BEFORE THE NATIONAL GREEN TRIBUNAL

AT NEW DELHI

MEMORANDUM OF APPEAL

APPEAL NO. 21 OF 2021

IN THE MATTER OF:

DR. BHARAT JHUNJUNWALA & ANR

...APPELLANTS

VERSUS

UNION OF INDIA & ORS **...RESPONDENTS**

Index

S.No.	PARTICULARS	PAGE NOS.
1.	Reply filed on behalf of Respondent No.3 in Appeal No. 21 of 2021 with supporting affidavit	1-42
2.	**Annexure – R/3-1:** Copy of the order dated 02.02.2018 passed by the Hon'ble Supreme Court in Civil Appeal with Diary No. 42503/2017	43
3.	**Annexure – R/3-2 (Colly):** Copies of Letters dated 13.09.2019, 05.12.2019 and 30.01.2020 addressed to MoEF&CC by Respondent No.3	44-53
4.	**Annexure – R/3-3 (Colly):** Copies of Notification dated 18.01.2021 bearing reference S.O. 221(E) published by MoEF&CC and Notification dated 16.06.2021 bearing reference S.O. 2346(E) published by MoEF&CC	54-58

NOTARY GOVT. OF UTTARAKHAND

महाप्रबंधक (सा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

5.	**Annexure – R/3-4:** Copy of Email dated 19.11.2020 addressed by Answering Respondent to MoEF&CC	59
6.	**Annexure – R/3-5:** Copy of the relevant extracts of the Draft REIA Report prepared by M/s WAPCOS	60-72
7.	**Annexure – R/3-6:** Copy of the ToR Compliance Report	73-91
8.	**Annexure – R/3-7:** Copy of the Answering Respondent's Presentation dated 27.07.2021 (relevant extracts).	92-115
9.	**Annexure – R/3-8:** Copy of the Executive Summary (2009 CES Report).	116-151
10.	**Annexure – R/3-9:** Copy of the Monthly Report on Blast Induced Ground Vibration Monitoring at VPHEP prepared by CIMFR.	152-160
11.	**Annexure – R/3-10:** Copy of Letter no. J-12011/29/2007-IA-1 dated 10.10.2017.	161
12.	**Annexure – R/3-11:** Copy of the Minutes of Meeting dated 28.02.2020 of Multi-Disciplinary Committee under the Chairmanship of PCCF-HoFF, GoU.	162-166
13.	**Annexure – R/3-12:** Copy of the relevant extracts of the 'Progress Report' prepared by ICAR- Directorate of Coldwater Fisheries and Research, Bhimtal, Uttarakhand.	167-170
14.	**Annexure – R/3-13:** Copy of the 'Technical Report of Ecological Monitoring of Vishnugad-Pipalkoti	171-201

NOTARY
COVT. OF UTTARAKHAND

महाप्रबंधक (पर्या. एवं वन)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

	Hydro Electric Project' prepared by Government Post Graduate College, Gopeshwar.	
15.	**Annexure – R/3-14:** Copy of the Report dated 05.11.2020 prepared by Pollution Control Research Institute.	202-209
16.	**Annexure – R/3-15:** Copy of the Latest Six Monthly Compliance Report (Jan-June 2021)	210-232
17.	**Annexure – R/3-16:** Copy of Chapter-I, Volume-II of DPR.	233
18.	Vakalatnama	234-235
19.	Authorisation Letter	236
20.	Proof of Service	237

RESPONDENT NO.3

महा प्रबन्धक (सा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

FILED THROUGH:

NOTARY GOVT. OF UTTARAKHAND

DHRUV DEWAN/HARSHITA CHOUBEY/CHANDNI GHATAK
ADVOCATES FOR RESPONDENT NO.3
C-519, SECOND FLOOR, DEFENCE COLONY, NEW DELHI - 110024
M: +91 9999776655/ +91 8769842888
E: choubey.harshita@gmail.com / chandnighatak26@gmail.com

PLACE: NEW DELHI
DATE: 29 .03.2022

BEFORE THE NATIONAL GREEN TRIBUNAL
AT NEW DELHI
MEMORANDUM OF APPEAL
APPEAL NO. 21 OF 2021

IN THE MATTER OF:

DR. BHARAT JHUNJUNWALA & ANR
…APPELLANTS

VERSUS

UNION OF INDIA & ORS **…RESPONDENTS**

Index
(Vol-1)

9.	**Annexure – R/3-8:** Copy of the Executive Summary (2009 CES Report).	116-151
10.	**Annexure – R/3-9:** Copy of the Monthly Report on Blast Induced Ground Vibration Monitoring at VPHEP prepared by CIMFR.	152-160
11.	**Annexure – R/3-10:** Copy of Letter no. J-12011/29/2007-IA-1 dated 10.10.2017.	161
12.	**Annexure – R/3-11:** Copy of the Minutes of Meeting dated 28.02.2020 of Multi-Disciplinary Committee under the Chairmanship of PCCF-HoFF, GoU.	162-166
13.	**Annexure – R/3-12:** Copy of the relevant extracts of the 'Progress Report' prepared by ICAR- Directorate of Coldwater Fisheries and Research, Bhimtal, Uttarakhand.	167-170

FILED THROUGH:

DHRUV DEWAN/HARSHITA CHOUBEY/CHANDNI GHATAK
ADVOCATES FOR RESPONDENT NO.3
C-519, SECOND FLOOR, DEFENCE COLONY, NEW DELHI - 110024
M: +91 9999776655/ +91 8769842888
E: choubey.harshita@gmail.com / chandnighatak26@gmail.com

PLACE: NEW DELHI
DATE: 29.03.2022

BEFORE THE NATIONAL GREEN TRIBUNAL
AT NEW DELHI
MEMORANDUM OF APPEAL
APPEAL NO. 21 OF 2021

IN THE MATTER OF:

DR. BHARAT JHUNJUNWALA & ANR

...APPELLANTS

VERSUS

UNION OF INDIA & ORS **...RESPONDENTS**

REPLY FILED ON BEHALF OF RESPONDENT NO.3

MOST RESPECTFULLY SHOWETH

1. The present Reply is being filed on behalf of Respondent No. 3 in response to the instant Appeal.

2. By way of a background, Respondent No. 3/Answering Respondent, formerly Tehri Hydro Development Corporation Limited, is a 'Schedule A' Miniratna Company, currently engaged in implementing and commissioning of the 444MW Vishnugad-Pipalkoti Hydro Electric Project ("**Project**") on river Alaknanda in district Chamoli, Uttarakhand.

3. By way of the present Appeal under S. 16 of the National Green Tribunal Act, 2010, ("**Act**") the Appellants have erroneously sought to assail the Environment Clearance dated 26.08.2021 bearing no. J-12011/10/2020-IA.I(R) ("**EC**") granted by the

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

Ministry of Environment, Forest and Climate Change ("**MoEF&CC**") to the Project being developed by Respondent No. 3, primarily on the grounds that (i) the Project has purportedly undergone substantial change in scope and as such the aforesaid environment clearance dated 26.08.2021 could not be granted on the basis of the previous environment clearance dated 22.08.2007; (ii) the mandatory requirement for conducting a fresh public hearing could not be dispensed with inasmuch as the construction and implementation of the Project is allegedly below 50%.

4. At the outset, Respondent No. 3 denies each and every averment, contention, and allegation contained in the present Appeal which is inconsistent with the submissions made herein. Nothing contained in the present Appeal should be deemed to be admitted for want of a specific traversal. It is respectfully submitted that unless stated otherwise, this Reply may be treated as denying in *seriatim* the contents of the present Appeal.

PARA-WISE REPLY

1. The contents of para 1 are a matter of record and do not merit a specific response. It is however submitted that the Appellants have erroneously sought to impugn the environmental clearance dated 26.08.2021. The following paras would reveal that the same has been granted in consonance with and after following due procedure, pursuant to mindful consideration by the Expert Appraisal Committee ("**EAC**") and the MoEF&CC.

NOTARY ... GOVT. OF UTTARAKHAND

महाप्रबंधक (जल. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

2. The contents of para 2 are not admitted and the Appellants are put to strict proof thereof.

3. The contents of para 3(a), (b) and (c) are not admitted and the Appellants are put to strict proof thereof. Insofar as O.A No. 197 of 2016 dealt with in para 3(d) is concerned, it is submitted that proceedings under the said O.A stand closed *vide* Order dated 22.10.2018 passed by this Hon'ble Tribunal post submission of a final report on the subject by the Answering Respondent. It is further pertinent to mention that the compensation of INR 50 Lakhs imposed by this Hon'ble Tribunal, has been stayed by the Hon'ble Supreme Court *vide* Order dated 02.02.2018 in Civil Appeal with Diary No. 42503/2017. A copy of the order dated 02.02.2018 passed by the Hon'ble Supreme Court in Civil Appeal with Diary No. 42503/2017 is annexed herewith and marked as **Annexure- R/3- 1.**

4. The contents of para 4 are denied as being misleading. The Appellants are neither 'aggrieved' persons under S. 16 of the Act, nor 'injured' persons as stipulated under S. 18 of the Act. In other words, the Appellants do not have any *locus standi* to approach this Hon'ble Tribunal. Pertinently, the study/impact area of the Project is in the radius of 10 km, whereas Appellant No. 1 admittedly resides in the range of approximately 100 km downstream of the Project. Appellant No. 2 on the other hand is a resident of Faridabad and is in no manner affected by the

NOTARY Govt. of Uttarakhand

महाप्रबंधक (सोसा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

Project. It is also pertinent to note that the Appellant No.2 had also unsuccessfully challenged the grant of stage-I forest clearance in respect of the present Project before this Hon'ble Tribunal and the Hon'ble Supreme Court.

5. The contents of para 5 are denied for want of knowledge. For reasons detailed below, it would suffice to submit that the present Appeal assailing the EC is misconceived and ought to be dismissed.

6. With respect to the contents of para 6, the claim that the original EC expired on 21.08.2021 is denied. The Appellants have deliberately misrepresented the matter by suppressing the crucial facts regarding validity of EC. For the sake of completeness, it is pertinent to note that the delay in completion of the Project within the span of 13 years was not attributable to the Answering Respondent. Even though the environment clearance was obtained by the Answering Respondent on 22.08.2007 for a period of 10 years, the forest clearance required for diversion of 80.507 Ha land was only obtained in December 2013. As such, the award of Civil and Hydro Mechanical works was delayed by a period of 6 years, and effectively commenced on or around 17.01.2014. Thereafter, the Project was confronted by a number of unforeseeable hindrances. Even though, the Answering Respondent *vide* its letters dated 13.09.2019, 05.12.2019 and 30.01.2020 sought an extension of the environment clearance for a further period of three years given

महाप्रबंधक (सा. एवं प.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

that the Project was in an advance stage of execution and was expected to be completed by December 2022, by way of its response dated 04.05.2020, the MoEF&CC refused to further extend the validity of the environment clearance beyond the period of 13 years as per prevailing norms and suggested that the Answering Respondent initiate the process of obtaining an environment clearance *de novo*. Accordingly, the Answering Respondent preferred a fresh application for environment clearance on 20.07.2020 and 15.07.2021. Meanwhile, *vide* the notification dated 18.01.2021 bearing reference S.O. 221(E) published by MoEF&CC, the period between April 2020 to March 2021 was exempted from calculation of the period of validity of any prior environment clearance granted by it. Thereafter, *vide* another notification dated 16.06.2021 bearing reference S.O. 2346(E), the proviso to Rule 5 in sub-rule (3) in clause (d) of Environment Protection Rules, 1986 was substituted to provide that the validity of notification expiring in the financial year 2020-21 and 2021-22 was extended up to 31.12.2021 or 06 months from the end of the month when the relevant notification would have expired without any extension, whichever is later. In view of the said notifications, the validity of the environment clearance granted to the Answering Respondent stood automatically extended till 31.12.2021. In the meantime, MoEF&CC granted the environment clearance to the Answering Respondent on 26.08.2021 on the recommendation of the EAC as per EIA notification-2006. Copies of Letters dated 13.09.2019,

NOTARY GOVT. OF UTTARAKHAND

महाप्रबंधक (सोसा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

05.12.2019 and 30.01.2020 addressed to MoEF&CC by Respondent No.3 are annexed and marked collectively herewith as **Annexure – R/3-2 (Colly).** Copies of Notification dated 18.01.2021 bearing reference S.O. 221(E) published by MoEF&CC and Notification dated 16.06.2021 bearing reference S.O. 2346(E) published by MoEF&CC are annexed and marked collectively herewith as **Annexure – R/3-3 (Colly).**

7. The contents of para 7 are denied for want of knowledge.

8. With respect to the contents of para 8, it is submitted that heading of Sr. No. 7 of Form 2 under which the Answering Respondent had furnished information, mentions '*public consultation*'. Accordingly, the Answering Respondent had in consonance with the said form, mentioned public consultation. Any adverse inference that the Appellants seek to draw from the same is entirely misconceived. A Copy of Email dated 19.11.2020 addressed by Answering Respondent to MoEF&CC is annexed and marked herewith as **Annexure- R/3-4.**

9. The contents of para 9 insofar as they state that a detailed representation dated 26.07.2020 was made to the EAC, is denied for want of knowledge. It is pertinent to mention that the Draft REIA Report was prepared by M/s WAPCOS, which is a NABET accredited EIA consultant organization and a public-sector enterprise under the aegis of Union Ministry of Jal Shakti, Govt. of India. As per the report furnished by WAPCOS, the

NOTARY GOVT. OF UTTARAKHAND

महाप्रबंधक (पर्या. एवं वन)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

Environment Benefit to Cost ratio of the Project is 138.20:1. Copy of the relevant extracts of the Draft REIA Report prepared by M/s WAPCOS is annexed and marked herewith as **Annexure – R/3-5**.

10. The contents of para 10 are a mere reiteration of the minutes of the EAC Meeting for River Valley and Hydroelectric projects held on 29.07.2020, and as such, do not merit a specific response.

11. The contents of para 11 are wholly denied. The Appellants have sought to impugn the validity of the EAC observations on the purported ground that the Project has undergone a change in scope, thereby occasioning the need for a fresh EIA and fresh public consultation including public hearing. Such assertion is wholly denied for being incorrect as the Project has not undergone any such change in scope. In this regard, it is submitted that while alleging that "*the project proponent made substantial changes in the design amounting to change in scope of the project*", the Appellants appear to have drawn sustenance from an erroneous comparison of the Salient Features of the Project in the Detailed Project Report (2006) ("**DPR**") and the current design parameters as per the 2021 EAC Minutes.

In this regard, it is pertinent to note that pursuant to Section 8 of the Electricity Act, 2003 and the guidelines thereunder, the DPR of hydroelectric schemes is prepared by the project proponent and submitted to the Central Electricity Authority ("**CEA**") for concurrence. Key parameters such as justification of the

NOTARY GOVT. OF UTTARAKHAND

महाप्रबंधक (सा...)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

project, hydrological parameters, installed capacity, project design principle (Civil/Electro-mechanical/Hydro-mechanical), etc; are more or less frozen during the DPR stage. Accordingly, the CEA accords a Technical- Economic Clearance, where under, the project proponent is permitted to optimize various project components as per the site conditions during the detailed design stage/construction stage. In fact, such optimization & detailed structural designing/analysis are carried out during the construction stage/design stage as per the site conditions or otherwise which is a common practice undertaken in all Hydroelectric projects and the present Project is no exception to the same.

In view of the foregoing, it is submitted that during the execution of the Project, certain components were optimised considering the site requirements which were carried without any modification in the basic design philosophy and main parameters of the project such as Probable Maximum Flood (PMF), Minimum Draw Down Level (MDDL), Full Reservoir Level (FRL), Maximum Water Level (MWL), Tail Water Level (TWL), Installed Capacity, etc.; and the same have been accordingly reported in the current salient features while applying for fresh EC. It is reiterated that (i) the purpose and installed capacity of the project; (ii) Height and Top elevation of the Dam; (iii) Storage capacities and submergence area of the project; (iv) Hydrology of the project; (v) Peak Maximum Flood (PMF); (vi) Design discharge of the project, are the same as

NOTARY
COVT. OF UTTARAKHAND

महाप्रबंधक (पर्या. एवं प्रभा.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

stipulated in the DPR. Therefore, there exists no change in scope as envisaged under the conditions stipulated in the EC dated 22.08.2007. This is evident from the table below:

SN	Parameter	DPR	Current as recorded in the EAC minutes	Change
01	Installed Capacity	444 MW	444 MW	No Change
02	Project Type	RoR	RoR	No Change
03	MDDL	E L 1252.5 m	E L 1252.5 m	No Change
04	FRL	E L 1267 m	E L 1267 m	No Change
05	TWL	Max. TWL 1030.0 m (with all M/C running)	Max. TWL 1030.0 m (with all M/C running)	No Change
06	Submergence Area	24.5 ha	24.5 ha	No Change
07	PMF	10840 m^3/sec	10840 m^3/sec	No Change

NOTARY
CONT. OF UTTARAKHAND

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

08	Design discharge	725 m3/s	725 m3/s	No Change

It is also pertinent to mention here that – a) the monitoring reports generated by the Answering Respondent through its contractor, i.e. M/s HCC concerning the environmental parameters and b) EMP monitoring reports generated on a six monthly basis, by a third-party entity, namely M/s WAPCOS; both reflect no significant impacts in the environment during the execution of the Project. Further, the Answering Respondent had, as part of the request for EC, requested the MoEF&CC to consider "one season baseline data" for the purpose of according "Terms of Reference" ("**ToR**"). This would have not only resulted in overall time and cost-efficiency but would also not prejudice any interests of stakeholders since the Project did not undergo any change in scope, as evidenced by the table referred *supra*.

12-13. That the contents of paras 12 and 13 are matters of record. For the sake of completeness, the Answering Respondent submits that all the conditions laid by MoEF&CC in the ToR accorded *vide* letter dated 02.03.2021 were duly complied with by the Answering Respondent. Insofar as the email dated 17.08.2020 addressed by the Appellant No.1 is concerned, it is submitted that the suggestions made therein were not directed to be included in the cost-benefit analysis by either the EAC or the MoEF&CC. Even otherwise the Answering Respondent was not

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

bound to include the suggestions in the Cost-Benefit Analysis which was ultimately undertaken by M/s WAPCOS in accordance with the extant law. A Copy of the ToR Compliance Report is annexed and marked herewith as **Annexure - R/3-6.**

14. That the contents of para 14 are denied, and the Appellants are put to strict proof of the same. It is submitted that the scope and purport of the exemptions granted under the Notification dated 18.03.2021 which *inter alia* includes exemption from the requirement of public hearing, were such that it would squarely apply to the Project as the same has been implemented not less than fifty percent in its physical form. This is clear from the following table which details the total expenditure incurred by the Answering Respondent as of June 2021, as a function of the total financial outlay for the project. The constituents of the table below comprise of various items of work involved in execution of the project, against each of which a weightage in terms of its total share in the project costs has been assigned. In the last column of the table, the percentage of expenditure incurred against each line item in the form of weighted average has been provided. This information (which has been derived from the duly audited accounts) reflects that as of June 2021, the Answering Respondent had spent 53.05% of the total project costs without taking into account the IDC. This naturally and effectively shows that the project had been implemented not less than 50% of its physical form.

महाप्रबंधक (सोशल एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

S. No.	Item of Works	Cost	Financial Progress		Physical Progress	
			Expenditure (Rs in Lakhs)	% age	Expenditure (Rs in Lakhs)	% age
1	Works (Civil, HM & EM)	264527.84	130279.62	33.75 %	130279.62	37.13%
2	Infrastructure	21228.99	14850.01	3.85%	14850.01	4.23%
3	Establishment	30516.04	37220.50	9.64%	37220.50	10.61%
4	R&R	18921.07	9636.29	2.50%	9636.29	2.75%
5	CAT Plan & Environment	7654.95	5943.43	1.54%	5943.43	1.69%
6	Miscellaneous	8022.03	11691.78	3.03%	11691.78	3.33%
7	Outstanding Contractual Advances (to be deducted)				**-23488.00**	-6.69%
8	Total	**350870.92**			**186133.63**	**53.05%**
9	IDC	35165.00	16946.60	4.39%		
10	**Gross Total**	**386035.92**	**226568.23**	**58.69 %**		

The above information establishes that up to June 2021, the Project had attained 53.05% implementation which is well above the minimum threshold as provided in the Notification dated 18.03.2021. Thus, any averment suggesting that the Answering Respondent could not have taken the benefit under said notification is misguided and erroneous.

General Manager
टीएचडीसी इण्डिया लि.
THDC India Ltd. Rishikesh

15. In response to contents of Para 15, while the contents of the Letter dated 08.07.2021 addressed by the Answering Respondent to the MoEF&CC are admitted, it is pertinent to mention that the MoEF&CC *vide* its Letter dated 01.06.2021 had allowed the Project to receive the benefit of the exemption granted under Notification dated 18.03.2021 based on three facts, namely – a) that the EAC recommended that such exemption from re-conducting public hearing be granted to the Answering Respondent in connection with the Project since no additional land was required in construction of the Project; b) that as per the purport and scope of the Notification dated 18.03.2021, compliance with such requirement may be exempted in cases of Projects that have been implemented not less than fifty percent in its physical form or construction and c) the Answering Respondent *vide* Email dated 15.04.2021 had confirmed the MoEF&CC of the fact that the physical progress of the Project exceeded 50%. Such confirmation along with the various site visits and physical inspection of the Project site which had been carried out by the officials of MoEF&CC from time to time. It was in view of these three facts that the MoEF&CC granted such exemption in favour of the Project.

16. The contents of Para 16 are denied in their entirety. It is pertinent to highlight that the Appellants are well aware of the fact that the Project is under active construction stage and was already provided with the necessary environment clearance on

महाप्रबंधक (पर्या. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

22.08.2007, which was granted on the basis of the final EIA/EMP Report generated at the time. The final EIA/EMP Report generated at the time when the original EC was granted, i.e., on 22.08.2007 was prepared in keeping with all compliances which *inter alia* included the process of public hearing. Accordingly, the said report was duly updated with the concerns/responses of stakeholders expressed at the time of the public hearing as was conducted then in accordance with the conditions laid down in the EIA Notification, 2006. In such light, it is necessary to appreciate that the EIA/EMP Report prepared at the relevant time is largely complete and in the present day requires only mere updation, more so because the Project is an 'ongoing' project without any substantive changes having taken place in design and/or its scope. Based on these facts and circumstances, the MoEF&CC *vide* its Letter dated 02.03.2021 accorded ToR to the Project whereby it has directed that the Answering Respondent may proceed to prepare the EIA/EMP Report based on one-season fresh baseline data. Such variation emanates from a mindful consideration of the circumstances surrounding the present progress of the Project and thus cannot be faulted with on any ground. As such, the present EIA report submitted by the Answering Respondent was prepared based on one season baseline data in consonance with the ToR stipulated by MoEF&CC, and no infirmity can be made out with the same.

महाप्रबंधक (
General Manager
टीएचडीसी इण्डिया लि.,
THDC India Ltd. Rishikesh

It is pertinent to note that in terms of the letter dated 01.06.2021 issued by the MoEF&CC, the requirement for a public hearing stood dispensed with for reasons highlighted above. The EIA/EMP report was submitted to the EAC on 15.07.2021 for appraisal and review. The same was considered by the EAC in its meeting conducted on 27.07.2021. Thereafter, the minutes of meeting dated 27.07.2021, were uploaded on the official MoEF&CC website on 16.08.2021 which *inter alia* noted the fact that EAC recommended grant of EC in favour of the Project and accordingly, the said recommendation was allowed subject to certain additional conditions of compliance by the Answering Respondent. A perusal of the additional conditions as prescribed and noted during the course of the said meeting indicates that there was no condition imposed upon the Answering Respondent to submit any other document and/or update any submitted document to the Form-2 already submitted by the Answering Respondent. Since the public hearing had already been dispensed with and no comments were made to the draft EIA/EMP Report by the EAC, it is this report which stood accepted and is liable to be treated as the approved and final EIA/EMP Report. Accordingly, the Answering Respondent uploaded the same on its website for ease of public access. It is reiterated that the need for a repeated action of conducting a public hearing does not arise in the present instance for the reasons stated *supra* and more pertinently because there has been no substantive change

NOTARY GOVT. OF UTTARAKHAND

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

carried out in design and/scope of the Project. It is also noteworthy that the EAC in its meeting conducted on 27.07.2021 has mindfully noted that all compliances with respect to process of public hearing had been adequately completed. This observation was expressly made and recorded in the minutes of meeting dated 27.07.2021 and has been reproduced below for ease of reference –

> *"15.4.2.*
>
> *xxv) The commitments made by the Project during Public Hearing held on 09.01.2007 are all fulfilled by the project and compliance of the same is being shared with the MoEF&CC through six monthly compliance report. Also, MoEF&CC vide its letter dated 01.06.2021 grant exemption to under construction VPHEP project from any repeat Public Hearing..."*

Therefore, on any count, the Appellants objections in the para under reply are devoid of any merit.

17. The contents of Para 17 are wholly denied. The Answering Respondent specifically denies the allegation that the EIA Report is deficient and fails to consider various environmental impacts and also the table reproduced by the Appellants in the corresponding para, containing summary of certain purported monetary value of environmental costs for which the Appellants are put to strict proof thereof. It is submitted that the EIA/EMP

NOTARY GOVT. OF UTTARAKHAND

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

prepared for the Project by M/s WAPCOS Limited, is in accordance with the Guidelines issued by the MoEF&CC for conducting EIA/EMP as well as those guidelines issued *vide* its Letter No. 7-69/2011-FC(Pt.) dated 01.08.2017 (for conducting cost-benefit analysis for projects involving diversion of forest land under provisions of the Forest (Conservation) Act, 1980) which identifies all potential adverse impacts such as sedimentation, fugitive emissions, blasting operations, pollution due to increased vehicular movement etc.; and accordingly provides for mitigating such impact. Thus, the Appellants are incorrect in alleging that the report as it stands fails to note crucial aspects such as environmental impact and/or environmental costs simply on the basis that the factors considered by Appellant No. 1 in its cost-benefit analysis have purportedly not been included. Further, it is pertinent to note that the cost-benefit analysis conducted by M/s WAPCOS at Chapter 9 of the REIA Report (relevant extracts whereof have been annexed as Annexure -R/3-5 *supra*) has been done in accordance with all parameters recommended in the guidelines issued by MoEF&CC as stated *supra* in this respect, and no deficiency can be made out.

18. The contents of Para 18 are wholly denied. As stated in the foregoing submissions, the Project has not undergone any substantive changes in design and/or scope. The allegation that the Answering Respondent misled the concerned authorities regarding the physical status of the Project and wrongly claimed

NOTARY ... GOVT. OF UTTARAKHAND

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

that the Project is in advance stage of construction is completely denied. Equally unworthy is the allegation that the EAC blindly relied upon the submissions of the Answering Respondent and did not verify the correctness of the same. In this regard, the Answering Respondent submits that the officials of the MoEF&CC had from time to time undertaken site visits of the Project and were thus completely aware of the progress made towards the implementation of the Project. Aside from the above, the Answering Respondent had made two detailed presentations before the EAC on 29.07.2020 wherein the status of the Project and completion of milestones was duly informed to the EAC. These facts are also recorded in the Minutes of Meeting of EAC dated 29.07.2020 (*See Annexure A-6 as filed by the Appellants)*. Thereafter, another presentation detailing the status of the Project and milestones was made by the Answering Respondent on 27.07.2021, which fact finds mentioned in the Minutes of Meeting of EAC dated 27.07.2021 (*See Annexure A-12 as filed by the Appellants)*. Furthermore, by the time the EAC meeting for the purpose of recommending EC to the Project took place on 29.07.2021, the Project was already exempted from *'public hearing' vide* Letter dated 01.06.2021 issued by MoEF&CC, on the strength of the Notification dated 18.03.2021. A Copy of the Answering Respondent's Presentation dated 27.07.2021 (relevant extracts) is annexed and marked herewith as **Annexure -R/3-7.**

महाप्रबंधक (सामा. एवं पया.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

19-20. The contents of Paras 19 and 20 are wholly denied. It is submitted that the process followed by the EAC and MoEF&CC, respectively, cannot be said to have been carried out in a casual, improper and illegal manner. In fact, the record shows that the EAC and the MoEF&CC were alive to all relevant considerations in connection with the grant of EC to the Project and such approval was well in accordance with extant guidelines and regulations, applicable in the present case.

RE: GROUNDS

A. That the submissions raised in Ground 'A' are entirely denied. It is specifically denied that the Project has undergone a change in scope and/or substantial changes in design and parameters for which a fresh appraisal as per the EIA Regulations is required. The other allegations that the EAC failed to consider that the Project (as considered for the Impugned EC) is substantially different from the one for which original EC dated 22.08.2007 was granted is also denied. The Answering Respondent has exhaustively addressed such contentions in Para 11 of the instant Reply, which for the sake of brevity are not being repeated herein but may be read as part and parcel of the reply to the present Ground.

In particular, the Answering Respondent reiterates that the purported comparison done by the Appellants between certain technical features in the 2006 DPR and the EAC minutes of 2021 to allege a change in scope is totally misconceived. As already

NOTARY GOVT. OF UTTARAKHAND

महाप्रबंधक (सा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

detailed in Para 11 *supra*, the core features of the Project remain unchanged, and the changes highlighted in the table in Ground 'A' are only changes made to optimize various Project components. These changes are limited to optimization only and cannot be said to constitute a change in scope, as wrongly contended by the Appellants.

In the present instance, while the Appellants have raised various spurious grounds to allege that the Project has undergone a change in scope by using a comparative approach between the DPR and the current stage reports/data of the Project, the Appellants have failed to show as to how there has been a substantial and meaningful change in the Project, such that the Project has become a totally new project, thereby disentitling it from the benefit of the Notifications dated 14.09.2016, 18.01.2021 and 18.03.2021. In the respectful submission of the Answering Respondent, it is not enough for the Appellants to cherry pick certain optimizations that have been made in the technical specifications/project components and on that basis alone allege a change in scope of the Project. The change in scope must derive its color, purpose and meaning from the EIA Notification, 2006 and thus should be one which renders the current Project as being qualitatively different from the one originally appraised at the time of grant of original EC. This is not the case here and the Appellants besides pointing out purported changes have failed to explain as to how the Project is

NOTARY GOVT. OF UTTARAKHAND

महाप्रबंधक (सा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

qualitatively different (as it stood in June 2021) from when it was originally envisaged and appraised for the grant of EC in the year 2007. Furthermore, even while the Appellants have pointed out to several purported "changes", they have not pleaded much less shown by cogent evidence as to how the environmental impact of the Project (as appraised in June 2021 for grant of fresh EC) is materially different from the original environmental impact of the Project as it stood in the year 2007. In other words, while the general plea of change in scope has been advanced, there is absolutely no nexus drawn between this so-called change in scope and the impact of the Project (with such change in scope) on the environment, which constitutes the fundamental issue to be borne in mind and decided.

Additionally, the reliance by the Appellants on the factum of there being a 'Design Review Consultancy' Contract executed by the Answering Respondent with an international design consultant to support their theory of change in scope is also misplaced. The overall framework and broad contours of the Project were finalized at the time of DPR in the year 2006 itself. However, the specific designing of individual components and detailed analysis of the various components is to be done by a design consultant after the basic (tender stage) hydraulic and geo-technical inputs have been provided to it by the Answering Respondent. This is in line with the well-established and customary practice, where upon receipt of the basic design

NOTARY ... GOVT. OF UTTARAKHAND

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

inputs, the expert design consultant works out the design, reviews the engineering studies, analysis and reports submitted by the EPC contractors and ensures compatibility of various components to fulfill the implementation of the Project. This by itself, however, does not mean that there is a change in scope of the Project. It bears repetition to state that the core and fundamental attributes of the Project remain unchanged, and the provision of design and services does not amount to change in scope for the purposes of the EIA Notification.

The Appellants further submit that in view of the alleged and purported "change in scope" of the Project, the exemptions granted by way of Notifications No. S.O 2944 (E) dated 14.09.2016 for extension of validity of three years, Notification dated 18.01.2021 (excluding one year validity in view of Covid-19) and Notification No. S.O 1247(E) dated 18.03.2021 for exemption from public hearing on the basis of 50% construction have been wrongly applied in favour of the Answering Respondent. Such assertion is entirely bareboned and meritless for the simple reason that a perusal of the submissions made *supra* would establish that no substantive change in scope and/or design had occurred in the Project and thus exemptions granted through the aforesaid Notifications could enure to the benefit of the Answering Respondent. In any case, it constitutes a complete mischaracterization of the Notifications in question to urge that the benefits under these Notifications would not apply in case there is any change in scope of Project (which in any

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

case there is none). Last, the judgments cited and relied upon by the Appellants do not automatically lead to an adverse inference against the case of the Answering Respondent. It is submitted that each of the judgments cited are clearly distinguishable from the facts of the instant case and have no application to the present facts.

B. That the contents of Ground 'B' have already been dealt with and responded to in Para 14 of the present Reply, which may be read as part and parcel to the present Ground under reply. That said, the Answering Respondent denies the various allegations made in the said Ground, with respect to the fact that the Answering Respondent had not achieved 50% or more progress by the time the exemption from public hearing was granted in June 2021. The Answering Respondent submits that for the purposes of the Notification dated 18.03.2021, the dispensation for holding a public hearing can be granted if the Project has achieved not less than 50% physical form or construction. In the Project of the present nature which entails various milestones/activities to be completed, the implementation of the Project in terms of physical form can only be meaningfully reckoned in terms of the percentage of the amount spent by the project proponent vis a vis the total project cost. Incidentally, in the Ground under reply, the Appellants have also worked out the implementation of the Project in terms of the financial progress of the Project. In this light, as detailed in Para 14 *supra,* the total project spent by the

NOTARY Govt. of Uttarakhand

महाप्रबंधक (सा.मा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

Answering Respondent as on June 2021 was INR 2265.68 Cr This figure when contrasted with the approved final project cost, i.e., INR 3860.35 Cr works out to 58.69%. In other words, the Answering Respondent spent 53.05% of the total approved final project cost, thereby evincing that the implementation of the Project at the relevant time was more than 50%.

That said, it is imperative to clarify that in the Ground under reply, the Appellants have considered the total project cost to be INR 4397.8 Crores, which figure has been taken from the CEA Report of 2021. In this regard, the Answering Respondent submits that the said amount of INR 4397.8 Crores is not the approved final project cost but only the tentative estimate of the final project cost which may be incurred at the time of the anticipated completion of the Project in December 2024. Thus, this figure cannot be considered for the purpose of discerning the financial progress of the Project in percentage terms and it is only the figure of the approved project costs of INR 3860.35 Crores which should be taken into consideration. That said, even considering this figure of INR 4397.8 Crores, the spent amount of INR 2265.68 Crores as of June 2021 constitutes 51.5%.

C. That the submissions made in Ground 'C' are denied in their entirety and the Appellants are put to strict proof thereof. It is submitted that the present Project is a World Bank financed project which has been subject to various pre-conditions and continuous checks based on environmental and social safeguard

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

standards as mandated by the World Bank. In addition to the EIA report prepared in 2006 to comply with the World Bank international standards, the Answering Respondent also commissioned another EIA-EMP in the year 2009. This EIA was conducted by CES, a third-party entity, after following a due tender process. The 2009 CES Report is a comprehensive report specifying best practices, which takes into account various internationally accepted methodologies for safeguarding and protecting the environment. Since the said Report is voluminous, Executive summary of the said report are being annexed along with the present Reply. A Copy of the Executive Summary (2009 CES Report) is annexed and marked herewith as **Annexure- R/3-8.**

The Answering Respondent has been executing the Project in terms of the EC and the best practices outlined in the 2009 CES Report.

