051		8018		2130				0		
Pressure Shaft	6576		10437		5068				0		
PH	4388		6965		19204						
TRT	2450		3888		1810				0		
Total	153917	198669	244313	239361	269024	63468	0	175893	140714		393135



6.3 SELECTION OF MUCK DISPOSAL SITE

The selection of muck disposal sites was carried out considering the quantity of the muck, landscape, cost effectiveness, nearness to source of generation, absence of ground and surface water, relief and scope for afforestation works. All the dumping locations shall be well supported at base and at higher elevation by suitable retaining structures. Subsequently all the spoil tips (muck disposal sites) will be developed by taking up plantation through bio-technological methods to generate a thick forest canopy over them. Three (3) muck dumping sites have been identified matching the criteria. The details of dumping sites along with their total capacity and amount of muck to be disposed are enumerated in Table 6-2.

Table 6-2: Details of Muck Disposal Sites

Sl. No.	Name of Dumping Site	Location of Dumping Site	Area in Ha	Capacity in cum	Vol. of Muck to be dumped in cum
1.	Muck Disposal Area 1	Approx. 1200 m downstream from Barrage axis, Right Bank	2.0	108050	140714
2.	Muck Disposal Area 2	Approx. 3000 m downstream from Barrage axis, Left Bank	0.9	42060	
3.	Muck Disposal Area 3	Approx. 3600 m downstream from Barrage axis, Left Bank	3.24	243025	
Total			6.14	393135	

The Layout plans of Muck Disposal Sites are shown in Figure 6-1, 6-2 and 6-3.

