

I/268286/2023

From: Conservator of Forests (T), Chamba-176 310. To Nodal Officer-Cum-APCCF (FCA) O/O Pr. CCF, H.P. Shimla.

**Sub: Diversion of 211.8427 hectare of forest land for the construction of Dugar 500 MW Hydro Electric Project in favour of NHPC, within jurisdiction of Pangri Forest Division, District Chamba.**

**Memo,**

Kindly refer to GoI, MOEF and CC letter No. 8-15/2022-FC dated 05.09.2023 on the subject cited above.

In this connection, it is submitted that the observations as raised vide letter under reference have been attended by the user agency as well as DFO Pangri, the point wise reply is furnished as under:

Sr. No.	Observation	Reply
1	A study of the project area, impact of the proposed project and feasibility shall be conducted by the renowned/reputed Institute in the field such as Wadia Institute of Himalayan Geology, Dehradun at the cost of the user agency.	The detailed reply has been submitted by User Agency in his reply uploaded against additional information in Part-I and DFO Pangri to this point.
2	There is only one Muck Dumping site which involves 8.5797-hectare forest land. State Govt. may shall explore the possibility of muck dumping on non- forest land and away from the river. A detailed plan containing the details of muck generation and proposed utilization shall be submitted.	The detailed reply has been submitted by User Agency in his reply uploaded against additional information in Part-I and DFO Pangri to this point.
3	The copy of the approved CAT plan for instant proposal shall be submitted	CAT Plan has been formulated by the user agency and is under process for approval. The detailed reply has been submitted by User Agency in his reply uploaded against additional information in Part-I and DFO Pangri to this point.
4	The approved mining plans in case of the proposed quarry sites shall be submitted.	NOC for mining activities of the project has been obtained from Mining Department vide letter dated 28.10.2023.  The detailed reply has been submitted by User Agency in his reply uploaded against

		additional information in Part-I and DFO Pangri to this point.
5	The details of saplings/poles shall be correctly uploaded in the Part-II of the application on PARIVESH portal	Needful has been done, the details of sampling/poles has been uploaded in Online Part-II of the Parivesh Portal.
6	The State Govt. shall intimate the status of the River basin Cumulative Impact Assessment and Carrying Capacity Study (CIA&CCS) in case of Chenab river on which this project is located.	The Cumulative Impact Assessment and Carrying Capacity Study (CIA&CCS) of Chenab River basin has been approved and accepted by MoEF&CC in 2018. Detailed reply of User Agency/DFO is uploaded please.
7	As per proposal submitted, the project is a run of the river project, whereas a huge area is proposed for submergence at the same time. The State shall clarify the position in this regard.	The detailed reply has been submitted by User Agency in his reply uploaded against additional information in Part-I and DFO Pangri to this point.
8	The State Govt. shall submit a detailed report regarding the impact of the project on the water flow in the areas downstream. The impact of the project on farming and flow of water in the distributaries downstream shall also be studied and a report shall be submitted	The Cumulative Environmental Impact Assessment (CEIA) study carried out in year 2016 for Chenab River basin in Himachal Pradesh under the agencies of MoEF&CC, GoI has recommended the quantum of environmental flow for Dugar HEP. The detailed reply given by User Agency is uploaded against additional information in Online Part-I and reply of DFO Pangri is attached herewith.

The reply of DFO Pangri along with enclosures is attached herewith. Submitted for favour of your information and necessary action please.

**Conservator of Forests,  
Chamba Forest Circle, Chamba.**

Copy to the DFO Pangri with reference to his office Memo. No. 2849 dated 13.10.2023 for information please.

No. Gen. / 2849  
Forest Department, Himachal Pradesh

Dated Killar, the 13-10-2023

**From: -** Divisional Forest Officer, Pangi Forest Division, Killar  
**To: -** The Conservator of Forests (T) Chamba Circle Chamba (HP)

**Subject: -** Diversion of 211.8427 hectare of forest land for the construction of Dugar 500 MW Hydro Electric Project in favour of NHPC, within the jurisdiction of Pangi Forest Division, District Chamba (HP).

**Memo:-**

Kindly refer to Government of India Ministry of Environment, Forests and Climate Change letter No. 8-15/2022-FC dated 05-09-2023 on the subject cited above.