The so-called shortcomings highlighted in the REIA Report, outlined by the Appellants in Ground under reply have been clearly addressed and dealt with in the first EIA Report of 2006 and 2009 CES Report. It is significant to clarify that the REIA Report is concurrent with respect to the ongoing Project and its mandate is largely confined to assessing whether the implementation of the ongoing Project requires safeguards in addition to those specified in the EIA Report of 2006 to be adopted. It is for this reason that the impugned EC makes it clear that all terms and conditions of the 2007 EC must be adhered to by the Answering Respondent.

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

That said, before providing a point-wise response to the same, it is pertinent to mention that each of the specific points mentioned in Ground 'C' are attributes of the Project as originally conceived in and assessed for environmental viability at the time of grant of the original EC in the year 2007. In other words, it is not as if these potential issues have only arisen now so as to give the Appellants any *locus* to raise a challenge with respect to the same. The Appellants cannot be permitted to raise these issues at present since the Project with all such attributes was already granted an EC in the year 2007.

The Answering Respondent is providing its point-wise response to Ground 'C', as follows –

Impact of Soil Erosion

The Appellants have incorrectly stated that the flow passing through the reservoir will be 'sediment scarce'. In fact, the Project reservoir will trap only coarser sediments whereas more of the medium and fine sediments particles will flow with the river discharge passing through the spillways.

Pertinently, soil erosion is more a function of discharge and velocity of river flow rather than sediment concentration. Thus, the statement that the river flow with less sediments will cause more soil erosion cannot be supported factually. Moreover, in hilly terrain the river flow through rocky strata, therefore, the contention of soil erosion in the downstream of project is not correct. In monsoon sufficient discharge will be released from the

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
[illegible] लि., ऋषिकेश
[illegible]

Dam which will be sufficient to carry the load of silt (during silt flushing) to the downstream river course. Accordingly, the normal erosion and sediment transport typically observed in riverbeds and along riverbanks will not be disturbed by the Project set up. A well-designed Catchment Area Treatment ("**CAT**") Plan is prepared to address the issue of soil erosion and sedimentation in the dam. The CAT plan is prepared and being implemented by the State Forest Deptt., Govt. of Uttarakhand. The Catchment Area Treatment involves understanding of the erosion characteristics of the terrain and suggesting remedial measures to reduce the erosion rate. For this reason, the catchments of the directly draining rivers, streams, tributaries, etc. are treated and the treatment plan has been included in the project. The criticism of the mitigation measure i.e., flushing to clear out the sediments on the basis that the same will disturb sediment balance and cause further erosion is completely unfounded.

Impact of Blasting:

The allegations/faults highlighted by the Appellants under such heading are false and misleading and accordingly stand denied. Blasting for construction activities is being done in a controlled manner and monitoring of the same is done on day-to-day basis through a reputed agency such as Central Institute of Mining & Fuel Research (CIMFR), Roorkee. A perusal of the latest report provided by CIMFR, (September 2021) also does not report any adverse impact. Thus, the Appellants attempt to selectively look

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

at data without assessing the current status at the Project area and the mitigative measures being taken in any case by the Answering Respondent amount to an unfair and misleading assessment, solely done for the purpose of prejudicing this Hon'ble Tribunal.

In any event, it is noteworthy that to avoid excessive use of blasting, the Answering Respondent has installed Tunnel Boring Machine (TBM) for construction of Head Race Tunnel (HRT) in the Project area, which will avoid use of blasting technique for construction of Project. Internationally, insofar as safeguarding the environment is concerned, TBM has been found preferable over Drilling and Blasting Method (DBM). Further, in addition to such measures, all the structures lying along the alignment of HRT (up to 250 metres on either side of tunnel) have been insured and are protected should anything adverse occur on site. Copy of the Monthly Report on Blast Induced Ground Vibration Monitoring at VPHEP prepared by CIMFR is annexed and marked as **Annexure – R/3-9.**

NOTARY
GOVT. OF UTTARAKHAND

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

Impact on Aquatic Biodiversity

The submissions made under this head are baseless, incorrect and misleading hence, denied. At the outset it is stated that the Project is being implemented in keeping with the principles of maintaining ecological conservation to the highest extent possible. The 2006 EIA Report, 2009 CES Report and REIA Report of 2021 did not suggest any appreciable changes in climatic factors due to the Project.

In any case, the Answering Respondent is committed to protect the biodiversity surrounding the Project and has accordingly adopted a multi-tier monitoring and implementing mechanism for ensuring the same. The mechanisms adopted by the Answering Respondent in this regard are *inter alia* as follows -

a. The CAT plan is prepared and being implemented by the State Forest Deptt., Govt. of Uttarakhand. The budget of INR 47 Crores has already been deposited to the Compensatory Afforestation Fund Management and Planning Authority ("**CAMPA**") Fund by Answering Respondent. Further, works executed by Forest Department are being monitored by a third-party agency i.e., the Indian Council of Forestry Research and Education ("**ICFRE**").

b. For protecting the environment and social aspects of Project near by area, proper mitigation plans have been prepared under EMP of the Project which got approved

महाप्रबंधक (सा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

by MoEF&CC the Answering Respondent is committed for proper implementation of the same on the Project site. Further, third party monitoring through entities such as M/s WAPCOS and M/s HCC are done on a regular basis and accordingly, no such adverse impact is going unreported.

c. *Vide* letter no. J-12011/29/2007-IA-1 dated 10.10.2017, MoEF&CC, New Delhi re-constituted the Multi-Disciplinary Committee under the Chairmanship of PCCF-HoFF, GoUK with experts from various backgrounds including Ecology, Forest, Wildlife, Sociology, NGO etc; to oversee implementation of various environmental safeguards proposed in EIA/EMP of the project. This reconstituted committee has met thrice i.e., on 08.07.2018, 28.02.2020, and 31.07.2021, respectively. However, since only the minutes of meeting dated 28.02.2020 have been uploaded, the same are being annexed with the present reply. A Copy of Letter no. J-12011/29/2007-IA-1 dated 10.10.2017 is annexed and marked herewith as **Annexure- R/3 - 10.** Copy of the Minutes of Meeting dated 28.02.2020 of Multi-Disciplinary Committee under the Chairmanship of PCCF-HoFF, GoUK is annexed and marked herewith as **Annexure - R/3 - 11.**

d. The Project has consulted Wildlife Institute of India ("**WII**"),

महाप्रबंधक (सोशल एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

Dehradun to mitigate / minimize the adverse impact on Fish population and based on the recommendation of WII, Dehradun, Project has engaged Indian Council of Agricultural Research - Directorate of Cold-Water Fisheries Research ("**ICAR-DCFR**"), Bhimtal for preparation and implementation of Fish Management Plan of the Project. Based on the recommendations of ICAR-DCFR a snow trout (i.e., Schizothorax richardsonii) Fish Hatchery is under construction at Project site for strengthening the Fish population in the river Alaknanda.

Aside from the above, it is noteworthy that in order to mitigate the issue arising out of blocking the path of the fishes, a fish hatchery has been found to be a more viable and feasible option as compared to building a fish ladder. Some of the reasons supporting such view are *inter alia* as follows –

i. Typically, the snow trout species of fish are known to be weak swimmers with a lower capacity for jumping over tall heights. In the present case, since the Project dam is exceeding 65m in height, installation of a fish ladder will not enable the seamless migration of the snow trout fish.

ii. Alternatively, a 'fish lift' can not only enable the snow trout to migrate easily but also enable smaller sized fish to traverse such course thereby enhancing the overall probability of the secure migration of fish in

NOTARY ★ GOVT. OF UTTARAKHAND ★

महाप्रबंधक (सा.प्र.एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

the river.

Copy of the relevant extracts of the 'Progress Report' prepared by ICAR- Directorate of Coldwater Fisheries and Research, Bhimtal, Uttarakhand are annexed and marked herewith as **Annexure-R/3-12.**

e. Government Post Graduate College, Gopeshwar has been engaged to monitor the Ecology in the project area in order to assess Environmental & Biological wealth during construction period. No adverse impact has been reported by the agencies till date. A Copy of the 'Technical Report of Ecological Monitoring of Vishnugad-Pipalkoti Hydro Electric Project' prepared by Government Post Graduate College, Gopeshwar is annexed and marked herewith as **Annexure - R/3- 13.**

Impact due to deterioration in the Water Quality:

The Answering Respondent is mindful and committed towards ensuring no deterioration of water quality takes place as a result of the execution of the Project. The same is being ensured in *inter alia the following ways* –

a. The Project is conducting the monitoring of River Water et;. through reputed recognized Govt. lab, Pollution Control Research Institute i.e., Bharat Heavy Electrical Limited (PCRI-BHEL), Haridwar (a Govt. of India undertaking). Around 43 parameters are being monitored and no deterioration has been reported till date. Copy of the Report dated 05.11.2020

महाप्रबंधक (सा.मा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

prepared by Pollution Control Research Institute is annexed and marked herewith as **Annexure -R/3 – 14.**

b. Similarly, an independent third-party agency i.e., M/s WAPCOS Limited, Gurugram, Haryana (a Govt. of India undertaking) has been engaged for monitoring of implementation of EMP and Aquatic Biodiversity of the river Alaknanda.

c. Mitigative steps on quarry and borrow area management are included in the EIA-EMP report and is regularly being followed.

d. Insofar as other potentially adverse environmental factors are concerned, the Answering Respondent has been entirely transparent with respect to the discovery and rectification of any such factors. The same for instance is evidenced by the fact that the MoEF&CC authorities regularly visit the project for onsite monitoring of the implementation of EC conditions and the MoEF&CC has been kept abreast with all regular updates regarding progress of the Project and also its environmental impact by way of monthly reports prepared by the third-party contractor, i.e. M/s HCC. A perusal of six-monthly compliance report (for the period Jan – June 2021) also would reveal that no adverse comment/observation has been received so far. A Copy of the Six Monthly compliance Report (Jan-June 2021) is annexed and marked herewith as

महाप्रबंधक (वानि. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

Annexure- R/3-15.

e. Adequate arrangements for sewage treatment have been made in EMP and are being implemented accordingly. Beside the above, at present, 150 KLD capacity sewage treatment plant has also been constructed by the project for the disposal of domestic effluent/waste, for which Consolidated Consent Authorization ("**CCA**") has been obtained from the State Pollution Control Board.

Further, the Appellants reliance on the Appellant No.1 's book titled "Water: Impact of Dams on its Qualities' is misplaced, and the Appellants are put to strict proof insofar as the cited paragraphs are concerned.

Loss of Aesthetic Value

The Appellants' grievance on this score are without merit and ignore the benefits which will be achieved by the construction of the Project. It is submitted that citing literature, to support spurious reasoning which attempts to defeat the advantages of building dam projects cannot be a compelling reason to doubt the overall advantageous nature of the current Project. It is submitted that hydro power project improves the overall aesthetic value of the local area and generate employment for local people in remote hilly and backward areas and provide incidental benefits of development of road/rail, telecommunications, electrification, industrialisation and improvement of the quality of life in backward areas which lead

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

to overall development of the area. Apart from the above, the construction and working of such projects as in the present case proves to be a robust source of income for the State Government and aids in boosting tourism etc.

Pertinently, various activities envisaged in the EMP of the Project such as - road side plantation, greenbelt development, afforestation work, development of herbal garden, stabilization of slope through biological measures and landscaping etc will in turn improve the aesthetic value of the area. Thus, all submissions made by the Appellant in this respect overlooks the many advantages arising out of execution of Projects such as the present one and hence ought not to be considered in the present case. The Appellants reliance on the study titled as *"Non-Use Value of River Ganga"* is not apposite to the present Project and does not constitute any ground to revoke the EC granted in favour of the present Project.

Presence of RET Species not considered:

The Appellants submissions under this head, are challenges which arise in case of all projects and are not unique to the present Project alone. In order to overcome potential prejudice to native species of flora and fauna, as stated *supra* the Answering Respondent has engaged third party agencies and expert institutes to regularly monitor the status of the Project's potential adverse impact on the animal population in and around the Project's vicinity. Further, considering that the Project is a

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

World-Bank financed project, as stated hereinabove, the Project has also been studied based not only on parameters stipulated in the relevant EIA notifications but also those stipulated by the World Bank and the 2009 CES Report is a testament to this fact. The Answering Respondent is constantly vigilant regarding developing mitigative measures to reduce any adverse impact if at all on the overall ecosystem. A perusal of the Six-Monthly Compliance Report (annexed herewith as *Annexure-R/3-15*) would also indicate that measures such as Fish Management Plan, roadside plantation etc; all are being undertaken on a regular basis. Thus, this Hon'ble Tribunal should not be prejudiced by these generic issues which will arise in any project similar to the current Project, in view of the mitigation measures taken by the Answering Respondent.

The submissions made in the Appeal also ignore the actual measures taken by the Answering Respondent to ensure utmost protection in and around the Project. The measures taken by the Answering Respondent *inter alia* include –

a. Installation of watch towers at identified locations at Powerhouse and TBM sites nearby the boundary of KWLS. *(See S.No.3 of Compliance Report annexed as Annexure R/3 -15)*

b. Provision of required logistical assistance to Forest Department for the monitoring of Nanda Devi Bio-sphere Reserve (NDBR), Joshimath;

महाप्रबंधक (सामा. एव पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

c. Compensatory Afforestation(120.27ha) and other works (Roadside Plantation, construction of 4 feet high pillar etc.) is already being done by the State Forest Department, Govt. of Uttarakhand and the requisite funds have already been deposited by Answering Respondent in CAMPA.

D. That the submissions raised in Ground 'D' are entirely meritless and accordingly denied. Once again, the Appellants have attempted to challenge the entire process by way of which the EAC granted EC to the Project on a misconceived basis that the same stands vitiated on the ground of lack of application of mind. Such submission is far from the truth as the EAC has in fact considered all the underlying reports and documents including the CBA which was conducted by M/s WAPCOS which is an accredited environmental consultant. As stated in the foregoing submissions, more particularly in Paras 14 and 17, the CBA prepared by M/s WAPCOS cannot be faulted with as it is made in accordance with the parameters as set out *vide* letter No. 7-69/2011-FC(Pt.) dated 01.08.2017. In the absence of any specific earmarked guidelines for the purpose of working out Cost Benefit Analysis, the guidelines as notified *vide* letter No. 7-69/2011-FC(Pt.) dated 01.08.2017 albeit for the purpose of forest diversion, provide useful guidance for working out cost benefit analysis. No infirmity or lacunae can be alleged in the use of said guidelines as guiding factors for working out the CBA as it is the only available norm published by the MoEF&CC in this regard.

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

Therefore, a combined reading of the above as well as the submissions made in Paras 11 and 17, the averments raised in the Ground under reply, ought not to be considered by this Hon'ble Tribunal on account of being devoid of any merit.

E. That the submissions contained in Ground 'E' are wholly denied for being meritless and factually incorrect. The Answering Respondent has already addressed the issues regarding 'change in scope' of Project and exemption from public hearing in Paras 11,14,16,17 hereinabove. Thus, for the sake of brevity the said submissions are not being repeated herein but may be read as part and parcel of the present paragraph being advanced in connection to the averments raised in the Ground under reply. That apart, it is also submitted that each of the judgments cited are clearly distinguishable from the facts of the instant case and accordingly have no application to the present facts. The Answering Respondent craves liberty to deal with the said judgments at the time of the hearing of the present appeal.

F. The contents of Ground F are denied in their entirety. While it is true that the Project is run of the river, pertinently, the same provisions for diurnal storage capacity, and utilize a net rated head of 212.46m. This allows the power plant to operate as a peaking load station. This aspect has been explained in Chapter-I, Volume-II of DPR. As such, it is denied that the Answering Respondent has misled the EAC, or that the EAC has proceeded

NOTARY Anil Kumar Regd. No. 12601/02 GOVT. OF UTTARAKHAND

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

only upon the information provided by the Answering Respondent without verifying the same. Copy of Chapter-I, Volume-II of DPR, is annexed and marked herewith as **Annexure – R/3 -16.**

G. The contents of Ground G are denied as being specious. It is submitted that the Appellants have wrongly conflated the devastation caused natural calamities with the impact of hydro power projects undertaken in the area. Admittedly, the flooding event in the Tapovan-Vishnugadh HEP was caused by a glacial debris flow in February 2021 and could not in any manner be attributed to the said project itself. It is submitted that such events are not and cannot be triggered by scientifically controlled blasting or designed scope excavation adopted in the development of Hydro power projects. Quite to the contrary, it is submitted that the Tapovan Barrage has minimized the effect of flash flood to a great extent in the downstream area. Similarly, the Tehri Dam subdued the effect of the flood in 2013. Pertinently, the Project is 21 km downstream of the Tapovan Vishnugad HEP (TVHEP). The flooding incident referred to in the para under response did not impact the Project adversely, as the flood passed safely through the diversion tunnel. Therefore, the riverbed level near project has not risen. The deposited muck around coffer dam has also been cleared. Thus, the Project has not undergone any landscape change. In fact, the reports referred to in the ground under response pertain to the Tapovan

NOTARY ★ ★ GOVT. OF UTTARAKHAND

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

Vishnugad HEP (TVHEP) and have no nexus with the Project. Insofar as the averments regarding the mitigation measures undertaken pursuant to the EMP, it is submitted that slope stabilisation measures such as construction of a diversion tunnel, trail race tunnel area etc. have already been carried out.

5. Considering all the submissions advanced, it is humbly submitted that no case has been made out for quashing the Environmental Clearance dated 26.08.2021 and issued in favour of the present Project and thus, this Hon'ble Tribunal may be pleased to dismiss the present Appeal with costs.

NOTARY ★ GOVT. OF UTTARAKHAND ★

RESPONDENT NO.3

General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

FILED THROUGH:

DHRUV DEWAN/HARSHITA CHOUBEY/CHANDNI GHATAK
ADVOCATES FOR RESPONDENT NO.3
C-519, SECOND FLOOR, DEFENCE COLONY, NEW DELHI - 110024
M: +91 9999776655/ +91 8769842888
E: choubey.harshita@gmail.com / chandnighatak26@gmail.com

PLACE: NEW DELHI

DATE: ____.03.2022

BEFORE THE NATIONAL GREEN TRIBUNAL

AT NEW DELHI

MEMORANDUM OF APPEAL

APPEAL NO. 21 OF 2021

IN THE MATTER OF:

DR. BHARAT JHUNJUNWALA & ANR

...APPELLANTS

VERSUS

UNION OF INDIA & ORS **...RESPONDENTS**

AFFIDAVIT

I, Pradeep Kumar Naithani, son of Late Sh. Govind Ram Naithani aged about 59 years, Address Office of General Manager (Social and Environment) , Gangotri Bhawan , THDCIL, Pragatipuram, Bypass Road, Rishikesh and working as General Manager (Social and Environment) for the Respondent No.3, do hereby solemnly affirm and state as under:

1. That I am the authorised representative of the Respondent No.3 in the captioned appeal and am well conversant with all the facts and circumstances of the case and as such I am competent to swear this present Affidavit.

2. That I have read and understood the contents of the accompanying Reply and say that the facts stated therein are true and correct to the best of my knowledge and belief as derived from the records of the case.

3. I state and declare that the accompanying Reply has been drafted on behalf of Respondent No.3 under my instructions.

Register S.No 815
Date 28.3.22

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

4. I also state that the copies of the documents annexed to the present Reply are true copies of their respective originals.

DEPONENT

महाप्रबंधक (सा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

VERIFICATION:

I, the above named Deponent do hereby verify that the contents stated in the above Affidavit are true and correct to the best of my knowledge and belief and no part of it is false and nothing material has been concealed therefrom.

Verified at Rishikesh on this 29 day of March 2022.

NOTARY GOVT. OF UTTARAKHAND

This affidavit is sign and Sworn before me Pradeep Kr. Naithani who is identified by [illegible]

Anil Kumar Notary
Tehsil Rishikesh

DEPONENT

महाप्रबंधक (सा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

ANNEXURE - R/3-1

ITEM NO.19 COURT NO.5 SECTION XVII

S U P R E M E C O U R T O F I N D I A
RECORD OF PROCEEDINGS

CIVIL APPEAL Diary No(s). 42503/2017

(Arising out of impugned final judgment and order dated 12-09-2017 in RA No. 8/2017 13-04-2017 in OA No. 197/2016 passed by the National Green Tribunal)

TEHRI HYDRO DEVELOPMENT CORPORATION Petitioner(s)

VERSUS

VIMAL BHAI & ORS. Respondent(s)
(IA No.10863/2018-EXEMPTION FROM FILING C/C OF THE IMPUGNED JUDGMENT and IA No.10861/2018-STAY APPLICATION and IA No.10856/2018-CONDONATION OF DELAY IN FILING APPEAL and IA No.10864/2018-PERMISSION TO PLACE ADDITIONAL FACTS AND GROUNDS and IA No.12413/2018-PERMISSION TO FILE ADDITIONAL DOCUMENTS)

Date : 02-02-2018 This petition was called on for hearing today.

CORAM : HON'BLE MR. JUSTICE A.K. SIKRI
HON'BLE MR. JUSTICE ASHOK BHUSHAN

For Petitioner(s) Mr. P.S. Narasimha, ASG
Mr. Anil Kaushik, Adv.
Mr. Uttam Dutt, Adv.
Mr. Rajinder Singh, Adv.
Mr. Abhishek Mishra, Adv.
Ms. Riya Gulati, Adv.
Ms. Arunima Dwivedi, AOR

For Respondent(s)

UPON hearing the counsel the Court made the following
O R D E R

Delay condoned.

Issue notice, returnable in six weeks.

In the meantime, the petitioner is not required to pay the penalty as ordered by the Tribunal.

(ASHWANI THAKUR) (MALA KUMARI SHARMA)
COURT MASTER (SH) COURT MASTER

//True Copy//

टीएचडीसी इंडिया लिमिटेड
THDC INDIA LIMITED
(भारत सरकार एवं उ.प्र.सरकार का संयुक्त उपक्रम)
(A Joint venture of Govt. of India & Govt. of UP)
CIN : U45203UR1988GOI009822

No. THDCIL/RKSH/ DTS/ 3653
Dated: 13.09.19

Mrs. GEETA MENON
Joint Secretary (EIA-I Division)
Ministry of Environment, Forest & Climate Change, Govt. of India
Indira Paryavaran Bhawan, Jor bagh Road,
New Delhi - 110003

Madam,

Subject: Implementation of 444 MW Vishnugad Pipalkoti Hydro Electric Project (VPHEP) by THDC India Limited (THDCIL) in district Chamoli, Uttarakhand – *Regarding extension of the validity of the Environment Clearance of the VPHEP beyond the extended period of 10+3 years.*

THDC India Limited (THDCIL), a Mini Ratna Category-I and Schedule 'A' CPSE under the administrative control under the Ministry of Power, is implementing the 444 MW Vishnugad Pipalkoti Hydro Electric Project (VPHEP) on river Alaknanda in district Chamoli in the State of Uttarakhand. The Civil and Hydro Mechanical works of VPHEP is currently under implementation by the contractor M/s HCC Limited. The project is under active construction stage. The project is being funded by the World Bank.

Vide letter no. J-12011/29/2007-IA.I dated 22.08.2007, the project has been accorded with Environmental Clearance (EC) by MoEF&CC, as per the provisions of the EIA Notification 1994 and 2006 ***(Annexure 1)***. Initially the E.C. was granted for a period of ten years i.e. up to 21.08.2017 and later the same got extended for a period of 03 years i.e. up to 21.08.2020 by MoEF&CC vide letter dated 25.04.2018 ***(Annexure 2)***. The project has been granted with the maximum extension as per the provision under EIA Notification 2006 and its subsequent amendment dated 14.09.2016 ***(Annexure 3)***.

Subsequent to the grant of E.C. to VPHEP in 2007, it took a period of more than six years for THDCIL to award the Civil & HM works of VPHEP, which got effective from 17.01.2014. This delay was attributed mainly due to delay in the forest clearance for diversion of 80.507 ha forest land.

//True Copy//

The Forest Land case of VPHEP was forwarded for consideration of the Forest Advisory Committee (FAC) of the MoEF&CC, GoI through the State Forest Department, GoUK in the year 2009. The same was deffered by FAC due to want of Cumulative Impact Assement Studies in the entire Alaknanda and Bahgirathi basins by IIT Roorkee and Wildlife Institute of India, Dehradun as per the directions of the Hon'ble Supreme Court of India in a case related to Forest land diversion for Kotlibhel 1A & 1B projects of NHPC. The Stage 1 Forest Clearance (Principal Approval) was granted to VPHEP proposal on 03rd June 2011 with certain stipulations which were fulfilled by the project in a time bound manner.

Further, due to involvement of considerable time period in obtaining the recommendations of the Standing Committee of the NBWL, the Stage 2 Forest Clearance (Final Approval) was granted to VPHEP on 28th May 2013 ***(Annexure 4)***. In the meantime, the Stage-1 Forest Clearance of the project was also challenged by Mr. Vimal Bhai and Others before the Hon'ble NGT during July 2011. The NGT Appeal No. 05/2011 was dismissed finding no merits vide order dated 14.12.2011 ***(Annexure 5)***.

Furthermore, the Government Order for the aforesaid Forest Land diversion from GoUK was issued on 06th Dec. 2013, with some additional delay from the date of issue of Stage-2 Forest Clearance ***(Annexure 6)***.

It is submitted that after the award of the project works in January 2014, the construction works were initially proposed to be executed within 54 months from the date of award. However the same got delayed due to various factors encountered by the project from time to time which includes Hindrances / stoppages caused by the locals, Poor Geology encountered, Unforeseeable conditions viz. rise in river water level etc.

It is pertinent to mention that Hindrances caused frequently by the local public (includes Project Affected Families) was among one of major reasons for delay of the project works at various construction sites like Dam Site, Machine Hall, Transformer Hall, Dumpyards, Main Access Tunnel (MAT), Ventilation Tunnel (VT), Tail Race Tunnel (TRT) area etc. The work progress got hampered at various instances due to non-availability of access and possession of site due to blockade of access road to site by locals, for a considerable time. The works at sites like TRT area were hindered frequently, with a total delay of more than a year time (i.e. 365 days). Even the start of works at Tunnel Boring Machine (TBM) site was held up for a period of about 06 months due to delay in handing over of encumbrances free site to the contractor. Similar delays also occurred in handing over other sites like Access Roads and Dumpyard to the

contractor. The project authority organized numerous meetings to appropriately address the public issues in consultation with the District Administration and the Social experts of the World Bank from time to time.

Apart from the above impediments, events attributed the poor geology encountered, unforeseeable conditions viz. rise in river level etc. were also among the reasons for considerable delay in the project construction schedule. Due to unprecedented rains in July 2013 resulting to catastrophe, there were aggradations in the river bed level at the location of approach to Power House. This led to the considerable change in level and location of the approach tunnels to the Power House (i.e MAT & VT). This required revised survey and fixing of alignment depending upon the availability of acquired & sufficient land and availability of reasonably good rock. As a result the approach road to MAT/VT which was in the scope of THDCIL and was to be handed over to the contractor on date of award could not be completed. The same was added in the scope of the Contractor.

In addition to the above, events of poor Geology encountered like Cavity formations (at TBM Adit, Transformer Hall, Machine hall, Adit to TRT), Loose fall (at MAT, TRT area & VT) and landsliding (at TRT road) considerably delayed the progress of construction works. Events of hindrance due to unforeseeable physical conditions viz. unforeseen increase in river water level also delayed the works at some sites like Dam site area. Additonally, Rockfall at Dam site area due to road widening works on NH-58 also delayed the works. All of these events were addressed by adopting appropriate measures like additional strengthening at various sites.

Moreover, the construction schedule was further delayed due to the financial stress being faced by the contractor. In order to come out with a solution, THDCIL has made every possible efforts and has also convened meetings at Ministry of Power (MoP) for additional financial support to the contractor to expedite the construction works at a faster pace.

Now, the project works are being executed smoothly and completion of the same is anticipated by December 2022. A large investment of more than 1733 crores have already been done on the project by THDCIL up to August 2019.

As the commissioning of the project is now expected by December 2022, VPHEP will require a further additional extension of 03 years in the validity of the EC beyond August 2020. However, currently there seems to be no provision of extension of E.C. of VPHEP beyond the extended period as per the existing EIA Notification 2006 and its subsequent amendments.

//True Copy//

In this regard, it is to inform that VPHEP may be one of the first HEP requiring additional validity extension beyond the above provisions of EIA Notification 2006. It is also to inform that as the project is already under the advance stage of construction, any formal process for obtaining *fresh approval* for such a project under construction phase (Scoping/ToR, fresh EIA study and Public Hearing, fresh appraisal) may be time and capital intensive.

In view of the above, it is requested to kindly consider this special case of implementation of VPHEP which got delayed due to the facts beyond the control of the project proponent and allow for additional provisions of 03 years validity extension in the Environment Clearance (i.e. upto August 2023) beyond the existing provisions for maximum 10 plus 03 years of the EIA Notification 2006 and its amendment dated 14.09.2016

Submitted for kind consideration please.

Thanking you,

Encl.: As above

Yours Sincerely

13/09/2019

(RAJEEV KUMAR VISHNOI)
Director (Technical),
THDC India Limited

//True Copy//

टीएचडीसी इंडिया लिमिटेड
THDC INDIA LIMITED
(भारत सरकार एवं उ.प्र.सरकार का संयुक्त उपक्रम)
(A Joint venture of Govt. of India & Govt. of UP)
CIN : U45203UR1988GOI009822

सूचना का अधिकार
Right To Information

No. THDCIL/RKSH/DTS/3975
Dated: 05/12/2019

Mrs. GEETA MENON
Joint Secretary (EIA-I Division)
Ministry of Environment, Forest & Climate Change, Govt. of India
Indira Paryavaran Bhawan, Jor bagh Road,
New Delhi - 110003

Madam,

Subject: Implementation of 444 MW Vishnugad Pipalkoti Hydro Electric Project (VPHEP) by THDC India Limited (THDCIL) in district Chamoli, Uttarakhand – *Regarding extension of the validity of the Environment Clearance of the VPHEP beyond the extended period of 10+3 years.*

Refer.: THDCIL Letter No. THDCIL/RKSH/DTS/3653 dated 13.09.2019

As aware, THDC India Limited (THDCIL), a Mini Ratna Category-I and Schedule 'A' CPSE under the administrative control under the Ministry of Power, is implementing the 444 MW Vishnugad Pipalkoti Hydro Electric Project (VPHEP) on river Alaknanda in district Chamoli in the State of Uttarakhand. The Civil and Hydro Mechanical works of VPHEP is currently under implementation by the contractor M/s HCC Limited. The project is under active construction stage. The project is being funded by the World Bank.

Vide MoEF&CC letter no. J-12011/29/2007-IA.I dated 22.08.2007 ***(Annexure 1)***, the project has been accorded with Environmental Clearance (EC) in line with the provisions of the EIA Notification 1994 and 2006 with a validity period of ten years i.e. up to 21.08.2017. Later vide MoEF&CC letter dated 25.04.2018 ***(Annexure 2),*** the same has been extended for a period of 03 years i.e. up to 21.08.2020. The project has been granted with the maximum extension as per the provision under EIA Notification 2006 and its subsequent amendment dated 14.09.2016 ***(Annexure 3)***.

---1---

contd.

//True Copy//

Subsequent to the grant of EC to VPHEP in August 2007, it took a period of more than six years for THDCIL to award the Civil & HM works of VPHEP, which got effective from 17.01.2014. This delay was attributed mainly due to delay in processing of the Forest Land case towards diversion of 80.507 ha of forest land of VPHEP, which was was forwarded for consideration of the Forest Advisory Committee (FAC) of the MoEF&CC, GoI through the State Forest Department, GoUK in the year 2009. The said forest land got diverted in favor of VPHEP after the grant of Stage 1 Forest Clearance (Principal Approval) on 03rd June 2011, Stage 2 Forest Clearance (Final Approval) on 28th May 2013 and issuance of Government Order from GoUK on 06th Dec. 2013.

Thereafter, the construction works of the project were awared in January 2014 with a target completion period of 54 months from the date of award. However the same also got delayed due to various factors encountered by the project from time to time which includes Hindrances / stoppages caused by the locals, Poor Geology encountered, Unforeseeable conditions viz. rise in river water level etc. The project authority organized numerous meetings to appropriately address the public issues in consultation with the District Administration and the Social experts of the World Bank from time to time. Appropirate measures likes additional strengthening etc. were also adopted at various construction fronts by THDCIL.

Additionally, the construction schedule was further delayed due to the financial stress being faced by the contractor. In order to come out with a solution, THDCIL has made every possible efforts and has also convened meetings at Ministry of Power (MoP) for additional financial support to the contractor to expedite the construction works at a faster pace.

Currently, the project works are being executed smoothly and completion of the same is anticipated by December 2022. A large investment of more than 1810 crores have already been incurred on the project by THDCIL up to October 2019.

As the commissioning of the project is now expected by December 2022, VPHEP will require a further additional extension of 03 years in the validity of the EC beyond August 2020. However, currently there seems to be no provision of extension of E.C. of VPHEP beyond the extended period as per the existing EIA Notification 2006 and its subsequent amendments. Keeping in view that the project is already under the advance stage of construction, any formal process for obtaining fresh approval for such a project under construction phase (Scoping/ToR, fresh EIA study and Public Hearing, fresh appraisal) may be time and capital intensive.

---2---

contd.

//True Copy//

A request in the said matter has also been made previously through above referred letter dated 13.09.2019 ***(Annexure 4)***.

In this regard, it is requested to kindly consider this special case of implementation of VPHEP which got delayed due to the facts beyond the control of the project proponent and allow for additional provisions of 03 years validity extension in the Environment Clearance (i.e. upto August 2023) in addition to the existing provisions for maximum 10 plus 03 years of the EIA Notification 2006 and its amendment dated 14.09.2016

Submitted for kind consideration please.

Thanking you,

Encl.: As above

Yours Sincerely

05/12/2019

(RAJEEV VISHNOI)
Director (Technical)

Copy to:

1. **Joint Secrtary (Hydro),** Ministry of Power, Government of India, New Delhi.

//True Copy//

टीएचडीसी इंडिया लिमिटेड
THDC INDIA LIMITED

सूचना का अधिकार
Right To Information

(भारत सरकार एवं उ.प्र. सरकार का संयुक्त उपक्रम)
(A joint venture of Govt. of India & Govt. of UP)

DGM(E) 10.2.2020

No. THDCIL:RKSH:CMD: 1450
Dated: 30.01.2020

To,
Secretary (EF&CC)
Ministry of Envt., Forest & Climate Change, Govt. of India
Indira Paryavaran Bhawan, Jor bagh Road,
New Delhi - 110003

ED(S&E) 31/01

Subject: Implementation of 444 MW Vishnugad Pipalkoti Hydro Electric Project (VPHEP) by THDC India Limited in district Chamoli, Uttarakhand – *Regarding extension of the validity of the Environment Clearance of the VPHEP beyond the extended period of 10+3 years.*

Dear Sir,

THDC India Limited (THDCIL), a Mini Ratna Category-I and Schedule 'A' CPSE under the administrative control of Ministry of Power, is implementing the 444 MW Vishnugad Pipalkoti Hydro Electric Project (VPHEP) on river Alaknanda in district Chamoli in the State of Uttarakhand through World Bank funding. The project is under active construction stage and the Civil and Hydro Mechanical works of VPHEP is currently under implementation by the contractor M/s HCC Limited and EM works to M/s.BHEL.

Environmental Clearance (EC) of the project was accorded MoEF&CC vide letter no. J-12011/29/2007-IA.I dated 22.08.2007 ***(Annexure 1)***, in line with the provisions of the EIA Notification 1994 and 2006 with a validity period of ten years i.e. up to 21.08.2017. The same was extended for a period of 03 years i.e. up to 21.08.2020 by MoEF&CC vide letter dated 25.04.2018 ***(Annexure 2),*** on the request of THDCIL. The project has been granted with the maximum extension in accordance to the provision under EIA Notification 2006 and its subsequent amendment dated 14.09.2016 ***(Annexure 3)***.

