MUCK DISPOSAL PLAN

1.0 Proposed Tunnels

The project involves construction of 6 tunnels, out of which tunnel 2 & 3 are twin tunnels. Total length of the proposed tunnel is 15.368 km. Details of the proposed tunnels along with length and construction packages are provided in Table 1. The typical cross sections of single tube tunnel, twin tube tunnels and interchange tunnels are provided in Figure 1 to 3. Tunnel Cross Passages are proposed in 2 twin tunnels as safety measures. There are 9 cross passages in Tunnel 2 and 5 cross passages in Tunnel 3.

Table 1: Details of the Proposed Tunnels

Tunnels	Type	Side	Start	End	Length	Cross Passages	PKG
Tunnel 1	Single Tube	North Bound	155+100	155+495	395	-	IV
Tunnel 2	Twin Tube	North Bound	154+415	158+650	4235	9	I
		South Bound	156+035	160+260	4225		I
Tunnel 3	Twin Tube	North Bound	158+750	161+350	2600	5	II
		South Bound	160+360	163+368	3008		II
Tunnel 4	Single Tube	North Bound	164+140	164+570	430	-	II
Tunnel 5*	Single Tube	-	0+060	0+195	135	-	II
Tunnel 6	Single Tube	South Bound	176+330	176+670	340	-	IV
Total Length (6 tunnels)					**15368**	**14**	

** Tunnel 5 is an interchange tunnel located near Marog village*

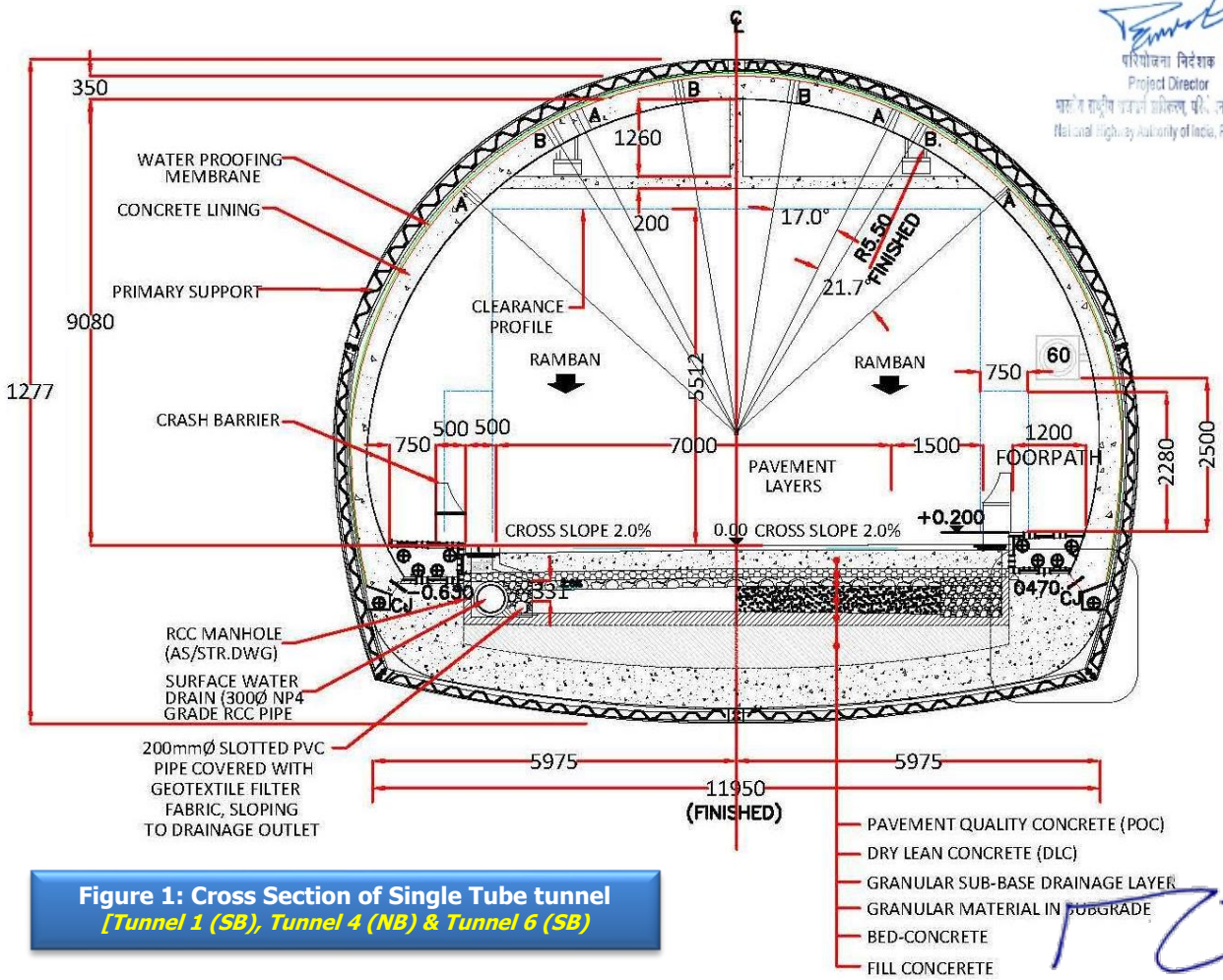

Figure 1: Cross Section of Single Tube tunnel
[Tunnel 1 (SB), Tunnel 4 (NB) & Tunnel 6 (SB)

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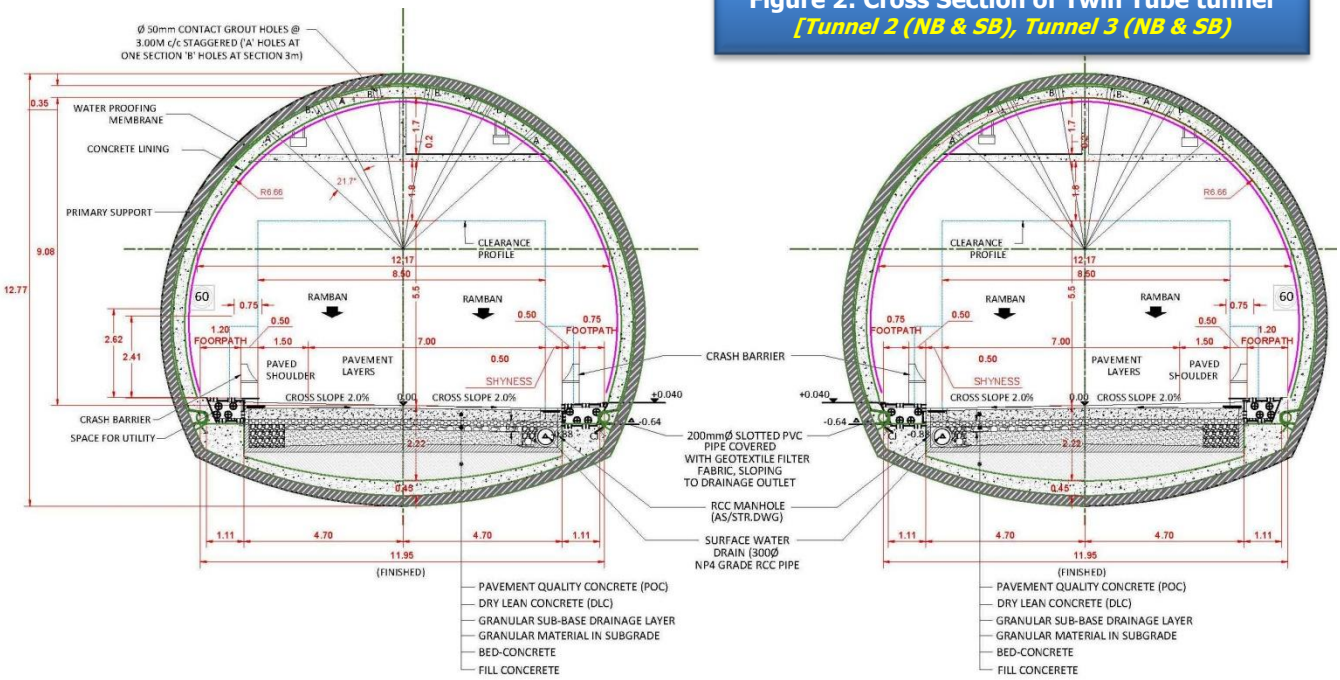
Figure 2: Cross Section of Twin Tube tunnel
[Tunnel 2 (NB & SB), Tunnel 3 (NB & SB)