2. The point wise observations raised vide your office memo under reference is attended as under:-

**Point No. i:** As stated by the user agency Geological aspects of Dugar HE project have been reviewed in detail by Geological Survey of India (GSI) during DPR examination stage and GSI has accorded clearance (letter no 134/Dugar HEP/EPE/DGCO/GSI/2015/928 dated 23.02.2021) to the project after holistically evaluating the geo environment and geological stability of the project area. DPR of the project has been cleared from CEA, Govt. of India after thorough inspection from the various functional groups and Techno-economic clearance also has been obtained from Govt. of India on 26.4.2022.

- (i) Site specific seismic design parameters have been derived and MEQ studies have also been undertaken by IIT Roorkee. Foundation engineering and seismic aspects of the project have been studied and cleared by CWC and NCS DP (letter no. 11/10/TE/2016/FE & SA/26-28 dated 19/01/2021). During the above studies, Dugar Project has been extensively investigated in accordance with GSI guidelines and IS Codes. The surface investigations carried out for Dugar HEP are detailed geological mapping of the project area from dam site to TRT outfall on 1:2000 scale and Reservoir area on 1:5000. Beside this, entire project area has been explored by total 20 no. of drill holes (cumulative depth 1477.0m). Exploratory drifts having total length of 506.4m (2 level drifts at both abutments, Powerhouse drift 320.9m). Moreover, to determine the engineering properties of rock mass, laboratory test on rock samples & in-situ tests viz. Plate Load tests, Direct Shear tests, Hydro-fracturing tests were carried out in dam and powerhouse drifts. Besides above, Geophysical Studies and Petrography studies were also conducted in the project area. Geological stability of dam abutments and foundation has been ascertained. Rock supports has been proposed for dam abutment stability during construction stage. Stability of proposed underground caverns, tunnels and shafts has been



evaluated and the same stand cleared by respective directorates of CWC. Water tightness of the reservoir has also been ascertained. Seismic hazards and tectonic framework of the area has been studied.

In view of above, new study by any other agency may not be prudent as the sufficient geological investigations and studies have been done already in this regard.

**Point No. ii:** As stated by user agency needful has been done already (**Copy enclosed as Annexure-I**). After satisfied with the above reply state government has forwarded the proposal to MoEF&CC, New Delhi.

Moreover, as per requirement of the project, Muck dumping site has been identified in a single patch over an area of 8.5797 ha forest land and found suitable for temporarily disposal of muck. The temporarily muck dumping site will be handed over back to the State Forest Department after completion of construction activities.

The construction would involve about 3,70,880 m<sup>3</sup> of soil excavation and 9,23,970 m<sup>3</sup> 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. Total quantity of excavation in common soil and balance quantity of rock excavation would have to be disposed in muck disposal areas. Thus considering swell factors 0.63 for rock and 0.80 for common soil adopted from CWC Guidelines and redeposit compaction factor of 83%, total muck disposal area should have a capacity of about 8,71,706 m<sup>3</sup>. Keeping the above requirement, one muck disposal area with total capacity more than 8.75 Lac m<sup>3</sup> has been identified taking into consideration availability of suitable area, minimum distance from generation sites, safe distance from highest flood level (HFL) etc.

Prior to start of dumping activity, muck disposal area will be protected with retaining structure to avoid any spillage of muck. After the completion of dumping activity, proper restoration plan with Biological and Engineering measures will be implemented for restoration of the dumping area. A suitable restoration plan has been proposed under the EMP for muck dumping site (**copy enclosed as Annexure-II**). The EIA/EMP Studies has been carried out by independent Environment consultant and Muck Management Plan has been proposed under EMP. The EIA/EMP study was appraised / examined by Expert Appraisal Committee (EAC) of MoEF&CC, New Delhi in meeting held on 29-08-2022, where-in EAC has recommended for grant of Environment Clearance.

As per forest proposal of Part-I (D), Justification for locating the Project in Forest land and details of alternatives has been examined. Based on the investigation done on the three alternatives and considering all the Engineering and Environmental considerations it was decided to develop the project at this site, which has least probability of geological risk.

Considering all the components / parameters of land requirement and design aspects of the Project, CEA has issued Technical Concurrence vide letter No. CEA-SY-25-44/3/2020-PAC Division dated 26-04-2022.

Most of the area in Pangri Sub-division is Forest Land and some of the Private land available in Pangri area is use by local people for residential and agriculture purpose. The possibility of



locating muck dumping site in Private land / Non-Forest land in nearby area has been examined/explored in Pangi Forest Division and after carefully examine the possibility of muck dumping site, it was found that No Private land / Non-Forest land is available in nearby area which is suitable for disposal of muck. The area available in Private land / Non-Forest land is very far distance from project area and steep sloppy which is not possible to fulfil the requirement of dumping site.