The project construction activities were required to be completed within the validity period, however the project construction schedule got extended beyond the said period due to following reasons:

1. *Delay of more than 06 years in award of Civil and HM works for THDCIL due to delay in obtaining Forest clearance towards diversion of 80.507 ha of forest land of VPHEP.* The forest land case proposal of VPHEP was forwarded for consideration of the Forest Advisory Committee (FAC) of the MoEF&CC, GoI through the State Forest

Department, GoUK in the year 2009. The said forest land got diverted in favor of VPHEP after the grant of Stage 1 Forest Clearance (Principal Approval) on 03rd June 2011, Stage 2 Forest Clearance (Final Approval) on 28th May 2013 and issuance of Government Order from GoUK on 06th Dec. 2013. Thereafter, the construction works of the project were awarded to M/s HCC Limited on 17th January 2014 with a target completion period of 54 months from the date of award.

2. *Post Award delays:*

a. After the award of project works in January 2014, the execution of the same got hampered due to various issues encountered from time to time beyond the control of THDCIL. The issues were mainly attributed to *Hindrances / stoppages caused by the locals, Poor Geology encountered, Unforeseeable conditions viz. rise in river water level etc.* THDCIL organized numerous meetings to appropriately address the public issues in consultation with the District Administration and the Social experts of the World Bank from time to time.

b. The construction schedule also got delayed due to the *financial stress being faced by the contractor*. In order to come out with a solution, THDCIL has made every possible efforts and has also convened meetings at Ministry of Power (MoP) for additional financial support to the contractor to expedite the construction works at a faster pace.

Currently, the project works are being executed smoothly and completion of the same is anticipated by December 2022. A large investment of more than ` 1826 crores has already been incurred on the project by THDCIL up to December 2019.

As the commissioning of the project is now expected by December 2022, VPHEP will require a further additional extension of around 03 years in the validity of the EC beyond 21st August 2020. However, currently there seems to be no provision of extension of E.C. of VPHEP beyond the extended period as per the existing EIA Notification 2006 and its subsequent amendments. Keeping in view that the project is already under the advance stage of construction, any formal process for obtaining fresh approval for such a project under construction phase (Scoping/ToR, fresh EIA study and Public Hearing, fresh appraisal) may be time and capital intensive.

In this conncetion, THDCIL vide its letter *No. THDCIL/RKSH/DTS/3653 dated 13.09.2019 and No. THDCIL/RKSH/DTS/3975 dated 05.12.2019* ***(Annexure 4 & 5)*** has requested MoEF&CC officials to consider the special case for additional provisions of 03 years validity extension in the Environment Clearance (i.e. up to August 2023) beyond the

existing provisions of implementation of VPHEP which got delayed due to the facts beyond the control of the project proponent and to allow. The same is still under consideration.

In this regard, it is requested to kindly direct the concern divison for considering the extension in the Environment Clearance of VPHEP by allowing additional provisions of 03 years validity beyond the extended period of (10+03) years as a special case .

Submitted for favourable consideration please.

Thanking you,

Encl.: As above

Yours Sincerely

(D.V.SINGH)
Chairman and Managing Director

Copy to:
The Secretary (Power), Ministry of Power, Government of India, New Delhi.

To
D (T)

//True Copy//

रजिस्ट्री सं. डी.एल.- 33004/99 REGD. No. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

सी.जी.-डी.एल.-अ.-18012021-224513
CG-DL-E-18012021-224513

असाधारण
EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (ii)
PART II—Section 3—Sub-section (ii)

प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

सं. 201] नई दिल्ली, सोमवार, जनवरी 18, 2021/पौष 28, 1942
No. 201] NEW DELHI, MONDAY, JANUARY 18, 2021/PAUSHA 28, 1942

पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय

अधिसूचना

नई दिल्ली, 18 जनवरी, 2021

का.आ. 221(अ).— केंद्रीय सरकार, तत्कालीन पर्यावरण और वन मंत्रालय में, पर्यावरण (संरक्षण) अधिनियम, 1986 की धारा 3 की उप-धारा (1) और उप-धारा (2) के खंड (v) के अधीन अपनी शक्तियों के प्रयोग करते हुए, पर्यावरण समाघात निर्धारण अधिसूचना, 2006 (जिसे इसके बाद उक्त अधिसूचना कहा गया है) संख्या का. आ. 1533 (अ), तारीख 14 सितंबर, 2006 द्वारा प्रकाशित किया जा चुका है, उक्त अधिसूचना की अनुसूची में सभी संबंधित सूचीबद्ध नई परियोजनाओं या क्रियाकलापों के लिए उनके विस्तार और आधुनिकीकरण और/या उत्पाद मिश्रण में परिवर्तन किया जा सकता है यथास्थिति, भूमि को अभिप्राप्त करने के सिवाय, परियोजना प्रबंधन द्वारा किसी भी संनिर्माण कार्य या भूमि को तैयार करने से पूर्व संबंधित विनियामक प्राधिकरण से पूर्व पर्यावरणीय अनापत्ति अपेक्षित होगी ।

और कोरोना वायरस (कोविड-19) के प्रकोप को देखते हुए और तत्पश्चात इसके नियंत्रण के लिए घोषित लॉकडाउन (कुल या आंशिक) ने , क्षेत्र में परियोजनाओं या क्रियाकलापों के कार्यान्वयन को प्रभावित किया है। पर्यावरण और वन जलवायु परिवर्तन मंत्रालय उक्त अधिसूचना में अनुज्ञात अधिकतम अवधि से परे पूर्व पर्यावरणीय अनापत्तियों की विधिमान्यता के विस्तार के लिए अनुरोधों की संख्या प्राप्ति में है, क्योंकि कोविड 19 महामारी अभी तक समाप्त नहीं हुई है। मामले की उक्त मंत्रालय में समीक्षा की गई है और चिंता इस तथ्य को ध्यान में रखते हुए है कि लॉकडाउन (कुल या आंशिक) के कारण, क्षेत्र में क्रियाकलापों को जारी रखना कठिन हो सकता है।

अत: अब, केंद्रीय सरकार, पर्यावरण (संरक्षण) नियम, 1986 के नियम 5 के (4) खंड के साथ पठित पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 3 की उप-धारा (1) की उप-धारा (2) के खंड (v) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, लोक हित में उक्त नियमों के नियम 5 के उप-नियम (3) के खंड (क) के अधीन नोटिस की अपेक्षा अभिमुक्ति के पश्चात भारत के राजपत्र असाधारण, भाग- II, खंड 3, उपखंड (II), में प्रकाशित, भारत सरकार की तत्कालीन पर्यावरण और वन मंत्रालय अधिसूचना का.आ.1533 (अ), तारीख 14 सितंबर, 2006, में निम्नलिखित और संशोधन करती है, अर्थात्: -

उक्त अधिसूचना में,

(i) उप शीर्ष II "चरण (2)_विस्तारण", के अधीन पैरा 7 के उप पैरा 7(i) में, खंड (viii) के पश्चात निम्नलिखित खंड अंत:स्थापित किया जाएगा अर्थात्: -

"(ix) उपरोक्त में अंतर्विष्ट किसी बात के होते हुए, 1 अप्रैल 2020 से 31 मार्च 2021 की अवधि में कोरोना वायरस (कोविड-19) के प्रकोप को देखते हुए और तत्पश्चात इसके नियंत्रण के लिए घोषित लॉकडाउन (कुल या आंशिक) की दृष्टि में इस अधिसूचना के उपबंधो के अधीन मंजूर संदर्भ की शर्तों की विधिमान्यता की अवधि की गणना के प्रयोजन के लिए विचार नहीं किया जाएगा ,तथापि उक्त संदर्भ की शर्तों के संबंध में इस अवधि के दौरान अपनाए गए सभी क्रियाकलाप विधिमान्य समझे जाएंगे ।";

(ii) पैरा 9 क के स्थान पर, निम्नलिखित पैरा रखा जाएगा, अर्थात् : -

"9 क. इस अधिसूचना में अंतर्विष्ट किसी बात के होते हुए, 1 अप्रैल 2020 से 31 मार्च 2021की अवधि में कोरोना वायरस (कोविड-19) के प्रकोप को देखते हुए और तत्पश्चात इसके नियंत्रण के लिए घोषित लॉकडाउन (कुल या आंशिक) की दृष्टि में इस अधिसूचना के उपबंधो के अधीन मंजूर पूर्व पर्यावरणीय अनापत्ति की विधिमान्यताकी अवधि की गणना के प्रयोजन के लिए विचार नहीं किया जाएगा ,तथापि उक्त पर्यावरणीय अनापत्ति के संबंध में इस अवधि के दौरान अपनाए गए सभी क्रियाकलाप विधिमान्य समझे जाएंगे ।";

[फा. सं. 22-25/2020-आईए.III]

गीता मेनन, संयुक्त सचिव

टिप्पण : मूल अधिसूचना भारत के राजपत्र, असाधारण, भाग II, खंड 3, उप-खंड (ii) संख्या का.आ. 1533 (अ), तारीख 14 सितंबर, 2006 द्वारा प्रकाशित की गई थी और अधिसूचना अधिसूचना संख्या का.आ. 4254 (अ),तारीख 27 नवंबर, 2020 द्वारा अंतिम बार संशोधन किया गया था।

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 18th January, 2021

S.O. 221(E).—Whereas, the Central Government in the erstwhile Ministry of Environment and Forests, in exercise of its powers by sub-section (1) and clause (v) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 has published the Environment Impact Assessment Notification, 2006 (hereinafter referred to as the said notification) *vide* number S.O.1533(E), dated the 14th September, 2006, making the requirement of prior environmental clearance from the concerned regulatory authority mandatory for all new projects or activities listed in the Schedule to the said notification, their expansion and modernisation and/or change in product mix, as the case may be, before any construction work or preparation of land by the project management except for securing the land;

And whereas, in view of the outbreak of Corona Virus (COVID-19) and subsequent lockdowns (total or partial) declared for its control, implementation of projects or activities in the field has been affected. Ministry of

Environment, Forest and Climate Change is in receipt of number of requests for extension of the validity of prior environmental clearances beyond the maximum period allowed in the said notification, as the COVID-19 pandemic has not yet come to an end. The matter has been examined in the said Ministry and the concern is genuine keeping in view the fact that due to lockdowns (total or partial), continuation of activities in the field has been difficult.

Now, therefore, in exercise of the powers conferred by sub-section (1) and clause (v) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986), read with sub-rule (4) of rule 5 of the Environment (Protection) Rules, 1986, the Central Government, after having dispensed with the requirement of notice under clause (a) of sub-rule (3) of rule 5 of the said rules in public interest, hereby makes the following further amendments in the notification of Government of India, in the erstwhile Ministry of Environment and Forests, number S.O. 1533 (E), dated the 14th September, 2006, published in the Gazette of India, Extraordinary, Part-II, Section 3, Sub-section (II), namely:-

In the said notification, -

(i) in paragraph 7, in sub-paragraph 7(i), under sub-heading II. "Stage (2) – Scoping", after clause (viii), the following clause shall be inserted, namely:-

"(ix). Notwithstanding anything contained above, the period from the 1st April, 2020 to the 31st March, 2021 shall not be considered for the purpose of calculation of the period of validity of Terms of Reference granted under the provisions of this notification in view of outbreak of Corona Virus (COVID-19) and subsequent lockdowns (total or partial) declared for its control, however, all activities undertaken during this period in respect of the said Terms of Reference shall be treated as valid.";

(ii) for paragraph 9A, the following paragraph shall be substituted namely:-

"9A. Notwithstanding anything contained in this notification, the period from the 1st April, 2020 to the 31st March, 2021 shall not be considered for the purpose of calculation of the period of validity of Prior Environmental Clearances granted under the provisions of this notification in view of outbreak of Corona Virus (COVID-19) and subsequent lockdowns (total or partial) declared for its control, however, all activities undertaken during this period in respect of the Environmental Clearance granted shall be treated as valid.".

[F.No.22-25/2020-IA.III]

GEETA MENON, Joint Secy.

Note: The principal notification was published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-section (ii) *vide* number S.O. 1533 (E), dated the 14th September, 2006 and was last amended vide the notification number S.O. 4254(E), dated the 27th November, 2020.

Uploaded by Dte. of Printing at Government of India Press, Ring Road, Mayapuri, New Delhi-110064
and Published by the Controller of Publications, Delhi-110054.

//True Copy//

रजिस्ट्री सं. डी.एल.- 33004/99 REGD. No. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

सी.जी.-डी.एल.-अ.-16062021-227644
CG-DL-E-16062021-227644

असाधारण
EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (ii)
PART II—Section 3—Sub-section (ii)

प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

सं. 2182] नई दिल्ली, बुधवार, जून 16, 2021/ज्येष्ठ 26, 1943
No. 2182] NEW DELHI, WEDNESDAY, JUNE 16, 2021/JYAISHTHA 26, 1943

पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय

अधिसूचना

नई दिल्ली, 16 जून, 2021

का.आ. 2346(अ).—केन्द्रीय सरकार, पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 6 और धारा 25 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, पर्यावरण (संरक्षण) नियम, 1986 का और संशोधन करने के निम्नलिखित नियम बनाती है, अर्थात् :-

1. (1) इन नियमों का संक्षिप्त नाम पर्यावरण (संरक्षण) संशोधन नियम, 2021 है।

(2) ये सरकारी राजपत्र में उनके प्रकाशन की तारीख को प्रवृत्त होंगे।

2. पर्यावरण (संरक्षण) नियम, 1986 के नियम 5 के, उप-नियम (3) के, खंड (घ) में, निम्नलिखित परंतुक अंत:स्थापित किया जाएगा, अर्थात्:-

"परंतु यह कि कोविड-19 महामारी के कारण, इस खंड के प्रयोजन के लिए, वित्तीय वर्ष 2020-2021 और 2021-2022 में समाप्त होने वाले अधिसूचना की विधि मान्यता की अवधि को 31 दिसंबर, 2021 तक बढ़ाया जाएगा या महीने के अंत से छह महीने तक जब सुसंगत अधिसूचना बिना किसी विस्तार के समाप्त हो जाती, जो भी बाद में हो।"।

[फा. सं. 25/03/2010-ईएसजेड]

डॉ. सतीश चन्द्र गढ़कोटी, वैज्ञानिक 'जी'

टिप्पण: मूल नियम संख्यांक का.आ. 844 (अ), तारीख 19 नवंबर, 1986 द्वारा प्रकाशित किया गया था और अधिसूचना संख्यांक का.आ. 4367(अ), तारीख 3 दिसंबर, 2020 को अंतिम संशोधन किया गया था।

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 16th June, 2021

S.O. 2346(E).—In exercise of the powers conferred by sections 6 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules further to amendments in the Environment (Protection) Rules, 1986, namely: —

1. (1) These rules may be called the Environment (Protection) Amendment Rules, 2021.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. In the Environment (Protection) Rules, 1986, in rule 5, in sub-rule (3), in clause (d), for the proviso the following shall be substituted, namely:-

"Provided that on account of COVID-19 pandemic, for the purpose of this clause, the period of validity of the notification expiring in the financial year 2020-2021 and 2021-2022 shall be extended up to 31st December, 2021 or six months from the end of the month when the relevant notification would have expired without any extension, whichever is later.".

[F.No. 25/03/2010-ESZ]

Dr. SATISH C. GARKOTI**,** Scientist 'G'

Note: The principal rules were published *vide* number S.O. 844 (E), dated the 19th November, 1986 and was last amended *vide* notification number S.O. 4367 (E), dated the 3rd December, 2020.

Uploaded by Dte. of Printing at Government of India Press, Ring Road, Mayapuri, New Delhi-110064
and Published by the Controller of Publications, Delhi-110054.

Gmail Environment Rishikesh <enviro.rksh@gmail.com>

Physical & Financial progress of Vishnugad Pipalkoti Hydro Electric Project (VPHEP) Reg.

1 message

Vijay Sehgal <thdc_vijay@yahoo.com> Thu, Nov 19, 2020 at 2:17 PM
Reply-To: Vijay Sehgal <thdc_vijay@yahoo.com>
To: Kerketta <s.kerketta66@gov.in>
Cc: Environment VPHEP <enviro.vphep@gmail.com>, CO Deptt VPHEP <vphep444@yahoo.com>, Rakesh Khare <s.ethdc@yahoo.com>

Sir,

This has reference to the subject matter.

As desired, the progress of Vishnugad Pipalkoti Hydro electric Project as on 15th Nov' 2020 is as below:

1. % of civil and hydro mech works completed - 25.95 %
2. % of electro mech works completed - 37 %
3. % of Rehabilitation completed - More Than 90 %
4. Overall investment/ expenditure done - Rs. 2047.28 Crs

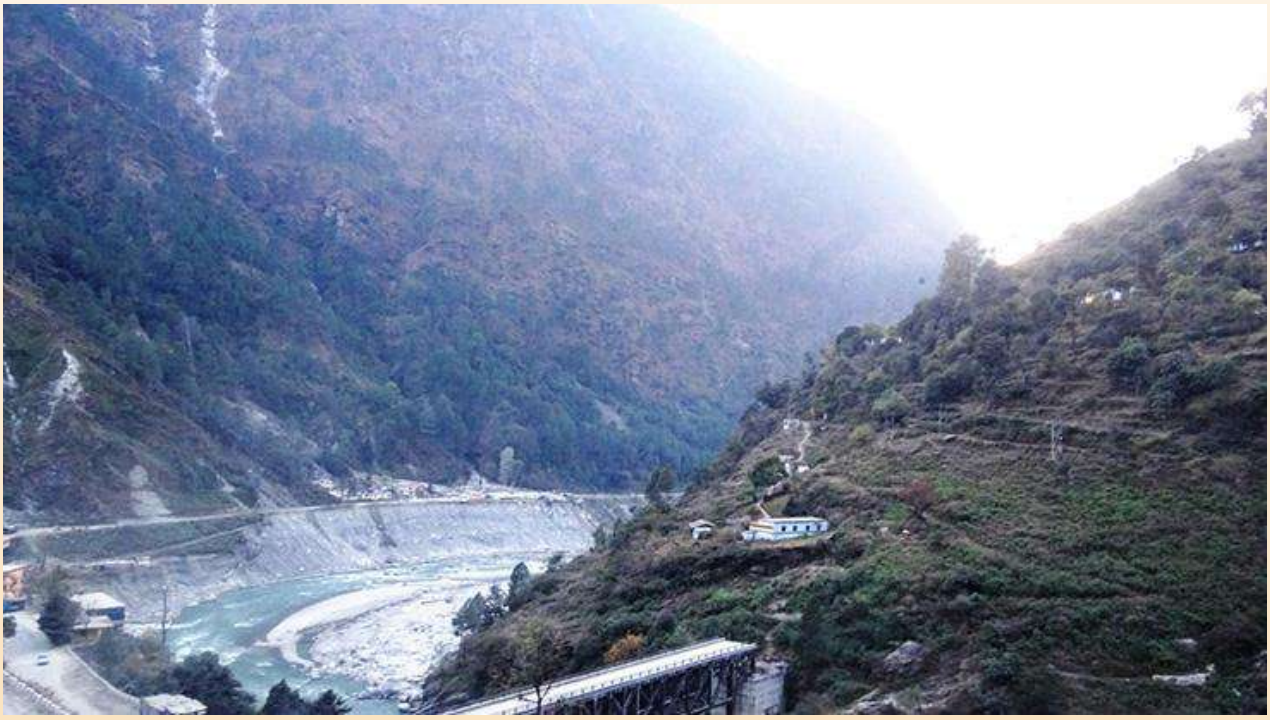
Kind Regards,

Vijay Sehgal
AGM (Env)

VPHEP Project
Alaknanda puram,
Siyasain, Pipalkoti,
Chamoli
Ph- 01372 - 256 217

ANNEXURE -R/3-5

THDC INDIA LTD.



ENVIRONMENTAL IMPACT ASSESSMENT & ENVIRONMENTAL MANAGEMENT PLAN BASED ON ONE SEASON STUDY FOR VISHNUGAD PIPALKOTI HEP (444 MW), UTTARAKHAND

REIA REPORT

वाप्कोस लिमिटेड
WAPCOS LIMITED
(भारत सरकार का उपक्रम - जल संसाधन, नदी विकास और गंगा संरक्षण मंत्रालय)
(A Government of India Undertaking - Ministry of Water Resources, River Development & Ganga Rejuvenation)

WAPCOS LIMITED
(A Government of India Undertaking)
76-C, Sector 18, Gurugram - 122015, Haryana, INDIA
Tel. 0124-2397396, Fax. 0124-2397392
Email: environment@wapcos.co.in

//True Copy//

CHAPTER-9
ENVIRONMENTAL COST BENEFIT ANALYSIS

CHAPTER-9
ENVIRONMENTAL COST BENEFIT ANALYSIS

9.1 INTRODUCTION

The environment has mainly two important components viz., physical and socio-economic. In recent years, there has been a remarkable growth of interest in environmental issues in sustainability and the management of development in harmony with the environment. Put in simple words the Environment Cost - Benefit analysis (ECBA) basically involves reducing numerous complex physical and social-economic variables of environment to easy, quantifiable components of costs and benefits. It is a useful tool to predict the damage caused to the environment by any development project in term of its impact of cost which can help management to take precautionary measure to minimize the damage and reduce the cost.

9.2 ENVIRONMENTAL COST AND BENEFITS

Essentially benefits connote an increase in human wellbeing (utility) and costs are reductions in human wellbeing. For a project or policy to qualify on cost-benefit grounds, its social benefits must exceed its social costs. The value of environmental costs and benefits are most clearly understood when represented in monetary units, and then balanced against one another. It is essential' that ecological and environmental losses and socio-economic distress caused to the people who are displaced are weighted against economic and social gains.

9.3 ENVIRONMENTAL COST BENEFIT ANALYSIS OF HYDRO PROJECT

Hydro Power projects like any power project significantly contribute to growth rate of power sector of any country and in turn demand huge financial and human resources of a country. Hydroelectric projects like most of the developmental activities have in built pollution control and mitigative measures. The society has to compulsorily bear the cost of various degradation and pollution, directly or indirectly. Hydroelectric project generally involves intervention in river thereby changing river flow regime in the submergence area and causes changes in existing land use in relation to the land forest, agriculture and barren land beside water bodies

9.4 GUIDELINES FOR DETERMINATION OF ENVIRONMENTAL COST AND BENEFITS

The MoEF&CC vide letter No. 7-69/2011-FC(Pt.), dated 1st August,2017, issued Guidelines for conducting Cost Benefit Analysis for projects involving diversion of forest land under the provisions of the Forest (Conservation) Act, 1980. These guidelines are applicable for conducting cost-benefit analysis for projects involving forest diversion, yet to a larger extent provide a broad and self-explanatory methodology for assessing ecological and environmental losses and eco-economic distress caused due to the population/families who are displaced and weighted against economic and social gains.

9.5 ENVIRONMENTAL COST

The impacts due to the project could be direct, e.g., loss of forest land and the vegetal cover over it, loss of agriculture land and agriculture produce, distress to the people due to involuntary acquisition of land assets, impact to aquatic life and reduction in diversity and population density of migratory fishes, loss of public facilities and administrative infrastructure. Apart from this there are host of indirect impacts viz., loss of animal husbandry productivity, loss of fodder, habitat fragmentation, etc.

9.5.1. Cost of Loss to Ecological Services

Forests are prime natural resource system and host a large number of endemic or endangered species that provide ecological services which cannot be substituted. They constitute not just an ecosystem, but form part of a complex social system involving a very wide range of stock holders. The diversion of forestland for non-forestry purpose certainly destabilize the existing eco-system balance. As per “Polluter Pays” policy, the agency demanding the diversion of forest land has to pay for the loss of benefits from ecological services from such land. The benefits of forests include both goods and services only some of which can be valued directly like timber, fuel wood and NTFP products at prevalent market rates.

Forestry is viewed as a community assets, which provide various benefits over an extended time of horizon. The NPV of forest land can be termed as the discounted value of benefits from the forest land net of the management costs.

As per MoEF&CC guidelines dated 1.8.2017, the economic value of loss of eco-system services due to diversion of forests shall be the net present value (NPV) of forest land being diverted as prescribed by the Central Government (MoEF& CC). In case of National Parks, NPV shall be ten (10) times the normal NPV and in case of Wildlife Sanctuary the NPV shall be five (5) times the normal NPV or otherwise prescribed by the ministry or any

other competent authority.

9.5.2 Cost of Loss of animal husbandry productivity, including loss of fodder

Forests are one of the most important sources of fodder for people involved in livelihoods associated with livestock. A significant proportion of cattle used in livestock management are grazed in forests. A recent study conducted by the Forest Survey of India (FSI) found that more than 86 million Adult Cattle Units (ACUs) are completely dependent on forests for fodder requirements (FSI 2011b). Based on standard fodder requirements for each ACU (22 kg. /ACU/day), the total consumption of fodder from forests is estimated (R. Pandey 2011).

Forests provide fodder leaves and grazing facility to the rural animals. About 20 per cent livestock population depends upon forest grazing and leaf fodder supply. Leaf fodder of several tree species is almost as nutritious as that of agricultural fodder crops. Trees provide animal fodder, enabling communities to keep livestock that provide them with nutritionally important milk and meat.

Forest provides a good landscape for shelter and breeding of wild animals, besides providing escape routes to animals. These have good forage and browse values of the habitat for wild animals. Natural generation in forest area improves the vegetal cover and grass cover. With habitat depletion of the area, the source population shall be easily targeted and will always be at the risk of being eliminated.

The diversion of forest land shall result in reduction of the grazing area for cattle of fringed villages. To meet the fodder requirement of such area, the local folks have either to seek other grazing grounds, if available nearby, or purchase fodder from other areas.

As per MoEF&CC guidelines dated 1.8.2017, this loss is to be quantified and expressed in monetary terms or 10% of NPV applicable whichever is maximum. For tropical Dry Deciduous Forests, the total value of fodder/ha @ average fodder market rate of Rs. 2000/tonne has been estimated at Rs 25070/ha.

9.5.3 Cost of Habitat Fragmentation

Reservoir triggers fragmentation of natural areas on either bank of river. The surface works like dam, intake structure, haul and project roads, exposed penstock line and surface power house also cause physical barrier and fragmentation. Habitat fragmentation bisects the landscape and leaves smaller, more isolated land for wildlife, causing local and population level changes to native flora and fauna. Fragmentation can shift habitat use and provide opportunity for invasions of non-native species. Fragmentation increases the amount of “edge” in a landscape, which can negatively impact wildlife by causing changes in abiotic (increased sunlight and higher wind speeds) and biotic (increased risk of predation and brood parasitism, invasion of non-native species) conditions, making the habitat unsuitable

for some native species (Henning's, L., and J. Soll. 2010. Wildlife corridors and permeability). Isolation of habitats can negatively impact species that require access to multiple small habitat patches to survive by reducing their access to resources. Increased isolation of habitats can lead to inbreeding, which can cause genetic abnormalities and weaknesses (Young, A., T. Boyle, and T. Brown. 1996- the population genetic consequences of habitat fragmentation for plants).

Currently, there is insufficient knowledge to predict with precision when habitat fragmentation will be ecologically consequential to many organisms. Clearly, as habitat is reduced in extent and subdivided, at some point it becomes structurally disconnected.

Habitat loss and fragmentation is a complex, multidimensional process. Consequently, the quantitative analysis of habitat loss and fragmentation is fraught with numerous difficult issues. There are many ways to model or represent landscape structure corresponding to different perspectives on habitat fragmentation. Clearly, given the number and variety of components of landscape structure affected by habitat loss and fragmentation, it is unreasonable to expect a single metric, or even a few metrics, to be sufficient (Neel et al. in prep.). Therefore, it is not possible to reliably identify the "best" measures of habitat loss and fragmentation.

There are five major spatial components to habitat loss and fragmentation: (1) habitat extent, (2) habitat subdivision, (3) patch geometry, (4) habitat isolation, and (5) habitat connectedness. Numerous landscape metrics have been developed for each of these components (e.g., Baker and Cai 1992; McGarigal and Marks 1995; Jaeger 2000, McGarigal et al. 2002). However, these categories are not discrete and many landscape metrics measure properties that relate to several components. Thus, a simple classification of metrics into these categories is not straightforward.

As per MoEF&CC guidelines dated 1.8.2017, while the relationship between fragmentation and forest goods and services is complex, for the sake of simplicity the cost due to fragmentation bas been pegged at 50% of NPV applicable as a thumb rule.

9.5.4 Compensatory afforestation & soil moisture conservation cost

Compensatory afforestation refers to the practice of ensuring that when a forested area is diverted for non-forest purposes, another area is afforested to maintain biodiversity equilibrium. It is the provision which direct to do plantation of new trees to compensate loss of trees that happened during any infrastructure or development project activity. It can be treated as a replacement cost of diverted forestland by way of either afforestation in equivalent new non-forest area or double of area diverted in a degraded forest area. The norms for raising plantation has been fixed by the MoEF&CC The actual cost of

Compensatory afforestation & soil moisture conservation and its maintenance in future at the present discounted value shall be considered as substitution cost per MoEF&CC guidelines dated 1.8.2017.

9.5.5 Loss of Public facilities and administrative infrastructure

Many a times, public infrastructure (Roads, buildings, schools, dispensaries, electric lines, railways, etc.) existing on private land or in forest land are to be lost under proposed acquisition/diversion for project works. These structures shall be relocated, the provision for which is generally made under sub-head “B-land” in the DPR. For relocation of such facilities likely to be diverted, forest land would be further required. Similarly, if located in non-forest land, these shall have to be relocated at appropriate location with the consent of stakeholders. As per MoEF&CC guidelines dated 1.8.2017, the replacement cost of such facilities has to be quantified and expressed in monetary terms as per actual cost basis at the time of diversion.

9.5.6 Possession value of forest land diverted

Forest land has value over and above the value of land itself. This re-adjustment should achieve comparability with guidelines of land valuation for other purposes, e.g., acquisition. Possession Value of land reflects the value of space provided by the diverted forest land over and above its NPV. Forest land diverted for project such as irrigation, hydropower, railways, roads and transmission lines are unlikely to be returned and remain in possession of the user agencies. As per MoEF&CC guidelines dated 1.8.2017, 30% of environmental costs (NPV) due to loss of forests or circle rate of adjoining area in the district should be added as a cost component of possession value of forestland, whichever is maximum.

9.5.7 Cost of human resettlement

For infrastructure project for public purpose land (Public and Private) invariably is to be acquired by the appropriate government either for its own use or for a requiring body as the case may be. Though the project is conceived with the sole objective of minimal displacement of people, compulsory acquisition of some extent of private land for the public purpose is necessitated. The acquisition of the land shall be in consonance with “The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013”, (RFCTLARRA 2013) which has come into force from 1-1-2014, notified by Government of India and conjointly with the provision of the State R&R Policy 2013, for Hydro Electric Projects for the Rehabilitation & Resettlement of displaced/project persons. Component of compensation package in respect of land acquired under the Act shall be as per First Schedule. Elements of Rehabilitation and Resettlement entitlements for all the affected families (both land owners and the families whose livelihood is primarily

dependent on land acquired) shall be as contained in Second Schedule, in addition to those provided in the First schedule. As per MoEF&CC guidelines dated 1.8.2017, the cost is to be quantified and expressed in monetary terms as per R&R Plan.

9.5.8 Cost of Loss of Agriculture Production

There shall be loss of agriculture production from acquired land as due to change in its land use it shall not be put under agriculture. The loss shall be @ average yield of 2.25 ton/ha for each crop harvested and the cost worked on the basis of current minimum support price.

9.6 ENVIRONMENTAL BENEFITS

The benefits from the project are mainly from increase in productivity attributable to the specific project, benefits to economy, economic benefits due to of direct and indirect employment due to the project, long term economic benefits due to implementation of certain management plan. The economic benefits of hydro projects are saleable electricity, employment creation during construction and post construction, and in some cases fisheries and tourism.

9.6.1 Increase in Productivity (Electric Generation)

Electricity generates public benefits and is logically considered as a public good. As per National Electricity Policy,2005 and Tariff Policy,2016 availability of electricity to consumers at reasonable and competitive rates. Electricity is a public good that attribute to the broader goals of socio- economic development. Based on CERC method for setting tariff for electricity, the estimate of annual power generation, in 90% dependable year, benefits from the project can be computed. After accounting for 12% free power being given to the home state, the annual saleable units shall be 0.88x annual generation. As per MoEF&CC guidelines dated 1.8.2017, the cost is to be quantified and expressed in monetary terms. The cost of saleable units shall be based on levelized tariff as contained in the Financial Evaluation Chapter of DPR.

9.6.2 Benefit to the State

As per State Hydro power Policy for the Development of Hydropower in Uttaranchal through Projects of Capacity of 100 MW and Larger, Twelve percent (12%) of electricity generated shall be made available free of cost to the State during the entire life of the Project. This free power will be in addition to the amounts received at the time of allotment. However, as per Policy for the Development of Hydropower in Uttarakhand through Projects of Capacity of 25 MW and Larger, on all projects governed by this policy, for the first 15 years, royalty at the rates of 12% of net energy wheeled (after deducting wheeling charges) or supplied directly without wheeling would be charged.

//True Copy//

9.6.3 Benefits to Local Population

As per Hydro Power Policy, 2008 read with Ministry of Power Order dated 8.3.2019, an additional 1% free power from the project would be provided and earmarked for a Local Area Development Fund, aimed at providing a regular stream of revenue for income generation and welfare schemes, creation of additional infrastructure and common facilities etc. on a sustained and continued basis over the life of the project. Just as host State governments have been turned into stake-holders by stipulating that 12% of the power is given to them free cost as a royalty, there is need to turn the project affected areas and persons also into stake-holders with a continuing stake not only in the completion but also in the continued operation of the project.

9.6.4 Economic benefits

Establishment of project will facilitate the emergence of industries, trade and commerce and would bring more and more economic development in the State and Country. At present the industry sector alone consumes 42% of total consumption of the state. Since the tariff for mixed industry in the state is more than the tariff for domestic consumption the difference of tariff shall accrue as an additional income to the state.

9.6.5 Employment Generation

During peak stage of construction, employment will be generated for 1200 skilled/semi-skilled/unskilled labour. Besides this due to implementation of labour-oriented works under CAT Plan, Green Belt Development Plan and Command Area Development Plan a large number of local people are likely to be engaged. The creation of the reservoir will increase the fish production and development of pisciculture in the region. Many families will get job in the fisheries which will improve their socio-economic conditions. After completion during operation about 50 people will get employment for O&M, routine upkeep / maintenance of roads and buildings.

9.6.6 Economic benefits due to compensatory afforestation

As per MoEF&CC guidelines dated 1.8.2017, benefits from such compensatory afforestation accruing over next 50 years monetized and discounted to the present value should be included as benefits of compensatory afforestation. For benefits of CA the guidelines of the Ministry for NPV estimation may be consulted.

9.7 ENVIRONMENTAL COST AND BENEFITS

The environment cost and benefits of the project has been carried out based on the methodology and discussion made in foregoing section/sub-sections and elucidated in **Table 9.1**. It is manifest from table that the cost to environment is Rs 18020.84 lakh whereas the annual benefits are Rs 83499.83 lakh and for useful life of project these are projected as Rs 2490595.8 lakh, with benefit cost ratio of 138.20:1. The details are given in **Table-9.1**.