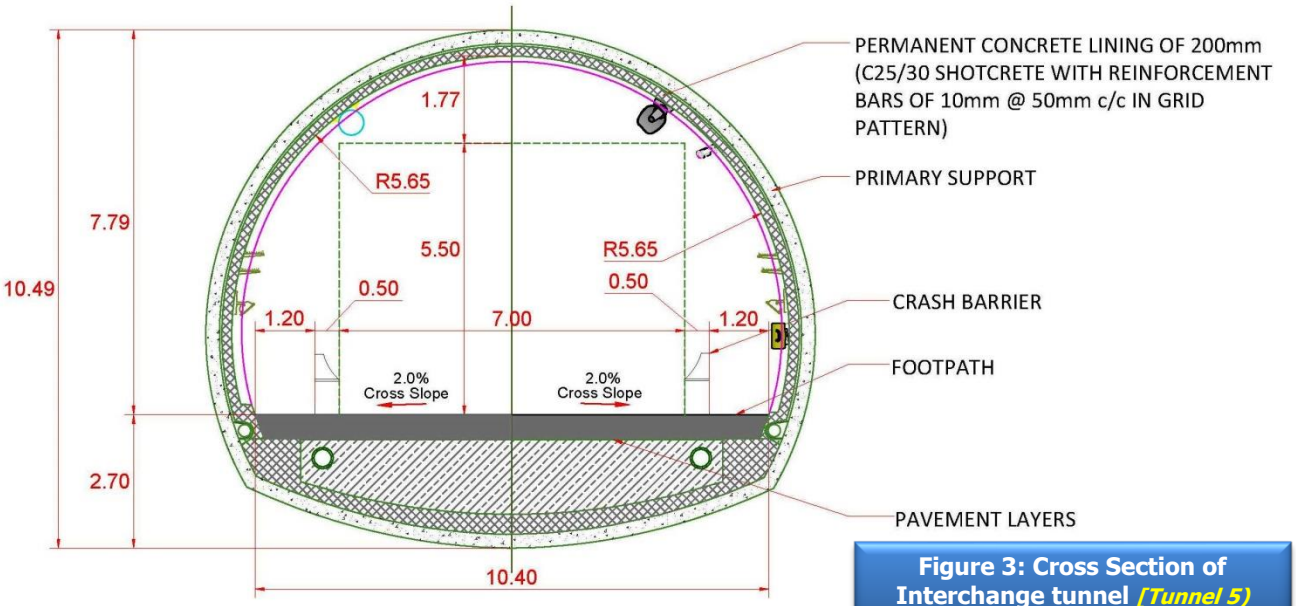


Figure 3: Cross Section of Interchange tunnel ***[Tunnel 5)***

2.0 Generated Muck Volume

Construction of tunnels requires removal of blasted debris or soil materials (muck) from tunnel interior to open area outside tunnel. The estimated volumes of muck to be generated from the proposed tunnels are detailed in **Table 2**. About 40% of the generated muck is to be reused in road construction for filling, construction of retaining/gabion walls and in approaches of viaducts as necessary. The total quantity of generated muck, reusable quantity and quantity to be disposed are provided in **Table 3**.

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Table 2: Volume of Muck to be generated

Feature	Side	From	To	Length (m)	CS Area (m^2)	Volume (m^3)
Tunnel 1	SB	155+100	155+495	395	147.59	58298.05
Tunnel 2	NB	154+415	158+650	4235	147.59	625043.65
	SB	156+035	160+260	4225	147.59	623567.75
Tunnel 3	NB	158+750	161+350	2600	147.59	383734.00
	SB	160+360	163+368	3008	147.59	443950.72
Tunnel 4	NB	164+140	164+570	430	147.59	63463.70
Tunnel 5*	SB	0+060	0+195	135	105.1	14188.50
Tunnel 6	SB	176+330	176+670	340	147.59	50180.60
T2 CP 1	NB	158+286	158+311	25	128.63	3215.75
T2 CP2	NB	157+786	157+811	25	128.63	3215.75
T2 CP3	NB	157+286	157+311	25	128.63	3215.75
T2 CP4	NB	156+786	156+811	25	128.63	3215.75
T2 CP5	NB	156+286	156+311	25	128.63	3215.75
T2 CP6	NB	155+286	155+311	25	128.63	3215.75
T2 CP7	NB	154+786	154+811	25	128.63	3215.75
T2 CP8	NB	155+786	155+802	16	128.63	2058.08
T2 CP9	NB	155+802	155+810	8	128.63	1029.04
T3 CP1	NB	160+786	160+811	25	128.63	3215.75
T3 CP2	NB	160+286	160+311	25	128.63	3215.75
T3 CP3	NB	159+786	159+811	25	128.63	3215.75
T3 CP4	NB	159+286	159+311	25	128.63	3215.75
T3 CP5	NB	158+784	158+809	25	128.63	3215.75
Total: (Tunnels: 2262426.97 m^3 + 41676.12 m^3)						**23,04,103.09**

Table 3: Volume of Muck to be disposed

Muck Volume (Cum)	Re-used Volume (m^3)	Disposal Volume (m^3)
2304103.09	921641.24	1382461.85

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3.0 Proposed Muck Disposal Sites

4 muck disposal sites measuring a total area of 39.8727 ha have been selected as designated site for muck disposal as detailed in **Table 4**.

Table 4: Muck Disposal Sites-Present Status

Village	Dumping Site	Survey No	Existing Land		To be acquired		Total Land (Ha.)
			Forest Land (Ha.)	Non Forest Land (Ha.)	Forest Land (Ha.)	Non Forest Land (Ha.)	
Maroog	MDS1	633	-	-	2.7519	-	2.7519
	MDS1	630	-	-	2.0535	-	2.0535
	MDS2	53	4.1898	-	15.7285	-	19.9183
Digdol	MDS3	731	-	-	3.1997	-	3.1997
	MDS4	466	-	-	4.6953	-	4.6953
	MDS4	466	-	-	3.4700	-	3.4700
Total (Ha.)			**4.1898**	**-**	**31.8989**	**-**	**36.0887**

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The muck disposal lands are located in forest areas as no other alternative non-forest land is available in the project area. Out of the total, 4.1898 ha forest land was already diverted in 2017 through Govt Order No 8/FST of 2017 and cabinet decision No 24/02/2017 for muck disposal. A total of 8.08 Ha land was diverted for muck disposal in the said approval, out of which 4.1898 ha land is lying unused and will be utilized for dumping of mucks generated from the present improvement proposal.