In view of above, it is requested to kindly consider the identified single patch of 8.5797 ha forest land for muck dumping site as per forest proposal.

**Point No. iii:** CAT plan of the Project has been formulated by the Independent Authority/ Consultant M/s. R.S. Envirolink Technologies Pvt. Ltd., Gurgaon in line with approved Comprehensive Catchment Area Treatment Plan of Chenab River Basin in Himachal Pradesh prepared by the Himachal Pradesh Forest Department (HPFD) and also in the light of guidelines issued by the Department of Forest, Himachal Pradesh, vide Notification No. FFE-B-F-(2)-72/2004-Pt-II Shimla, dated 30-09-2009, amended vide Notification No. FFB-B-F- (5)-9/2017 dated 21.11.2019.

Accordingly, Project has submitted CAT Plan of the Project amounting to Rs. 59.81 Crore (1.5% of the project cost Rs. 3987.34 crore) to DFO, Pangi on dated 05-11-2022. Further, DFO, Pangi and CCF, Chamba has forwarded the CAT Plan to APCCF (Nodal Officer) / APCCF (CAMPA) for necessary action and further Approval. However, Wildlife Management Chapter under the CAT Plan has been approved by PCCF (Wildlife) and Chief Wildlife Warden, Shimla vide letter dated 04-04-2023.

**Point No. iv:** NOC for mining activities of the Project has been obtained from Mining Department vide letter dated 28-10-2020 (**Copy enclosed as Annexure-III**).

For meeting the requirement of coarse and fine aggregates, three rock quarry sites such as Dugar Rock Quarries (DRQ) have been identified and marked as DRQ-01 (Quarry site 1:- Upstream of Punto Hasku Bridge), DRQ-2 (Quarry site 2:- Downstream of Punto/Hasku Bridge), and DRQ-6 (Quarry site 3:- Near Village Dharwas) and two River shoal deposits / Barrow area (FAS-01 Near Tail Race Outfall and FAS-02 Tail end of Reservoir near Findru Village) are proposed for quarrying of construction materials. For this purpose, total of 8.625 ha Quarry area and 3.880 ha Borrow area have been proposed for diversion of forest land under this forest proposal. The EIA/EMP Studies has been carried out by independent Environment consultant and landscaping restoration plan of quarry area has been proposed under EMP. The EIA/EMP study was appraised / examined by Expert Appraisal Committee (EAC) of MoEF&CC, New Delhi in meeting held on 29-08-2022, where-in EAC has recommended for grant of Environment Clearance.

For approval of Mining Plan of above quarry sites and Barrow areas from Government of Himachal Pradesh on-line mining application has been submitted by Project to Geological Wing, Department of Industries, Govt. of HP. After examination of the proposal, State Geologist vide letter dated 26-09-2022 has framed a Committee comprising of Officers from Forest, PWD, IPH, HPSPCB and Mining under the Chairmanship of SDM, Pangi for Joint Site Inspection. The Joint Site Inspection for approval of mining plan has been conducted by the Committee on 02-06-2023 and Joint Site Inspection Report has been signed by the above



Committee and will be forwarded to Geological Wing, Department of Industries, Govt. of HP by Mining Officer, Chamba for further consideration and approval.

Therefore, approval of Mining Plan of above quarry sites and Barrow areas from Government of Himachal Pradesh is under progress and will be submitted as soon as approval has been obtained from competent authority.

**Point No. V:** Needful has been done the details of samplings/poles has been uploaded in the Part-II of the Parivesh portal.

**Point No. Vi:** The Cumulative Impact Assessment and Carrying Capacity Study (CIA&CCS) of Chenab River basin has been approved and accepted by MoEF&CC in 2018.

Total hydropower potential of Chenab River in Himachal is assessed as 3510.95 MW (56 projects) out of which only 6.40 MW (6 micro hydel) has been commissioned till the finalization of the report. Out of remaining 50 projects, 20 are large projects i.e. with installed capacity of greater than equal to 25 MW; 9 are small HEPs i.e. IC of greater than 5 MW and less than 25 MW and 21 are micro hydel i.e. IC < 5 MW promoted by Himurja. Detailed Cumulative Impact Assessment carried out based on 3 season baseline data for entire study area and recommendations are made for sustainable development of hydropower projects in the basin.