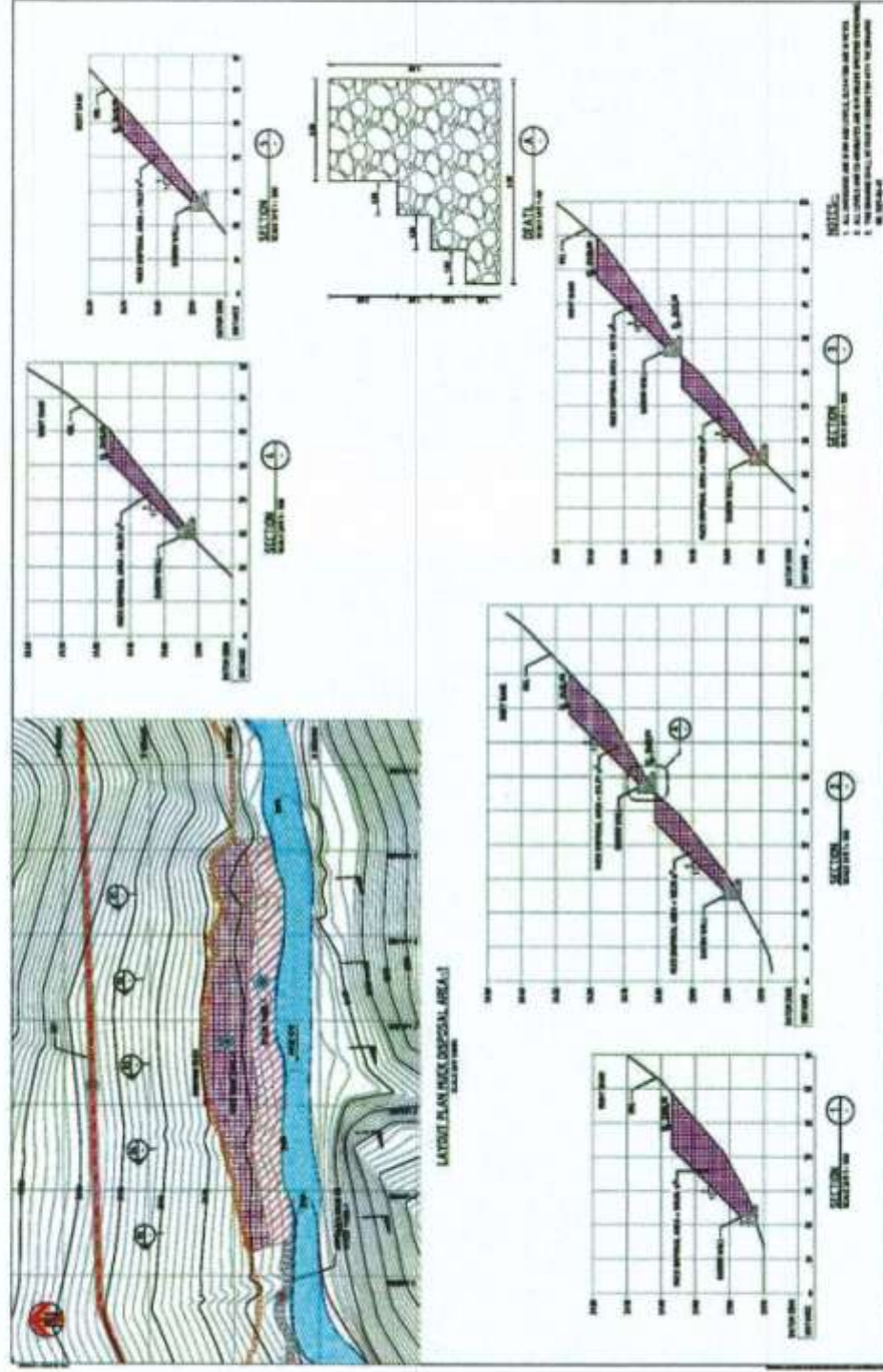


Figure 6-1: Layout plan of Muck Disposal Site -1

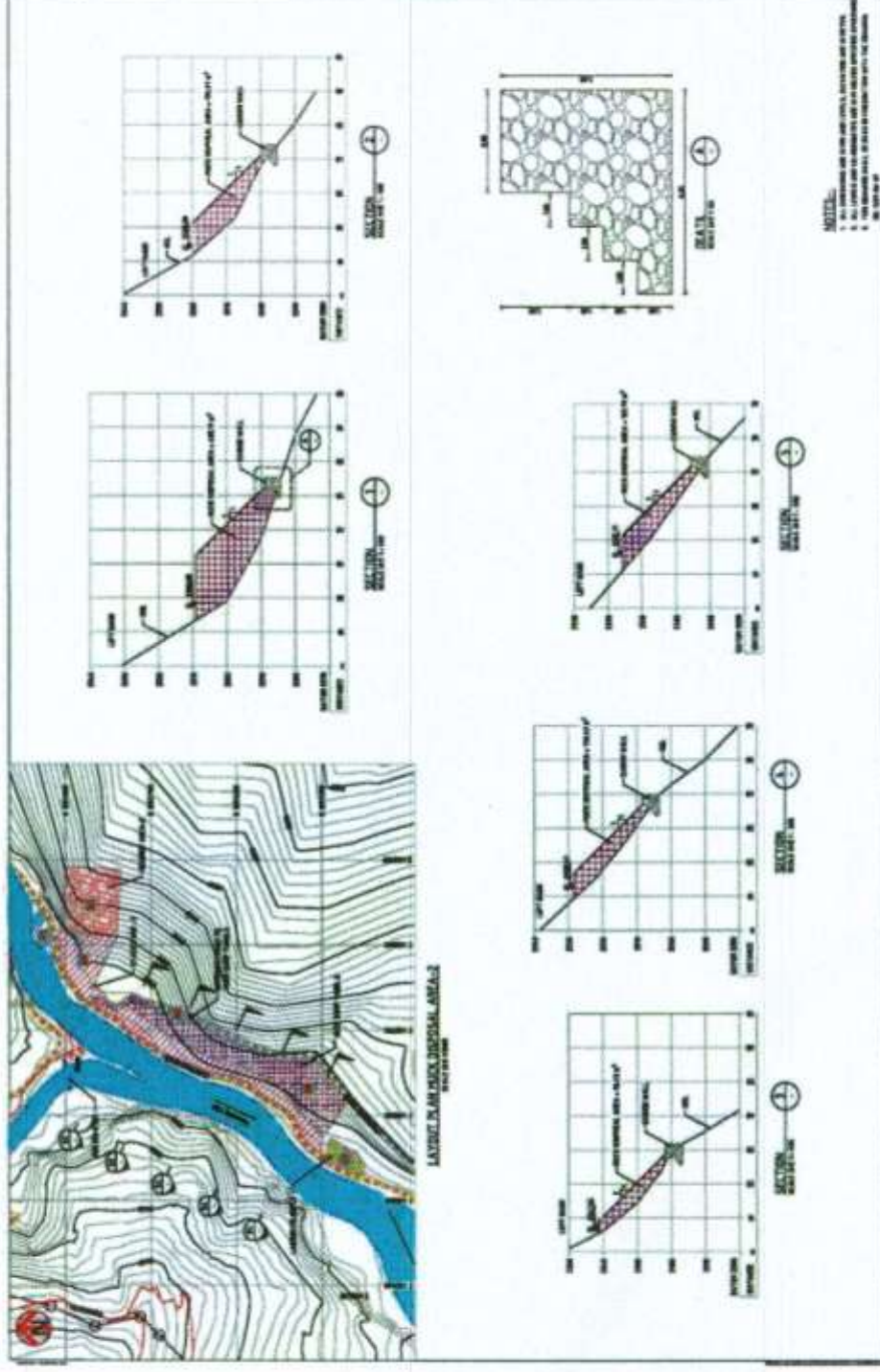


Figure 6-2: Layout plan of Muck Disposal Site- 2

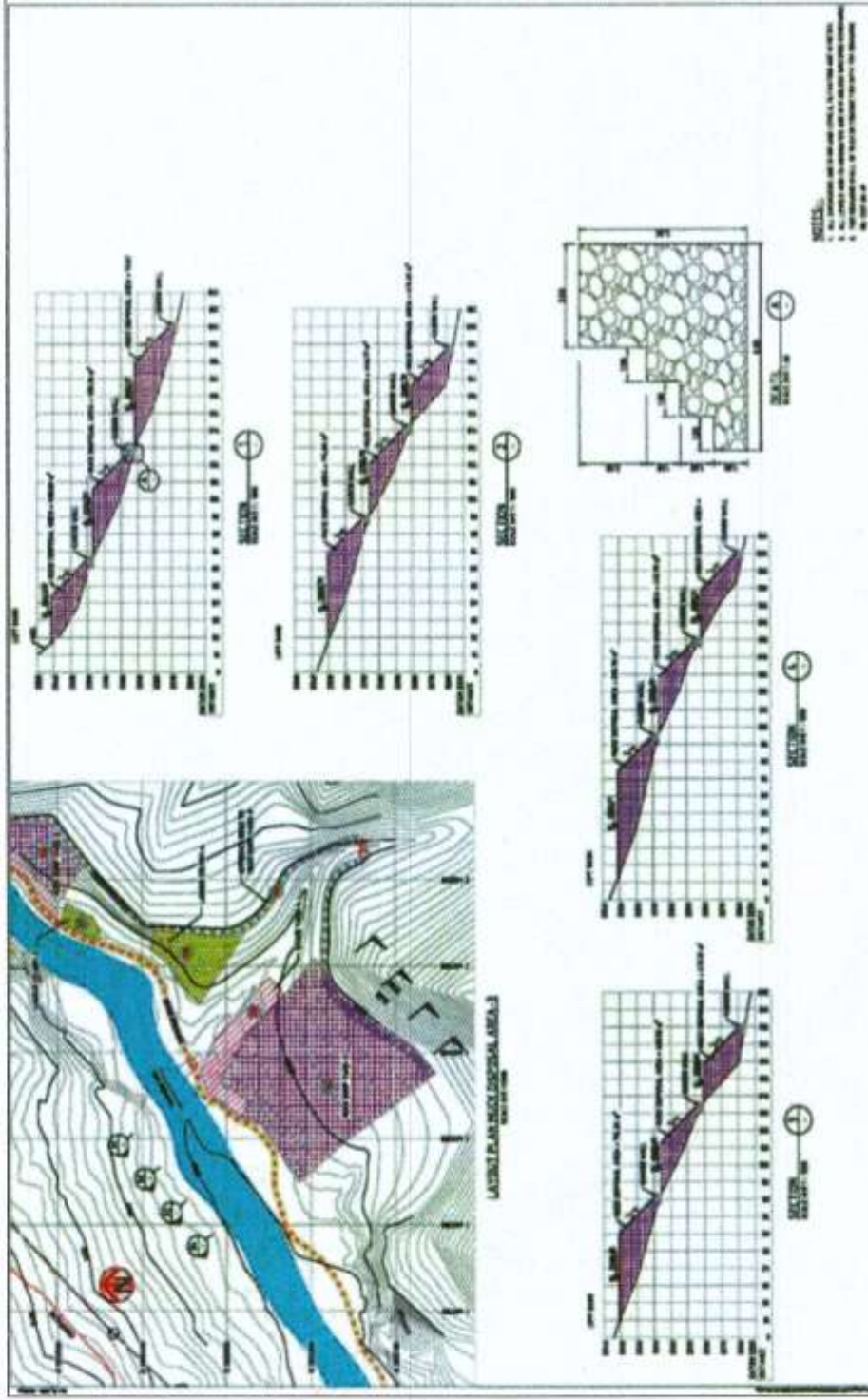


Figure 6-3: Layout plan of Muck Disposal Site - 3



6.4 DESCRIPTION ON MUCK DISPOSAL SITES

6.4.1 MUCK DISPOSAL SITE D-1

The proposed muck disposal site 1 is located about 1200 m downstream of barrage axis on Right bank of Mago Chu. The site is located approx. 33 m away from the river bed. The plan area of the site is 2.0 ha.



6.4.2 MUCK DISPOSAL SITE D-2

The proposed muck disposal site 2 is located about 3000 m downstream of barrage axis on left bank of Tawang Chu, near Nyukcharong Chu and Mago Chu Confluence point. The site is located more than 30 m away from the river bed. The plan area of the site is 0.9 ha.

6.4.3 MUCK DISPOSAL SITE D-3

The proposed muck disposal site - 3 is located about 3600 m downstream of barrage axis on left bank of Tawang Chu. The site is about 535 m downstream from confluence point. The site is located approx. 49 m away from the river bed. The plan area of the site is 3.24 ha.

In total 140714 cum shall be dumped in Muck Disposal Site 1, 2 & 3 and properly roller compacted. After the capacity of any disposal area is exhausted, the top surface would be levelled, graded and provided a gradual slope for efficient drainage. The surface so available would be put to greenery development.

6.5 IMPLEMENTATION OF ENGINEERING MEASURES AT MUCK DISPOSAL SITE