Table 9.1: Environment Cost and Benefits Analysis

S. No.	Environment Cost/Benefit	MoEF Guidelines for CBA of forest land diversion,2017	Parameters	Total loss (Rs. lakh)
A. Environmental Cost:				
1	Eco-system services losses due to proposed forest diversion	Economic value of loss of eco-system services due to diversion of forests shall be the net present value (NPV) of forest land being diverted	NPV of 100.36 ha forest land is Rs. 825 lakh, which is already deposited	825.00
2	Loss of animal husbandry productivity including loss of fodder	To be quantified and expressed in monetary terms or 10% of NPV applicable, whichever is maximum	100.36 ha x Rs. 25070/ha = Rs. 25.16 lakh (ii) 10% of Rs 825 lakh = Rs 82.50 lakh. (Max. of two is adopted)	82.50
3	Cost of human resettlement	To be quantified and expressed in monetary terms as per R&R Plan	R&R Plan has been prepared as per NPRR, 2007 and approved by state government.	6883.88
4	Loss of Public facilities and administrative infrastructure (Roads, buildings, schools, dispensaries, electric lines, railways, etc.) on forest land, which would require forest land if these facilities were diverted due to the project.	To be quantified and expressed in monetary terms as per actual cost basis at the time of diversion.	all the public facilities/ infrastructures were fully compensated. therefore, for the sake of calculations has already been incorporated in the cost at point 03 above)	0.00
5	Possession value of forest land diverted	30% of environmental costs (NPV) due to loss of forests or circle rate of adjoining area in the district should be added as a cost component of possession value of forestland, whichever is maximum	30% of Rs 825 lakh (NPV) = Rs. 247.5 lakh	247.50
6	Cost of sufferings to oustees	The social cost of rehabilitation of oustees (in addition to the cost likely to be incurred in providing residence, occupation and social	All the affected parties have been fully compensated w.r.t loss of income or livelihood during the rehabilitation	0.00

S. No.	Environment Cost/Benefit	MoEF Guidelines for CBA of forest land diversion,2017	Parameters	Total loss (Rs. lakh)
		services as per R&R plan) be worked out as 1.5 times of what oustees should have earned in two years had they not been shifted.	period. therefore, for the sake of calculations has already been incorporated in the cost at point 03 above).	
7	Habitat fragmentation cost	While the relationship between fragmentation and forest goods and services is complex, for the sake of simplicity the cost due to fragmentation has been pegged at 50% of NPV applicable as a thumb rule.	50% of NPV = 0.50x Rs 825.0 lakh = Rs. 412.50 lakh	412.50
8	Compensatory afforestation & soil moisture conservation cost	The actual cost of Compensatory afforestation & soil moisture conservation and its maintenance in future at the present discounted value	Cost of Compensatory Afforestation& Roadside plantation, pillar demarcation and muck management on road sides =Rs. 125 lakh + Rs. 43.81lakh + Rs. 15 lakh = Rs 183.81 lakh	183.81
9	Cost of Environmental Management Plan for avoiding, mitigating, checking the adverse impacts on various environmental components during construction and operational phase of the project.	As per cost of EMP included in EIA report avoiding the cost of losses already included in serial No.1 to 8.	Total cost of EMP after discounting cost of Compensatory afforestation plan, cost of human resettlement i.e., R&R plan, relocation cost of public facilities (old EMP & New EMP)- Compensatory Afforestation & Biodiversity Management= (10953.16-6267.51+4700)	9385.65
Total Environment Cost (A)				**18020.84**
B. Environment Benefits				
1	Increase in productivity attribute to the specific project	To be quantified and expressed in monetary terms avoiding double counting	After accounting for 12% free power to the state and 1% free power for local development of area, net annual Saleable annual energy (after accounting for 0.70% auxiliary consumption and 0.50% transmission loss)	65962.2

//True Copy//

S. No.	Environment Cost/Benefit	MoEF Guidelines for CBA of forest land diversion,2017	Parameters	Total loss (Rs. lakh)
			= 1677.4 GWhX0.87 = 1459.34 MU. The benefit expressed in monetary terms shall be for 1459.34 MU @ average of peaking and non peaking tariff of Rs. 4.52/unit	
2	Benefits to economy due to specific projects	The incremental economic benefit in monetary terms due to the activities attributed to the specific project.	Establishment of project will facilitate the emergence of industries, trade and commerce and would bring more and more economic development in the State and Country At present the industry sector alone consumes 42% of total consumption of the state. Therefore, on a conservative estimate about 704.50 GWh shall be consumed in industry. Since the tariff for mixed load in the state is Rs. 5.45/unit which implies that the difference of Rs. 5.45-4.52 = Rs. 0.93/unit shall accrue as an additional income of Rs 14583.15 lakh to the state.	6551.85
3	Number of Populations benefit due to specific project	As per DPR	The project will directly benefit the population of the country as a whole and the population of state, due to share of 12% free power and people of the project area by 1% free power for local development of area. The benefit expressed in monetary terms shall be for 1677.4x0.13= 218.06 MU @ average tariff of Rs 4.52/unit	9856.31
4	Economic benefits due to direct and indirect employment due to	As per DPR	(i) During peak stage of construction, employment will be generated for	720.0

S. No.	Environment Cost/Benefit	MoEF Guidelines for CBA of forest land diversion,2017	Parameters	Total loss (Rs. lakh)
	the project.		2000 skilled/semi-skilled/unskilled labour. Assuming that on an average 1000 persons are employed with an average minimum wage of Rs 10000/- pm after discounting the income of Rs. 4000/pm by the person being earned before being engaged in construction, the net benefit shall be = Rs. 6000x12x1000= Rs. 720.0 lakh. (ii) After completion during operation about 100 people will get employment for O&M, routine upkeep / maintenance of roads and buildings. Average benefit shall be 100x12x30000= Rs. 360.0 lakh	360
5	Economic benefits due to compensatory afforestation	Benefits from such compensatory afforestation accruing over next 50 years monetized and discounted to the present value should be included as benefits of compensatory forestation. For benefits of CA the guidelines of the Ministry for NPV estimation may be consulted	Benefits from Compensatory afforestation in 200.72 ha @ discount rates of 6%/year of NPV =Rs 49.5 lakh)	49.5
Total Environment Benefits (B)				**83499.86**
Total benefits due for useful life of 30-year =30 (operational year) x (83499.86 - 720) + 720* 10 (construction year) = Rs. 2490595.8 Lakh				**2490595.8**
Environment Benefit Cost Ratio= 2490595.8/18020.84				**138.20:1**

//True Copy//

ANNEXURE - R/3-6

ANNEXURE-III

Additional TOR

S.No.	Additional ToR	Response
1.	Land acquired for the project shall be suitably compensated in accordance with the law of the land with the prevailing guidelines. Private land shall be acquired as per provisions of Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013.	The details are covered in section 7.2 of Chapter-7 of the Report
2.	Funds Allocated for Corporate Environment Responsibility (CER) shall be made as per O.M. No. 22-65/2017-IA.III dated 01.05.2018 for various activities therein.	The aspect is covered in section 10.17 of chapter-10
3.	The details of funds allocation and activities for CER shall be incorporated in EIA/EMP report.	The aspect is covered in section 10.17 of chapter-10
4.	Consolidated EIA/EMP report is to be submitted as per the generic structure (Appendix III & IIIA) given in the EIA Notification, 2006.	Complied
5.	One season baseline data shall be collected for all the environmental attributes as mentioned in the standard ToR of hydro projects.	The study for Post monsoon season as mentioned in section 3.2 for various aspects (air, water, noise & soil) has been covered in section 3.3.5 to 3.3.8
6.	The EIA report should clearly mention activity wise EMP and CER cost details and should earmarked clear break-up of the capital and recurring cost along with the timeline for incurring the capital cost.	The aspect is covered in section 10.16 of chapter-10
7.	Conservation plan for the Scheduled I Species, if any, in the project study area shall be prepared and submitted to the Competent Authority for approval.	The aspect is covered in section 10.2 of chapter-10
8.	Approved DPR by CWC/CEA shall be submitted.	Complied
9.	Dam break analysis, Disaster Management Plan and Fisheries Management Plan be prepared and submitted in the EIA/EMP report.	The aspect has been covered in section 7.3.8, section 7.3 of chapter-7. The Fisheries Management Plan has been covered in section 4.11.2.2 of chapter-4
10.	Environmental matrix during construction and operational phase needs to be submitted.	The aspect is covered in Table 10.27 & 10.28 of Chapter-10
11.	Both capital and recurring expenditure under EMP shall be submitted.	The aspect is covered in Table 3.17 of Chapter-3
12.	Environmental Cost benefit analysis shall be done.	The aspect is covered in Chapter-9

//True Copy//

S.No.	Additional ToR	Response
13.	Impact of development activity/project on the wildlife habitat, if any, within 10km of the project boundary shall be studied.	The aspect is covered in section 3.2 of the report. The impacts of development activity/ project are presented in Chapter-4
14.	Detailed Social Impact analysis along with status of R&R plan shall be submitted in the EIA/EMP report.	The aspect is covered in section 7.2 of Chapter-7
15.	Compliance report from the Regional Office of MoEF&CC for the earlier Environmental Conditions issued vide letter dated 22.08.2007 and 25.04.2018.	Compliance report from the Regional Office of MoEF&CC for the earlier Environmental Conditions is given in Annexure-XIII and IV-A.
16.	Status of all the pending Court Cases shall be submitted.	Status of Court cases is given in Annexure-IVB.
17.	The consultant engaged for preparation of EIA/EMP report has to be registered with Quality Council of India (QCI/NABET) under the scheme of Accreditation & Registration of MoEF&CC. This is a pre-requisite.	WAPCOS IS NABET registered with Certificate No. :- NABET/EIA/1619/RA 0106
18.	Consultant shall include a "Certificate" in EIA/EMP report regarding portion of EIA/EMP prepared by them and data provided by other organization(s)/ laboratories including status of approval of such laboratories. Declaration by the Consultant that information submitted in the EIA/EMP is factually correct and shall be submitted along with EIA/EMP reports.	Declaration is given in EIA Report
19.	As undertaking as part of the EIA report from Project proponent, owing the contents (information and data) of the EIA report with the declaration about the contents of the EIA report pertaining to a project have not been copied from other EIA reports.	Undertaking from client is given in the EIA Report
20.	As per Ministry's Notification 17.07.2020, the ToR will remain valid for a period of 5 years from the date of issue of this letter for submission of EIA/EMP report. The ToR will stand lapsed after completion of 5 years in case of final EIA/EMP is not submitted. The period of validity of ToR in the present case shall be counted from the date of expiry of the Environmental Clearance issued by the Ministry vide letter no. J-12011/29/2007-IA I dated 22.08.2007 as further modified by this Ministry's notification dated 18.01.2021.	Complied
21.	Baseline data shall not be older than 3 years, at the time of submission of the proposal, for grant of Environmental Clearance.	The baseline study was conducted in Post Monsoon period (November 2020). The details are mentioned in section 3.2 of Chapter-3

//True Copy//

S.No.	Additional ToR	Response
22.	In case of any charge in the scope of the project such as capacity enhancement, charge in submergence, etc., fresh scoping clearance has to be obtained.	NA
23.	Details of the name and number of posts to be engaged by the project proponent for implementation and monitoring of environmental parameters be specified in the EIA report.	The aspect is covered in Chapter-12 of the report
24.	The EIA/EMP report must contain an Index showing details of compliance of all ToR conditions. The Index will comprise of page No. etc., vide which compliance of a specific ToR is available. It may be noted that without this index, EIA/EMP report will not be accepted.	Complied
25.	Appropriate Biodiversity Conservation and Management plan for the Native, Rare & Endangered floral and faunal species getting affected due to the project shall be prepared.	The aspect has been covered in section 10.2 of chapter-10
26.	The PP should complete all the tasks as per the provisions of EIA Notification, 2006 and as amended time to time and submit the application for final clearance within the stipulated time.	Complied

Standard TOR

S. No.	TOR Points	Compliance
1	**Scope of the EIA Studies**	
	The EIA Report should identify the relevant environmental concerns and focus on potential impacts that may change due to the construction of proposed project. Based on the baseline data collected for three (3) seasons (Pre-monsoon, Monsoon and Winter seasons), the status of the existing environment in the area and capacity to bear the impact on this should be analysed. Based on this analysis, the mitigation measures for minimizing the impact shall be suggested in the EIA/EMP study.	The study for Post monsoon season for various aspects (air, water, noise & soil) has been covered in section 3.3.5 to 3.3.8 The detailed study of environment impacts with their mitigation measures for minimizing the impact has been done in chapter-4
2	**Details of the Project and Site**	
	• General introduction about the proposed project.	This aspect has been covered in section 1.1 of chapter-1 of EIA report

//True Copy//

S. No.	TOR Points	Compliance
	• Details of project (existing and proposed) and site giving L-sections of all U/S and D/S projects of River with all relevant maps and figures. Connect such information as to establish the total length of interference of Natural River, the total length of tunnelling of the river and the committed unrestricted release from the site of diversion into the main river.	This aspect has been covered in section 2.2 of chapter-2
	• A map of boundary of the project site giving details of protected areas in the vicinity of project location.	This aspect has been covered in chapter-2
	• Location details on a map of the project area with contours indicating main project features. The project layout shall be superimposed on a contour map of ground elevation showing main project features (viz. location of dam, Head works, main canal, branch canals, quarrying etc.) shall be depicted in a scaled map.	The location Map of the project is given Figure 1.1 of Chapter-1. Location Layout Map has been shown in Figure 2.1 of chapter-2
	• Layout details and map of the project along with contours with project components clearly marked with proper scale maps of at least a 1 :50,000 scale and printed at least on A3 scale for clarity.	The aspect is covered in Chapter-2 on Page 2-13
	• Existence of National Park, Sanctuary, Biosphere Reserve etc. in the study area, if any, should be detailed and presented on a map with distinct distances from the project components.	NBWL Clearance is attached as Annexure-X
	Drainage pattern and map of the river catchment up to the proposed project site.	The aspect has been covered in section 3.3.2.1 of chapter-3. The drainage Map is covered in Annexure-XIII
	• Delineation of critically degraded areas in the directly draining catchment on the basis of silt Yield Index as per the methodology of All India Soil and Land Use Survey of India.	The aspect has been covered in section 10.2 of chapter-10
	• Soil characteristics and map of the project area	The aspect has been covered in section 3.3.5 of chapter-3.
	• Geological and Seismo-tectonic details and maps of the area surrounding the proposed project site showing location of dam site and powerhouse site.	The aspect has been covered in section 3.3.2 of the chapter-3.
	• Remote Sensing studies, interpretation of satellite imagery, topographic sheets along with ground verification shall be used to develop the land use/land cover pattern of the study using overlaying mapping techniques viz. Geographic Information System {GIS), False Color Composite (FCC) generated from satellite data of	The study area Map is represented in Fig 3.1 of Chapter-3. The FCC and Classified image of Study area are represented in Fig 3.3 (a) and 3.3 (b) of section 3.3.4

S. No.	TOR Points	Compliance
	project area.	
	• Land details including forests, private and other land.	This aspect has been covered in section 3.5 of chapter-3
	• Demarcation of snow fed and rain fed areas for a realistic estimate of the water availability.	This aspect has been covered in section 10.3.2 of chapter-10
	• Different riverine habitats like rapids, pools, side pools and variations in the river substratum-bedrocks, rocks, boulders, sand/silt or clay etc. need to be covered under the study.	This aspect has been covered in section 3.3.2.1 of chapter-3
3	**Description of Environment and Baseline Data**	
	To know the present status of environment in the area, baseline data with respect to environmental components air, water, noise, soil, land and biology & biodiversity (flora & fauna), wildlife, socio-economic status etc. Should be collected with 10 km radius of the main components of the project site i.e. Dam site and power house site. The air quality and noise are to be monitored at such locations which are environmentally & ecologically more sensitive in the study area. The baseline studies should be collected for 3 seasons (Pre-Monsoon, Monsoon and Post Monsoon seasons). The study area should comprise of the following: • Catchment area up-to the dam site • Submergence Area • Project area or the direct impact area should comprise of area falling within 10 km radius from the periphery of reservoir, land coming under submergence and area downstream of dam upto the point where Tail Race Tunnel (TRT) meets the river. • Downstream upto 10 km from tip of Tail Race Tunnel (TRT).	The details of study area have been covered in section 3.2 of Chapter-3. The baseline data of the various aspects has been covered in section 3.3.5 to 3.3.8 of chapter-3. The ecological and socio-economic have been covered in section 3.4 & 3.5 respectively.
4	**Details of the Methodology**	
	The methodology followed for collection of base line data along with details of number of samples and their locations in the map should be included. Study area should be demarcated properly'. On the appropriate scale map. Sampling sites should be depicted on map for each parameter with proper legends. For forest classification, Champion and Seth (1968) classification should be followed	The sampling location Map for soil, water & air are represented in Fig 3.5, 3.6 & 3.7respectively. The methodology adopted for field survey of Terrestrial Flora has been outlined in section 3.4.1.4 of Chapter-3. . The methodology for collection of baseline data for aquatic fauna has been described in section 3.4.1.9 of Chapter-3 & the

S. No.	TOR Points	Compliance
		methodology for survey and sampling of Fishes has been covered in section 3.4.1.9.4
5	**Methodology for collection of Biodiversity Data**	
	• The number of sampling locations should be adequate to get a reasonable idea of the diversity and other attributes of flora and fauna. The guiding principles should be the size of the study area (larger area should have larger number of sampling locations) and inherent diversity at the location, as known from secondary sources (e.g. eastern Himalayan and low altitude sites should have a larger number of sampling locations owing to higher diversity).	This aspect has been covered in section 3.4 of chapter-3.
	• The entire area should be divided in grids of 5km X 5km preferably on a GIS domain. There after 25% of the grids should be randomly selected for sampling of which half should be in the directly affected area (grids including project components such as reservoir, dam, powerhouse, tunnel, canal etc.) and the remaining in the rest of the area (areas of influence in 10 km radius for project components). At such chosen location, the size and number of sampling units (e.g. quadrats in case of flora/transects in case of fauna) must be decided by species area curves and the details of the same (graphs and cumulative number of species in a tabulated form) should be provided in the EIA report. Some of the grids on the edges may not be completely overlapping with the study area boundaries. However these should be counted and considered for selecting 25% of the grids. The number of grids to be surveyed may come out as a decimal number (i.e. it has an integral and a fractional part) which should be rounded to the next whole number.	This aspect is covered in section 3.4.1.4.i.e. Floristic survey and quantitative analysis of vegetation of main section 3.4 of Chapter-3
	• The conventional sampling is likely to miss the presence of rare, endangered and threatened (R.E.T.) species since they often occur in low densities and in case of faunal species are usually secretive in behaviour. Reaching the conclusion about the absence of such species in the study area based on such methodology is misleading. It is very important to document the status of such species owing to	The Status of all the floral species as per IUCN Status is marked in Table 3.17. Similarly, status of faunal species i.e. Mammals, reptiles, avifauna etc. as per IUCN are marked in Table 3.40 to Table 3.44.

S. No.	TOR Points	Compliance
	their high conservation value. Hence likely presence of such species should be ascertained from secondary sources by a proper literature survey for the said area including referring to field guides studies/surveys in the larger landscapes which include the study area for the concerned project must be referred to since most species from adjoining catchments is likely to be present in the catchments in question. In fact such literature form the entire state can be referred to. Once a listing of possible R.E.T. species from the said area is developed, species specific methodologies should be adopted to ascertain their presence in the study area which would be far more conclusive as compared to the conventional sampling. If the need be, modern methods like camera trapping can be resorted to, particularly for areas in the eastern Himalayas and the secretive/nocturnal species. A detailed listing of the literature referred to, for developing lists of R.E.T. species should be provided in the EIA reports.	
	• The R.E.T. species referred to in this point should include species listed in Schedule I and II of Wildlife (Protection) Act, 1972 and those listed in the red data books (BSI, ZSI and IUCN).	The Status of all the floral species as per IUCN Status is marked in Table 3.17. Similarly, status of faunal species i.e. Mammals, reptiles, avifauna etc. as per IUCN are marked in Table 3.40 to Table 3.44.
6	**Components of the EIA Study**	
	Various aspects to be studied and provided in the EINEMP report are as follows:	
	A. Physical and Chemical Environment Geological & Geophysical Aspects and Seismo - Tectonics	
	• Physical geography, Topography, Regional Geological aspects and structure of the Catchment	This aspects has been covered in section 3.5 of chapter-3.
	• Tectonics, seismicity and history of past earthquakes in the area. A site specific study of the earthquake parameters will be done. The results of the site specific earthquake design shall be sent for approval of the NCSDP (National committee of Seismic Design Parameters, Central water commission, New Delhi for large dams.	The aspect has been covered in section 3.3.2.1 to 3.3.2.5, section 3.3 of chapter-3.
	• Landslide zone or area prone to landslide existing in the study area should be examined.	This aspect has been covered in section 4.2.1.6 of chapter-4.

S. No.	TOR Points	Compliance
	• Presence of important economic mineral deposit, if any.	The aspect has been covered in section 3.3 and 3.8 of chapter-3.
	• Justification for location & execution of the project in relation to structural components (dam height).	The aspect has been covered section 2.2 and 2.3 of chapter 2
	• Impact of project on geological environment	This aspect has been covered in Table 4.5 of chapter-4.
	Meteorology, Air and Noise:	
	• Meteorology (viz. Temperature, Relative humidity, wind speed/direction etc.) to be collected from nearest IMD station.	The aspect has been covered in Table 3.3.1 of chapter-3.
	• Ambient Air Quality with parameters viz. Suspended Particulate Matter (SPM), Respirable Suspended Particulate Matter (RSPM) i.e. suspended particulate materials <10 microns, Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NOx) in the study area at 6 locations.	This aspect has been covered in section 3.3.8, section 3.3 of chapter-3
	• Existing noise levels and traffic density in the study area at 6 locations.	This aspect has been covered in section 3.3.7, section 3.3 of chapter-3
	Soil Characteristic:	
	• Soil classification, physical parameters(viz., texture, porosity, bulk density and water holding capacity) and chemical parameters (viz. pH, electrical conductivity, magnesium, calcium, total alkalinity, chlorides, sodium, potassium, organic carbon, available potassium, available phosphorus, SAR, nitrogen and salinity, etc.) (6 locations).	The aspect has been covered in section 3.3.5, of chapter-3.
	Remote sensing and GIS Studies	
	• Generation of thematic maps viz., slope map, drainage map, soil map, land use and land cover map, etc. Based on these, thematic maps, an erosion intensity map should be prepared	The land use map is shown as Figures- 3.3 (a) & 3.3 (b) The soil map is shown as Figure 3.5 of Chapter-3. The drainage, Erosion Intensity & Slope Map is covered in Annexure-XIII
	Water Quality:	
	• History of the ground water table fluctuation in the study area	
	• Water quality for both surface water and ground water for (i) Physical parameters (pH, temperature, electrical conductivity, TSS); (ii) Chemical parameters (Alkalinity, Hardness, BOD, COD, NO_2,	The aspect has been covered in section 3.3.6 of chapter-3.

S. No.	TOR Points	Compliance
	$P0_4$, Cl, $S0_4$, Na, K, Ca, Mg, Silica, Oil & Grease, phenolic compounds, residual sodium carbonate); (iii) Bacteriological parameter (MPN, Total coliform) and (iv) Heavy Metals (Pb, As, Hg, Cd, Cr-6, total Cr, Cu, Zn, Fe) (6 locations).	
	• Delineation of sub and micro-watersheds, their locations and extent based on the All India Soil and Land Use Survey of India (AISLUS), Department of Agriculture, Government of India. Erosion levels in each micro-watershed and prioritization of micro-watershed through silt yield index (SYI) method of AISLUS.	The aspect has been covered in section 10.3.2 of chapter-10
	Water Environment & Hydrology	
	• Hydro-Meteorology of the project viz. precipitation (snowfall, rainfall), temperature, relative humidity, etc. Hydro-meteorological studies in the catchment area should be established along-with real time telemetry and data acquisition system for inflows monitoring.	The aspect has been covered in section 3.3.3 of chapter-3.
	• Run off, discharge, water availability for the project, sedimentation rate, etc.	The aspect has been covered in section 3.3.3 of chapter-3
	• Basin characteristics	The aspect has been covered in section 3.3.3 of chapter-3
	• Catastrophic events like cloud bursts and flash floods, if any, should be documented.	The aspect has been covered in section 3.3.3 of chapter-3.
	• For estimation of Sedimentation Rate, direct sampling of river flow is to be done during the EIA study. The study should be conducted for minimum one year. Actual silt flow rate to be expressed in ha-m km^2 year-1.	The aspect has been covered in section 3.3.3 of chapter-3
	• Set up a G&D monitoring station and a few rain gauge stations in the catchment area for collecting data during the investigation.	The aspect has been covered in section 3.3.3.2, main section 3.3.3 of chapter-3
	• Flow series, 10 daily with 90% 75% and 50% dependable years discharges.	The aspect is covered in section 10.5.6 of Chapter-10
	• Information on the 10-daily flow basis for the 90 per cent dependable year the flow intercepted at the dam, the flow diverted to the power house and the spill comprising the environmental flow and additional flow towards downstream of the barrage for the project may be given	The aspect is covered in section 10.5.6 of Chapter-10
	• Environmental flow to be as per MoEF's norms of @20% in lean season 20-30% in non-lean & non-monsoon and 30% during monsoon seasons. In addition, site specific	The aspect is covered in section 10.5.6 of Chapter-10

S. No.	TOR Points	Compliance
	study is to be carried out for accurate assessment of environmental flow and to be submitted.	
	• E-flow release shall be through un-regulated opening	Complied
	• Longitudinal connectivity for biota movement and sediment transportation to be explored. A suitable design is to be provided for this purpose.	The aspect is covered in section 10.5.6 of Chapter-10
	• Hydrological studies/data as approved by CWC shall be utilized in the preparation of EIA/EMP report. Actual hydrological annual yield may also be given in the report.	The aspect has been covered in sub-section 3.3.3 of chapter-3
	• Sedimentation data available with CWC may be used to find out the loss in storage over the years.	The aspect has been covered in sub-section 3.3.3.5, section 3.3.3 of chapter-3
	• A minimum of 1 km distance from the tip of the reservoir to the tail race tunnel should be maintained between upstream and downstream projects.	Complied
	Biological Environment	
	Besides primary studies, review of secondary data/literature published for project area on flora & fauna including RET species shall be reported in EIA/EMP report	
	Flora:	
	• Characterization of forest types (as per Champion and Seth method) in the study area and extent of each forest type as per the Forest Working Plan.	The aspect has been covered in section 3.4 of the chapter-3.
	• Documentation of all plant species i.e. Angiosperm, Gymnosperm, Pteriodophytes Bryophytes (all groups).	The aspect has been covered in section 3.4 of the chapter-3.
	• General vegetation profile and floral diversity covering all groups of flora including lichens and orchids. A species wise list may be provided•.	This aspect has been covered in sub-section 3.4.1.2 of chapter-3.Secies wise list is given in Table 3.16 & Table 3.17 of Chapter-3
	• Assessment of plant species with respect to dominance, density, frequency, abundance, diversity index, similarity index, importance value index (IVI) , Shannon Weiner index etc. of the species to be provided. Methodology used for calculating various diversity indices along with details of locations of quadrates, size of quadrates etc. to be reported within the study area in different ecosystems.	The aspect has been covered in in section 3.4.1.6.2, section 3.4 of Chapter-3

//True Copy//

S. No.	TOR Points	Compliance
	• Existence of National park, Sanctuary, Biosphere Reserve etc. in the study area, if any, should be detailed	NBWL Clearance is attached as Annexure-X
	• Economically important species like medicinal plants, timber, fuel wood etc.	The aspect has been covered in Table 3.17 of chapter-3.
	• Details of endemic species found in the project area.	-
	• Flora under RET categories should be documented using International Union for the Conservation of Nature and Natural Resources (IUCN) criteria and Botanical Survey of India's Red Data list along-with economic significance. Species diversity curve for RET species should be given.	The aspect has been covered in Table 3.17 of chapter-3.
	• Cropping pattern and Horticultural Practices in the study area	The section is covered in section 3.5 of the report
	• Biodiversity study which is a component of EIA study is to be carried out by associating a reputed organisation as recommended by WII, Dehradun or by ICFRE, Dehradun. The list of institutes is available on MoEF portal.	Biodiversity study was carried out by our own team of experienced scientist accredited by NABET
	Fauna	
	• Fauna study and inventorisation should be carried out for all groups of animals in the study area. Their present status along with Schedule of the species.	The aspect has been covered in section 3.4.1.8, section 3.4 of chapter-3.
	• Documentation of fauna plankton (phyto and zooplankton), periphyton, benthos and fish should be done and analysed.	The aspect has been covered in section 3.4.1.9 section 3.4 of chapter-3.
	• Information (authenticated) on Avi-fauna and wildlife in the study area	The aspect has been covered in section 3.4.1.8.1., section 3.4 of chapter-3.
	• Status of avifauna their resident/ migratory/ passage migrants etc.	The aspect has been covered in section 3.4.1.8.1., section 3.4 of chapter-3.
	• Documentation of butterflies, if any, found in the area.	The aspect has been covered in section 3.4.1.8.5, section 3.4 of chapter-3
	• Details of endemic species found in the project area.	The aspect has been covered in section 3.4 of chapter-3
	• RET species-voucher specimens should be collected along-with GPS readings to facilitate rehabilitation. RET faunal species to be classified as per IUCN Red Data list and as per different schedule of Indian Wildlife (Protection) Act, 1972.	Status of faunal species i.e. Mammals, reptiles, avifauna etc. as per IUCN are marked in Table 3.40 to Table 3.44.

//True Copy//

S. No.	TOR Points	Compliance
	• Forest and Wildlife clearance (WLC) is to be obtained as per extent procedures	NBWL Clearance is attached as Annexure-X. The details of Forest Clearance are mention in Annexure-IX
	• Camara trap to be used for wildlife survey	
	• Existence of barriers and corridors, if any, for wild animals.	No Barriers
	• Compensatory afforestation to compensate the green belt area that will be removed, if any, as part of the proposed project development and loss of biodiversity.	The aspect has been covered in subsection section 10.2.3 of section 10.2 of chapter-10.
	• Collection of primary data on agricultural activity, crop and their productivity and irrigation facilities components.	The aspect has been covered in section 3.5 of chapter-3
	D. Aquatic Ecology	
	• Documentation of aquatic fauna like macro-invertebrates, zooplankton, phyto-plantktons, benthos etc.	The aspect has been covered in section 3.4.1.9 of chapter-3. The presence of such species are presented in Table 3.45, 3.46, 3.47 & 3.48
	• Fish and fisheries, their migration and breeding grounds.	The aspect has been covered in section 3.4.1.9.4 of chapter-3.
	• Fish diversity composition and maximum length & weight of the measured populations to be studies for estimation of environmental flow.	The aspect has been covered in section 3.4.1.9.4 of chapter-3
	• Conservation status of aquatic fauna.	The aspect has been covered in section 3.4.1.9 of chapter-3.
	• Sampling for aquatic ecology and fisheries and fisheries must be conducted during three seasons - Pre-monsoon (summer), monsoon and winter. Sizes (length & weight) of important fish species need to be collected and breeding and feeding grounds should also be identified along the project site or in vicinity.	The aspect has been covered in section 3.4.1.9 of the chapter-3.
	E Socio-Economic	
	• Collection of baseline data on human settlements, health status of the community and existing infrastructure facilities for social welfare including sources of livelihood, job opportunities and safety and security of workers and surroundings population	The aspect has been covered in section 3.5 of chapter-3.
	• Collection of information with respect to social awareness about the developmental activity in the area and social welfare measures existing and proposed by	The aspect has been in section 3.5 of chapter-3

S. No.	TOR Points	Compliance
	project proponent	
	• Collection of information on sensitive habitat of historical, cultural and religious and ecological importance	The aspect has been covered in section 3.5 of chapter-3.
	• The socio-economic survey/ profile within 10 km of the study area for demographic profile; Economic Structure; Developmental Profile; Agricultural Practices; Infrastructure, education facilities; health and sanitation facilities; available communication network etc.	The aspect has been covered in section 3.5 of chapter-3.
	• Documentation of demographic, Ethnographic, Economic Structure and development profile of the area	The aspect has been covered in section 3.5 of chapter-3.
	• Information on Agricultural Practices, Cultural and aesthetic sites, Infrastructure facilities etc.	The aspect has been covered in section 3.5 of chapter-3.
	• Information on the dependence of the local people on minor forest produce and their cattle grazing rights in the forest land	The aspect has been covered in section 3.5 of chapter-3.
	• List of all the Project Affected Families with their name, age, educational qualification, family size, sex, religion, caste, sources of income, land & house holdings, other properties, occupation, source of income, house/land to be acquired for the project and house/land left with the family, any other property, possession of cattle, type of house etc.	The aspect has been covered in section 3.5 of chapter-3.
	• Special attention has to be given to vulnerable groups like women, aged persons etc. and to any ethnic/indigenous groups that are getting affected by the project.	The aspect has been covered in section 3.5 of chapter-3.
7	**Impact Prediction and Mitigation Measures**	
	The adverse impact due to the proposed project should be assessed and effective mitigation steps to abate these impacts should be described.	
	Air Environment:	
	• Changes in ambient and ground level concentrations due to total emissions from point, line and area sources.	The aspect has been covered in section 4.6 of chapter 4.
	• Effect on soil, material, vegetation and human health.	The aspect has been covered in section 4.6 of chapter 4.
	• Impact of emissions from DG set used for power during the construction, if any, on air environment.	The aspect has been covered in section 4.6.1.1 of chapter 4.