Dugar HEP is one of the 20 large projects proposed in Chenab basin. Cumulative Environmental Impact Assessment (CEIA) Study for Chenab River basin in Himachal Pradesh Report has recommended Dugar HEP for development in the present form and have noted that *“Reoli Dugli, Sach Khas and Dugar HEPs - These projects are located in well forested area of otherwise scanty forested landscape of Chenab basin and is rich in biological wealth with large sized trees. Projects can be developed in the present form without any modification/change of parameters. Specific issues should be addressed in the EIA report with mitigation and management plan.”*

Environment Flow release recommendation for Dugar HEP has been worked in the CEIA report based on modelling study and final recommendations are reproduced below. These have been accepted and incorporated in the project design.

	% of Average Discharge of Low Flow Period in 90% DY	% of Average Discharge of High Flow Period in 90% DY	% of Average Discharge of Intermediate Period in 90% DY
Months	Nov to Apr	June to Sept	May and Oct
Average Discharge based on 90% DY (1993-94)	81.04	567.86	168.04
Environment Flow Release Recommendation (%)	25%	20%	25%
Minimum Environment Flow to be maintained	20.26	113.57	42.01

(cumec) in respective months			
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Dugar HE Project is in advance stage of development on Chenab River in Himachal Pradesh and other projects are under Survey & Investigation (S&I) which development is behind the Dugar HE Project. Dugar HEP is likely to start construction after getting mandatory Clearances from MoEF&CC.

The status of Cumulative Impact Assessment and Carrying Capacity Study (CIA&CCS) in case of Chenab river has already been deliberated at Sl. No 4 (iv) of this MOM of FAC (Dt 21.8.2023) as reproduced below:

*The Project has been recommended for development in the Cumulative Environmental Impact Assessment (CEIA) Study carried out in 2016 for Chenab River basin in Himachal Pradesh under the aegis of MoEF&CC.*

**Point No. Vii:** The Dugar H.E. Project is a run-of-river project located on the Chenab River. The project involves the construction of a 128-meter high concrete gravity dam across the Chenab River. The Full Reservoir Level (FRL) and Minimum Draw Down Level (MDDL) of the dam are 2114.00 meters and 2102.35 meters respectively. The reservoir has a storage capacity of 61.58 million cubic meters (MCM) at Full Reservoir Level (EL) 2114 meters, with a live storage capacity of 16.57 MCM. The project has been conceived to meet the peaking requirement around 3 hours of power generation on daily basis. Therefore, pondage requirement as per IWT has been carried out considering the outflow limitations. Dam height and other reservoir levels has been kept according to the pondage requirement and operating pool.

In accordance with the Indus Water Treaty (IWT), a pondage of 16.57 MCM has been kept for meeting the diurnal variation in the discharges. Clearance from IWT with respect to project features and pondage requirement has been obtained for FRL 2114 m and MDDL 2102.35 m.

It is pertinent to mention here that the DPR of the project has been cleared from CEA, Govt. of India after thorough inspection from the various functional groups and Techno- economic clearance also has been obtained from Govt. of India on 26.4.2022.

Land submergence has been kept minimum with optimizing the height of the dam fulfilling the IWT provisions and power generation. No additional submergence more than whichever required has been kept in the project.

It is also mention that there is no displacement of Population due to submergence area of reservoir of Dam has been envisaged in the EIA report.

**Point No. VIII:** The Cumulative Environmental Impact Assessment (CEIA) Study carried out in 2016 for Chenab River basin in Himachal Pradesh under the aegis of MoEF&CC, GoI has



recommended the quantum of environmental flow for Dugar HEP. Accordingly, the required provision for environmental flow has been made in the Design & engineering aspects of Dugar HEP and described in the Detailed Project Report (DPR). DPR has been concurred by Central Electricity Authority (CEA), GoI vide letter No. CEA-SY-25-44/3/2020-PAC Division/74- 115, dated April 26, 2022.

In the design of project, the e-flow provision has been kept by passing the discharge from auxiliary power house exiting the water downstream of the spillway in plunge pool area. The flow in the river shall be regulated as per the Indus Water Treaty (IWT) provisions.

Moreover, E-flow provision has been mentioned in the EIA and EMP studies Report of Dugar HEP. The Expert Appraisal Committee(EAC) in its 33rd meeting held on 29.08.2022 recommended for the grant of Environment Clearance to Dugar HEP subject to prior approval of Forest Clearance Stage-I.

Regarding distributaries, it is intimated that river flows in gorge area in downstream area of Dugar HEP and there are several tributaries contributing enhanced flow of water in the downstream area. However, no distributaries are formed by river. As such, no impact on distributaries is anticipated. Drainage Map of Chenab River in downstream area of Dugar HEP is attached (**Annexure-IV**).