Digital elevation models, as presented in **Figure 4, 5, 6 & 7** of the four selected muck disposal sites, were prepared for all muck dumping sites to ascertain the topography and determining the location and length of the gabion wall for slope protection so as to prevent the muck from reaching into natural streams. The

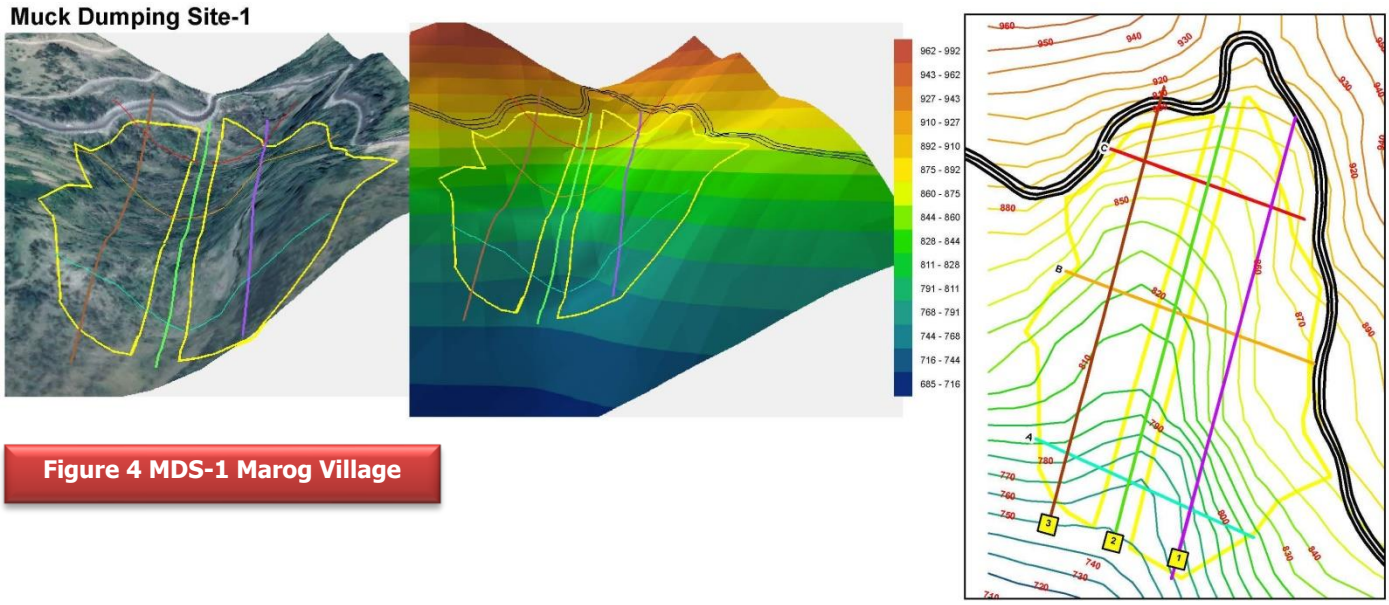

Figure 4 MDS-1 Marog Village

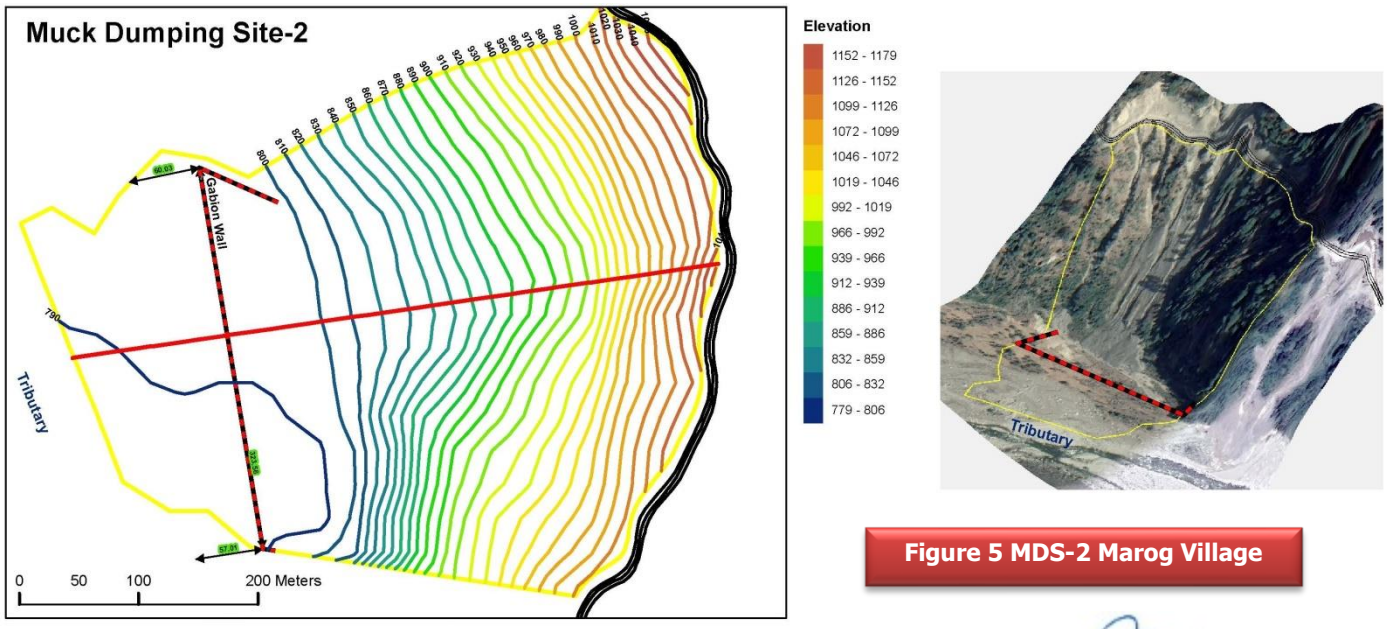

Figure 5 MDS-2 Marog Village

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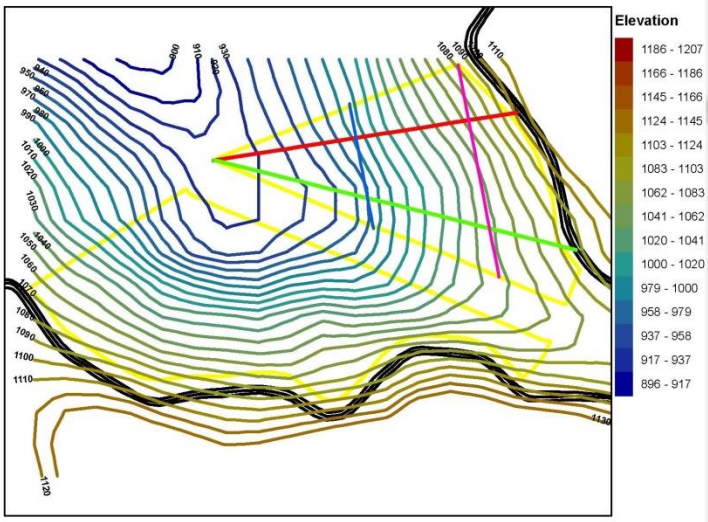
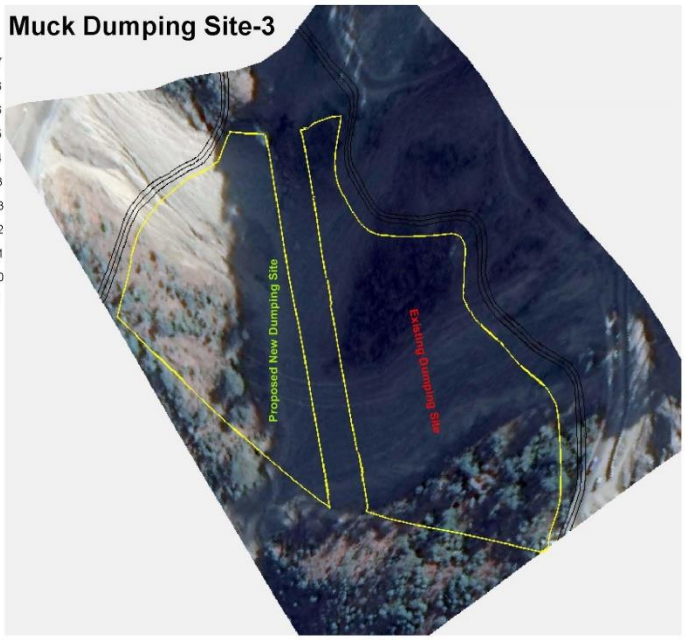