S. No.	TOR Points	Compliance
	• Pollution due to fuel combustion in equipment and vehicles.	The aspect has been covered in section 4.6.1.1 & 4.6.1.5 of chapter 4.
	• Fugitive emissions from various sources.	The aspect has been covered in section 4.6.1.2 & 4,6.1.3 of chapter 4.
	Water Environment:	
	• Changes in surface and ground water quality	The aspect has been covered in section 4.3 of chapter 4.
	• Steps to develop pisci-culture and recreational facilities.	The aspect has been covered in section 4.3 of chapter 4.
	• Changes in hydraulic regime and downstream flow	The aspect has been covered in section 4.5 of chapter 4.
	• Water pollution due to disposal of sewage.	The aspect has been covered in section 4.3.1 of chapter 4.
	• Water pollution from labour colonies/ camps and washing equipment.	The aspect has been covered in section 4.3.1 of chapter 4.
	Land Environment:	
	• Adverse impact on land stability, catchment of soil erosion, reservoir sedimentation and spring flow (if any) (a) due to considerable road construction / widening activity (b) interference of reservoir with the inflowing stream (c) blasting for commissioning of HRT, TRT and some other structures.	The aspect has been covered in section 4.2 of chapter 4
	• Changes in land use / land cover and drainage pattern.	The aspect has been covered in section 4.5 of chapter 4
	• Immigration of labour population.	The aspect has been covered in section 4.2.1.5 of chapter 4
	• Quarrying operation and muck disposal.	The aspect has been covered in section 4.2.1.2 & 4.2.1.3 of chapter 4
	• Changes in land quality including effects of waste disposal.	The aspect has been covered in section 4.2.1.2 of chapter 4
	• River bank and their stability.	The aspect has been covered in section 4.2.1.1 of chapter 4
	• Impact due to submergence.	The aspect has been covered in section 4.2.1.1 of chapter 4
	Biological Environment:	
	• Impact on forests, flora, fauna including wildlife, migratory avi-fauna, rare and endangered species, medicinal plants etc.	The aspect has been covered in section 4.8 of chapter 4
	• Pressure on existing natural resources.	The aspect has been covered in section 4.8 of chapter 4
	• Deforestation and disturbance to wildlife, habitat fragmentation and wild animal's	The aspect has been covered in section 4.8 of chapter 4

S. No.	TOR Points	Compliance
	migratory corridors.	
	• Compensatory afforestation-identification of suitable native tree species for compensatory afforestation and green belt	The aspect has been covered in section 4.8 of chapter 4
	• Impact on fish migration and habitat degradation due to decreased flow of water.	The aspect has been covered in section 4. 4.10.2.2 of chapter 4
	• Impact on breeding and nesting grounds of animals and fish.	The aspect has been covered in section 4.6 of chapter 4
	Socio-Economic Aspects:	
	• Impact on local community including demographic profile	The aspect has been covered in section 4.13 of chapter-4.
	• Impact on socio-economic status.	The aspect has been covered in section 4.13 of chapter-4.
	• Impact on economic status.	The aspect has been covered in section 4.13 of chapter-4.
	• Impact on human health due to water/ vector borne disease.	The aspect has been covered in section 4.13.2.4 & 4.12.2.1 of chapter-4.
	• Impact on increase traffic.	The aspect has been covered in 4.6.1.5 of report
	• Impact on Holy Places and Tourism	The project immediate influence area is comprised of 500m on both sides of project sites. One archaeological site is located in PIAA area at Haat- Lakshmi-Narayan temple
	• Impacts of blasting activity during project construction which generally destabilize the land mass and leads to landslides, damage to properties and drying up of natural springs and cause noise population will be studies. Proper record shall be maintained of the baseline information in the post project period.	The aspect has been covered in section 4.7.1.5 of chapter-4.
	• Positive and negative impacts likely to be accrued due to the project are listed.	The aspect has been covered in section Chapter-8 of the report
8	**Environmental Management Plans:**	
	1. Catchment Area Treatment (CAT) Plan should be prepared micro-watershed wise. Identification of free draining/ directly draining catchment based upon Remote Sensing and Geographical Information System (GIS) methodology and Sediment Yield Index (SYI) method of AISLUS, Deptt. of Agriculture, Govt. of India coupled with ground survey. Areas or watersheds falling under 'very severe' and	The aspect has been covered in section 10.3 of chapter-10. The aspect is further covered in Annexure-XIII

//True Copy//

S. No.	TOR Points	Compliance
	'severe' erosion categories should be provided and required to be treated. Both biological as well as engineering measures should be proposed in consultation with State Forest Department for areas requiring treatment. Year-wise schedule of work and monetary allocation should be provided. Mitigation measures to check shifting cultivation in the catchment area with provision for alternative and better agricultural practices should be included.	
	2. Compensatory Afforestation shall be prepared by the State Forest Department in lieu of the forest land proposed to be diverted for construction of the project as per the Forest (Conservation) Act, 1980. Choice of plants for afforestation should include native and RET species, if any. This will be a part of the forest clearance proposal.	The aspect has been covered in section 10.2 of chapter-10.
	3. Biodiversity and Wildlife Conservation and Management Plan for the conservation and preservation of rare, endangered or endemic floral/faunal species or some National Park/ Sanctuary/ Biosphere Reserve or other protected area is going to get affected directly or indirectly by construction of the project, then suitable conservation measures should be prepared in consultation with the State Forest Department and with the physical and financial details. Suitable conservation techniques (in-situ/ex-situ) will be proposed under the plan and the areas where such conservation is proposed will be marked on a project layout map.	The aspect has been covered in section 10.2 of chapter-10
	4. Fisheries Conservation and Management Plan - a specific fisheries management measures should be prepared for river and reservoir. If the construction of fish ladder/ fish-way etc. is not feasible then measures for reservoir fisheries will be proposed. The plan will detail out the number of hatcheries, nurseries, rearing ponds etc. proposed under the plan with proper drawings. If any migratory fish species is getting affected then the migratory routes, time/season of upstream and downstream migration, spawning grounds etc. will be discussed in details.	The aspect has been covered in section 4.11.2.2 of chapter-4
	5. Resettlement and Rehabilitation Plan needed to be prepared on the basis of findings	The aspect is covered in section 7.2 of Chapter-7

//True Copy//

S. No.	TOR Points	Compliance
	of the socio-economic survey coupled with the outcome of public consultation held. The R&R package shall be prepared after consultation with the representatives of the project affected families and the State Government. Detailed budgetary estimates are to be provided. Resettlements site should be identified. The plan will also incorporate community development strategies. ***Compensation for acquisition of land, R&R plan and other applicable benefits shall be in line with applicable law/policy in J&K.***	
	6. Green Belt Development Plan along the periphery of the reservoir, approach roads around the colonies and other project components, local plant species must be suggested with physical and financial details. A layout map showing the proposed sites for developing the green belt should be prepared.	The aspect has been covered in section 10.7 of chapter-10.
	7. Reservoir Rim Treatment Plan for stabilization of land slide/land slip zones, if any, around the reservoir periphery is to be prepared based on detailed survey of geology of the reservoir rim area. Suitable engineering and biological measures for treatment of identified slip zones to be suggested with physical and financial schedule. Layout map showing the landslide/landslip zones shall be prepared and appended in the chapter.	The aspect has been covered in section 4.2.1.6 of chapter-4
	8. Muck Disposal Plan suitable sites for dumping of excavated materials should be identified in consultation with State Pollution Control Board and State Forest Department. All muck disposal sites should be minimum 30 m away from the HFL of river. The quantity of muck to be generated and the quantity of muck proposed to be utilized shall be calculated in consultation with the project authorities. Details of each dumping site viz. area, capacity, total quantity of muck that can be dumped etc. should be worked out and discussed in the plan. Plan for rehabilitation of muck disposal sites should also be given. The L-section/cross section of muck disposal sites and approach roads should be given. The plan shall have physical and financial details of the measures proposed.	The aspect has been covered in section 10.4 of Chapter-10
	9. Restoration Plan for Quarry Sites and landscaping of colony areas, working areas,	The aspect has been covered in section 4.2.1.2 of chapter-4.

//True Copy//

S. No.	TOR Points	Compliance
	roads etc. Details of the coarse/fine aggregate/clay etc. required for construction of the project and the rock/clay quarries/river shoal sites identified for the project should be discussed along-with the Engineering and Biological measures proposed for their restoration with physical and financial details. Layout map showing quarry sites vis-a-vis other project components, should be prepared.	
	10. Study of Design Earthquake Parameters: A site specific study of earthquake parameters should be done. Results of the site specific earthquake design parameters should be approved by National Committee of Seismic Design Parameters, Central Water Commission (NCSDP}, New Delhi.	The aspect has been covered sub section 3.5.2, section 3.5 in chapter 3.
	11. Dam Break Analysis and Disaster Management Plan The outputs of dam break model should be illustrated with appropriate graphs and maps clearly bringing out the impact of Dam Break scenario. To identify inundation areas, population and structures likely to be affected due to catastrophic floods in the event of dam failure. DMP will be prepared with the help of Dam Break Analysis. Maximum water level that would be attained at various points on the downstream in case of dam break will be marked on a detailed contour map of the downstream area, to show the extent of inundation. The action plan will include Emergency Action and Management plan including measures like preventive action notification, warning procedure and action plan for co-ordination with various authorities.	The aspect has been covered in section 7.3.8, section 7.3 of chapter-7
	12. Water, Air and Noise Management Plans to be implemented during construction and post-construction periods.	The aspect has been covered in section 4.3, 4.6 and 4.7 of chapter-4
	13. Public Health Delivery Plan including the provisions of drinking water supply for local population shall be in the EIA/EMP Report. Status of the existing medical facilities in the project area shall be discussed. Possibilities of strengthening of existing medical facilities, construction of new medical infrastructure etc. will be explored after assessing the need of the labour force and local populace.	The aspect has been covered in section 10.12 of chapter-10.
	14. Labour Management Plan for their Health and Safety	The aspect has been covered in sector 10.11 of chapter-10.

S. No.	TOR Points	Compliance
	15. Sanitation and Solid waste management plan for domestic waste from colonies and labour camps etc.	The aspect has been covered in 4.2.1.5 of chapter-4.
	16. Local Area Development Plan to be formulated in consultation with the Revenue Officials and Village Pancahayats. Appropriate schemes shall be prepared under EMP for the Local Area Development Plan with sufficient financial provisions.	The aspect has been covered in section 10.16 of chapter-10.
	17. Environmental safeguards during construction activities including Road Construction.	The section is covered in section 10.10 of Chapter-10
	18. Energy Conservation Measures for the work force during construction with physical and financial details. Alternatives will be proposed for the labour force so that the exploitation of the natural resource (wood) for the domestic and commercial use is curbed.	The aspect has been covered in section 4.8.1 of chapter 4
	19. Environmental Monitoring Programme to monitor the migratory measures implemented at the project site is required will be prepared. Provision for Environment Management Cell should be made. The plan will spell out the aspects required to be monitored, monitoring indicators/ parameters with respect to each aspect and the agency responsible for the monitoring of that particular aspect throughout the project implementation.	The aspect has been widely discussed in chapter-6.
	20. A summary of Cost Estimates for all the plans, cost for implementing all the Environmental Management Plans and CER.	The aspect has been covered in Table 10.26 of chapter-10.

//True Copy//

Item No. 15.4

Vishnugad Pipalkoti Hydro-Electric Project (444 MW) in Chamoli district, Uttarakhand by M/s THDC India Limited- **regarding EC**

STATUS OF WORKS

STATUS OF WORK

SATELLITE IMAGE OF POWER HOUSE COMPLEX AREA

//True Copy//

STATUS OF WORK

SATELLITE IMAGE OF TBM PLATFORM AND SURGE SHAFT AREA

//True Copy//

Sr. No.	WORK FRONT	TOTAL SCOPE OF WORK (Qty)	CURRENT PROGRESS (Qty)	CURRENT PROGRESS (%)
	DAM Site			
1	DIVERSION TUNNEL	494 M	494 M	100%
2	RIVER DIVERSION (on 02 April 2018)	ACTIVITY	COMPLETE	100%
3	COFFER DAM U/S	19536 CUM	19536 CUM	100%
4	DAM LEFT ABUTMENT (including plunge pool reach)-EXCAVATION	449519 CUM	297283 CUM	66.13 %
5	DAM RIGHT BANK -EXCAVATION	390881 CUM	39173 CUM	10%
6	ADIT TO INTAKE (EL1250 TO EL 1270)	240 M	240 M	100%
7	ADIT TO INTAKE TUNNEL (EL 1262 TO EL 1242)	245 M	245 M	100%
8	ADIT TO INTAKE TUNNEL TOP(EL 1270 TO EL 1290)	205 M	205M	100%
9	ADIT TO DESILTING CHAMBER TOP	185 M	185 M	100%
10	ADIT TO DC BOTTOM	215 M	215 M	100%

//True Copy//

Sr. No.	WORK FRONT	TOTAL SCOPE OF WORK (Qty)	CURRENT PROGRESS (Qty)	CURRENT PROGRESS (%)
11	DESILTING CHAMBER-1 : PILOT TUNNEL	390 M	390 M	100%
12	DESILTING CHAMBER-2 : PILOT TUNNEL	390 M	390 M	100%
13	DESILTING CHAMBER-3 : PILOT TUNNEL	390 M	390 M	100%
14	DESILTING CHAMBER-1 : SIDE SLASHING	390 M	390 M	100%
15	DESILTING CHAMBER-2 : SIDE SLASHING	390 M	390 M	100%
16	DESILTING CHAMBER-3 : SIDE SLASHING	390 M	390 M	100%
17	DESILTING CHAMBER-1 : BENCHING	83632 CUM	20108 CUM	24%
18	DESILTING CHAMBER-2 : BENCHING	83632 CUM	36085 CUM	43.2%
19	DESILTING CHAMBER-3 : BENCHING	83632 CUM	48265 CUM	57.7%
20	ADIT TO HRT	371 M	371 M	100%

//True Copy//

Sr. No.	WORK FRONT	TOTAL SCOPE OF WORK (Qty)	CURRENT PROGRESS (Qty)	CURRENT PROGRESS (%)
21	HRT-(DBM-HEADING)-After realignment	960 M	761 M	79%
22	ADIT TO HRT GOC	221 M	221 M	100%
23	BALANCE ADIT TO HRT GOC	130 M	130M	100%
24	ADIT TO SFT	124 M	91.5 M	73.8%
25	GOC-1 SHAFT EXCAVATION	664 CUM	69 CUM	10%
26	GOC-2 SHAFT EXCAVATION	664 CUM	105 CUM	15.8%
27	GOC-3 SHAFT EXCAVATION	664 CUM	197 CUM	29.6%
28	ADIT TO SFT GOC	150M	10M	7%
29	INTAKE TUNNEL 1-EXCAVATION	134 M	134 M	100%
30	INTAKE TUNNEL 1-KERB CONCRETING	134 M	92 M	69%
31	INTAKE TUNNEL 1-OVERT CONCRETING	134 M	92 M	69%
32	INTAKE TUNNEL 1-INVERT CONCRETING	134 M	87 M	65%
33	INTAKE TUNNEL 2-EXCAVATION	198 M	198 M	100%
34	INTAKE TUNNEL 2-KERB CONCRETING	198 M	160 M	81%
35	INTAKE TUNNEL 2-OVERT CONCRETING	198 M	159 M	80%
36	INTAKE TUNNEL 3-EXCAVATION	262 M	262M	100%

22

//True Copy//

Sr. No.	WORK FRONT	TOTAL SCOPE OF WORK (Qty)	CURRENT PROGRESS (Qty)	CURRENT PROGRESS (%)
37	INTAKE TUNNEL 3-KERB CONCRETING	262 M	207 M(LHS)	79%
38	INTAKE TUNNEL 3-OVERT CONCRETING	262 M	180 M	80%
	POWER HOUSE COMPLEX and TBM			
39	ADIT TO POWER HOUSE TOP	416 M	416 M	100%
40	POWER HOUSE : PILOT TUNNEL	146 M	146 M	100%
41	POWER HOUSE : SIDE SLASHING-LEFT	146 M	146 M	100%
42	POWER HOUSE : SIDE SLASHING-RIGHT	146 M	146 M	100%
43	TRANSFORMER HALL : PILOT TUNNEL	140 M	140 M	100%
44	TRANSFORMER HALL : SIDE SLASHING	100 M	71 M	71%
45	DRAINAGE GALLERY	348 M	348 M	100%
46	MAIN ACCESS TUNNEL (MAT)	416 M	397 M	95%
47	ADIT TO PS BOTTOM	305 M	253 M	85%

//True Copy//

Sr. No.	WORK FRONT	TOTAL SCOPE OF WORK (Qty)	CURRENT PROGRESS (Qty)	CURRENT PROGRESS (%)
48	ADIT TO D/S SURGE TANK BOTTOM	352 M	338 M	96%
49	ADIT TO D/S SURGE TANK TOP	56 M	56 M	100%
50	ADIT TO U/S SURGE SHAFT BOTTOM	325.5 M	147.5 M	45.3%
51	SURGE TANK DOWNSTREAM-Heading	150 M	80 M	53%
53	ADIT TO TRT	637 M	637 M	100%
54	TRT EXCAVATION-D/S	2480 M	138 M	5.5%
55	TRT EXCAVATION-U/S	564 M	74 M	13%
56	TBM ENTRY ADIT-Heading	55 M	55 M	100%
57	TBM ENTRY ADIT-Benching	55 M	55 M	100%

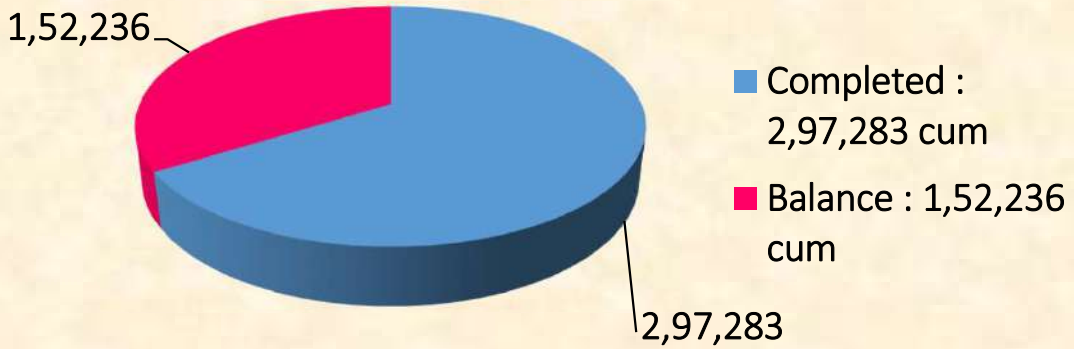
//True Copy//

U/S COFFER DAM AND DT INLET

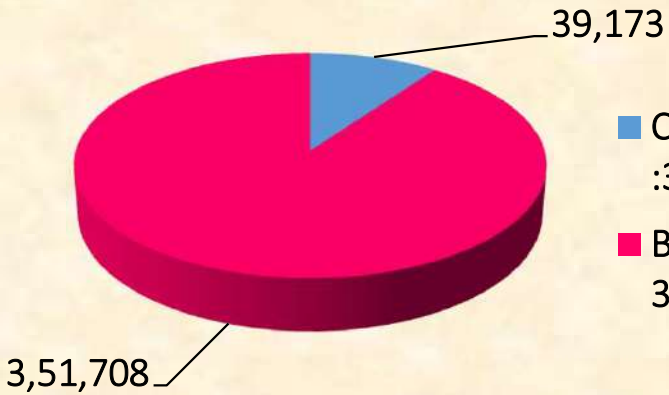
//True Copy//

EXCAVATION OF DAM

Excavation at Dam Left Bank Abutment (including plunge pool reach)
Total Qty 4,49,519 Cum



Excavation at Right Bank
Total Qty 3,90,881 Cum



Dam excavation 39% completed //True Copy//

DESILTING CHAMBER
(390 m X 16 m X 21.25 m)

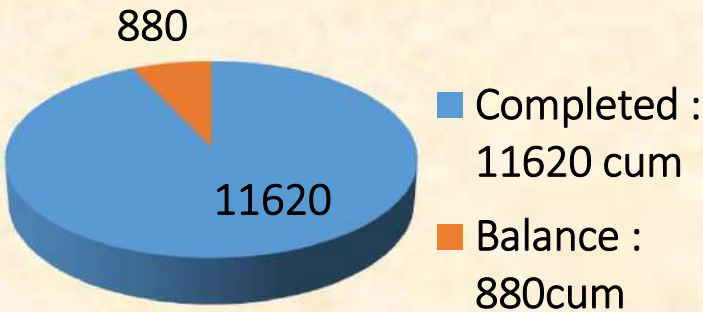
Reinforcement for concrete lining in DC-2

Lining work in DC-2 is in progress

Heading of all 3 DCs completed and benching 41.74% completed

//True Copy//

DSPT U/G EXCAVATION
(Total Quantity : 12500 Cum)



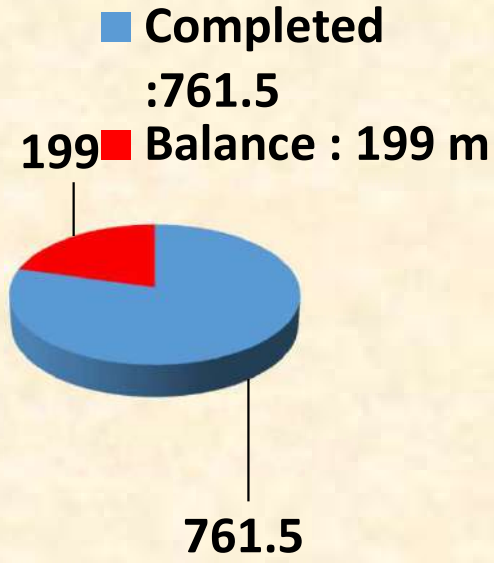
//True Copy//

DIVERSION TUNNEL OUTLET

//True Copy//

HEAD RACE TUNNEL (by DBM)

(Length: 960 m)



Heading 79.32 % completed

//True Copy//

ADIT TO HRT GATE OPERATION CHAMBER

(Length 221 m)

Adit to HRT Gate Operation Chamber : Completed

Adit to HRT

//True Copy//

Tunnel Boring Machine

//True Copy//

ADDITIONAL BYPASS ADIT FOR TBM

//True Copy//

MACHINE HALL

(146 m x 20.3 m x 48 m)

Steel Rib Erection in Progress

//True Copy//

TRANSFORMER HALL

(140.3 m x 15 m x 25.5 m)

Crown Excavation In Progress (70 % Completed)

//True Copy//

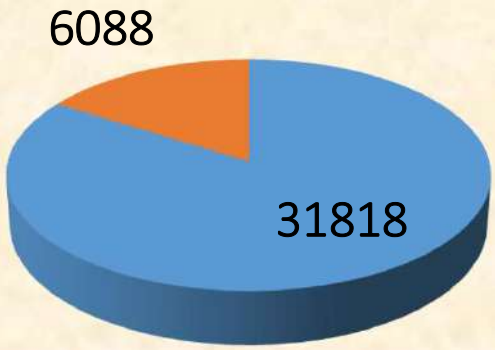
TAIL RACE TUNNEL

(Length: 3070m)

Heading excavation 485m out of 3070m completed

STABILIZATION WORK AT TRT OUTFALL

Stabilization Work At TRT Outfall



- Completed : 31818 cum
- Balance : 6088 cum

//True Copy//

Progress of Works

- River Diversion and construction of Upstream Coffer Dam has been completed on 31.07.2019.
- Dam excavation 40% completed and balance is in progress.
- Heading of all three De-silting Chambers has been completed and benching 41.74% completed and balance is in progress.
- Heading excavation by DBM in HRT 79.29 % completed and balance is in progress.
- TBM has been commissioned and operation started from 03.11.2020.

Progress of Works

- In Machine Hall, crown excavation has been completed and strengthening of geologically weak section with steel rib supports is in progress.
- In Transformer Hall, crown excavation and strengthening of geologically weak section with steel rib supports is in progress.
- In TRT, heading excavation 485 m out of 3070 m completed and balance is in progress.
- At TRT outlet area, 80% slope stabilization work has been completed.

//True Copy//

Schedule of Commissioning

- The different power generating units of VPHEP are scheduled to be commissioned by following timeline:

First Unit	- December, 2023
All Units	- June, 2024

Progress of Works

Physical progress of major works including Financial progress as on 30th June, 2021 is as under:

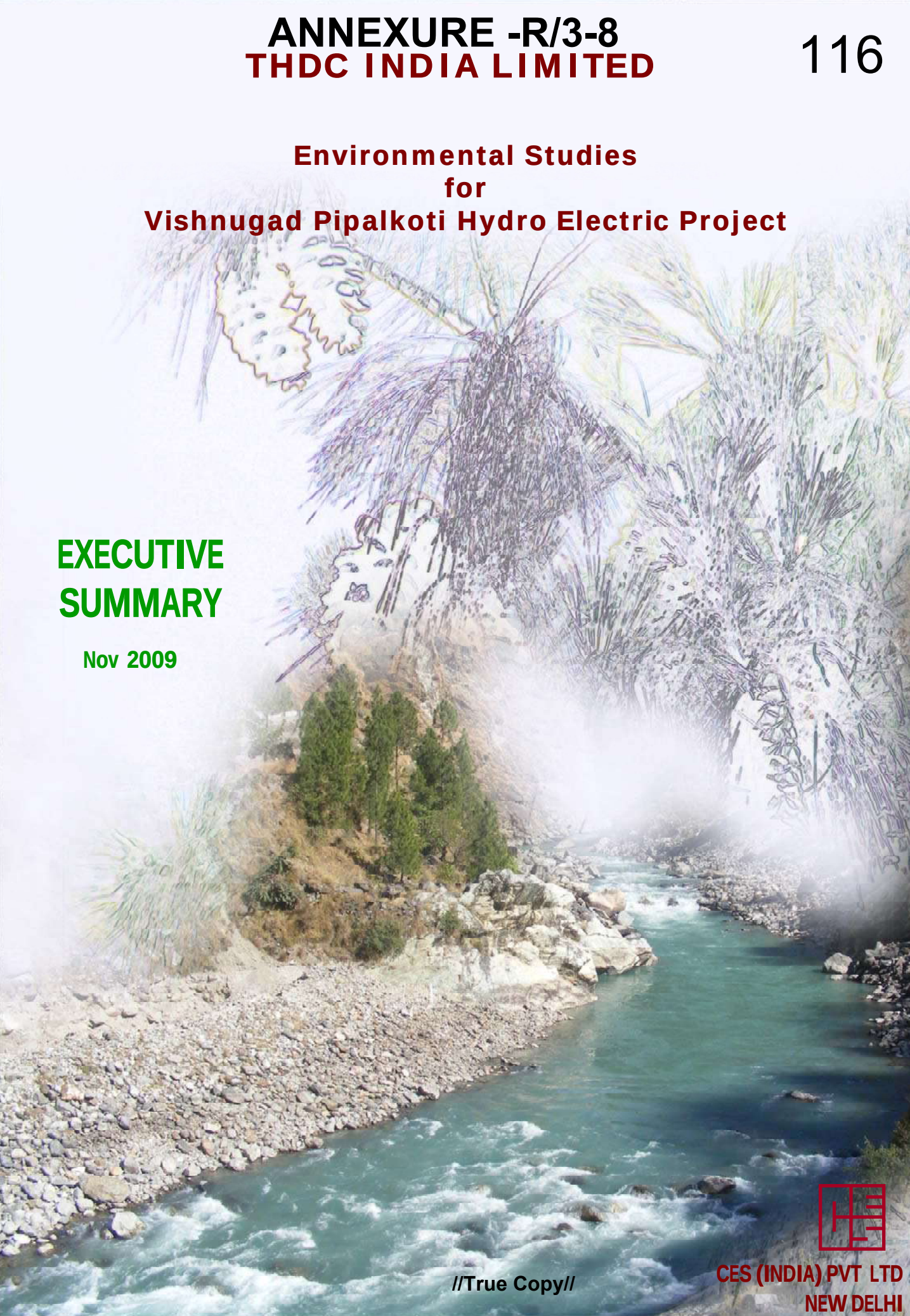
- More than 53.05% of Civil & Hydro-Mechanical and Electro-Mechanical works completed.
- Overall investment is Rs. 2265.68 Cr.

//True Copy//

ANNEXURE -R/3-8

THDC INDIA LIMITED

Environmental Studies for Vishnugad Pipalkoti Hydro Electric Project



EXECUTIVE SUMMARY

Nov 2009

//True Copy//

CES (INDIA) PVT LTD
NEW DELHI

Executive Summary

1. INTRODUCTION

THDC India Ltd. proposes to commission Vishnugad Pipalkoti Hydro-electric Power (VPHEP) Project on the river Alaknanda, a major tributary of the river Ganga. VPHEP is a run-of-the-river hydropower project with an installed capacity of 444 Mega Watts. A dam is to be located at village Helong in Joshimath Tehsil and an underground power house at village Haat in Chamoli Tehsil.

The Government of India has requested World Bank financing for VPHEP. Prior to GoI's decision to request World Bank funding, THDC had undertaken an Environmental Impact Assessment (EIA) of VPHEP through Water & Power Consultancy Services (WAPCOS), a PSU under Ministry of Water Resources, engaged in total consultancy in water resources, water supply, hydro power and allied sectors. The Project also obtained Environmental Clearance from the Statutory Authority on the basis of this original EIA.

On reviewing the approved EIA of VPHEP, it was found that some aspects, such as managed river flow, terrestrial biodiversity, environmental impacts of advanced construction sites and archaeological survey etc., needed further analysis to strengthen the report and to comply with World Bank policy requirements for environmental assessment. In order to address these shortcomings, THDC assigned the work to M/s Consulting Engineering Services (India) Private Limited, New Delhi to carry out additional environmental studies and consolidate the initial EIA into a comprehensive Environmental Assessment in line with the requirements of the Government of India and the World Bank.

In addition, the Social Impact Assessment (SIA) & Resettlement Action Plan (RAP) has been undertaken through the Centre for Management & Social Research (CMSR), Hyderabad. The project involves acquisition of public (government and forest land) and private land from titleholders located in 19 villages. The acquisition of land and consequent displacement will have potential impacts on the social, economic, cultural and environmental attributes of the affected population.

The present Executive Summary is a concise document bringing out the salient points from the consolidated EA developed by M/S CES as described above. The summary is set out under the following sub-headings:

- Project Context and Location
- Project Description
- Environment and Social Assessment Process
- Analysis of Alternatives
- Important Site Characteristics
- Environmental & Social Impacts & Mitigation Measures
- Environmental Management Plan
- Implementation Arrangements
- Environment Management Monitoring.

2. PROJECT CONTEXT & LOCATION

2.1 Project Context

Development of hydro power resources is important for energy security of the country. Considering the fact that hydro power is a renewable source of energy and is environment-friendly compared to coal based thermal power plants, and also the fact that India has huge hydro power potential, policy decisions were taken at national level to develop hydro power to meet the country's growing energy demand.

India is currently facing an energy deficit. In Northern region there is an energy deficit of 13.41 percent and a peaking deficit of 17.62 percent and the demand for energy is projected to rise further. According to estimates by the Central Electricity Authority, the demand for peaking power in the Northern Region alone is projected to rise from 35,145 MW during 2007-08 to 48137 MW in 2011-12.

To meet the all India peak demand and energy requirement at the end of 12th Plan, a capacity addition of more than 90,000 MW has been assessed during 12th Plan (2012-2017), which includes 30,000 MW of hydro electric power.

The requirement of power (Source: Ministry of Power) during the year 2002-03 in the state of Uttarakhand and the Northern Region was 3774 MU and 156610 MU against availability of 3670 MU and 144218 MU respectively. Thus there was a deficit of 2.8% and 9.1% respectively. Uttarakhand is one state which has tremendous scope for development of Hydro power projects. The hydro power potential of the State is assessed by CEA on 31 Jan 2009 is given below.

Identified capacity	:	18,175 MW
Capacity Developed	:	3056.1 MW (16.81%)
Capacity under Construction	:	1850 MW (10.18%)
Capacity yet to be Developed	:	13269 MW (73.01%)

VPHEP is suited to help provide peaking power to the national grid. Once commissioned, the project will provide 1813 million units of electricity each year to the Northern Region to meet India's growing energy needs. The Project shall also help to improve the hydro-thermal mix in the country.

As per the Hydro Policy 2008 of GoI, the following benefits would be provided:

Twelve percent of the power generated at VPHEP will be provided free of cost to the home state of Uttarakhand.

Twenty five percent of the remaining power will go to Uttar Pradesh in lieu of its equity in the company.

The rest of the power will be available to the Northern Grid.

An additional 1 percent free power from the project will be earmarked for a Local Area Development Fund. This amount will be provided on a sustained and continued basis over the life of the project.

100 units of electricity per month will be provided free to each Project Affected Family (PAF) through the relevant distribution company, for a period of 10 years from the date of commissioning of the project.

2.2 Project Location

Vishnugad Pipalkoti Hydro Electric Project (4 x 111 MW) is located on Alaknanda River, a major tributary of river Ganga, in district Chamoli in the state of Uttarakhand. It is a run-of-the river hydro power project & envisages construction of a diversion dam of 65 m height near village Helong (79°29'30" E and 30°30'50" N). An underground power house is proposed at village Haat (79°24'56" E and 30°25'31"N), 3 km from Pipalkoti.

The nearest railway station is at Rishikesh about 225km from project site. National Highway NH-58 from Ghaziabad-Rishikesh – Pipalkoti-Joshimath is located on the left bank of the River and all the project components are located on right bank of the river.

3. PROJECT DESCRIPTION

The project comprises the following main components:

- **Dam Site:** A 65m high concrete diversion dam with spillway section having 4 No. 6.6m x 15m opening is proposed near village Helong. The reservoir will have a gross storage capacity of 3.63 million cum, out of which 2.47 million cum shall be live storage. A diversion cum spill tunnel of 10 m dia shall divert the discharge of 725 m^3/sec during the construction period.
- **Power House Site:** The power house site is located inside a hill in right bank of Alaknanda River downstream of Haat village. It will comprise of two separate underground caverns for installation of turbines and transformers. The dimensions of power house will be 127 m x 20.3 m x 50 m. The size of transformer cavern is 112 m x 16 m x 24.5 m. The power house will have 4 units of 111MW. The project would generate an annual energy generation of 1813.03 GWH on 90% dependability basis
- **Head Race Tunnel:** 13.4 km long & 8.8 m dia modified horse shoe shaped head race tunnel has been proposed on right bank of the Alaknanda River.
- **Tail Race Tunnel:** 3.07 km long & 8.8 m dia modified horse shoe shaped tail race tunnel has been proposed on right bank of the Alaknanda River.
- Intake structure with 3 No. modified horse shoe shaped intake tunnel of 6m diameter

- 3 No. underground sedimentation chambers
- Silt flushing tunnel of size 3.6m x 4.0m
- Earlier, four Adits located at Gulabkothi village (Adit -1), Langsi (Adit-2), Maina Nadi (Adit- 3) and Adit-4 on U/s of Surge shaft had been envisaged by Project. THDC has introduced, Tunnel Boring Machine for the portion of Head race tunnel operations. This will reduce the use of identified muck disposal sites. Adit–1 at Gulabkoti & Adit-4 on U/s Surge Shaft shall be utilized for muck disposal and will be constructed. Adit 3 at Maina Nadi shall be considered for construction at later stage in view of any contingency,

4. ENVIRONMENT AND SOCIAL ASSESSMENT PROCESS

The project area is located in the Himalayas and is characterized by rugged topography with steep hills. The area experiences subtropical climate and is sparsely vegetated. The hill slopes are steep, and are generally covered with sparse vegetation. Most of the human population in the area is concentrated in the villages along the highway.

Although forestry is the major land use in the hill state of Uttarakhand (with 34,662 km^2 or about 64.79% of the state area under legally defined forests) the forest cover is 24,442 km^2 (45.7 %), there has been a long history of forest degradation. As a result, only about 4002 km^2 area of the state currently is classified as "dense" forest, and the remaining is a mix of "open" forests, meadows, grasslands and barren scree slopes. Most of the good quality forests remain in the relatively remote and inaccessible areas, whereas the forest cover near the traditional settlements, major towns and near major transportation routes are relatively poor.

As part of the governments' plans and programs for managing forests, biodiversity and wildlife, vast tracts of forest land is currently being protected in the state. Of these, 71.08% forest areas are demarcated as Reserved Forests, and 28.51% as Protected Forests. An area of 0.71 million ha (13.35 % of the state area) is under the protected area network, which include 6 national parks and 6 wildlife sanctuaries.

Historical reasons combined with the natural setting, have led to areas around the project having relatively poor forest cover. The project is located by the side of a major pilgrim route (National Highway 58), and in the midst of a number of traditional settlements including the township of Pipalkoti. The steep rocky slopes by the deep gorges of the Alaknanda and its tributaries do not support good forests. The project area does not include any protected area.

4.1 EIA Process

Environmental impact assessment involved a detailed survey of the project area and review of relevant literature on various environmental aspects. A baseline environmental study was conducted to understand the present status of the environmental resources in the project area. The study area consisted of Project Influence Area (7km around the Project sites), Project Immediate Affected Area (500m on either side of Project sites) and at the Project Affected Areas (land acquired for Project). The Environment aspects

involved topography, geology, hydrology, land use, aquatic ecology, terrestrial biodiversity and archaeology of the Project area. Primary survey was followed by detailed consultation with local people and relevant Govt department such as Forest, Public Health, Jal Nigam, Watershed, Irrigation etc to get the relevant information about the area and future plan, if any. Based on baseline environmental status and proposed project activities potential impacts have been assessed and predicted and appropriate mitigation measures are suggested to avoid / reduce/ compensate the potential adverse impacts and enhance the positive impacts.

THDC has, over the last three years, conducted wide-ranging and detailed consultations with project-affected communities as part of its project preparation process. In order to strengthen its own capacity for handling community relations, the company hired two social workers and retained the services of a reputed local NGO to help the consultation process around assessing possible direct and indirect impacts of the project on local communities and their environment, and to forge appropriate mitigation measures. Some 72 formal consultation sessions; five project-wide public meetings (including two statutory public hearings that are part of the environmental clearance process); 11 meetings focused on environment issues and; innumerable informal meetings with Project-affected persons have been held during project preparation. Details of the formal consultation sessions can be found in the Project Information Center at Pipalkoti and on THDC's corporate website at thdc.nic.in.