The farming land is available in downstream of Project which is situated at higher elevation from the river. The water of the river Chenab is not being used for farming because the farms are situated at higher elevation from the river. However, the local population uses the water from streams/nallaha coming from hill sides. Therefore, no impact of the project is on farming activities is anticipated.

**Submitted for favour of information and further necessary action under FCA-1980 please.**

**Encl: - As above.**

  
Divisional Forest Officer,  
Pangi Forest Division, Killar  
Pangi Forest Division  
Killar 176323



vi. The State has mentioned in the CA scheme, that the Root stock is there in the proposed CA areas, however, the density is less due to grazing pressure. How the govt. Intends to mitigate the grazing pressure for proposed CA plantations is therefore required to be submitted.  
Reply: Observation pertains to DFO, Pangi.

Annexure-I

vii. The Muck dumping (8.5797 ha) and the job facility area (7 ha) can be taken on non-forest land. The justification for proposing the same on Forest land may be submitted.

Reply: Muck dumping site involves 8.5797 ha forest land and job facility area involve 7.08 ha forest land as per requirement of the Project. The total land required for the construction of project is 220.62 ha. Out of which 211.84 ha is Forest land and the remaining 8.78 ha is Non-Forest land. As per requirement, a single patch of 8.5797 ha forest land has been identified and found suitable for temporarily disposal of muck, and 7.08 ha forest land has been identified and found suitable for temporarily job facility area (like batching plant, pre-fabrication yard etc). Both the temporarily muck dumping site and job facility area will be handed over back to the State Forest Department after completion of construction activities. After the completion of dumping activity, proper restoration plan with Biological and Engineering measures will be implemented for restoration of the dumping area. A suitable restoration plan has been proposed under the EMP for muck dumping site (copy enclosed from page No. 248 to 255). After the completion of work from job facility area, proper restoration plan with Biological and Engineering measures will be implemented for restoration of the job facility area. A suitable restoration plan has also been proposed under the landscaping and restoration plan of EMP Plan.

As per forest proposal of Part-I (D), Justification for locating the Project in Forest land and details of alternatives has been examined. Based on the investigation done on the three alternatives and considering all the Engineering and Environmental considerations it was decided to develop the project at this site, which has least probability of increase in area of medium geological risk.

Considering all the components / parameters of land requirement and design aspects of the Project, CEA has issued Technical Concurrence vide letter No. CEA-SY-25-44/3/2020-PAC Division dated 26-04-2022 (Copy enclosed from page No. 240 to 246).

The possibility of locating muck dumping site and job facility area in Private land / Non-Forest land in nearby area has been examined/explored in consultation with Officials of Pangi Forest Division and after carefully examine the possibility of muck dumping site and job facility area, it was found that No Private land / Non-Forest land is available in nearby area which is suitable for disposal of muck and job facility area. The area available in



**एनएचपीसी लिमिटेड**  
(भारत सरकार का उद्यम)  
**NHPC Limited**  
(A Govt. of India Enterprise)  
ISO-9001:2001 & IS 18001 Certified Company

डुगर जल विद्युत परियोजना (500 MW)  
Dugar HE Project (500 MW)  
डुज, किल्लार (पंगी), चंबा (हि.प्र.) 176123  
Luj, Killar (Pangi), Chamba (H.P.)  
ई मेल: [dugarhep@nhpc.nic.in](mailto:dugarhep@nhpc.nic.in)  
Phone No: +91-8968136260

Private land / Non-Forest land is very far distance from project area and steep sloppy which is not possible to fulfil the requirement of dumping site and job facility area.

In view of above, it is requested to kindly consider identified single patch of 8.5797 ha forest land for muck dumping site and 7.08 ha forest land for job facility area as per forest proposal. Hope the above replies will satisfy the respective observations and after doing the needful action is re-submitted for approval of the competent authority.