Figure 6 MDS-3 Digdol Village



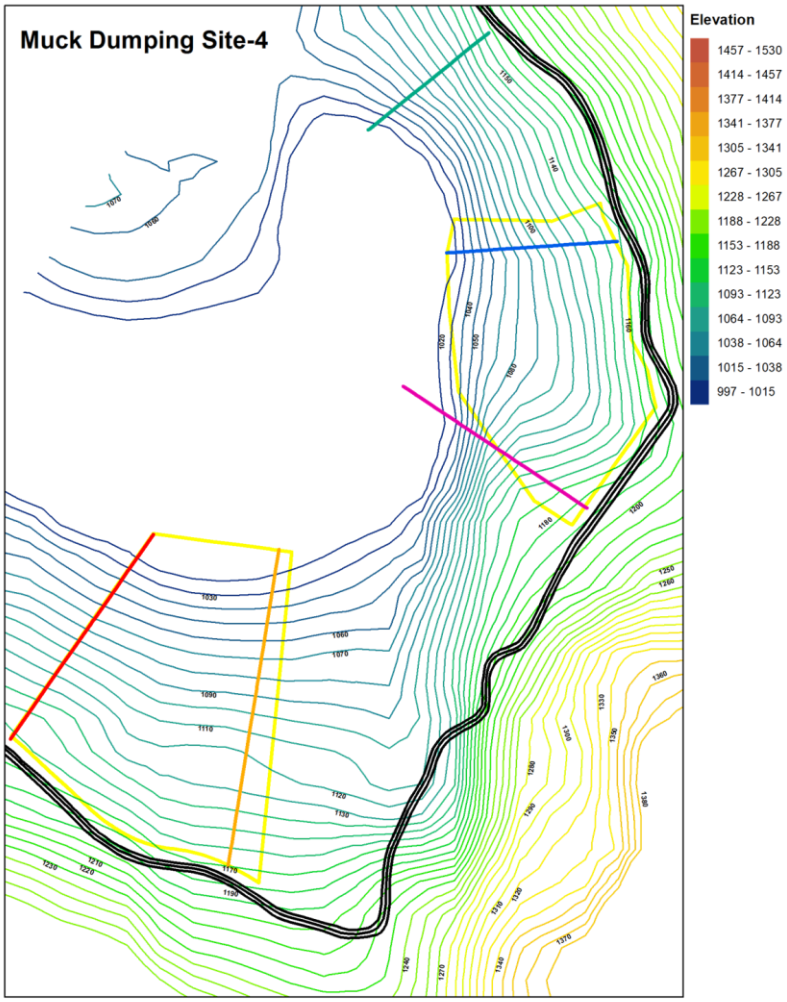


Figure 7 MDS-4 Digdol Village

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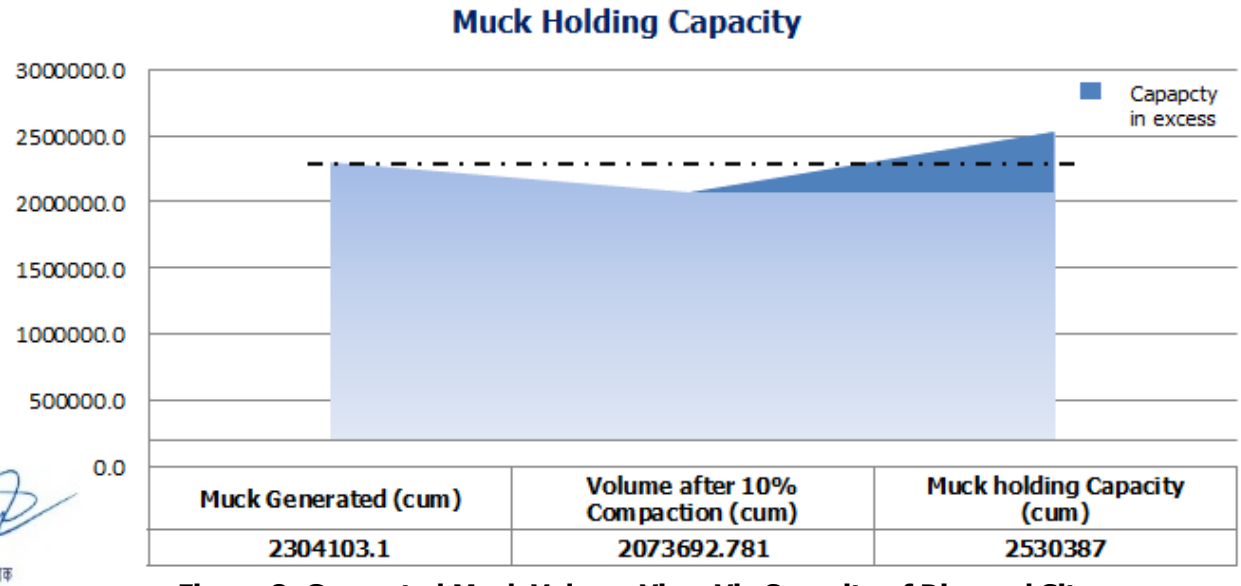
The muck holding capacity of the all muck disposal sites (including the already diverted/acquired plot) are detailed in **Table 5** and comparison of muck volume to be generated vis-à-vis capacity of the disposal sites are presented in infographics in **Figure 8**.

Table 5: Muck Holding Capacity of Disposal Sites

Village	Section	Survey Number	Forest Compartment	Area (Ha.)	Length (m)	Width (m)	Gabion all Height (m)	Capacity (m^3)
Maroog **MDS-1**	Section-A	630	40	2.0535	62	74	5	22940
	Section-B				76	103	5	39140
	Section-C				80	105	5	42000
	Section-D	633	40	2.7519	45	126	5	28350
	Section-E				136	85	5	57800
	Section-F				93	113	7	73563
Maroog **MDS-2**	Section-A	53	39	15.7285	310	68	7	147560
	Section-B				310	46	7	99820
	Section-C				310	42	7	91140
	Section-D				310	39	7	84630
	Section-E				310	24	7	52080
	Section-F				393	89	7	244839
	Section-G				439	100	7	307300
	Section-H				467	76	7	248444
Digdol **MDS-3**	Section-A	731	39	3.1997	156	283	7	309036
	Section-B*	53	39	4.1898	38	220	7	58520
	Section-C*				39	239	5	46605
	Section-D*				70	369	5	129150
Digdol **MDS-4**	Section-A	466	38	4.6953	122	161	5	98210
	Section-B				204	93	5	94860
	Section-C			3.4700	265	160	6	254400
				36.0887				**2530387**

* Already Diverted for muck dumping vide Govt. Order No 8/FST of 201



Muck Generated (cum)	Volume after 10% Compaction (cum)	Muck holding Capacity (cum)
2304103.1	2073692.781	2530387

Figure 8: Generated Muck Volume Vis-a Vis Capacity of Disposal Sites

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It can be inferred from the Figure 8 that capacity of the disposal sites exceeds the generated muck volume. Therefore, the proposed muck disposal sites with the suggested gabion wall height will suffice the requirement of dumping of excavated muck.

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4.0 Environmental Impacts of Improper Muck disposal

The dumping of rock spoil can potentially be a cause for environmental problems and land degradation. It may cause landslides if not disposed properly and be an aesthetical damage to the natural landscape. Improper muck dumping without slope protection measures results in wash away into the river causing siltation and blockage of natural channels. The trees and undergrowth vegetation of the dumping sites are also affected due to change in land use. Further, when stacked without adequate stabilisation measures, muck moves along with runoff and creates landslides.

5.0 Environmental Safeguard Measures for Muck Disposal Sites

- Multiple gabion walls at different elevation levels are proposed to retain muck within the boundary of muck disposal sites. Gabion wall of height of 5 m including 0.75 m of buffer along with standard wire gauge galvanised wire (SWG GI) having 10 cm x 10 cm mesh and dimension 1.15 m x1.15 m x1.15 m in multi tiers with 0.5 m wide offset to be laid concurrently with the dumping of muck for side protection. Muck dumping plan of all 4 proposed disposal sites along with elevation profile and desired placement of gabion wall is provided in drawings at the end of this report.