4.2 SIA Process

The loss of private assets resulting in loss of income and displacement has made social impact assessment an important input into the project design while initiating and implementing developmental interventions. An understanding of the issues related to social, economic and cultural factors of the affected people is critical in the formulation of an appropriate rehabilitation plan. A detailed social impact assessment (SIA) therefore was carried out incorporating social analyses and participatory processes into project design and implementation to make it responsive to social development concerns. SIA also helped in enhancing the project benefits to poor and vulnerable people while minimizing or mitigating concerns, risks and adverse impacts. Further as the project implementation entails a large number other social issues such as influx of labour during construction and others, a systematic assessment provided the basis to formulate the approach to the Social Impact Assessment (SIA) through Resettlement Action Plans etc..

The objectives of the SIA were:

- To carry out a socio-economic, cultural and political/institutional analysis to identify the project stakeholders and social issues associated with the project;
- To assess the extent of land acquisition/appropriation and other losses and undertake the census of potential project affected people;
- To develop a Resettlement Action Plan (RAP) in consultation with the affected people and project authorities;
- To identify likely occurrence of HIV/AIDS resulting from the influx of outside labourers and others and develop a strategy to reduce their incidence; and
- To develop a consultation framework for participatory planning and implementation of proposed mitigation plan.

In order to conduct SIA, both qualitative as well as quantitative data was collected. The assessment was conducted in two phases. In the first phase, familiarization exercise was carried out and various stakeholders were identified through (a) discussions with Project Implementing authorities and other concerned and (b) collection of available Project Affected Persons database and other relevant project literature. Consultations were held with concerned village revenue officials to update the ownership of land and its utilization pattern by referring to Records of Right (ROR) or *Jamabandi* Registers. Literature review and consultations formed the basis for identification of key stakeholders. Following the review, rapid preliminary field visits were conducted as a part of ground truthing exercise. This enabled to cross verify the issues identified in the chapter on social impact in Environmental Assessment report prepared by WAPCOS. This has provided the basis for field research preparation and helped in testing the questionnaires and checklists. In phase II of the assessment, census survey of all the project-affected persons available was conducted. The survey, *inter alia*, has assessed the impacts of the project, the socio-economic conditions, and living standards of affected persons due to the project implementation. Qualitative surveys were conducted for evaluation of both affected population and implementation capacities of THDC. The qualitative survey included focus group discussions and in depth interviews with various sections of the population such as women, knowledgeable persons and community leaders to elicit their expectations and suggestions, which will support and provide additional information collected through quantitative survey.

4.3 Policy and Regulatory Framework

From the point of view of environmental impact assessment, the project is subject to a variety of national and state laws, and rules and regulations. Among these, the prominent are the following:
a) The Forest Act 1927; the Forest (Conservation) Act 1980; the Wildlife (Protection) Act,1972; National Wildlife Action Plan 1983, revised 2002; National Conservation Strategy,1992; National Forest Policy, 1988;

b) The Environment (Protection) Act 1986; and the Environmental Impact Assessment Notifications Sept 2006.

According to the prevailing procedures, the project required Forestry clearances and Environmental clearances.

Forest clearance is required to acquire forest land for the project. After joint survey and verification of forest land to be transferred for the project , GoUK has recommended the forestland to be acquired for the project for approval before MoEF and clearance is expected shortly.

The project has obtained the three-stage environmental clearance from the Ministry of Environment and Forests, GoI (MoEF). The final environmental clearance to the project was granted on 22 August 2007. This was preceded by the Stage I(2003) and the Stage II clearances from MoEF in May 2005. The no-objection certificate from the UK State Pollution Control Board (UKPCB) was obtained in April 2007. Public hearing as part of

environmental clearance of the project was held twice: in October 2006 and also in January 2007.

The project does not require any regulatory clearance under the GoI Ancient Sites and Remains Act, as it does not impact, directly or indirectly any known or notified cultural heritage resource. However, as a part of due diligence on safeguard policies, EA consultants conducted a study by surveying the archeological, historical and religious sites around the project area to identify and understand the impacts, if any, on such sites due to project activities. The study revealed that there is no such site within the project area (where land is going to be acquired for project infrastructure).

A detailed description of the project's baseline environmental conditions; probable adverse social and environmental impacts; and detailed environmental management plans including institutional responsibilities, implementation schedules, budget, and arrangements for monitoring and evaluation, are provided in the THDC-commissioned Environmental Assessment and Management Plan (EA/EMP) consolidated and prepared by CES India Pvt. Ltd.; and Social Impact Assessment and Resettlement Action Plan by Centre for Management & Social Research, Hyderabad.

The EA/EMP was supplemented with the following supporting documents (i) Study of the Managed River Flow in the project stretch of the River Alaknanda.; (ii) Assessment of the Terrestrial Biodiversity Impacts from the project; (iii)Assessment of Archeological, Physical and Cultural Resources (documents (i) to (iii) prepared by CES Pvt. India Ltd.) (iv) Safety Assurance Plan for the project prepared in house by THDC; (v) Catchment Area Treatment Plan for the project prepared by the State Forest Department. The summary recommendations of all the above studies have been incorporated in the EMP.

5. ANALYSIS OF ALTERNATIVES

In 1984, Uttar Pradesh Irrigation Department identified Vishnugad – Pipalkoti HEP for development with an installed capacity of 340 MW. Several alternative sites were considered in the identification report. The report also considered construction of a high dam and creation of a large storage. Two alternatives were considered. In the first case, an underground power house at Birahi on right bank was considered, and in the second alternative, a surface power house near village Haat, on the left bank, was proposed. However, no detailed investigations were carried out at the time.

In a subsequent development, the Government of Uttarakhand assigned the THDC the task of investigating and developing Vishnugad Pipalkoti site for hydro power generation. In order to decide on a barrage or a dam, investigations were carried out by THDC at several locations in the area. A summary of the findings of various alternatives is given below:

Summary of findings of various Alternatives of Dam Site

Alternatives	Location	Environmental, Social & Technical issues	Remarks
D-1 site	Near Pipalkoti	▪ Pipalkoti town and 6 villages will submerge ▪ Huge forestland under submergence	Not suitable

Alternatives	Location	Environmental, Social & Technical issues	Remarks
		▪ NH-58 below pond level, will need realignment in 20/30 km stretch ▪ Main Central Thrust close to the site ▪ Calcareous rock-not suitable for storage dam	
Upper Barrage Site	Just d/s of Animath nala - Alaknada confluence	▪ Overburden depth too much- much excavation required	Not suitable
Lower Barrage Site	Near Helong	▪ Close to MCT ▪ Full head not able to utilize	Not suitable
D-2 Site	120 m d/s of D-1	▪ Overburden depth too much	Not suitable
D-3 Site	200 m d/s of D-2	▪ Rockfall prone ▪ 20m thick river borne material terrace above water level on both bank	Not suitable
D-4 Site	1.5 km of d/s of D-1	▪ Least environmental and social problem	Found suitable
D-5	50 m d/s of D-4	▪ Most appropriate site from environmental, social and technical aspects	**Finally selected**

Conclusion: On the basis of these investigations, **Alternative-D5** has been selected for construction of a diversion dam with low height spillway.

Once the dam site was finalized, location/ alignments of other project components like HRT, power house, approach road etc. were selected. Environmental and social aspects were taken into consideration while finalizing the location/ alignments of these components.

No-Project Scenario

The demand for power in the agricultural, industrial and domestic sectors in Uttarakhand and other States in the northern region of India is increasing. Most of the States in the region are experiencing power shortage. In order to overcome this shortage, it is felt necessary to increase generation of hydro power, for which there is huge potential in Uttarakhand. The Central Electricity Authority (CEA), in its 16th Electric Power Survey, projected the growth in demand in the northern region at the rate of 7% during the 10th Plan and at the rate of 6.9% during the 11th Plan. The current deficit in power supply in Uttarakhand is 2.8% and in the northern region as a whole, 9.1%.

VPHEP is one of the important projects to improve the power generation. In the 'No-Project-scenario', that is, if VPHEP does not materialize, the present environmental status in the area may not change, but this may lead to other problems like:

- Non-availability of electricity affecting households, hospitals, tourism and other commercial activities, industry and agriculture.

- Dependence on diesel generators and firewood to meet local requirements, leading to green house gas emissions and other environmental and health related problems.

Taking all these aspects into consideration, it may be stated that environmental and health related problems would be there in the 'No-Project-Scenario' and, at the same time, power shortage problems will aggravate. It is, therefore, concluded that VPHEP is required to be implemented with adequate safeguards for environmental and social concerns due to the project.

6. IMPORTANT SITE CHARACTERISTIC

The topography is by and large rugged, the entire region is mountainous. The area is drained by Alaknanda River, which has originated from the Satopanth-Bhagirath Kharak group of glacier. From Dam site to TRT outfall Alaknanda River is drained by its three major tributaries namely Maina Nadi, flowing almost in northwest-southwest direction, while the Patal Ganga and Garur Ganga flowing in southeast-northwest direction.

6.1 Seismicity

State comes under **Seismic Zones V and IV** of Seismic Zoning Map of India, which corresponds to Zone Factors of 0.36 and 0.24 (effective peak ground acceleration in terms of 'g') (IS 1893 part I, 2002). The north dipping Main Central Thrust (MCT) lies about 2 km northeast of the proposed dam site. The Alaknanda fault, and Srinagar thrust (NAT) are located about 32 km and 45 km southwest respectively of the proposed dam site. A number of other less prominent structural dislocations are also present in the area. A detailed Scientific and Technical studies to determine seismic parameters with regard to the safety of the dam have been conducted by Dept. of Earthquake Engineering, IIT Roorkee. Based on this, dynamic analysis has also been conducted. The studies have been approved by the National Standing Committee on Seismic Design Parameters (NCSDP). It has been concluded that the present design of the dam is safe.

6.2 Geology

The project area forms part of Alaknanda valley, exposed rocks belonging to Garhwal and Central Himalayan Crystalline Group. The rocks occurring at the dam site are quartzites and along most of the length of the tunnel alignment are: quartzite with biotite schist, interbanded grey slates and dolomites/limestone, grey thinly bedded slates with minor interbeds of limestone, dolomitic limestone with subordinate grey slates, grey pyritous shale / slates, thinly bedded dolomitic limestones, grey slate / phyllite, white siliceous dolomite with magnesite and talc schist; light grey dolomite with stromatolitic structures, interbedded quartzite phyllite and dolomite belong to Garhwal Group. Calcareous shale and dolomitic limestone / dolomite were observed at the dam site. Along Tail race Tunnel, dolomitic limestone, metabasics, augen gneisses and schist were observed. During tunnel construction and underground power house construction proper air circulation should be maintained inside the work area. Proper ventilation should be provided. International guidelines for underground work with respect to air circulation, fire protection, communication, health, emergency preparedness should be followed

6.3 Landslide

On the basis of the Total Estimated Hazard (TEHD), five categories of landslide hazard zones have been identified namely, very low hazard, low hazard, moderate hazard, high hazard and very high hazard. Likelihood of landslide is higher on slopes showing steep angles, highly weathered and fractured lithology large unforested watershed and at locations showing concave transverse sections where colluvium is accumulated. In the study area very high hazard zone (VHH) are located along the valley of riverbed, in the Patal Ganga and Birahi Ganga area where old landslide and rock debris are accumulated and along the escarpment of Karmnasa river. Moderate hazard zones are present in the north of Dungri, around Kiruli, Gadora and around Baimru area. Low hazard and very low hazardous area are mainly restricted to cultivated fields, alpine zone and in the area with gentle slope with good vegetated cover. The dam and surge shaft area come under the low hazardous zone while the TRT outfall area come under the moderate hazardous zone. Slope stabilization techniques including engineering and vegetative measures are provided in detail in EMP.

6.4 Design Flood

The river diversion is required to facilitate the working area for construction and also to increase the availability of construction period during the year. Diversion structures required during the construction works has been estimated as 725m^3/sec for a return period of 1 in 25 years. A disaster management plan is prepared based on worst case scenario: in case failure of the dam. Administrative responsibility, warning system and emergency preparedness are identified.

6.5 Sedimentation and Silt erosion

For sediment handling of the VPHEP a very crucial choice has to be made, whether storage in the reservoir should be maintained through reservoir flushing from time to time or whether the reservoir should be allowed to fill up through sedimentation. The notion that reservoir sedimentation will be minimal or even that storage can be regained by discharging excess water through the gates during the monsoon does not hold. The flow velocities will be very low in (at least) the vicinity of the gates and significant sediment will take place. Effective flushing (i.e. flushing that regains storage) requires drawdown of the water level, hence the power plant cannot be operated during reservoir flushing. Advantages of maintaining reservoir storage through regular flushing are mainly 1) the sediment concentration in the intake will be smaller thus repair/maintenance costs of turbines will reduce drastically; and 2) with the storage a larger part of the flow during the lean period can be used for peak-hour production. To achieve the latter benefit flushing would only be required on the falling limb of the hydrograph. The main disadvantage is that high sediment concentrations occur during flushing events with potential negative environmental effects downstream. As an example: the model simulations have shown that flushing for 2 days with the radial gates fully open can recover 30 days of sedimentation during a “mean monsoon” period. This implies that the concentration – as an order of magnitude estimate – will be 15 (=30 divided by 2) times larger than the natural sediment concentration in the river for the same discharge. Another way to put the flushing concentration into perspective is that the flushing concentration corresponds to the (natural) river concentration that would occur for a 4 times larger discharge. If for instance only half of the flushing concentration would be acceptable then the duration of the reservoir flushing would have to double, and the power revenue reduced correspondingly.

Optimum Sediment Operation

When the sediment laden water enters the backwater of the reservoir the transport capacity of the flow decreases and sediment will start to settle. In this way the reservoir will gradually fill up starting upstream with a sedimentation "front" migrating through the reservoir. While the reservoir fills up the scope for operation will decrease and hence the possibility for storing water during off-peak periods to enable peaking production will decrease. Moreover, the retention time in the reservoir (and thus the settling time) decreases so that more sediment will enter the power intake. An important aspect of sediment handling is therefore to decide at which stage of the in-filling of the reservoir to start flushing to evacuate the sediment deposited. Flushing of the sediment deposited close to the radial gates will be much more efficient than flushing sediment deposited at the tail end of the reservoir. There will thus be a trade of between water usage for flushing and the benefit of the storage regained by flushing as well as the benefit of reduced sediment concentration in the intake. The two-dimensional M21C model has quantified the water usage for different flushing scenarios and the "Reservoir Model" has determined the sediment concentration at the power in-take associated with the various flushing scenarios. These model simulations in combination with a simple model for estimation of loss of revenue due to decreased life storage and water usage for reservoir flushing have identified the optimal flushing strategy involving start of flushing when life storage has been reduced with about 40%. This requires flushing about 4 times each year (in an average year) with each flushing lasting about three days. The turbines have to be closed down during flushing. The revenue loss for flushing the reservoir and reduced life storage compared to a "no sediment" scenario is about 5%.

Future Sediment Handling (for Operation)

Optimum sediment operation will be complex with many factors affecting the necessary decisions to be taken. For instance a decision about flushing the desilting chambers would have to consider the following factors:
How much sediment is deposited in the flushing trench of the desilting chambers and what is the likely increase of that? This would thus involve
1) Monitoring of sediment in trench and
2) A forecast of (near) future reservoir inflow (water and sediment).
What is the available flow for flushing thus a forecast of required production is required. How is the downstream conditions (flow and sediment transport) and what possible environmental constraints would there be in relation to sediment flushing.

This complexity calls for a Decision Support System (DSS) that integrates real-time monitoring data with forecasts values of inflow and production and a decision tree that will guide the operator to take the right decision. A real-time monitoring system should comprise discharge and sediment concentration at inflow to the reservoir, sediment concentration at intake, after desilting chambers (head race tunnel) and at sediment flushing channel from desilting chambers built up of sediment in trench of desilting chambers and at selected locations in the reservoir including in front of the intake. A minimum flow of 3 cumecs shall be maintained from dam downstream to TRT outfall where diverted river water will meet again in the river. A detailed CAT plan is also prepared to address erosion in the catchment area.

7. ENVIRONMENTAL & SOCIAL IMPACTS & MITIGATION MEASURES

- Impact on Flora and Fauna
- Water Quality Issue

- Construction related impacts
- Safety of workers and communities
- Impact on Physical and Cultural Resources
- Other induced impacts and cumulative impacts
- Dam safety
- Catchment Area Treatment & Other Environmental Enhancements
- Land Acquisition and its Impact
- Impacts on Indigenous people

7.1 Impact on Flora and Fauna

Baseline studies were conducted for the Project Influence Area (PIA- 7 Km area around the project) Project Immediate Affected Area (PIAA-500m on both sides of project sites) and the directly affected area. The project will require a total of 141.55 ha of land comprising 31.62 ha of private land, 90.09 ha of government forest/grazing land, 10.3 ha of van panchayat land (community held grazing and forest land), and 9.54 ha of state land owned by the Public Works Department.

7.2 Impact of the project on Nanda Devi Biosphere Reserve (NDBR)

The Nanda Devi Biosphere Reserve (30° 05'-31° 02'N latitude, 79°12'-80^{0}19'E longitude) – a World Heritage site for its Himalayan highland biodiversity is located in the northern part of West Himalayas and comprises of parts of the districts of Chamoli, Bageshwar and Pithoragarh, in altitude range of 1,800 – 7,817 m above mean sea level. The NDBR consists of a core zone (712km^2), surrounded by a buffer zone (5148km^2) which in turn is covered around by a transition zone (584km^2). The core zone (which includes two national parks) is protected as an absolutely undisturbed area. In the buffer zone, which surrounds the core zone, uses and activities are limited and managed in ways that protect the core zone. The usual uses permitted in buffer zone include forest restoration, demonstration sites for enhancing value addition to the resources, limited recreation and tourism, fishing and grazing. The transition zone is the outermost part of the biodiversity reserve, where uses and activities are managed to strike a balance between the need for protection of forests and the need for improving livelihood of people. Infrastructure and economic development activities are permitted in the transition zone unless specifically prohibited by a management plan of the transition zone. The transition zone currently includes major settlements, highways and other medium-scale economic infrastructure.

The project is located 37km away from the core zone of the NDBR. The project is also located outside the transition zone, and at its closest touches the boundary of the transition zone (at the dam site). No legal or regulatory restriction therefore applies to the project. Other than the NDBR, the protected area closest to the project is the Kedarnath Wildlife Sanctuary, 72km away from the project.

Although there is no direct impact of the project on the protected areas, the EA assessed the potential of indirect impacts on the transition and buffer zones of the NDBR, and determined that such impacts are not significant, during construction or operation. The EMP, nevertheless, provides for interventions to enhance the quality and the management of the buffer zone, even if the project's impacts are not significant.

If the environmental management measures envisaged in the EMP of the Project will be implemented , the overall impact of the project may be positive on the NDBR. The implementation of Catchment Area Treatment and Afforestation Plan will enhance the existing environmental status besides, resources and environment of the NDBR area. The interventions proposed in CAT plan under NDBR include:

Forestry Work: Afforestation work (50ha), Densification (100 ha) Medicinal plant plantation (50 ha), Assisted natural regeneration in the area (300 ha). The budget provided to NDBR for the Forestry activities is Rs 80,80,500/-

Soil & Moisture Conservation Engineering Work such as Vegetative check dams (250 No.), Gully Plugging (1500 No), Stone check dams (500 No.),Crate wire check dams (500 No.) Spurs (200 No.) and Water percolation tanks (500 No.)The budget provided to NDBR for the Soil & Moisture Conservation Engineering Work Rs 215,40,000/-

For management of Wildlife a budget of Rs.61,50,000/- is proposed in NDBR region under CAT Plan. The total Budget for NDBR is Rs.4,39,80,500/- under CAT plan out of Rs.44,66,64,900/-The management of CAT plan is provided in Chapter 4-EMP, Section 4.5.

Wildlife monitoring to be established in association with Forest Dept. in the project area and hunting/poaching should be strictly banned.

Comparative Distribution of Forest Types

Forest Type	Uttarakhand	Alaknanda Basin	Project Influence Area	Project Immediate Influence Area	Project Directly Affected Area
Moist Alpine Scrub	+	+	-	-	-
Sub- Alpine Forests	+	+	-	-	-
Himalayan Dry Temperate Forests	+	+	+	-	-
Himalayan Moist Temperate Forests	+	+	+	-	-
Sub-tropical Pine Forests	+	+	+	+	+
Tropical Dry Deciduous Forests	+	-	-	-	-
Tropical Deciduous Forests	+	-	-	-	-
Littoral & Swamp Forests	+	-	-	-	-

A comparative status of natural resources in the project area is summarized below

Comparative Status of Natural Resources in the Project Area

Parameters	Uttarakhand	Alaknanda Basin	Project Influence Area	Project Immediate Influence Area	Project Directly Affected Area
Forests Type	8	5	3	1	1
Flora (total trees, shrubs, climbers, grasses, ferns etc.)	4048	800	154	96	87
Flora : Diversity Index	-	-	-	0.89 – 2.41	0.89 – 2.41
National Parks	6	2	0	0	0
Sanctuaries	6	1	0	0	0
Biosphere Reserve*	1	1	1	1	1
Threatened / Protected fauna (no. of species)	22	15	5**	3***	3***
Other Fauna	2248	-	33	32	32

* The dam site touches the transitional boundary of NDBR

** *Varanus bengalensis, Panthera Pardus*, *Capricornis sumataensis Moschus chrysogaster, Ursus aretos (as per Indian Wildlife Protection Act 1972)*

*** *Panthera Pardus, Ursus aretos, Varanus bengalensis (as per Indian Wildlife Protection Act 1992)*

Based on the baseline data and comparison of available data, the forests of the project Influence area mainly fall in the degraded category. The forest areas are dominated by pine. The pine crops comprise mostly of middle age to mature trees. Young trees are generally deficient, occurring scattered or in small patches. The degeneration stage occur scattered in the Chir zone in patches where the trees are either destroyed or are unable to develop owing to excessively dry and shallow soil. Open shrub formations occupy the ground. The existing terrestrial biodiversity status of the project immediate influence area revealed the, natural flora is interrupted by human settlements and intensive agricultural & horticultural activities, heavy lopping & browsing activities, continuous traffic on existing NH-58. The Forest consists of Chir Pine and Sub tropical Scrub.

A detailed site specific investigation has been carried out to establish terrestrial biodiversity status which revealed that, dominant shrubs were *Berberis aristata* (Kashmoi)*, Eupatorium adenophorum* (Kala bansa) *Euphorbia royleana* (Shuru)*, Princepia utilis (*Bhekal) *Zanthoxylum alatum*(Timru), *Colebrookea oppositifolia* (Bindur), *Cannabis sativa* (Bhang), *Agave americana* (Rambans), *Euphorbia royleana* (Shuru), *Opuntia dilenii* (Nagpani*), Rubus ellipticus* (Hinsar*), Lantana camara* (Lantana*), Rumex hastatus (*Bhilmora*)* etc. The common tree species observed were *Pinus roxburghii* (Pine), *Cedrela toona* (Tun) *Bauhinia variegata* (Kachnar), *Melia azedarach* (Dhenk*), Ficus palmata* (Bedu), *Sapium insigne* (Khinna), *Phoenix humilis* (Khajoor) and *Mangifera India* (Aam). These species were widely distributed throughout the project immediate influence area as well as project influence area. The forest patches present in the project affected area is mostly plantation carried out by State Forest Department and Village Panchatyat. Most of the hill slopes are very steep and almost without any vegetation or with thin vegetation dominated by pine. There is a dense forest at one location after Guniyala villages towards the site of Maina Adit on the right bank of Alaknanda River. Three herb species *Berginia ligulata* (Silpara), *Hedychium spicatum* (Ban Haldi) and *Thalictrum foliolosum* (Mamiri) are reported in the forest area near Maina adit. These species fall in vulnerable category as per IUCN Red list. However these species are common in India in Himalayan region and are found in altitudinal range from 1000 to 3000 m. The vulnerable species found in the area should be developed in separate herbal garden at suitable place in consultation with forest department and propagation of the species must be taken. Besides the three species other species of medicinal value may be also encouraged.

Fauna of the project area is mainly represented by reptiles, birds and mammals. The reptiles were represented by *Calotes versicolor* (Common Lizard). The mammals were represented by domestic animals such as cow, buffalo, donkey, horses, mules, sheeps, goats and dogs. Mules and horses are the backbone of transportation system of local population in hilly areas. Most of the wildlife are present at higher elevation in the forest area and are not found near the river course. Steep slopes do not allow the mammals to use river water. The water of springs / tributaries is sufficient for these wild animals. Himalayan Musk Deer, Goral, Leopard, Brown bear and Wild Boar are reported in Project Influence Area. The common Leopard is reported to follow cattle/ goat/ sheep herds in the area. No threatened species are present in the project-affected area. The wildlife inhabits the forest areas mostly at higher elevations away from settlement. However they roam and hunt in the area. The project activities are likely to

disturb the normal peace of the wildlife and they are likely to move in other areas. There are no wildlife habitat areas in the project affected area and no fragmentation of habitat is occurring due to the project. In order to improve forest cover and wild habitat suggested recommendations to be strictly implemented as per approved Compensatory Afforestation Plan and Catchment Area Treatment Plan.

The project will clear fell an estimated 6153 trees. The major species to be affected are *Melia azedarach, Albizzia lebbek, Cedrela toona, Pinus roxburghii, Alnus nepalensis, Bauhinia variegata, Mallotus philippinensis* and *Cupressus torulosa.* No endangered, rare, threatened or endemic tree is lost due to felling in project. The species are commonly distributed throughout the project immediate influence area and project influence area. Therefore, adverse impacts on terrestrial biodiversity due to proposed tree felling is not expected. Owing to their common distribution the loss of these trees will not significantly affect existing biodiversity status of Project Influence Area, Alaknanda Basin or Uttarakhand in totality. It will not affect the structure composition, of existing forest types, forest cover or distribution characteristics of flora. The highest value of Diversity Index as 2.29 was reported at Dam site, which shows moderate diversity, and site was a planted site. For other areas it is lower and indicated that the area is not rich in floral wealth and represents poor diversity.

Compensatory Afforestation should be carried out to compensate the loss of trees. Compensatory Afforestation will be carried out in double the area of forest land acquired as regulated by Forest (conservation) Act 1980 and Uttarakhand Forest Policy. In lieu of 100.39 ha Forestland the project will undertake Compensatory Afforestation in double the area which will enhance the environment of the area. Additional measures by the project include roadside plantation, green belt development and Catchment Area Treatment Plan which will add to the natural resource of the area.

Indirect impacts of project activities on flora are expected to be limited to project immediate influence area and to some extent to project influence area. Indirect impacts will be due to various construction activities such as generation of dust due to earthwork, excavation, transportation of construction materials (sand aggregate, cement etc), quarry, crusher & blasting operations, air pollution due to movement of construction vehicles, equipments and machineries, influx of labour population and pollution generated through provision of labour camps established temporarily at construction sites etc. These impacts will be short term and limited to construction period only. The project will take necessary measures to control dust during construction period.

It may be ensured by the Contractor that no hunting is practiced at the site by any of the worker and that all site personnel are aware of the location, value and sensitivity of the wildlife resources. Movement of wildlife is reported in the area therefore monitoring unit should be established in the project sites in consultation with Forest Department.

The EMP also includes measures related to prevention of disturbance to Forest and wildlife by construction workers, procedure for disposal and management of muck and debris and redevelopment of muck disposal sites. Dumping area are either devoid of vegetation or show weedy shrubs. Very limited adverse impact is on flora is expected as these shrubs are widely distributed. To mitigate the loss of shrubs an approved muck

disposal plan should be strictly implemented. After the quarry operation the area should be redeveloped.

7.2 Water Quality Issue

Instream flow and water availability:The average discharge in the river at dam site is 182.7 m^3/s. Dependable flow at 50%, 75% and 90% are 88.6 m^3/s, 42.5 m^3/s, and 28.5 m^3/s respectively. Low flow of the order of 35 m^3/s occurs in the river in the month of January, February and March. Less than 100 m^3/s and more than 25 m^3/s discharges are available in months of November, December and April. 12 months discharge data of the tributaries were measured. Birahi was found to be the major tributary in this reach, while Garur Ganga & Tapan Nala are small tributaries. Very low discharge is available in months of Jan-Feb-March. There is likely impact on the flow downstream i.e. point of diversion to tunnel to point till water is released in to the main river. This may impact on water quality , water usages downstream and so on aquatic life especially during lean periods i.e December to February. To address the flow, aquatic and aesthetic requirement managed river flow suggests a minimum of 3 cumecs water to be made available in the stretch downstream of dam to TRT outfall where water diverted at intake will rejoin the main river course. This is critical only to the stretch between the dam to 2.69 km downstream of the dam (that too in lean period) as beyond this point there are four to five tributaries joining the main river which contribute to the main river flow.

THDC will maintain a minimum flow of 3 cumecs in the downstream of the dam throughout the year with the following mitigation measures as well (a) construction of six numbers of 5m high concrete overflow weirs across Alaknanda river on the d/s of the dam to address the issues of water diversion. These weirs are proposed up to the location where the first major tributary Tapan Nala meets river Alaknanda. With this arrangement there would be perennial pond age of about 0.13 Mcum of water in the above stretch of the river, which shall be good enough to allow the local people to fulfill all of their water needs during non monsoon /low discharge period. Average ponding of water behind each weir would be about 21666 cu.m. It is suggested that THDC should prepare an annual desilting plan for maintenance of the ponds. And; (b) In order to have regular replenishing of these ponds with fresh water, it is estimated that a minimum 2 cumecs of river water is required to gradually re-circulate the entire pond water in 3 hours time. In case of the minimum environmental flow of 3 cumecs as indicated for VPHEP, the water stored behind the weirs shall be fully replaced by the fresh water in about 2 hours time. Therefore, there would be no chances of this water becoming stagnant and the freshness of the water shall always be ensured.

Aquatic analysis: An in-depth aquatic ecological study was carried out in the project area. Primary data on various components of aquatic ecology were collected through intensive survey of area, aquatic sampling, consultation with local communities and fishery experts. Review of secondary data was also made for confirming the primary data. No commercial fishing is practiced in the entire stretch of Alaknanda River. However in distant past ,some local inhabitants used to operate cast net or fishing lines, hanging loops in the tributaries of Alaknanda. Although,Fishing is common throughout the year in the Birahi River which seems to be most favorite habitat for coldwater fish.

Periphytons were represented by 18 species of 3 families, Phytoplankton by 10 species from 3 families, Zooplankton by the 3 taxa of 5 species, Macrozoobenthos by 22 taxa from 5 orders and 20 Fish species in the River Alaknanda and its tributaries in project stretch. A detailed list of fish species, their local name and conservation status recommended by National Bureau of Fish Genetic Resources- NBFGR (2003) has been presented below.

Fish dwelling in Alaknanda River and its tributaries in the project stretch

S.No.	Zoological Name	Local Name	Conservation Status (NBFGR)
1.	*Schizothorax richardsonii* Gray	Maseen	Abundant
2.	*Schizothoraichthys progastus* McClelland	Chongu	Vulnerable
3.	*Tor tor* Hamilton	Dansulu	Endangered
4.	*Tor putitora* Hamilton	Dansulu	Endangered
5.	*Crossocheilus latius latius* Hamilton	Sunhera	Lower Risk
6.	*Garra gotyla gotyla* Gray	Gondal	Abundant
7.	*Garra lamta* Hamilton	Gondal	Lower Risk
8.	*Barilius bendelisis* Hamilton	Fulra	Abundant
9.	*Barilius bola* Hamilton	Fulra	Abundant
10.	*Barilius vagra* Hamilton	Fulra	Abundant
11.	*Barilius barna* Hamilton	Fulra	Abundant
12.	*Puntius sophore* Hamilton	Fulra	Lower Risk
13.	*Puntius chilinoides* McClelland	Fulra	Lower Risk
14.	*Glyptothorax pectinopterus* McClelland	Nau	Abundant
15.	*Glyptothorax madraspatanum* Day	Nau	Lower Risk
16.	*Pseudecheneis sulcatus* McClelland	Mungria	Vulnerable
17.	*Noemacheilus montanus* McClelland	Gadiyal	Abundant
18.	*Noemacheilus bevani* Gunther	Gadiyal	Abundant
19.	*Noemacheilus multifasciatus* Day	Gadiyal	Abundant
20.	*Noemacheilus zonatus* McClelland	Gadiyal	Abundant

On the basis of primary data and review of secondary data, it was revealed that the two important species of Mahseer (*Tor tor* and *Tor putitora)* are present in the Alaknanda River downstream the dam site of VPHEP. These species are endangered and migratory in nature. However, the species of Mahseer was not found in the project area up to the reach of the dam site due to the fact that their movement is obstructed by downstream Projects. Therefore, the EA study observed that VPHEP will not create obstruction to Mahseer. The other species *Schizothoraichthys progastus* and *Pseudecheneis sulcatus* are vulnerable in their ecological status which has their presence in the project area. Rest of the species are abundantly available and there is no problem of their survival.

There are some specific pockets of riparian vegetation in the Alaknanda River and its tributaries especially the Birahi River, a considerable riparian vegetation cover is present which provides conducive habitat for fish.

During the construction phase the water of the river will be not stored and the natural flow of the river will be available throughout the stretch. However, the area near the dam site will be affected due to the construction activities. The dam construction will block the local movement of the species *Schizothorax* (Snow trout). However tributaries like Patalganga and Birahi Ganga may provide habitat to the populations of these species in the area. However, the project will maintain a minimum flow of 3 cumecs of water from the dam downstream throughout the project operation and will monitor the same also for any downstream impact after the project is completed. The 3 cumecs flow for

aquatic survival will be essential during the lean period especially in the initial critical stretch up to 2.69 Km downstream of dam where next tributary with sufficient discharge namely Tapan Nala joins the river.

Fish management program has been undertaken by THDC Ltd. in consultation with the Department of Fisheries, GoUK / Directorate of Cold Water Fisheries (DCFR), ICAR, Bhimtal. The Senior Scientist from DCFR Bhimtal have already visited the project site for identification of suitable site for establishment of Snow Trout hatchery for fulfillment of fishery action plan towards restoration of aquatic ecosystem. The MoU for implementation of Fishery Action Plan is under process. The Mahseer hatchery already constructed at the Tehri Dam on the Bhagirathi River is used for propagation of the Mahseer**.** The catchment of Birahi river can be improved by plantation along the bank. The anthropogenic activity like extraction of sand, pebbles, gravels and stones and fishing activity in the river should be completely banned. In the event that Mahseer do in fact appear in the project area, efforts for complete diversion of route of Mahseer towards Birahi River may be made for effective management of Mahseer and other vulnerable fishes in the region. For in-depth study on fish potential and fishery biology in addition to aquatic biodiversity, any institute which has a reputation of undertaking this kind of work can be consulted. For that purpose, Department of Environmental Sciences, HNB Garhwal University (A Central University), Srinagar Garhwal, Uttarakhand is recommended for further consultation.

7.3 Construction related Impacts

During construction phase Construction / Labour Camp will be located along the project area. The project construction is likely to last for a period of about 5 years. The peak labour strength likely to be employed during project construction phase is about 2,000 workers and 600 technical staff. The establishment of labour camps is likely to affect environment through improper waste (Solid & Garbage / Sewage) disposal, negative impacts on public health, unfriendly use of community resources, poaching of wildlife by laborers, and leaving dirty and waste material after shifting from one site to another site. Laborers may cut trees for cooking fuel. There is possibility of transmission of diseases by immigrant labour population. t The improper disposal of muck generated from construction of structures could have negative impacts in the area, in particular on the river. The construction of new roads involve hill cutting that triggers soil erosion & landslides, generation of solid wastes in the form of debris, dust pollution, disturbance of local drainage, siltation in nearby water bodies.