धन्यवाद

Encl.: उपरोक्त अनुसार।

भवदीय,

(शशी कान्त)

महा प्रबंधक (प्रमुख),  
डुगर जल विद्युत परियोजना

डुगर जल विद्युत परियोजना  
डुज, किल्लार (पंगी), चंबा (हि.प्र.)  
176123  
महाराष्ट्र, डि. 176123

Regd. Office  
मुख्यालय

NHPC OFFICE COMPLEX, SECTOR-33, FAIDABAD-121003 (HARYANA)  
एनएचपीसी कार्यालय परिसर, सेक्टर-33, फ़रीदाबाद (हरियाणा) - 121003



## Section 10.2.5

# MUCK MANAGEMENT PLAN

### 10.2.5 MUCK MANAGEMENT PLAN

The excavation for construction of the project would generate about 3,70,880 cum of soil and 9,23,970 cum of rock. About 60% of rock excavated is expected to be used for producing coarse and fine aggregate for concrete production and as fillings for developing areas for construction facilities, etc. The total quantity of excavated common soil and balance quantity of rock excavated would have to be disposed of at 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 about **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	923970
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
	<b>Total muck to be disposed of (Cum)</b>	<b>716676</b>	

Muck dumping plan involves 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, providing protection measures at 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 Standard 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 10.10**).

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 10.11**).

#### **10.2.5.2 Preparation of Muck Dumping Site**


The muck that needs disposal would be piled at  $\phi$  (angle of repose) between  $30^\circ$  and  $36^\circ$  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  $30^\circ$  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 minimize damages due to the spillage of muck in the project area.

  
 महाप्रबन्धक  
 General Manager  
 डुगर जल विद्युत परियोजना  
 Dugar Hydro Electric Project  
 मण्डल, जिला गढ़वा (बिहार) - 175121  
 Meghain, Dist. Mandla (Bihar) - 175121



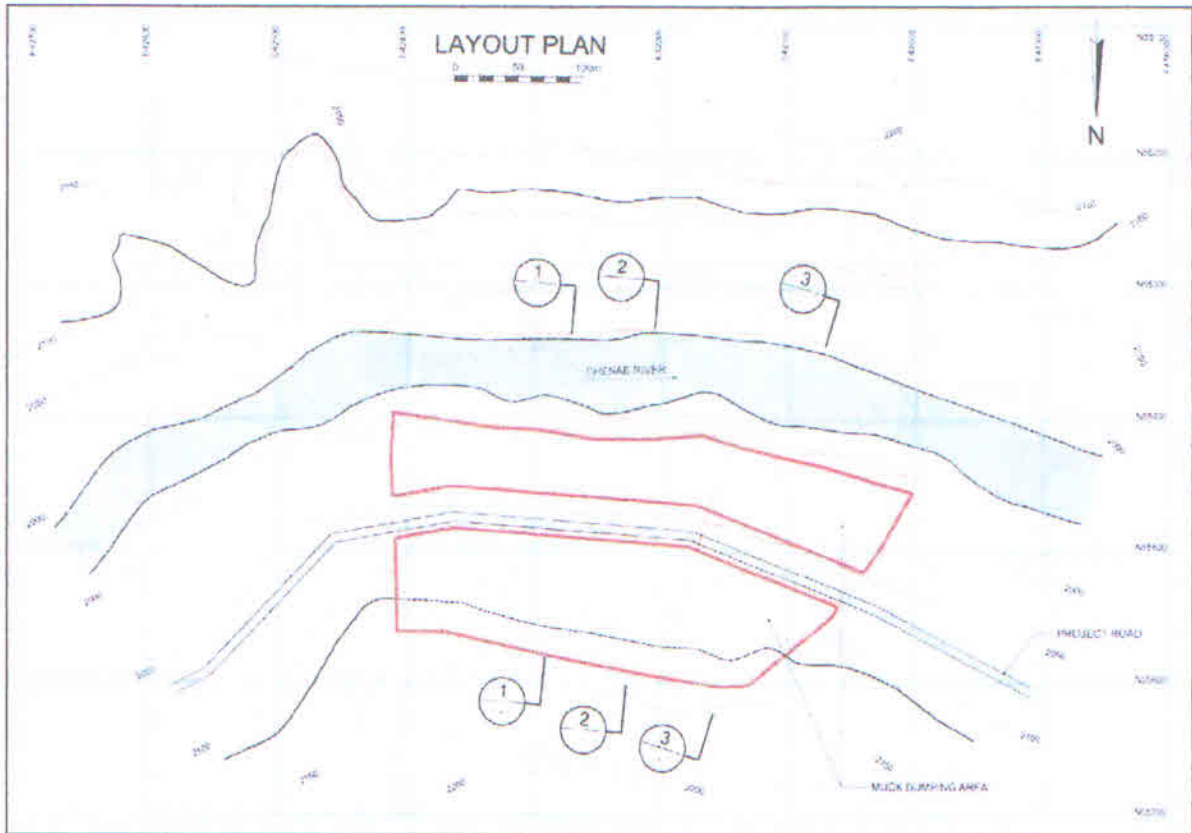


Figure 10.10: Layout of Muck Disposal area

*(Signature)*  
General Manager  
Dugar Hydro Electric Project  
Nagwan, Dist. Mandi (H.P.)-173121