It has been observed that after disposal of muck, it creates problem as it is susceptible to scattering unless the muck disposal yards are supported with engineering measures such as gabions. All the dumping sites need proper handling to avoid spilling of muck into the river water while dumping and in the post dumping stages. All the muck disposal sites have to be developed from the ground level either by providing stone masonry or by gabion structure. The costing of engineering measures has been worked out based on gabion structure. In all the muck dump sites, the muck brought in dumpers shall be dumped and manually spread behind the crates and roller compacted in such a manner that rock mass is properly stacked behind the crates with minimum of voids.



6.6 IMPLEMENTATION OF BIOLOGICAL MEASURES AT MUCK DISPOSAL SITE

Biological measures, however, require special efforts as the disposed muck will be devoid of nutrients and soil contents to support vegetation. The selection of soil for spreading over such an area would require nutrient profiling of soil for different base elements. Suitable mixture of nutrients would be done before placing the soil on the top surface of muck disposal areas to have administered growth of forest canopy.

6.6.1 PLANTATION TECHNIQUE

In view of the peculiar site conditions, particularly the soil conditions, the planting technique for all the categories of the plants has to be very site specific and suited to the stress conditions as anticipated and discussed above. The planting substrates would need to be considerably improved to support the plants in their initial stages of establishment. The moisture retention capability, availability of nutrients and soil aeration, permeability and porosity would require intervention and assistance.

Multi-storied and multipurpose plantations are proposed to be raised on the muck dumping sites as also in road side strips using grasses, shrubs and bushes in the under story and trees in the upper story. Nursery raised grass slips, seedlings of shrubs & bushes and tree species would be planted in the area combined with grass sowing in patches. In addition, cuttings of bushes and shrubs can also be planted to supplement the nursery raised stock but this would substitute requirement of raising the nursery of these species. Intimate mixture of species would be avoided right at the planning stage and would be strictly followed during planting. Grasses would be mixed by groups in rows, shrubs and bushes by group again in rows.

Grass slip planting and grass seed sowing would be done in strips at 0.10 m x 0.10 m spacing in the prepared staggered patches of 1 m x 0.5 m with a depth of 0.30 m. Soil mixture would be used while filling the patches.

Shrubs and bushes would be planted in elongated strips of 1.5 m x 0.5 m with a depth of 0.45m. Soil mixture would be used while filling the patches. Each patch would have two rows of planting.

Planting of trees would be done in pits of 0.60 m x 0.60 m x 0.60 m size. Soil mixture would be used while filling the pits. Balance dug up soil/muck will be stacked on downhill side of the pit for trapping the rain water and allowing it to percolate in the pit.