Management of construction related impacts: Management of construction related issues will be the responsibility of THDC (through Contractor, as and where relevant and described in the EMP). The construction agency is required to comply with the laws with respect to Environment protection, Pollution Prevention, Forest Conservation, Resettlement and safety and any other applicable law. The EMP constitutes of Emission and Dust Management Plan, Construction / Labour Camp Management, Borrow Area Management Plan, Public Health (including plan to manage HIV / communicable diseases) and Safety, Green Belt Development etc.

(a) **Muck Disposal Management:** The total quantity of muck to be generated is estimated at about 1.5 Mm^3. A muck disposal plan has been provided in the EMP to manage this muck. The plan includes: reuse of part of muck as construction material for the project,

site protection, rehabilitation measures which includes civil works, vegetative measures, fencing and planting. As the selected four muck disposal sites are located close to the Alaknanda River, there is a chance that muck / loose material may fall into the river, leading to blockage in river flow or contamination of water due to silting. To avoid this, retaining walls of height up to 7m shall be built prior to the commencement of muck dumping at identified muck disposal sites. Plantation shall be carried out at the disposal sites for the stabilization of the slopes, landscaping and improving the aesthetic value of the area. Once dumping activities are completed, the areas shall be developed into terraces and restored by laying of soil on the top and digging of pits and planting of plant saplings.

(b) **Labour Camp Management**: To ensure good health of the workers and hygienic conditions around the labour camp, the EMP calls for the provision of certain measures, such as: One community latrine for 20 persons, sewage treatment, one septic tank for 500 persons, Storm water drainage, Medical and first aid facilities and awareness camp on health and hygiene. In addition solid waste management and provision of kerosene / LPG for cooking and Community kitchen shall be encouraged. The contract for main civil works contract places similar obligations on the contractor.

(c) **Road Construction and Management** : The construction of new roads involves hill cutting that triggers soil erosion & landslides, generation of solid wastes in the form of debris, dust pollution, disturbance of local drainage, siltation in nearby water bodies. The EMP provides measures for muck disposal, slope stabilization drainage and bioengineering measures to protect the road slopes. The Project will utilise the existing road of PWD as part of the approach road to Dwing Adit. The old PWD road will be utilised from NH- 58 to River Alaknanda hence no new road cutting will be involved on the left bank for this reach. This will reduce the impact of road construction. The EMP also includes measures to control air and noise pollution. Regular water sprinkling on construction sites, haul & unpaved roads particularly near habitation will be undertaken to control fugitive dust. Trucks carrying soil, sand and stone should be duly covered to avoid spilling. Plants, machinery and equipment will be handled so as to minimize generation of dust. All crusher, machineries, vehicles and equipments used in construction shall conform to relative dust emission standards of CPCB.

7.4 Safety of Workers and Communities

THDC has adopted a Safety Manual which describes a system approach using an established standard similar to the well known ISO 9001 standards. The manual also stipulate the obligation to ensure effective health and safety management at site / in Plant, Safety Programme and its Implementation, Fire Prevention, Fire Fighting Arrangements, First Aid and Medical Care. At every work site adequate and suitable arrangements for rendering prompt and efficient first aid to injured persons shall be maintained under the guidance of the medical officer-in-charge of the project. First aid appliances including an adequate supply of sterilized dressings and sterilized cotton shall be maintained in a readily accessible place. The appliances shall be kept in good order and they shall be placed under the charge of a responsible person who shall be readily available during working hours. The contract for the main civil works contract puts these obligations on the contractor.

Downstream Hazards

The downstream hazards were assessed for the worst-case scenario in which the dam is washed away. The downstream hazards may occur due to failure of the dam and flooding of the river bank that triggers landslides. The water will flow with force, eroding the banks and causing damage to life and property located at the lower elevation. Most of the villages are located at higher elevations and there are no villages located close to the banks of the river Alaknanda. The villages which are located at lower elevations may suffer loss of property and life. The detail of villages is depicted in the EA. The villages may not be impacted directly but may be impacted in terms of loss of access route and agricultural land. THDC's Dam safety programme include a Disaster management plan to establish an effective Dam Safety Surveillance and Monitoring Programme, including rapid analysis and interpretation of instrumentation and observation data periodic inspection and safety reviews/evaluation by an independent panel of experts to formulate and implement an Emergency Action Plan to minimize, to the maximum extent possible, the probable loss of life and damage to property in the event of failure of dam.

7.5 Indirect Impacts

Indirect impacts are associated with various construction activities such as clearing of vegetation for establishment of various project units, movement of vehicles, construction equipments & machineries, interferences due to influx of laborers as well as temporary establishment of labour camps, blasting operations etc. These could impact on the project vicinity area and communities. The major positive effect of the VPHEP project will be creation of new job opportunities in the area. Development of Vishnugad Pipalkoti Hydro-electric Project is likely to trigger associated development in several sectors such as transportation, automobile, commercial sectors such as daily needs, agriculture related developments such as vegetable, fruit, grain, fertilizer, pesticides, irrigation, electric appliances, which is likely to provide employment opportunities for local people and help to increase their social & economic status. The possible negative impact relates to transmission of diseases by immigrant labour population. Indirect impacts of project activities on flora are expected in the project immediate influence area and to some extent in project influence area. Indirect impacts will be due to various construction activities such as generation of dust due to earthwork, excavation, transportation of construction materials (sand aggregate, cement etc), quarry, crusher & blasting operations, air pollution due to movement of construction vehicles, equipments and machineries, influx of labour population and pollution generated through provision of labour camps established temporarily at construction sites etc. These impacts will be limited to the construction period. The project will take necessary measures to control dust during construction period. The mitigation measures to be adopted have been suggested in the EMP for implementation under the project.

7.6 Impact on Physical and Cultural Resources

The project does not have any impact on cultural resources within the project influence area and project immediate affected area. There are sites of Cultural importance at Siyasain near the proposed colony area. There are remains and abandoned structures of Haat (*bazaar*) and transit camps of the pilgrimages that used to halt at this place en-route to Badrinath from Chamoli and vice-versa in earlier times. These structures are in

a bad state of conservation and preservation. Therefore it is suggested to conserve and preserve those portions of the structural members of such building which can be restored and preserved.

There are number of temples in the villages in the project area. It is suggested that the temples falling in the villages on the right bank of river Alaknanda may be considered for enhancement and beautification. These villages are Tirosi, Tapon, Dwing, Kimana, Palla, Lanji, Pokhani, Hyuna, Guniyala, Biamaru, Surenda, Kanda, Bedumath, Bajani, Math Jharetha, Haat, Siyasain, Jaisal, Durgapur, Kunj, Bowala and Chhinka.

In case of discovery of any archeological monuments, pottery, coin and artifacts the construction contractors will report to the concerned THDC official responsible for the supervision of the construction activity. The concerned THDC official in turn will report this to Archeological Survey of India. Any Archeological/Historical items and artifacts found during construction will be the property of Govt. of India. A chance find procedure has been included in the EMP.

7.7 Dam Safety

Dam safety programme includes the formation a Disaster management plan to establish an effective Dam Safety Surveillance and monitoring programme including rapid analysis and interpretation of instrumentation and observation data periodic inspection and safety reviews/evaluation by an independent panel of experts and to formulate and implement an Emergency Action Plan to minimize the probable loss of life and damage to property in the event of failure of dam.

The EAP presents warning and notification procedures to follow during the monsoon season in case of failure or potential failure of the dam. The objective is to provide timely warning to nearby residents and alert key personnel responsible for taking action in case of emergency. It also includes evacuation plans and procedures for implementation based on local needs. Any precarious situation during floods will be communicated either by an alert situation followed by a warning situation. An alert situation would indicate that although failure or flooding is not imminent, a more serious situation could occur unless conditions improve. A warning situation would indicate that flooding is imminent as a result of an impending failure of the dam. It would normally include an order for evacuation of delineated inundation areas. The alerts and warning shall be communicated to State Administration through wireless/telephone besides local radio/television/news paper and to local population through loudspeakers and warning sirens.

7.8 Catchment Area Treatment & Other Environmental Enhancements

Common anthropogenic factors leading to erosion in the catchment area are over-grazing and collection of trees for fuel fodder and timber. The project activities will accelerate the soil erosion in the area significantly in the construction phase. A well-designed Catchment Area Treatment (CAT) Plan is framed to address the issue and ameliorate the environment of the area.

The Plan includes 37 micro watersheds in 5 sub watersheds namely Saraswati, Dhauliganga, Rishigang, Budhiganga & Nagoigad. But as various CAT plans are already

under implementation in this catchment particularly Tapovan Vishnugad CAT plan, only 18 micro watersheds in 2 sub watersheds namely Budhiganga and Nagoigad have been selected for treatment. The total area of selected catchment is 84085.00 ha. Out of which, 12964.00 ha (15.42%) is rocky and snowbound. The remaining area of 71121.00 ha (84.58%) is treatable, of which, agriculture area is 6647.00 ha (7.90%), forest area is 40678.00 ha (48.38%) and blank area is 23.796 ha (28.30%). Therefore, total workable area is 71.121 Sq. Km. The total Budget for CAT plan is Rs.44,66,64,900/-

Project will give maximum emphasis on catchment treatment through plantation, soil and water conservation works. The biodiversity conservation measures shall be carried involving local inhabitants that will also enhance the livelihood of the people of the area. The interventions proposed in CAT plan are Forestry Work which includes afforestation work, densification, medicinal plant plantation and assisted natural regeneration in the area. A total of 1000 ha. area shall be treated for plantation activities. Out of this, 450 ha. area will be taken under densification, 50 ha. under pasture development and 300 ha under medicinal plants. Apart from this, around 1200 ha. area has been selected for assisted natural regeneration. Soil & Moisture Conservation Engineering Work comprise of construction of Vegetative check dams, Gully Plugging, Stone check dams , Crate wire check dams , Spurs and Water percolation tanks .

The CAT plan earmarks the provision for selected inputs in livelihood support activities for the local community, which would facilitate eco-restoration as well as eco-development of the catchment area. Education and awareness of the community for catchment development on watershed approach will be central to all these activities. Apart from this, special care is to be taken on decreasing dependence of the local people on forest areas. For this special effort will be done by raising forest on Civil Soyam and Van Panchayats and doing pastoral development activities

The responsibility of implementing the CAT plan will lie with the concerned Divisional Forest Officer (DFO). THDC will responsible for overall supervision of the CAT Plan implementation. The Environmental Management Cell (EMC) of THDC will supervise the implementation of each activity given in the CAT plan. EMC will also monitor physical & financial progress and prepare a quarterly progress report. Year wise fund will released by THDC for which a Memorandum of Understanding (MoU) may be signed between THDC & Forest Department.

The project will form a MoU with Directorate of Cold Water Fisheries (DCFR), ICAR, Bhimtal, for management of fish. For management of Mahseer (*Tor tor* and *Tor putitora*) TEHRI Mahseer hatchery will be utilised. For management of Snow trout, Gram Panchyats can be involved along with DCFR, ICAR, Bhimtal. DCFR will provide the technical assistance and the Gram Panchayats will be involved in intensive culture of fish. This will be an income generating activity for the local inhabitants and also provide nutrition to the malnourished population of the area. Thus it will contribute in enhancing the living condition of the people in the area.

7.9 Land Acquisition and its Impact

A Social Impact Assessment (SIA) for the project area was completed in April 2008. It included consultations with stakeholders, information on socio-economic and cultural features of the population and baseline data on land acquisition impacts. This

information together with consultations with communities in the project area regarding their concerns, and subsequent verification and updating by THDC of the SIA data on impacts have informed the measures to ensure that negative impacts are mitigated and that people receive benefits from the project.

To address land acquisition impacts, THDC has developed a project-specific Resettlement and Rehabilitation Policy which goes beyond the requirements of the National Resettlement and Rehabilitation Policy (NRRP) of 2007 and which together with the Resettlement Action Plan establishes compliance with the World Bank's OP 4.12. At THDC's headquarters, a Corporate Environment and Social Group is headed by a General Manger (Social and Environment) who is supported by a Senior Manager and a Manager at both the corporate office and at the project site. The team at the project site includes two social workers soon to be supplemented with two more. A reputed regional NGO has been recruited to assist with communication with the villagers, preparation and implementation of the Resettlement Action Plan (RAP), and preparation of local development activities. In line with the NRRP, 2007, the state government has appointed an Administrator and Commissioner for R&R, and established grievance redress arrangements.

Land Acquisition: As a run-of-river project, VPHEP has comparatively limited land acquisition impacts which affect a total of 1,223 households (1,477 families with 5,159 persons) in 19 villages. The project will require a total of 141.55 ha of land comprising 31.62 ha of private land, 90.09 ha of government forest/grazing land, 10.3 ha of *van panchayat* land (community held grazing and forest land), and 9.54 ha of state land owned by the Public Works Department.

Project Components and land requirement (July 2009)

	Project Component	**Area to be acquired (in ha.)**
1	Dam and reservoir	29.95
2	Access roads	21.66
3	Quarry	11.71
4	Excavation dumping sites	5.04
5	Colony, power house, switchyard & TBM assembly	63.65
6	PWD roads	9.54
	Total	141.55

The acquisition of private land affects 769 families in seven villages, while 708 families in the remaining 12 project-affected villages will lose partial access only to government forest/grazing and/or *van panchayat* land. Of the private land required, 60% is being purchased from willing sellers in one of the seven affected villages - Haat. The transfer of land and houses in Haat is based on land acquisition procedures to ensure complete recording of ownership and on the compensation and assistance provisions in THDC's Resettlement and Rehabilitation Policy. A total of 265 families will have to resettle, and 92% of these are families from Haat who requested THDC to purchase their land.

Haat village: After protracted negotiations THDC agreed to a demand from the village Haat, that the company acquire land and houses from anyone in the village who wished to relocate. THDC agreed to consider buying the additional land in recognition of the disproportionate impact on the village of land acquisition and construction disturbance from the powerhouse, switchyard, a surge shaft, and access roads. A total of 136

households (242 families) from Haat agreed to sell their land and houses amounting to 18.64 ha to THDC. Of the 136 households whose houses are acquired, only 95 reside in the village. The other 41 households who own houses or are part-owners of houses in Haat have already migrated and settled elsewhere over the years. Only in the hamlet of Hatsari did 8 of the households (11 families) not agree to this arrangement, since unlike the other 136 households they did not have alternative land or houses outside the main Haat village. To limit land acquisition impacts on Hatsari, THDC has therefore shifted the location of the switchyard from land to be acquired from this hamlet to already acquired government forest land, and has also realigned an access road. The land acquisition impacts on 8 households were reduced to 1.63 ha, and the total amount of private land obtained from Haat is 20.27 ha. With the recent decision to use Tunnel Boring Machine (TBM) instead of Drilling & Blasting Method (DBM) to excavate the Head Race Tunnel (HRT), THDC will make use of all the land acquired in Haat, since a substantial area shall be required for assembling the TBM.

Private land: An analysis of the loss of agricultural land shows that 32% of the affected landholders are losing less than 10 percent of their total holdings. Five landowners will be rendered landless and 264 landholders are losing more than 75% of their land. About 30 landowners will be left with less than a *Naali* (the basic local unit of land = 1/50th ha = 200 sq.m) after land acquisition, and therefore all their land will be acquired. Even if the amount of agricultural or residential land acquired is less than one *Naali,* the minimum compensation will be equivalent to 1.5 *Naali*. The majority of the affected land owners (about 96%) across various impact categories were marginal farmers with holdings below 1 ha prior to the land acquisition. In the village of Lungsi farmers along an existing PWD road, which needs widening as a project access road, have encroached into the right-of-way, and a total of 5.92 ha are utilized by 46 farmers who will be compensated for the value of their standing crops when the land is repossessed.

Grazing and forest land: Villages use both government land and *van panchayat* land for grazing and fodder collection. *Van panchayats* were formed from 1921 onwards for the use and management of forest and grazing land by village communities. A total of 11 villages will lose access to an average of 2.5% of the government forest land that they use at present for grass collection and grazing, and a total of 8 villages lose access to an average of 0.9% of the *van panchayat* land they use for grazing and collection of grass and firewood. Of these villages, 3 lose access to both government forest and *van panchayat* land.

Buildings and resettlement: A total of 139 private structures and 31 community properties will be acquired under the project. Of the private structures, 99 are residential, 5 are residential and commercial, 3 are only commercial, and the remaining 32 are cattle sheds or dilapidated structures. Of the families losing their houses, three are non-titleholders, who will nevertheless receive the minimum land compensation of INR 100,000. Of the 104 residential and residential / commercial houses to be acquired, 94 are in Haat, and the remaining are in the villages of Jaisal (6) and Batula (4). All the families that will be resettling have chosen to move to locations of their own choice. In addition to the house compensation – which in the case of Haat equals the agreed selling price – all the relocating households that are resident in the houses acquired (including the non-titleholders) will receive the additional INR 1 million for self-resettlement to substitute for the infrastructure they would have access to in a resettlement site.

Most of the households in Haat own either a house or land in the adjacent villages of Maina, Daswana, and Mayapur on the other side of the river. There are 17 Scheduled Caste households (29 families) from Haat most of whom hold agricultural *patta* land – granted by the government and allocated by the *Gram Panchayat* to landless families – in Daswana. A special permission is required from the District Magistrate to build houses on this land, and THDC will facilitate this. Whereas the NRRP of 2007 does not provide for compensation for *patta* land, THDC is paying compensation equivalent to land held as private property (*Naap* land). This enables the three Scheduled Caste households, who do not have land outside Haat, to buy replacement land with the payment they receive for their *patta* land.

Facilities: Since the affected families that will have to relocate have chosen to move individually to locations of their own choice where most already own an alternative house, THDC will not establish resettlement sites. In the case of Haat, the relocation will be across the river where people will be closer to the schools and health facilities that they already use. For the Scheduled Caste families from Haat who are moving to Daswana and building new houses there, THDC will provide a road connection to the site and access to electricity and water.

Indigenous Peoples: There is no Scheduled Tribal community in the project affected area, and the World Bank's OP 4.10 on Indigenous Peoples is not triggered. The population in the project affected villages is predominantly Hindu general castes (about two-thirds) and scheduled castes (one third). In Haat the affected population includes 11 Bhotia families (8 households) who migrated from Malari near the Hindu pilgrimage site of Badrinath on the upper reaches of the Alaknanda river 15 years ago and settled in the village. Another project affected Bhotia household resides in Batula. Of the families settled in Haat and Batula, some have acquired marginal landholdings while others are tenants, and some hold government jobs. They still hold land in their original home area. The Bhotia families do not speak a separate language from that of the majority population (Garhwali and Hindi) and are Hindus. They do not have a historically based collective attachment to the land in Haat or any customary rights to forest and grazing land. Nor do they or have political institutions that separate them from the majority population. The Bhotia families affected by land acquisition will receive compensation and assistance based on the provisions of the R&R Policy.

Local development and benefit sharing: Although the project causes adverse impacts, it will also bring positive benefits to the local population. Two categories of local development funds will be available which include (i) dedicated funds of INR 90 million that will be used for the 19 affected villages over five years during the construction period (THDC has already spent an additional INR 5 million from other sources during the current financial year); and (ii) as mandated by the Corporate Social Responsibility Policy of THDC, one percent of the plant's profit will be available for local development activities in a wider area comprising both directly and indirectly affected communities after the commissioning of the Project. The modalities for utilization of the one percent will be determined when the state Hydro Benefit Sharing Policy, which is currently being drafted, has been completed. However, for the first category, investment plans will be prepared by the communities. Civil works will be carried out by contractors or by the Gram Panchayats with monitoring by the beneficiary community. In addition, during the construction period, contracts for small civil works will to the extent possible be given to

eligible PAPs. THDC will also provide 100 kWh of free electricity per month for a period of 10 years to affected households.

7.10 Lessons learnt from Tehri Project

Tehri Dam Project was approved by the Planning Commission in 1972 and was accorded the administrative clearance in 1976 by Uttar Pradesh Government. Various Project activities related to R&R and Catchment Area Treatment (CAT) works started during 1976 to 1978. Forest (Conservation) Act came into existence in 1980; Environmental (Protection) Act came into existence in 1986 while National Forest Policy was framed in 1988, National Environment Policy in 2006 and National Water Policy in 2002, thus there were no guidelines and hence there was no clarity about environmental safeguards. The National R&R Policy was adopted in 2007. The EIA notification of 19994 has been revised in September 2006. In view of the above, there were no guidelines at that time on R&R as well as environmental aspects. Following experience were gained from implementation of Tehri Hydropower Project:

- The "CAT" programme should be developed by the Project in consultation with the State Forest Department keeping in mind (i) the results of fauna study, (ii) botanical species required for the desired fauna considering the fauna study, and (iii) soil conservation works in direct draining areas. CAT plan should include plantation of all types of the area including fruit bearing plants, medicinal plants, herbs and shrubs etc. The CAT plan should be implemented by Forest Department of the State Government, adopting their Joint Forest Management (JFM) Scheme.

- Compensatory afforestation should fulfill the requirement of an ideal forestry, that is: Supply of forest goods and services to the people with a well thought out plan of production; and long term ecological security through conservation of forest cover and its restoration. A massive social forestry programme is needed to meet the demands of local people for fuel, fodder, timber etc. Compensatory afforestation in the same eco-system is more effective and compensates the damages due to deforestation in that ecosystem.

- Measures should be taken for propagation of Fisheries

- Stabilization of Hill Slopes and Reservoir Rim

- A plan for re-vegetation of muck disposal sites should be adopted.

- Treatment of borrow areas, abandoned quarries should be undertaken by the project.

- People displaced from the affected areas may not be moved up-stream of the watershed as, use of forest and cultivation by them can change land use pattern and increase soil erosion, leading to increased sedimentation thereby reducing storage capacity and affecting water quality. Therefore, it is always advisable to resettle the displaced families in the plains or command area of the Project.

- Employment provision to local inhabitants for unskilled work**.**

- Promotion of improved ecotourism.

- EIA and SIA study should be conducted and a detailed Environmental and Social Management and Monitoring plan should be framed.

With the benefit of the lessons learnt during implementation of the Tehri Dam Project, THDC Management has taken a conscious decision to initiate actions on all the above aspects with respect to VPHEP. Thus, for VPHEP, works relating to Catchment Area Treatment, Compensatory Afforestation, Hatcheries for fish propagation, Resurfacing / Revegetation of Muck Disposal Sites, Quarry and Borrow area Relocation and Rehabilitation of Project Affected People have already been taken up or will be taken up shortly, as appropriate.

8. ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan (EMP) is the key to ensure a safe and clean environment. The desired results from the environmental mitigation measures proposed in the project may not be obtained without a management plan to assure its proper implementation & function. The EMP envisages the plans for the proper implementation of mitigation measures to reduce the adverse impacts arising out of the project activities during pre-construction, construction and operation stage. *Details on all the aspects and budget provisions have been detailed in the Consolidated EA & EMP Report.* A monitoring plan is framed to monitor the implementation of activities provided in EMP. *A summary of budget provisions of EMP is detailed below.*

Summary of EMP Budget

S. No.	Item	Activities proposed	Cost (Rs. million)
1.	Biodiversity Management	Development of Herbal garden, Compensatory afforestation, Roadside plantation, Wildlife protection	66.60
2.	Implementation of CAT Plan	Forestry work, Soil & moisture conservation, Wildlife management, Capacity building and exposure visit, Village level development and livelihood support, Income generation activities, PMC running cost, Alternate Energy support, Fish management, Construction & Renovation works, micro-planning etc	470.095
3.	Muck Disposal Management Plan	Plantation on spoil slope, Turfing of slopes, Fencing, nursery development & maintenance, Watch & ward and 4 portable pumps	19.783
4.	Fish Management	Transportation of seeds from TEHRI Mahseer hatchery, Management of Snow trout, Habitat restoration.	11.400
5.	Greenbelt Development Plan	Plantation of trees, shrubs and herbs	6.153
6.	Restoration of Quarry Sites	Filling up the excavated site, Green manure, , fertilizer, pesticides , fencing maintenance and watch & ward	5.000
7.	Solid Waste Management	Two covered truck for transportation of solid waste to landfill site, 10 persons for 5 years	9.799
8.	EMP Measures for Road	Clearing & grubbing, Breast wall catch water interceptors	9.000

S. No.	Item	Activities proposed	Cost (Rs. million)
	Construction	and drainage system along road	
9.	Sanitary Facilities for Labour Camps	Community Latrines, Septic tank including sewerage system	12.500
10.	Provision of Fuel	LPG Cylinders and Kerosene	1.000
	Public Health Delivery System	Establish Dispensary and First Aid Centers, employ medical staff, Medicine, Ambulance	37.300
11.	Environmental Monitoring Programme	Monitoring of Water Quality, Ambient Air Quality, Noise, Soil Erosion and Sedimentation, Incidence of water related diseases, Aquatic ecology, landuse (CAT)and Soil quality	22.310
12.	Adaptive Capacity	Corporate recruitment, special studies, lab set-up	64.080
13.	Capacity Building	Environmental Training and exposure visit of THDC Staff	21.38
14.	ISO 14001 / OHSAS	Formulation of Quality Manual & Quality Procedure, implementation of EMS, Hiring of consultant, OHSAS	2.00
15.	Archaeological Management	Conservation of Archaeological sites, opening of Archaeological Museum	2.50
	Grand Total		**760.900**

9. IMPLEMENTATION ARRANGEMENT

9.1 Institutional Framework

The THDC India Ltd. is headed by Chairman & Managing Director. The Board of Directors constitutes of total 12 executive staff. There are 3 Director - Personnel, Technical and Finance in the board. For taking care of Environmental affairs a Social & Environment Department headed by General Manager assisted by Senior Managers and Senior Environmental Officers is established at Corporate Office, Rishikesh. The functions of Corporate Environment Department include:

- Obtaining statuary and Non-statuary clearances, viz. Site / Environment Clearances, Forest Clearance, Wild Life Clearance and No Objection Certificate from SPCB etc.
- Coordination and interaction with MOP, MOEF, SPCB etc.
- Coordination with the Project on environmental matters and providing required assistance/ inputs
- Compliance reporting to statuary/ monitoring agencies.
- Monitoring of all environmental studies / implementation of environmental conditions.
- Policy related issues, viz National Environment Policy, NPV for Forest Land transfer, apportionment of CAT etc.

- Material for Standing Committee of Parliament reply of Parliament/ Assembly Questions related to environment and other VIP references

At VPHEP it is proposed to form an **Environmental Management Cell (EMC)** at project level. The EMC will handle all issues related to different environmental attributes, it will be responsible for overall environmental management in project being undertaken by THDC from investigation level to execution at project level. EMC will be strengthened by posting at least one specialized Environment specialist and one Social specialist at each project site. However during execution stage of various environmental mitigation measures, the individual teams can be reinforced from the Corporate Environment team.

VPHEP Social and Environment Cell (EMC)

- The Social and Environmental Cell will be responsible for the planning, implementation and monitoring of all environmental and social mitigation and compensation measures under THDC's responsibility outlined in EMP, R&R policy and RAP.
- Implementation of community development initiatives through its NGO under CSR.
- The cell will monitor mitigation measures that will be implemented by Contractor to ensure compliance with Constructor's Contract (CC).
- The cell will work closely with the State Pollution Control Board (SPCB) and MoEF, as appropriate.
- The cell will prepare regular reports for submission to SPCB and MoEF.
- During the construction and the operating phases, THDC, through the cell, will be responsible for Implementing and monitoring environmental mitigation measures.
- The cell will work closely with the Administrator and Commissioner of R&R for land acquisition and implementation of RAP.
- The cell shall also be responsible for hiring of consultants and NGO.
- The cell shall provide policy guidance to consultants and NGO

The Construction Contractors

- Meeting effluent standards before discharging into surface water
- Managing waste at construction sites
- Muck disposal
- Location of construction camps at proper place - away from Forest Area and Settlements
- Arrange fuel for the construction camp – no tree cutting for fuel and hut making for the camp
- Manage erosion and sedimentation in construction area
- Managing onsite traffic- provide diversion signs/flags/guard along approach road
- Control noise emissions
- Control dust and fugitive emission.
- Managing, preventing and developing emergency plans for chemical pollution incidents
- Implementing a health program for all persons engaged in undertaking construction works

State Forest Department

- Implementing Catchment Area Treatment (CAT) plan
- Implementing Compensatory Afforestation Plan
- Wildlife Conservation Program
- Develop Herbal Garden in consultation with State Medicinal Plant Board (SMPB)
- Facilitate and guide Van Panchayats.

Administrator - R&R

- Approval of award passed by Land Acquisition officer
- Oversee the disbursement of compensation for land acquired
- Formulation of Resettlement and Rehabilitation plans/schemes
- Minimize displacement of persons and identify non-displacing or least displacing alternatives in consultation with the project authorities
- Hold consultation with the PAPs and ensure the interest of adversely affected PAFs of STs and weaker sections
- Verification and approval of PAFs eligible for various entitlements
- Issuance of individual certificates to the land less people and those loosing houses
- Review the implementation of RAP and community development works

NGO (engaged by THDC)

- Develop rapport with PAFs and between PAFs and THDC
- Verification of PAFs
- Consultations with the VDAC and local community during the implementation of the RAP
- Preparation of micro plans and assist the PAFs in receiving the rehabilitation assistance
- Motivate and guide PAP for productive utilization of the compensation and assistance amounts
- Assist the PAFs in getting benefits from the appropriate local development schemes
- Forward the grievances of the PAFs to the grievance redressal mechanism
- Assist the PAFs in usage of modern techniques in agriculture and animal husbandry
- Assess the level of skills and efficiency in pursuing economic activities, identify needs for training and organize training programmes
- Participate in the monthly review meetings with the Project Social Group and VDACs
- Carry out other responsibilities as required from time to time

Van Panchayats

- Protection of plantation sites in the project area
- Regulate usage of Vanpanchayat resources
- Cultivation of Herbal species
- Develop nurseries for Plantation under the Project area

9.2 Responsibility Matrix

The EMP envisages the plans for the proper implementation of mitigation measures to reduce the adverse impacts and enhance positive impacts arising out of the project activities during pre-construction, construction and operation stage. The responsibility matrix defines the agency responsible for execution and supervision of mitigation measures in pre-construction, construction and operation phase.

Pre-Construction Stage

Sl. No.	Environmental and Social Issues	Responsibility	
		Planning and Execution	Supervision/ Monitoring
1.	Acquisition of Forest land	State Forest Department, EMC of THDC	THDC
2.	Felling of Trees	State Forest Department, EMC of THDC	THDC
3.	Clearing & Grubbing	The Contractor	Social and Environmental Cell
4.	Construction vehicles, equipment and machinery	The Contractor	Social and Environmental Cell
5.	Labour requirements	The Contractor	Social and Environmental Cell
6.	Construction camp – location, design and lay-out	The Contractor	Social and Environmental Cell
7.	Arrangements for temporary land	The Contractor	Social and Environmental Cell
8.	Orientation of Implementing Agency and the Contractors	EMC / THDC	Social and Environmental Cell
9	Acquisition of private land	Administrator – R&R	Social and Environmental Cell
10	Relocation of displaced households	Administrator – R&R / NGO	Social and Environmental Cell
11	Income restoration training	Administrator – R&R / NGO	Social and Environmental Cell - THDC
12	Disclosure of EMP, SIA and RAP	NGO / THDC	-
13	Disbursement of R&R assistance	NGO / THDC	-

Construction Stage

Sl. No.	Environmental Issues	Responsibility	
		Execution/ Civil Work	Supervision/ Monitoring
1.	Preservation of top soil	The Contractor	Environmental Expert of SC and EMC
2.	Earth from Borrow Areas for Construction	The Contractor	Environmental Expert of SC and EMC
3.	Quarry operation	The Contractor	Environmental Expert of SC and EMC
4.	Construction water	The Contractor	Environmental Expert of SC and EMC
5.	Construction of approach roads	The Contractor	Environmental Expert of SC and EMC
6.	Muck disposal	The Contractor	Environmental Expert of SC and EMC
7.	Water pollution from - construction wastes and fuel & lubricants	The Contractor	Environmental Expert of SC and EMC

Sl. No.	Environmental Issues	Responsibility	
		Execution/ Civil Work	Supervision/ Monitoring
8.	Air pollution	The Contractor	Environmental Expert of SC and EMC
9.	Noise pollution	The Contractor	Environmental Expert of SC and EMC
10.	Safety	The Contractor	Environmental Expert of SC and EMC
11.	First aid	The Contractor	Environmental Expert of SC and EMC
12.	Labour Camp Management	The Contractor	Environmental Expert of SC and EMC
13.	Contractor's Demobilization	The Contractor	Environmental Expert of SC and EMC
14	Disbursement of assistance for loss of Vanpanchayat land	NGO / THDC	-
15	Implementation of CSR activities	THDC	-

Operation Stage

Sl. No.	Environmental Issues	Responsibility	
		Execution/ Civil Work	Supervision/ Monitoring
1.	Monitoring Operation Performance	EMC	THDC
2.	Pollution Monitoring	Pollution Monitoring Agency, EMC	THDC
3.	Terrestrial Biodiversity	State Forest Department/ EMC	THDC
4	Implementation of CSR activities	THDC	

9.3 Capacity Building of THDC

THDC has successfully implemented environmental management measures of the Tehri Dam Project, Phase-1 of which is now fully operational. THDC has moved from single project (Tehri Dam Project) organization to multiple projects. At present THDC have 13 projects at National level and two abroad at various stages of investigation and development.

With increase in projects of THDC the increasing role of the organization is also felt. Requirement of qualified man power for the various Hydro Projects and enforcement of environmental activities at various stages - Construction, Commissioning, Operation & Maintenance phase, is essential. THDC is committed to the environmental management of the projects and a Social & Environment Department headed by General Manager assisted by Senior Managers and Senior Environmental Officers at Corporate Office is established.

THDC has already taken a number of actions to augment the capacity of the Social and Environment Department. For capacity building of environmental staff, a Capacity Building Plan has been prepared. It includes environmental activities at corporate level & project level, development plan for staffing of the EMC. Further, a detailed training plan has been prepared, which includes training for environmental staff of THDC at corporate & project level, training of contractor's staff, training components, list of training institutes and budget for capacity building.

9.4 THDC's Environmental and Social Commitments

THDC believes in Corporate Social Responsibility (CSR) and is committed to fulfill its obligation towards the society. The CSR objectives of THDC include the following aspects:

- To undertake community development in the neighborhood area of operating stations with particular focus on women, children, disabled persons and aged persons;

- To create appropriate partnership with the concerned stakeholders for the effective delivery of community development programs through consultation and participation.

- To explore and work in various domains of community such as Health, Education, Drinking water, peripheral development etc. on individual basis or partnership basis with the help of Government, NGO, Private firm etc. as per suitability to promote sustained livelihood, overall development and well being of the target communities.

10. ENVIRONMENTAL MANAGEMENT MONITORING

A monitoring plan is framed to monitor the implementation of activities provided in EMP. EMC, VPHEP in association with Corporate office shall be monitoring the EMP. However, a third-party monitoring for the implementation of the EMP will be conducted by an agency or a committee of experts who will visit the Project site twice a year to oversee and evaluate the EMP implementation and suggest improvements. In addition, THDC has retained an International Panel of Experts on Environment and social to advise THDC during preparation phase and this will continue in the implementation phase as well.