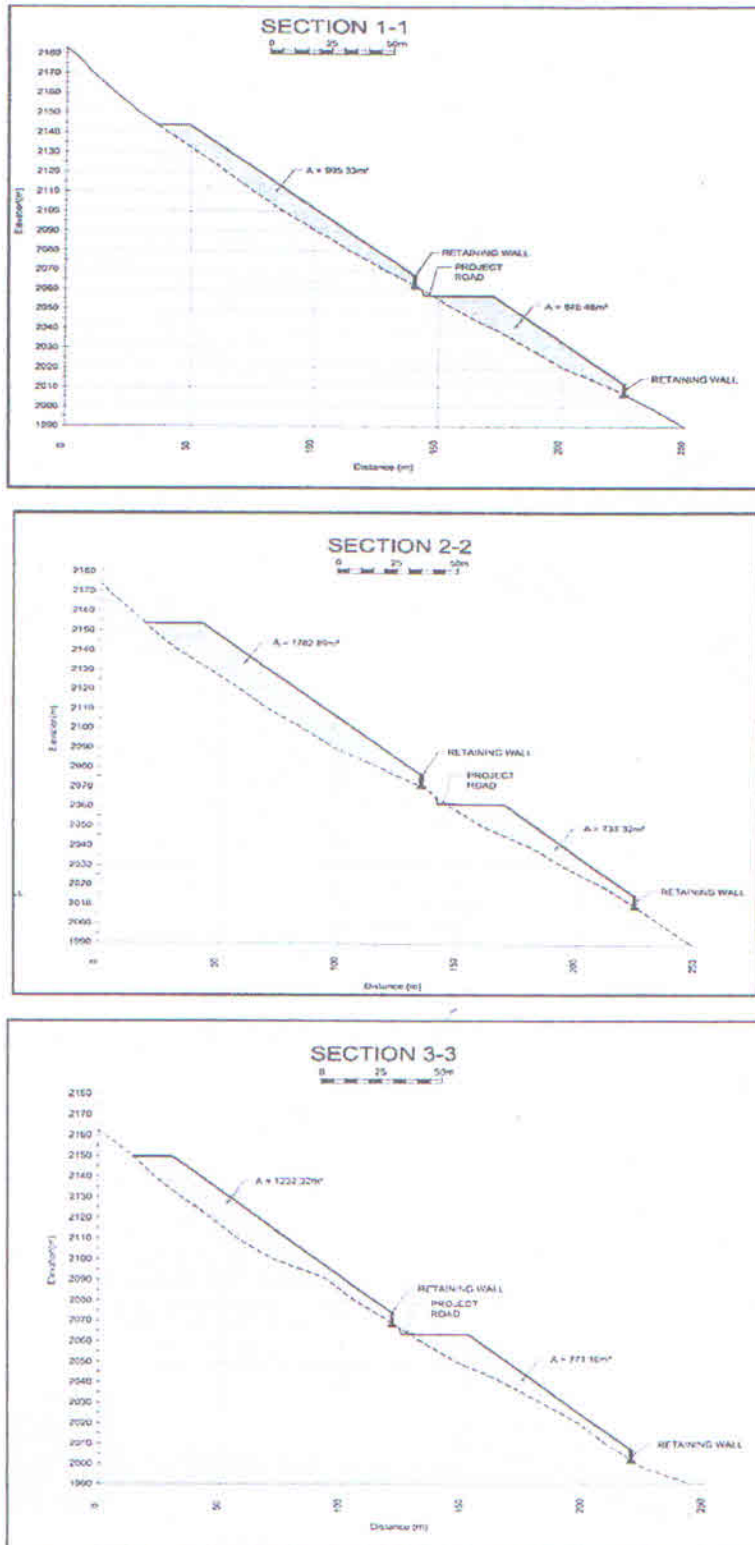


Figure 10.11: Sections of muck disposal area

*Signature*  
 General Manager  
 Dugar Hydro Electric Project  
 NHPC Ltd., Mandi (H.P.)-175121



### 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<sub>10</sub> and PM<sub>2.5</sub>) 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
<b>Total</b>	<b>27.6</b>