Use of Geo-mats for Slope Stabilization

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- After preparing the gabion wall at muck disposal site, the muck brought in dumpers shall be dumped and manually spread behind the wall in such a manner that rock mass is properly stacked behind the wall with minimum of voids.

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Rehabilitation of slopes using bio-engineering techniques

- Regular inspection by environmental expert of contractor and authority engineer (AE) shall be made to ensure complete avoidance of spilling of muck outside the boundary, especially into river beds.

- Bio-engineering is the technique of utilizing vegetation in addressing geotechnical problems. Slope of muck disposal sites after completion of dumping to a particular site should be stabilized by stone pitching and turfing with **geo mats (Coir Geotextile)** & indigenous species of soil stabilizing legumes like **Vetiver grasses**. Natural geotextiles degrade quicker than man-made counterpart, but facilitate growth of vegetation quicker and better due to its inherent characteristics. Hydro-seeder sprays are to be used for restoring soil fertility of the slope walls for quicker results, as necessary.

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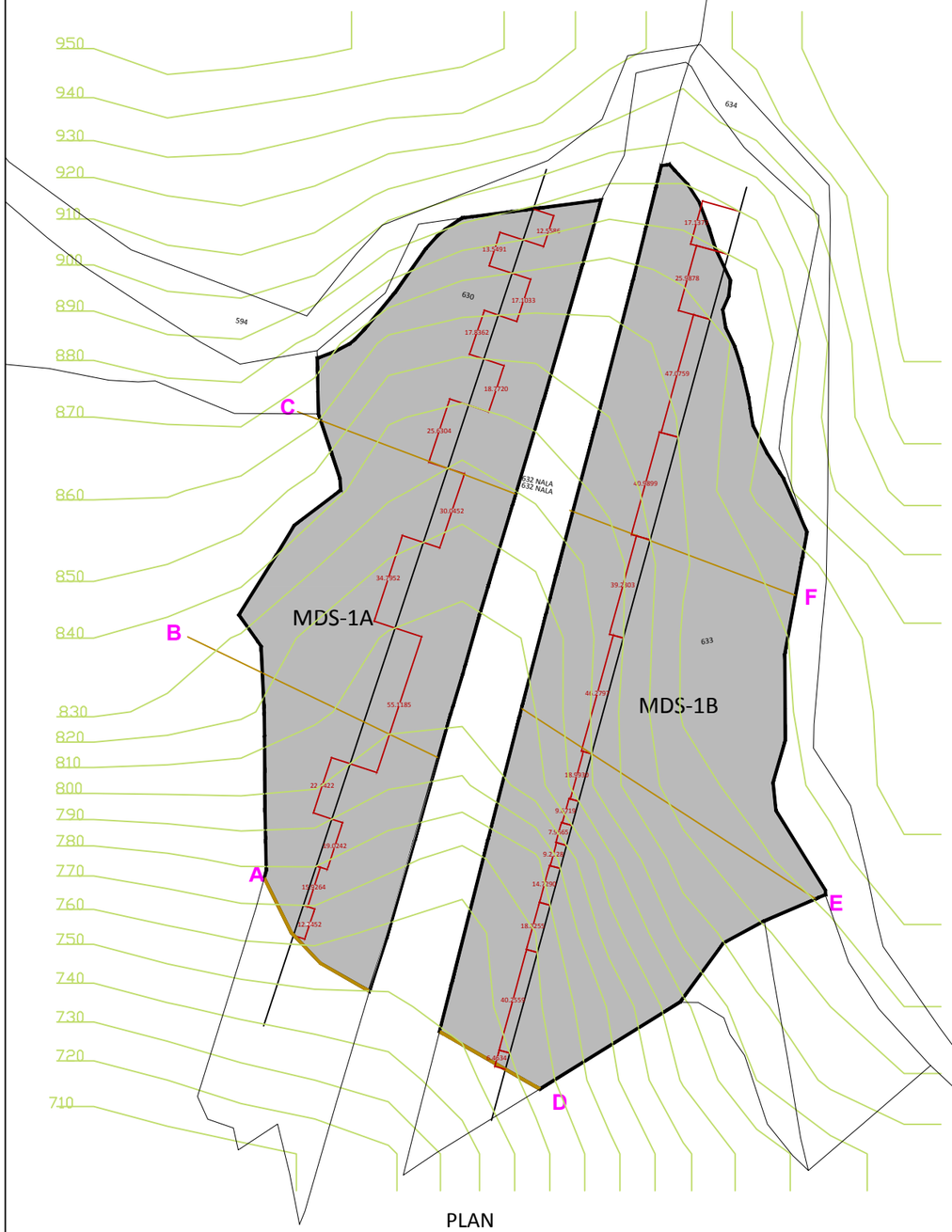
MUCK DUMPING SITE No-1



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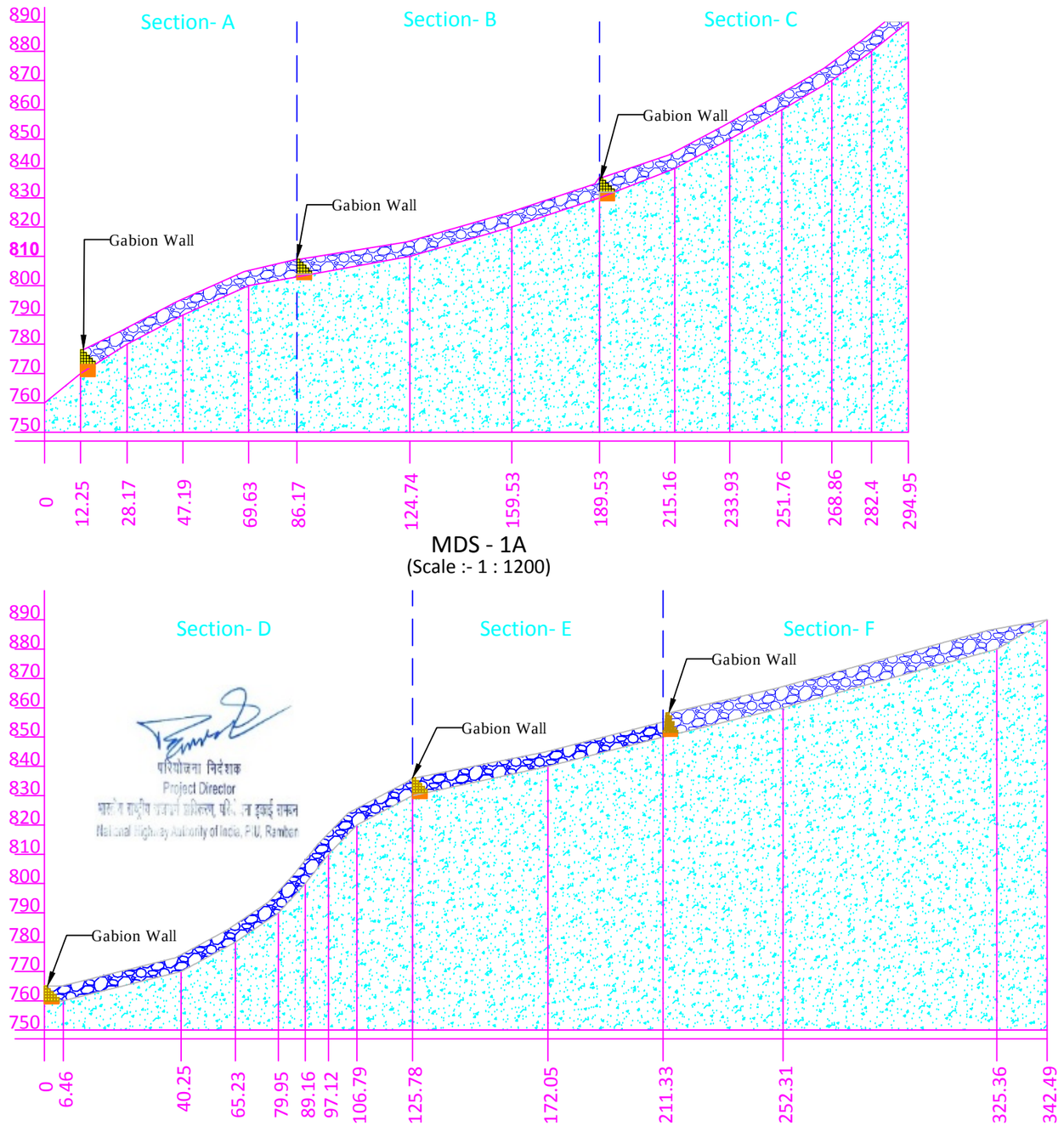