It is proposed to use soil mixture in the pits & patches consisting of soil imported from nearby areas mixed with compost or vermin-compost manually. The ratio for the mix would be 5 parts: Compost/manure 2 parts: Sand 2 part: and humus or vermin-compost 1 part. This will make nutrients available for the plants in the preliminary



stages and also help increase soil aeration, porosity & permeability and improved moisture available for the plants.

The stabilization sites from the time of execution of biological measures would be protected with barbed wire fencing on 2m high RCC posts and provided with inspection paths. Since the muck dumping sites are being provided with the wire crate (gabion) wall on the valley side (towards river) which is not negotiable by animals and human beings, fencing would not be required along the entire perimeter. Hence, it would be done on the vulnerable sections i.e. towards the hillside only.

The plantations under biological measures would be maintained for a period of 3 years by irrigating the plantation during dry seasons, mortality replacement and repair of fencing & inspection paths within the area. The task of irrigation would be performed by the watchmen provided in the cost estimate.

The proposed costs include raising plants, grass seedlings and also for mortality replacement.

Although the sites would be either levelled or finished in a grade, yet due to rain and sliding etc., they tend to develop rills and gulley. As such, while carrying out plantation; suitable soil conservation measures would also be taken.

6.6.2 SPECIES FOR PLANTATION

Afforestation with suitable plant species of high ecological and economic value and adaptable to local conditions will be undertaken in accordance with canopy cover requirement. Some plant species have been suggested in the Table 6-3. The selection of plant species, propagation and cultivation technique would be done in co-ordination with the institutes like State Forest Research Institute, Itanagar; Rajiv Gandhi University, Itanagar and North-Eastern Regional Institute of Science and Technology, Nirjuli.

Table 6-3: Suggested Species for Plantation

Sl. No.	Name of species	Family
1.	<i>Abies densa</i>	Pinaceae
2.	<i>Achyranthes aspera</i>	Amaranthaceae
3.	<i>Alangium alpinum</i>	Alangianaceae
4.	<i>Alnus nepalensis</i>	Betulaceae
5.	<i>Aristolochia griffithii</i>	Aristolochiaceae
6.	<i>Berberis aristrata</i>	Berberidaceae
7.	<i>Betula alnoides</i>	Betulaceae
8.	<i>Daphnae papyracea</i>	Thymelaeaceae
9.	<i>Lyonia ovalifolia</i>	Ericaceae
10.	<i>Pinus roxburghii</i>	Pinaceae
11.	<i>Pinus wallichiana</i>	Pinaceae
12.	<i>Populus sp.</i>	Salicaceae



Sl. No.	Name of species	Family
13.	<i>Rhododendron campanulatum</i>	Ericaceae
14.	<i>Rhododendron cinnabarium</i>	Ericaceae
15.	<i>Salix sp.</i>	Salicaceae
16.	<i>Tsuga dumosa</i>	Pinaceae
17.	<i>Zanthoxylum armatum</i>	Rutaceae

6.7 BUDGET FOR MUCK DISPOSAL PLAN

An estimation has been made for engineering measures of muck disposal plan as Rs. 92.12 Lakhs whereas biological measures as Rs. 33.93 Lakhs. The cost break-up of engineering and biological measures are detailed in Table 6-4 and 6-5.

Table 6-4: Cost Estimate for Engineering Measures

S. No.	Name of the work	Quantity	Unit	Rate	Amount (Rs. Lakhs)
A. Muck Disposal Site – 1					
1	Gabion Wall construction	681	m	5750	39.1575
2	Filling of earth /Top Soil	7286	sq. m	20	1.4572
3	Levelling	2	ha	2000	0.03
Sub-Total					40.64
Contingencies @ 10%					4.06
Total (A)					44.71
B. Muck Disposal Site – 2					
1	Gabion Wall construction	248	m	5750	14.26
2	Filling of earth /Top Soil	5300	sq. m	20	1.06
3	Levelling	0.9	ha	2000	0.018
Sub-Total					15.34
Maintenance Cost @10%					1.53
Total (B)					16.87
C. Muck Disposal Site – 3 (Near Road to Rho)					
1	Gabion Wall construction	522	m	5000	26.10
2	Filling of earth /Top Soil	8000	sq. m	20	1.60
3	Levelling	3.24	ha	2000	0.06
Sub-Total					27.76
Maintenance Cost @10%					2.78
Total (C)					30.54
Grand Total T1 = (A + B + C)					92.12

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