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 m<sup>3</sup> 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







debris, reinforcing soil, and increasing the infiltration capacity of the area. The area shall be maintained for a period of three years after plantation for ensuring survival of saplings. 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
	<b>Total</b>			<b>65.53</b>

#### 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
	<b>Total</b>	<b>670.80</b>

  
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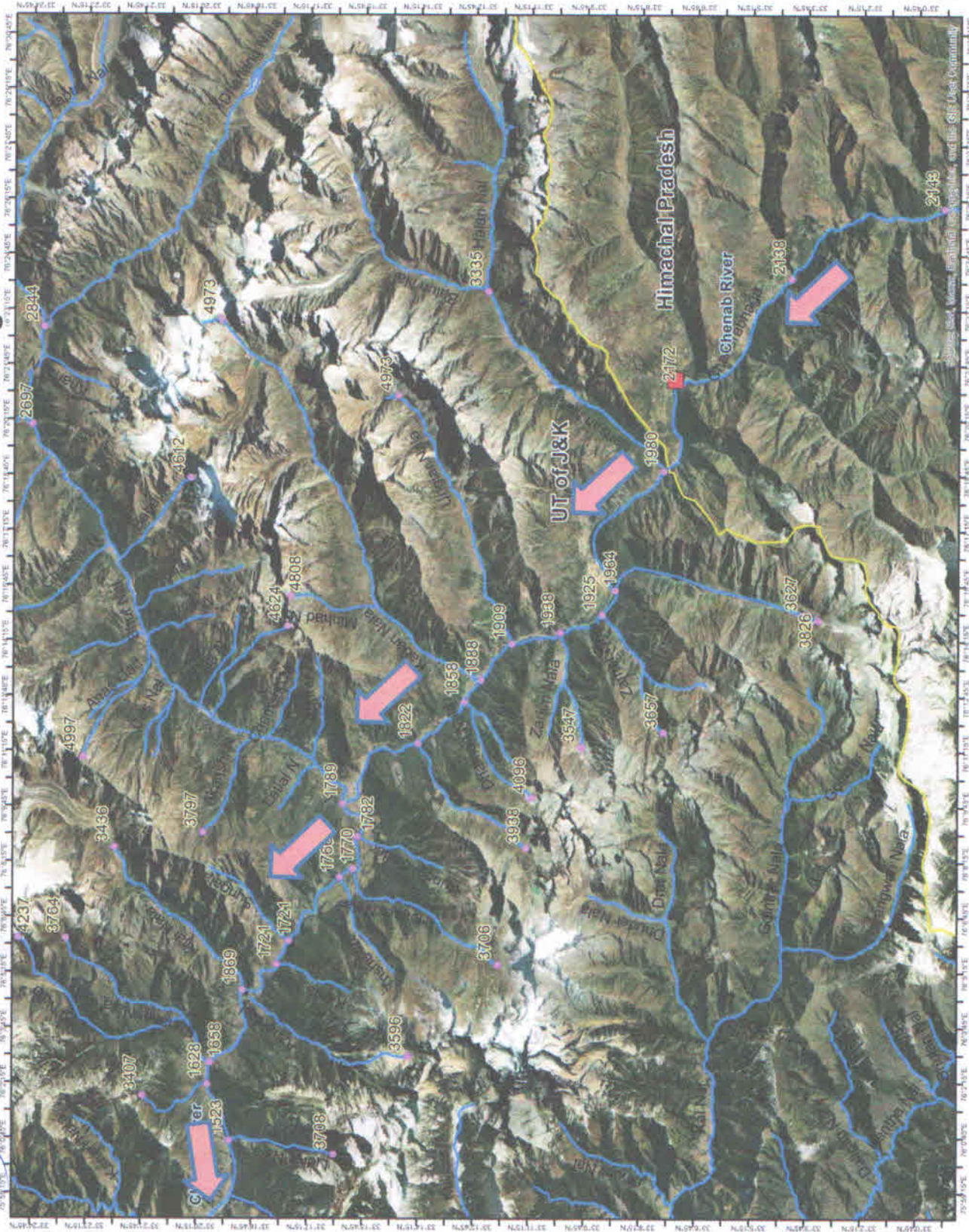




Annex - IV

(Annexure - IV)

# Drainage Map of Chenab River in Downstream of Dugar HEP



### Legend

- Dam Axis, Dugar HEP
- Elevation (m)
- River and its tributaries
- State Boundary

The elevation values are based on SRTM data of 30 meter resolution. The direction of main stream is towards North West.