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MDS - 1B
(Scale :- 1 : 1200)

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Revisions	Date	Description
Revisions		

Shawal Sharma	Madhusudhan Rao	Manoj Kumar	Sandip Bhattacharjee	Drawing Title :- NHAI / RAM - BANI / PLAN / 01	Rev. R0
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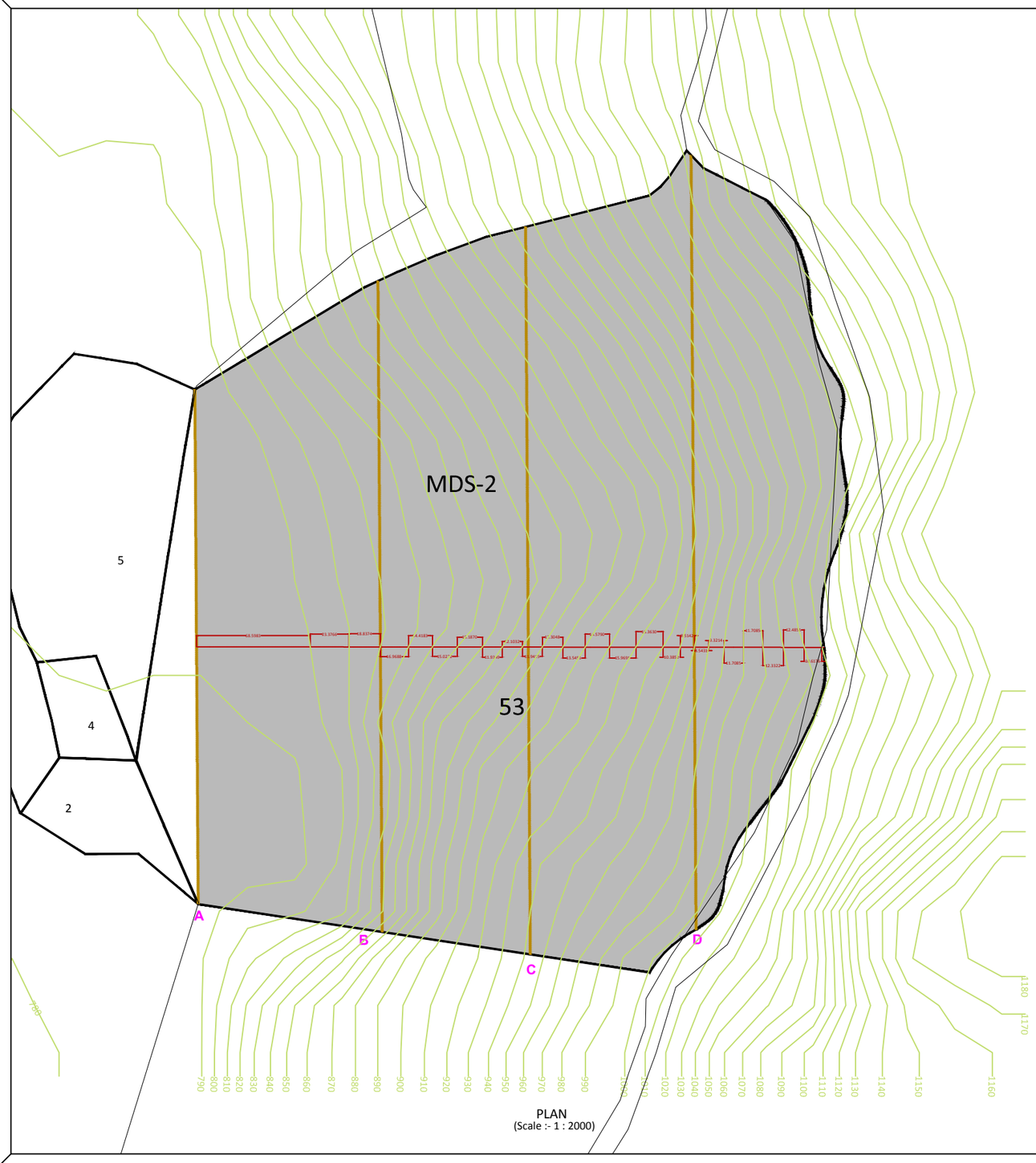

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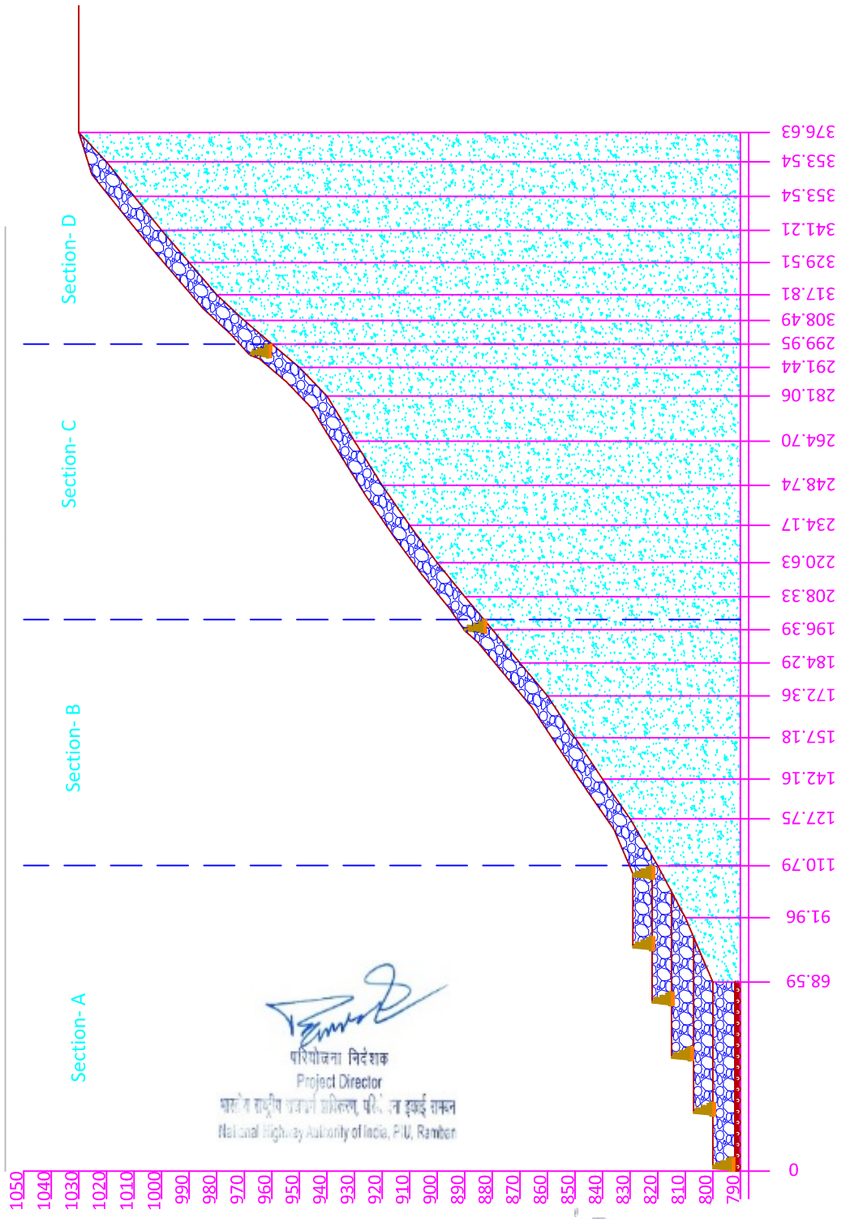

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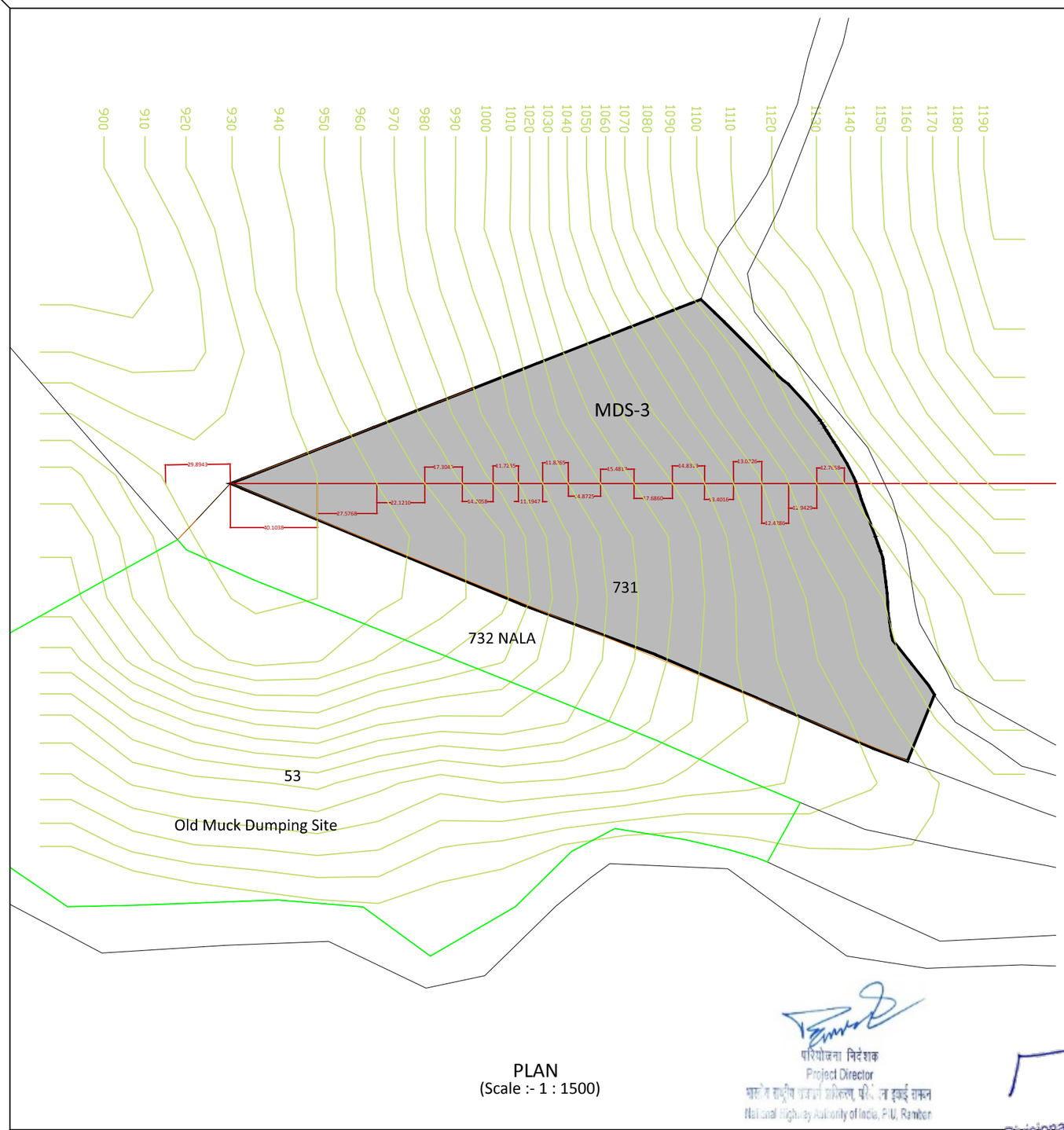

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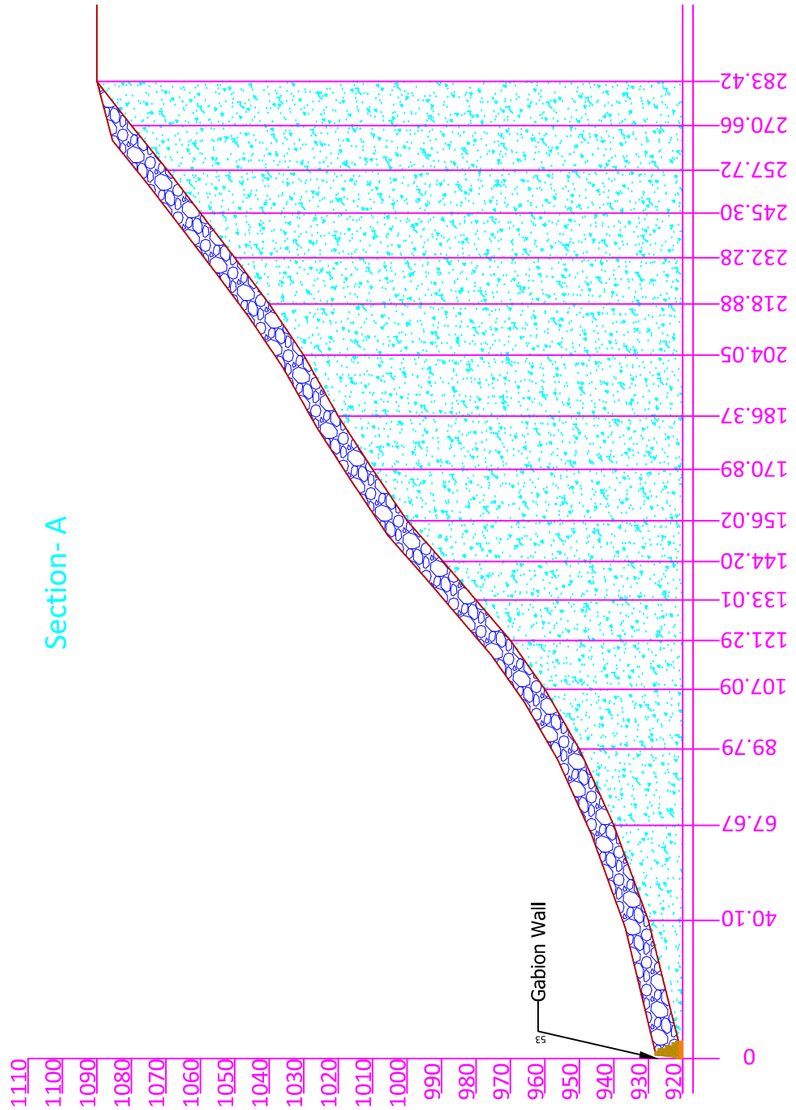

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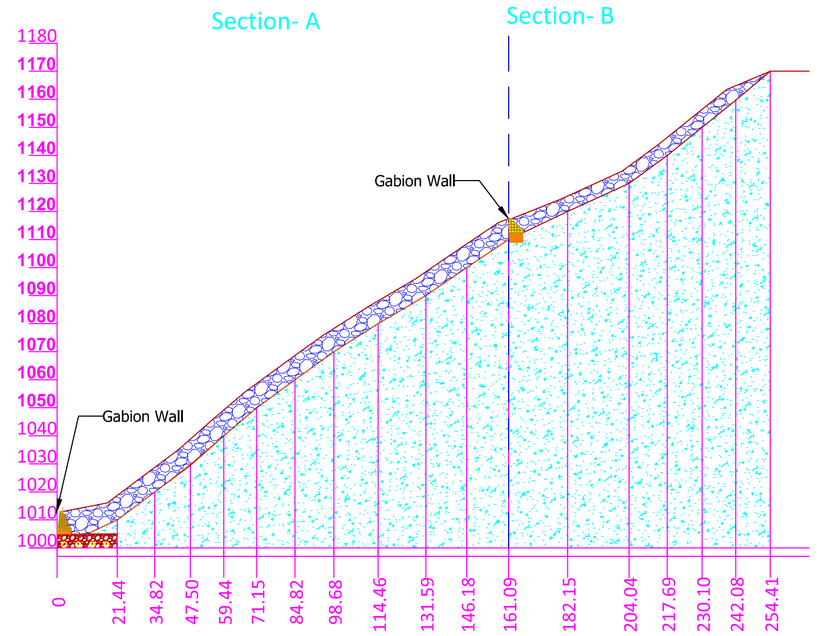

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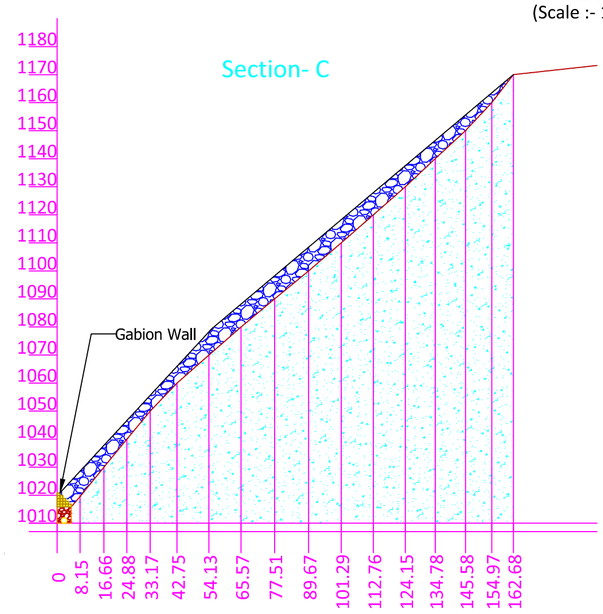

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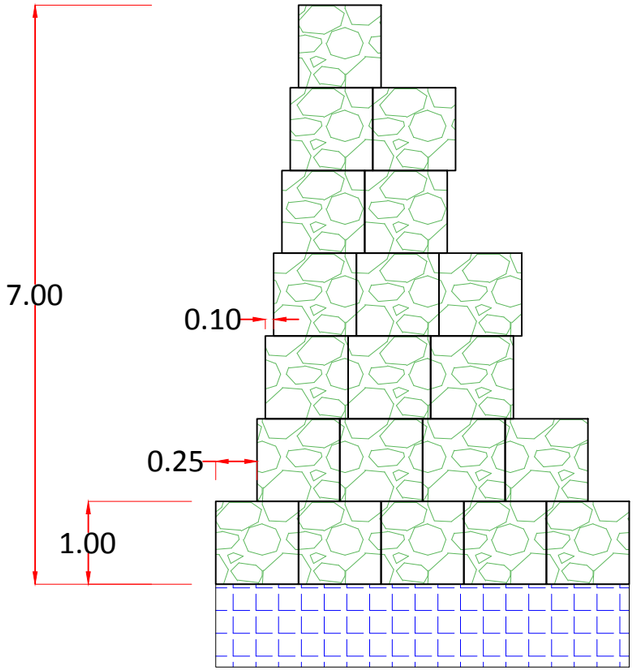
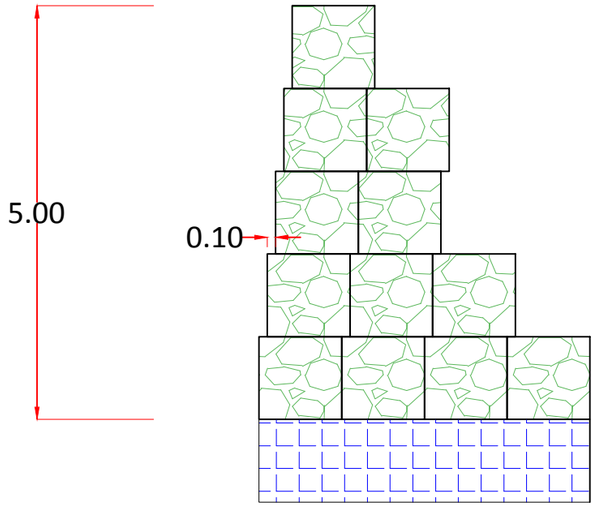


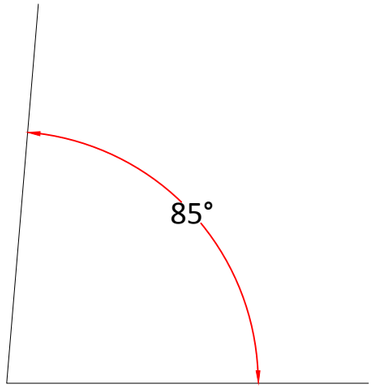
SECTION OF GABION WALL 7.00m HEIGHT



SECTION OF GABION WALL 5.00m HEIGHT

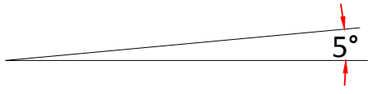
NOTES :-

1. ALL DIMENSION ARE IN METER UNLESS OTHERWISE SPECIFIED.
2. MINIMUM DEPTH FOR EMBEDMENT AT BOTTOM SHALL BE 500MMFOR WALL HEIGHT ABOVE 6M.
3. MINIMUM DENSITY OF STONE (USING FOR GABION FILL) = 2.2 T/M^3
4. MINIMUM AND MAXIMUM SIZE OF STONE OF STONE IS 1.5 TO 2.5 TIMES OF MESH OPENING.
5. CONSTRUCTION OF GABION WALL SHOULD BE AS PER THE IRC:SP:116-2018 AND MORTH 5TH REVISION.
6. BEARING CAPACITY SHOULD BE VERIFY AT FOUNDING LEVEL.
7. FORMATION LEVEL AND GROUND LEVEL SHELL BE VERIFIED AT SITE.
8. FOUNDATION SHALL BE ANCHORED IN FIRM STRATA.



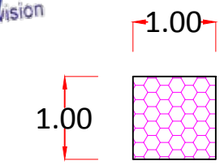
INCLINATION OF VERTICAL FACE

परियोजना निदेशक
Project Director
भारतीय राष्ट्रीय राजमार्ग प्राधिकरण, परि. ना इकाई रामबन
National Highway Authority of India, PIU, Ramban

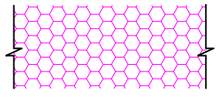


INCLINATION OF HORIZANTAL FACE

Divisional Forest Officer
Ramban Forest Division
Ramban



GABION BOX



ZINC COATED STEEL WIRE GABION MESH

Client :- NATIONAL HIGHWAYS AUTHORITY OF INDIA	Project Title :- Construction of Four Laning of part of Ramban to Banihal Section of NH-1A (Now NH-44), from Ch.165+092 to Ch.171+855 (North Bound) and from Ch.166+895 to Ch.173+638 (South Bound) , excluding section from Ch.166+610 to Ch.167+150 (North Bound), Ch.168+425 to Ch.168+935 (South Bound) and Section from Ch.167+960 to Ch.168+168 (North Bound), Ch.169+745 to Ch.169+951 (South Bound) (Package-III) in the UT of Jammu & Kashmir on EPC mode	Drawing Name :- PLAN MUCK DUMPING SITES	Intercontinental Consultants & Technocrats Pvt. Ltd., in Joint Venture with ALTINOK Consulting Engineering Inc. A-8, Green Park, New Delhi - 110016, India

Revisions	Date	Description
Revisions		

Shawal Sharma	Madhusudhan Rao	Manoj Kumar	Sandip Bhattacharjee
Prepared by	Designed by	Checked by	Approved by

Drawing Title :- NHAI / RAM - BANI / PLAN / 05 — Rev. R0

Scale :- 1:50 (on A2 Sheet)