11. PUBLIC CONSULTATION AND DISCLOSURE

The project has engaged stakeholders including the project-affected people to discuss different aspects of the project over the last two years. THDC has organized community meetings, meetings with village elders and elected leaders of the villages. During the preparation of EA and social assessments, a number of informal but significant meetings were organized. As part of the regulatory clearance process, a formal public hearing was organized. At Haat village, a Public Information Centre (PIC) was set up on July 20,2007, where the local community and other stakeholders have full access. The PIC has been helpful for the local public in recording their views about the project. Additionally, THDC has also opened a PIC near its office in Pipalkoti on August 19,2008. A schematic 3-D model depicting all the proposed components of the project has been placed in PIC for Public Display. THDC has distributed tree saplings (around 1000) to the local project affected villages for plantation in their respective villages. THDC has undertaken extensive consultations on environmental issues, organizing two public meetings on EMP and RAP as per regulatory requirement. During the course of EA and additional environment studies, SIA & RAP, till August 2009, a total of 72 consultations on environmental and social issues have been held. There were eleven focused related to

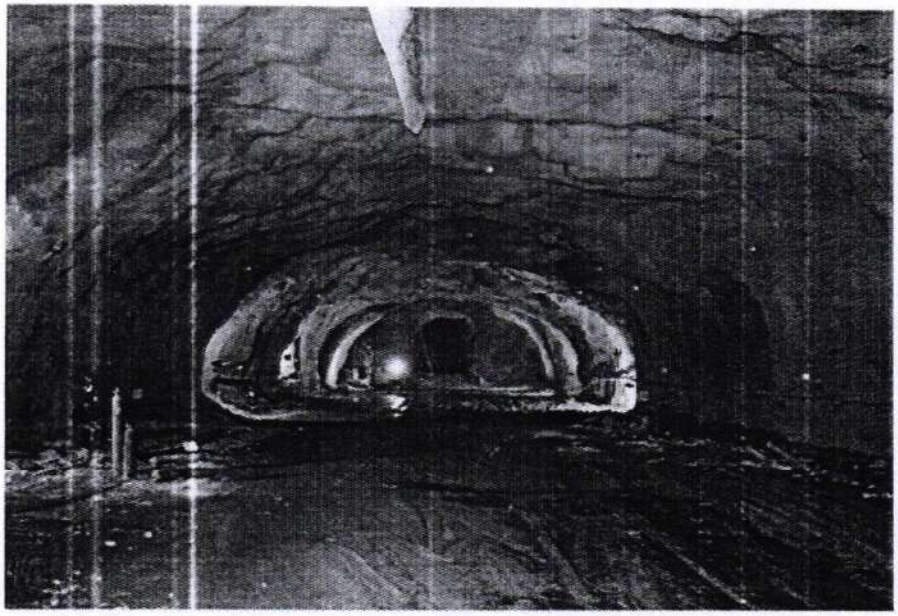
environmental issues during EA consolidation process and are recorded in the EA. The EIA report (based on which regulatory clearance for the project was granted) was disclosed before the formal public hearing, with assistance from the State Pollution Control Board. The revised updated EA/EMP prepared after incorporating recommendations of additional environmental studies and the RAP (including translation of the Executive Summaries in the local language, Hindi) is available in the PICs, offices of the affected panchayats, office of the District Magistrate/Collector/ SDM and in THDC's corporate office at Rishikesh. All the documents are also available on THDC's website, *www.thdc.nic.in*.

The availability of these documents was widely announced in the local newspapers (both English and Hindi newspapers) on 27 July 2009. These documents were also disclosed in the Bank's Info shop on Sept 14, 2009. The draft reports will be replaced with the final reports once their final versions are endorsed by the Bank and the borrower. A public meeting was held on September 13, 2009 at project site to disclosure the EA/EMP and RAP.

Project No.
SSP/R/398/19-20

Report
on

Blast Design optimisation and Evaluation of Blast induced Damage by Monitoring of Blasting Vibration during Rock Excavation at VishnugadPipalkoti Hydroelectric Power Project, Pipalkoti



Submitted to

M/s HCC, VPHEP, Pipalkoti, Uttarakhand

By

CENTRAL INSTITUTE OF MINING & FUEL RESEARCH
(CouncilofScientificandIndustrialResearch,NewDelhi,Govt.ofIndia)
Regional Research Centres,
Roorkee&Bilaspurwww.cimfr.nic.in

CSIR-CIMFR
SEPTEMBER 2021

CSIR-CENTRAL INSTITUTE OF MINING & FUEL RESEARCH

Ref: CIMFR : CNP/SSP-R/VPHEP/398/19-20

To,
The Project Manager
M/s Hindustan Construction Company (HCC)
Vishnugad-Pipalkoti Hydro Electric
Power Project (4X111 MW), Chamoli, (Uttarakhand)

Project: Construction Vishnugad-Pipalkoti Hydro Electric Power Project (4X111MW) on the River Alaknanda in Chamoli District,Uttarakhand,India.

Sub: Submission of monthly report on study of blast induced ground vibration monitoring at VPHEP Project Site for the month of Sep 2021.

Sir,

Please find attached here with, the monthly report on study on blast induced ground vibration monitoring at VPHEP Project Site for the month of Sep 2021 for your kind information and necessary action.

Thanking you!

(Byomesh Yadav)
Project Assistant
CSIR-CIMFR

//True Copy//

THDC IndiaLtd.,Pipalkoti HCC Ltd.,Pipalkoti

Monthly Report

On

Blast Induced Ground Vibration Monitoring at Vishnugad-Pipalkoti Hydro Electric Power Project (4×111 MW) Distt.-Chamoli (UK)

CNP/R/SSP/398/20

SEPTEMBER 2021

CSIR-CENTRAL INSTITUTE OF MINING & FUEL RESEARCH
(Council of Scientific and Industrial Research, Govt. of India)
Regional Research Centre Roorkee&Bilaspur

//True Copy//

SEPTEMBER-2021

OPEN &

UNDERGROUNDEXCAVA

TION

//True Copy//

Monthly Report on Observed Blasting Practices and Blast Vibration for the Month of September 2021

CSIR-Central Institute of Mining and Fuel Research Centre Roorkee has been entrusted with study on the controlled blast design, supervision and monitoring of blast induced ground vibration vide letter no. HCC/O/XX33/47/29/GN/WO/B/001 dated 17.04.2019. CIMFR Roorkee submits monthly technical report on the observed blasting practices and vibration records. This report pertains to observation for the month of September 2021.

In the month of September 2021, 10 major blasts has been carried out at Surge Shaft Bottom Adit, P.S Bottom, TH Chamber, By-Pass Tunnel and other part of VPHEP Pipalkoti Site. Continuous blast vibration monitoring at VPHEP Site has also been conducted by HCC as well as CIMFR Team during various blasting operations. CIMFR team has observed more than 10 major blasts during this period.

Blast design has been conducted by conducting trial blasts as per predominant rock mass conditions. The optimum blast design has been used for blasting in different faces both in Power house as well as Dam site of VPHEP Project. Blast Vibration Monitoring has been carried out with varying total Charge (TC) and Maximum Charge per Delay (MCD). In all the blasting practices Emulsion Explosive of 32mm as well as 40mm explosive cartridges has been used. In all the blasting practices, Non electric initiation system has been used of long delay series. Length of blast hole was kept 1.5m to 2.0m in Power house Site and 2.0 to 3.0m in Dam Site as per recommended round length of Construction Drawings. Spacing was kept (1.0-1.2)m and Burden suggested was (0.8-1.0)m.Continuous vibration monitoring has been carried out. Maximum charge per delay (MCD), 8.0kg to 14.48kg and Total Charge varied 50kg to 125 kg respectively in an optimized blast designs. Distance between sensor location and blast location ranges with 100 to 300m.The details of blast induced ground vibration monitoring and Sensor locations and blast design parameters are presented in the report. Amongst all the major 10 blasts observed by CIMFR, Minimum value of Peak Particle Velocity (PPV) was 1.27 mm/s of By-Pass Tunnel at 140m distance and Maximum value of PPV was 6.140 at SS Bottom Adit at 150m distance. The range of PPV lies from (1.127-6.140) mm/s in majority of the observations. Dominant frequency of the vibration remained more than 21.5 Hz.

5

//True Copy//

STANDARDS ON SAFE LIMIT OF VIBRATION FOR VARIOUS STRUCTURES

Over the years, numerous vibration criteria and standards have been suggested by researchers, organizations, and governmental agencies. Much of this work originated from the mining industry, where vibration from blasting is a critical issue. Different countries have set their own standard on the basis of experimental investigation in mining industry. As per the present Indian Standards, as mentioned in DGMS (Tech) (S&T) Circular No. 7 dated 29th August, 1997 depending on the type of structures and dominant excitation, the Peak Particle Velocity (PPV) on the ground adjacent to the structure shall not exceed the values given below in the Table1

Table 1. Permissible Peak Particle Velocity (PPV) in mm/sec as per DGMS (India) Standard

Type of Structures	Dominant Frequency, Hz		
	< 8 Hz	8 - 25 Hz	> 25 Hz
(A) Buildings/structures not belong to the owner			
(i) Domestic houses /structures (Kuchha brick and cement)	5	10	15
(ii) Industrial buildings (RCC and framed structures)	10	20	25
(iii) Objects of historical importance and sensitive structures	2	5	10
(B) Building belonging to owner with limited span of life			
(i)Domestic houses /structures (Kuchha brick and cement)	10	15	25
(ii) Industrial buildings (RCC and framed structures)	15	25	50

As given in Table DGMS criterion being followed in whole of the country is frequency based damage criterion. The standard specifies that damage potential of the peak particle velocity will primarily depend on the frequency of vibration. As the frequency increases, the damage potential of the vibration reduces and hence the safe permissible peak particle velocity also goes on increasing. The frequency of the vibration depends on local geological conditions. A hard massive rock will have higher frequency and a soft jointed rock will have lower frequency. Higher the geological disturbances less will be the frequency of vibration and therefore safe permissible PPV will also be lesser. Table 2 also reveals that the type of housing structures will decide the maximum safe PPV it can sustain. A domestic house of Kuchha brick and cement/ mud-clay can sustain less value of PPV whereas an industrial building with RCC frame will sustain higher level of PPV without incurring any damages. In DGMS standard as mentionedaboveinTable2,specialprovisionhasbeengiventotheownerofthestructure

6

close to the blasting activities. Limit of safe vibration for residential houses not owned by the project authorities are more restrictive than the one owned by the project authorities on account of temporariness of the structures. However, irrespective of ownership and type of construction material, historical objects have been given special emphasis and the safe limit of PPV has been most restricted.

Table 2: Permissible Peak Particle Velocity (PPV)in mm/s as per THDC India Ltd.(Vol.IV-ER Section IV 3- Civil Works)

Structure	Peak Particle Velocity (mm/s)
Building Containing operating electro-mechanical plant	20
Operating plant or equipment	0.2 acceleration & 0.25 mm amplitude
All other building and concrete on site, existing or under construction	50
For concrete, grout and shotcrete in place for more than 60 hours	50
For concrete, grout and shotcrete in place for less than 60 hours	100
Excavation under construction and construction fills	100

DGMS has recently recommended the damage criteria for underground coal mine working based on Rock Mass Rating (RMR) vide their circular no. DGMS/ (Tech) (S&T) Circular No. 06 of 2007 dated 28th May 2008 (Anon, 1997) on "Damage of below ground structures due to blast induced vibration in nearby open cast mines". The degree of damage observed below ground open mines is influenced by the RMR of roof rock. Thus, the damage criteria for below ground coal mines workings is based on RMR, because it includes the parameter like layer thickness, structural features, rock weather ability and strength of the roof rock and ground water seepage. The junctions of the below ground coal mines workings are more susceptible to blasts produced cracking than the galleries away from the junction. The threshold values of vibration at junction in terms of peak particle velocity has been given below for different RMR of roof rocks for the safety of below ground coal mines workings. The values of vibration in the pillar are also givenbelow

Table 3: Threshold values of vibration for the safety of roof in the below ground workings for different RMR

RMR of Roof Rock	Threshold Values of Vibration in Peak Particle Velocity (mm/s)
20-30	50
30-40	50-70
40-50	70-100
50-60	100-120
60-80	120

Table 4: Threshold values of vibration for the safety of pillar in the below ground workings for different RMR

RMR of Roof Rock	Threshold Values of Vibration in Peak Particle Velocity (mm/s)
20-30	20
30-40	20-30
40-50	30-40
50-60	40-50
60-80	50

CONCLUSIONS AND RECOMMENDATIONS

CIMFR team have continuously supervised and recorded blasting operation at THDC VPHEP, Pipalkoti Site during this reporting period. More than 10 blast events have been supervised and monitored for blast induced ground vibration at various critical locations. Major rock excavation during this reporting period have been carried out in Dam Site, DC-1st& 2ndU/S Benching, Right Bank (Road Cutting), Dam Top-(II&III) Benching, P.S Bottom, S.S Bottom & By-Pass.

Fast Furrier Transform (FFT) analysis of the observed data reveals that the principal frequency of blast vibration is greater than 21.5Hz in majority of the cases. As per THDC India Ltd. (Vol.IV-ER Section IV 3- Civil Works) represented in the Table: 2. Permissible Peak Particle Velocity(PPV) in mm/s for structures containing electro-mechanical equipments20 mm/s irrespective of the frequency. As per DGMS criterion, RCC building may sustain vibration up to 50mm/s having dominant frequency more than 50 Hz. In light of above discussion, all the blasting operation has been optimized to ensure peak particle velocity level to be less than 20mm/s. Amongst all the major 10 blasts observed by CIMFR, Minimum value of Peak Particle Velocity (PPV) was 1.127 mm/s of By-Pass Tunnel at 140m distance and Maximum value of PPV was 6.140 at SS Bottom Adit at 150 m distance. The range of PPV lies from (1.127-6.127) mm/s in majority of the observations. Dominant frequency of the vibration remained more than 21.5 Hz. The observed vibration values fall well within the safe permissible limit.

8

Analysis of the observed vibration data reveals minimum and maximum value of Peak Particle Velocity observed during this period is 1.127 mm/s and 6.140 mm/s. Majority of the observed vibration data remained less than 5mm/s. All the blasts were carried out using controlled blasting, additional line of line drilling and multi-drifting. This has successfully helped in blast induced ground vibration and all the values are found to be well within the recommended safe limit.

Blast design for excavation of various critical structures has been carried out by conducting Trial Blast. The blast design parameters are optimized based on the results of the trial blast with due consideration to proximity of the critical structures. It is recommended that the guiding principal as suggested time to time by CIMFR Team shall be followed to ensure safety of the structures.
It is further recommended that the continuous monitoring of the vibration shall be carried out. The geotechnical instrumentation data shall be analyzed in light of the observed vibration values to precisely understand the engineering behavior of the underground structures. Table-3 shows the threshold values of vibration for the safety of roof with corresponding RMR values.

//True Copy//

ANNEXURE -R/3-10

No. J-12011/29/2007-IA-1
Ministry of Environment, Forest & Climate Change
(IA-I Division)

Indira Paryavaran Bhawar,
Vayu Wing, Jorbagh,
New Delhi-1100003

Dated : 10th October, 2017

To
The General Manager (S&E)
M/s THDC India Ltd
Corporate Office, Rishikesh
Pragatipuram, By Pass Road,
Rishikesh - 249201 (Uttarakhand)

Sub : **Re-constitution of Multidisciplinary committee to oversee the implementation of the suggested safeguard measure at 444 MW Vishnugad Pipalkoti Hydroelectric Project (VPHEP) located in Chamoli Distt, Uttarakhand- reg.**

Sir,

With reference to above cited subject, the competent authority has approved the composition of formation of Multi Disciplinary Committee as below:-

S. No	Name/Post	Discipline	Nomination
1	PCCF HoFF GoUK		Chairman
2	General Manager (Project), VPHEP	Project Head	Co-Chairman
3	Dr. S.C. Katiyar, Assistant Director, Regional Office (North Central Zone), Dehradun	MoEF& CC Representative	Member
4	DFO, Badrinath Forest Division	Forestry	Member
5	DFO, Kedarnath Wildlife Division	Wildlife	Member
6	DFO, Alaknanda Soil Conservation, Gopeshwar	Soil Conservation	Member
7	Representative Environment Management Division, ICFRE, Dehradun	Ecology	Member
8	Dr. Kalyan Singh Rawat, Maiti Movement	Environmentalist/NGO	Member
9	Officer-in-Charge (Environment) Corporate Office THDCIL, Rishikesh.	-	Member
10	Director-in-charge, River Valley (MoEF) New Delhi.	-	Member
11	Officer-in-charge (Environment), VPHEP, THDCIL, Pipalkoti.	-	Member Secretary

//True Copy//

Minutes of the 2nd meeting of Multi-Disciplinary Committee (MDC) of Vishnugad Pipalkoti Hydro Electric Project (VPHEP), reconstituted by MoEF&CC, GoI, to oversee the implementation of the suggested safeguard measures (i.e. compliance conditions under Environment Clearance and Forest Clearance accorded by MoEF&CC) at VPHEP Project being implemented by THDCIL.

The Multi-Disciplinary Committee of the 444 MW Vishnugad Pipalkoti Hydro Electric Project (VPHEP) of THDC India Limited (THDCIL) has been re-constituted by MoEF&CC, GoI, vide letter No. J-12011/29/2007-IA-1 Dated: 10th October, 2017 to oversee the implementation of the suggested safeguard measures (i.e. compliance conditions under Environment Clearance and Forest Clearance accorded by MoEF&CC) at VPHEP Project being implemented by THDCIL.

The 2nd meeting of the said MDC of VPHEP was held on 28th February 2020 at PCCF-HoFF office, Van Bhawan, 85 – Rajpur Road, Dehradun under the Chairmanship of Sh. Jai Raj, PCCF-HoFF, GoUK.

Following committee members attended the meeting (Attendance Sheet Enclosed):

1. Sh. Jai Raj PCCF-HoFF, GoUK, Chairman, MDC
2. Sh. H.L. Bharaj, Executive Director, THDCIL, Co-Chairman, MDC
3. Dr. S. C. Katiyar Add. Director, Regional Office, MoEF&CC, Dehradun
4. Sh. Amit Kanwar, DFO, Badrinath Forest Division, Gopeshwar
5. Sh. Amit Kanwar DFO, Kedarnath Wild Life Sanctuary, Gopeshwar
6. Sh. Sarvesh Kumar Dubey, DFO, Alaknanda Soil Conservation Division, Gopeshwar
7. Dr. A.N. Singh, Scientist – F, ICFRE, Dehradun
8. Dr. D. L. Bhatt, DGM (Env.), THDCIL, Rishikesh
9. Sh. Vijay Sehgal, AGM (Env.) VPHEP, THDCIL, Member secretary

Special Invitees:

1. Sh. G.S. Pande, CCF, Garhwal Zone
2. Sh. N.N. Pandey, CF, Garhwal Zone
3. Sh. D.K. Singh, CF/Director, NDBR
4. Sh. Kishan Chand, DFO, NDBR, Joshimath
5. Sh. P.K. Agarwal, AGM (Incharge), VPHEP, THDCIL
6. Sh. S.P. Singh, Env. Engineer, UEPPCB, Dehradun
7. Sh. R. D. Bhat, Sr. Mgr (Social), VPHEP, THDCIL
8. Sh. Ayush Walia, Sr. Eng., VPHEP, THDCIL
9. Sh. B.S. Parik, Manager, Hindustan Construction Company, VPHEP project
10. Sh. Sunil Gupta, Sr. Env. Officer, Hindustan Construction Company, VPHEP project

The meeting started with the introduction of committee members/ special invitees followed by project briefing by Member Secretary. A detailed Presentation was given on technical aspects of project, status of construction activities and various safeguard measures (i.e. compliance conditions under Environment Clearance and Forest Clearance accorded by MoEF&CC) being implemented by THDCIL at VPHEP Project.

Following were the major points of discussions/ decisions taken during the meeting:

के० पी० सिंह
K. P. Singh
महाप्रबन्धक (परियोजना)
General Manager (Project)
टीएचडीसी इण्डिया लिमिटेड
THDC India Limited
वी०पी०एच०ई०पी० पीपलकोटी
V.P.H.E.P. Pipalkoti

अपर महाप्रबंधक
(पर्यावरण) वीपीएचईपी
टीएचडीसीआईएल,पीपलकोटी

प्रभागीय वनाधिकारी
केदारनाथ वन्यजीव प्रभाग
गोपेश्वर।

//True Copy//

1. It was apprised to the chair that as per MoEF&CC, EC condition, 6202 hectare degraded catchment area of high & very high category is to be treated. Catchment Area Treatment (CAT) Plan as has been proposed should be completed in three years. The total Implementation value for CAT Plan is Rs. 47 Crs. The total amount of Rs. 47.00 Crs stands deposited by THDCIL in CAMPA fund during year 2012. DFO Badrinath Forest Division, Gopeshwar is the Nodal Officer for implementation of CAT Plan. Final approval has been granted to DPR along with Micro plans for CAT Plan of VPHEP by Forest Deptt., GoUK vide their letter dt. 30.12.2017.

   As per progress received from Badrinath Forest division out of Rs. 17.59 Crs released by CAMPA, Rs. 16.78 Crs has been spent on various works till Dec, 2019. Details of the progress w.r.t. CAT was also discussed with DFO, Badrinath Forest Division, Nodal Officer for the work, and it was apprised to the chair that slow progress is due to non inclusion of activities in the Annual Plan of Operation (APO) by Forest Deptt.

   Chairman – MDC, directed the officials to look the matter and expedite satisfactory progress in implementation of CAT Plan. It was also directed that progress of the CAT works should be presented in next MDC meeting specifically w.r.t. the activities planned in the DPR and the progress of activities executed accordingly. Directions were also given to monitor the CAT works jointly comprising a team of officers from Forest department and THDCIL. The outcome of the committee report with observations / suggestions / recommendations, if any, should also be presented during next MDC meeting.

   It was also directed that works i.e. Compensatory Afforestation, Road side plantation, construction of RCC pillars with demarcation of forest land etc. for which requisite funds have already been deposited by THDCIL should also be completed at the earliest.

   (Action by Nodal officer, forest Deptt. & Env. Deptt, THDCIL)

2. As per EC condition of MoEF&CC, 3 cumecs minimum water flow should be released downstream of Dam during lean season. Further, MoEF&CC, vide their letter dated 31.05.2011, revised the minimum environment flow to 15.65 cumecs. For this, THDCIL has already given its undertaking to this effect and necessary provisions to comply said condition are being made in the project components also.

   However during discussions, Dr. S. C. Katiyar, Add Director, MoEF & CC, Regional office, Dehradun, pointed out that CWC has recently issued new guidelines in this regard and suggested to take care of those guidelines and modify the Project components accordingly.

   (Action by Design Deptt/Env Deptt THDCIL)

3. Regarding Muck Management, it was apprised to the Chair that Muck Management Plan has been prepared in the Environment Management Plan (EMP) keeping in view the MoEF condition and is being implemented as per plan. Dumping of muck is being done at designated / identified dump sites and well above the high flood level. Engineering measures such as construction of gabion faced reinforced earth wall with uniaxial geo-grid reinforcement are adopted at dumping sites. Compaction is being done. Benches have been developed to discontinue the slopes in dump yards.

के0 पी0 सिंह
K. P. Singh
महाप्रबन्धक (परियोजना)
General Manager (Project)
टीएचडीसी इण्डिया लिमिटेड
THDC India Limited
वी0पी0एच0ई0पी0 पीपलकोटी
V.P.H.E.P. Pipalkoti

अपर महाप्रबंधक
(पर्यावरण) वीपीएचईपी
टीएचडीसीआईएल,पीपलकोटी

प्रभागीय वनाधिकारी
केदारनाथ वन्यजीव प्रभाग
गोपेश्वर।

//True Copy//

Biological measures, such as formation of micro-benches (kyaries), laying of top soil, plantation of Vetiver grass, manuring etc. are under implementation.

After discussions, chairman MDC suggested to rethink and Brainstorm on the Muck Management issue. It was discussed that whatever Muck is generated i.e. Big size Rock, crushed rock material etc may be utilised for some purpose at Project or can be given to locals after going through statutory guidelines and taking necessary approvals from the Competent Authority. It was also directed by Dr. S. C. Katiyar, that Composition of Muck i.e. Soil & Boulder ratio may also be apprised in next MDC meeting.

(Action by Env & Execution Deptts of THDCIL)

4. As per EC condition of MoEF, plantation of those species which come under Rare, Endangered, and Threatened (RET) category, has been suggested to be planted during the implementation of CAT and Compensatory Afforestation works. THDCIL have also requested the State Forest Department to take care of the suggested measure by MoEF.

After discussions, Chairman MDC directed the Nodal officer, Forest Deptt to take immediate necessary action and expedite the matter. The Progress on the issue should also be apprised during next MDC meeting.

(Action by Nodal officer, forest Deptt. & Env Deptt THDCIL)

5. An Herbal Garden has been developed by THDCIL in the Project campus, for which Consultancy for the work was taken through Herbal Research and Development Institute (HRDI), Mandal, Gopeshwar. Medicinal plants like Harad (Terminalia Chebula), Lemon Grass (Cymbogogon felxuosus), Sarpgandha (Rauvolfia Serpentiina), Aloe Vera etc. have been planted in the garden.

Chairman, MDC suggested that development of the said garden should have an objective & a meaningful Purpose. It was directed to the Nodal officer, Forest Deptt to visit the Garden site and efforts should be made to create awareness among locals for use of these type of medicinal plants for their personal use and locals should be motivated to plant these type of medicinal plants for the benefit of the society.

(Action by Nodal officer, forest Deptt. & Env. Deptt, THDCIL)

6. 02 Watch Towers has been installed at identified locations at Powerhouse and Tunnel Boring Machine sites nearby the boundary of Kedarnath Wildlife Sanctuary (KWLS) for watch & ward of Wild life. Ten camera traps were also procured by THDCIL which were handed over to the Forest Deptt and the same has been installed at various locations by Forest Deptt.

It was directed by Chairman, MDC to the Forest Deptt to make best use of these watch towers. However, after discussions it was also decided that in future these types of watch towers if required by Forest Deptt, may be erected at suitable locations to have best use. Plus if towers are not required, the funds may be utilized for making other structures like two storied chowkies etc.

(Action by Nodal officer, forest Deptt. & Env Deptt, THDCIL)

7. Regarding Awareness programs related to Environment (ie; climate change, global warming, water scarcity, deforestation, pollution, forest fire etc) & wild life conservation.

के0 पी0 सिंह
K. P. Singh
महाप्रबन्धक (परियोजना)
General Manager (Project)
टीएचडीसी इण्डिया लिमिटेड
THDC India Limited
वी0पी0एच0ई0पी0 पीपलकोटी
V.P.H.E.P. Pipalkoti

अपर महाप्रबंधक
(पर्यावरण) वीपीएचईपी
टीएचडीसीआईएल,पीपलकोटी

प्रभागीय वनाधिकारी
केदारनाथ वन्यजीव प्रभाग
गोपेश्वर।

//True Copy//

It was directed by Chairman, MDC that outcome based Programs may be organised. Life style shift should be the Motto of the awareness programs. Forest Deptt should also be associated in the Programs.

(Action by Env Deptt, THDCIL & Nodal officer, Forest Deptt)

8. On Fish Management Plan it was apprised that the Consultancy Services for preparation & supporting Implementation of Fish Management Plan for VPHEP Project was awarded to ICAR - Directorate of Coldwater Fisheries Research (DCFR), Bhimtal. Based on the findings of survey work / primary data, appropriate fish management plan has been recommended by DCFR. In the mean time, construction of Fish Hatchery is in Progress. After construction, an Expert Agency is proposed to be hired for operation of Fish hatchery.

   During last MDC meeting it was suggested by Chairman, MDC that "Possibility of Fish entering the intake structure and get caught up in turbine" may be discussed with experts from ICAR-DCFR, Bhimtal and request them to suggest possible mitigative measures, if required any.

   It was apprised to the Chair, that the matter was discussed with DCFR and it was conveyed by DCFR experts that there is very less probability of Fish entering through trash rack intake due to presence of torrential flow at intake. Further, specific study on this particular aspect is not known to them.

   However, it was suggested by Chairman, MDC to implement mitigative measure as suggested by DCFR officials in this regard. It was also discussed that Fish ladder will not be feasible. However, it was directed that after commissioning of the Project, a study may be got done through an expert agency to know the Impact on aquatic Biodiversity upstream and downstream of the project to have a comparison of mortality of Aquatic Biodiversity.

   (Action by Env. Deptt/ Design Deptt, THDCIL)

9. Under Green Belt development approx. 8800 plants have been planted by THDCIL in Project campus. **It was directed by Chairman, MDC to Nodal officer, Forest Deptt for having Aerial monitoring of the plantation via Drone and progress may be presented in next MDC meeting.**

   (Action by Nodal officer, forest Deptt. & Env. Deptt, THDCIL)

10. During the meeting, Sh. Kishan Chand, DFO, NDBR apprised the Chair that during recent visit by him & forest officials at Dam site the issue of non compliance of EC/ FC conditions by THDCIL / Hindustan construction company at Dam site was observed ie; Illegal operation of crusher plant at dam site, Drainage of waste water being used at crusher plant directly into the river, Royalty of the Excavated material is not being paid, Establishment of labour camps on forest land, Non demarcation of forest land by RCC pillars, Disposal of excavated muck directly into the River and not at Muck disposal site, damage to Flora & Fauna.

    It was appraised by AGM (Env) THDCIL, to the Chair that the said visit of the DFO was not officially communicated to THDCIL/ HCC and it was also apprised that there is no such issue of non compliance. Crusher plant is being operated after getting due "consent to operate" from the concerned department, royalty of the material is being paid regularly, labour camps has been

के0 पी0 सिंह
K. P. Singh
महाप्रबन्धक (परियोजना)
General Manager (Project)
टीएचडीसी इण्डिया लिमिटेड
THDC India Limited
वी0पी0एच0ई0पी0 पीपलकोटी
V.P.H.E.P. Pipalkoti

अपर महाप्रबंधक
(पर्यावरण) वीपीएचईपी
टीएचडीसीआईएल,पीपलकोटी

प्रभागीय वनाधिकारी
केदारनाथ वन्यजीव प्रभाग
गोपेश्वर।

//True Copy//

established on the land taken on lease, demarcation of forest land by RCC pillars is to be done by forest department, money has already been released by THDCIL in this regard. Muck is being dozed in the portion of river which has been dried by diverting the river through the diversion tunnel which is the proposed site for dam, ultimately this muck will be disposed off in the designated dumping yard as per the construction methodology. Official communication with, clarifications and relevant documents in this regard has been submitted by THDCIL in the office of the DFO in this regard. DFO Shri Kishan Chand said that he has not yet received any clarification and relevant documents and forest offence has been registered against the user agency/contractor for voilating different sections of Forest Acts. The Chairman said that proper action should be taken during enquiry of the offences.

However, Chairman, MDC directed CF (NDBR), DFO (NDBR) & Sh. S.P. Singh, Eng Env, UK Pollution control Board to have a joint visit to the Project site on mutually agreed date in presence of THDC/ HCC representatives at the earliest and submit the report.

(Action by Forest Deptt, THDCIL & M/s HCC)

11. Also, Dr. S.C. Katiyar, Addl. Director, MoEF&CC, Dehradun has opined that MDC meeting should be arranged at project site only and any changes in configuration of the MDC committee members can be done with prior approval of MoEF&CC, New Delhi.

At last chairman, MDC wished that small issues should the resolved with a joint meeting among forest & THDC officials at local level. He also suggested that Forest Deptt and THDCIL should jointly work together as a team for successful implementation of EMP.

The Meeting ended with the vote of thanks to the Chair.

के0 पी0 सिंह
K. P. Singh
महाप्रबन्धक (परियोजना)
General Manager (Project)
टीएचडीसी इण्डिया लिमिटेड
THDC India Limited
वी0पी0एच0ई0पी0 पीपलकोटी
V.P.H.E.P. Pipalkoti

for

Co-Chairman, MDC
Sh. H. L. Bharaj, ED, THDCIL

Vijay Sehgal
Member Secretary, MDC

अपर महाप्रबंधक
(पर्यावरण) वीपीएचईपी
टीएचडीसीआईएल,पीपलकोटी

प्रभागीय वनाधिकारी
केदारनाथ वन्यजीव प्रभाग
गोपेश्वर।

Chairman, MDC
Sh. Jai Raj, PCCF-HOFF, GoUK

//True Copy//

Progress Report

CONSULTANCY SERVICES FOR PREPARATION AND SUPPORTING IMPLEMENTATION OF FISH MANAGEMENT PLAN FOR VISHNUGAD-PIPALKOTI HYDRO ELECTRIC PRforOJECT (VPHEP)

THDC INDIA LTD.
PRAGATIPURAM, RISHIKESH
UTTARAKHAND

ICAR-DIRECTORATE OF COLDWATER FISHERIES RESEARCH, BHIMTAL-263136
UTTARAKHAND

formulating any management plan. Establishment of hatcheries, artificial propagation under controlled condition and river ranching programme are important tools for natural stock enhancement and rejuvenation of species in its natural habitat. Brown trout and rainbow trout in Balkhila stream are introduced exotic species and have not any much commercial eco-tourism and food fishing activity. However, stock enhancement of these exotics by regular ranching in Balkhila stream would support the livelihood and income to the local people by promotion of angling and fishing. Construction activities during various developmental stages may lead to the destruction of habitat which is detrimental for the survival of the species. Similarly the blockages of migratory rout of mahseer and snow trout directly affect the natural population due to failure of reproduction. Moreover, fragmentation of river and in consequence fish population may also lead to loss of genetic diversity.

In the entire stretch of Alaknanda basin only a few areas could be identified as possible areas for conservation of ichthyofauna. Most of such areas are Gaderas/ small tributaries of Alaknanda river which provide breeding and shelter ground for the fish fauna. Among such Gaderas/ tributaries such as, Birahi Ganga, Bal Ganga (Bal khila), Nandakini and Pinder are important for Snow trout and mahseer species. These small streams have considerable presence of fish fauna mainly snow trout and mahseer of different life stages and are also important to substitute EFR in the river line.

5.3 MITIGATION MEASURES FOR MIGRATORY FISHES

The social survey from the local people reflected that the availability of these fish species has been affected due to HEP, might be due to disturbance of in the migration and destruction in the habitats. The major migratory rout of this fish including all 4 species is main river course to side tributaries and *vice-versa*. The most appropriate approach is regular ranching of artificially produced seed in the rivers particularly at the confluence points of the different tributaries. To sustain the 20 Kg/Km biomass of this fish, which is an average of the Indian streams, release of 1000 fingerlings/km of the average size of 6-8 cm assuming 40% survival is required on regular basis annually. The prospect of rehabilitating population of migrant fish is very heavily dependent on providing an adequate flow regime in the river downstream of the dam. Maintenance of adequate flow with at least 60 cm water column depth in downstream is crucial for providing a viable aquatic environment for the existence

of this commercially important fish. This will require the release of mini- floods which mimic the pre-existing natural flooding regime and strict maintenance of adequate dry season flow. The duration of the flood release must be long enough to allow the stocks to migrate over the full distance of the migration route.

Presence of active swimmer, endangered mahseer was observed occasional to rare and this species performs migration in search of feeding and breeding grounds. This species is mainly confined in Birahi streams, which is the favourable habitat for the survival of this species. Improvement and restoration of habitat in Birahi River would be helpful to sustain the natural population of this important species. However, regular ranching with advanced sized fingerlings at the rate of 1000 nos. per km on annual basis would be helpful for stock enhancement.

Due to the high head of the dam and unfavourable topography on dam site, construction of fish ladder is not feasible. Performance of the existing fish ladder at Teesta Low Dam Project-IV, Kalijhora Sikkim is yet to be confirmed and is under study. However, fish lift may be helpful to negotiate the weak swimmer fish like snow trout, but, species specific design of fish lift is not yet available in the country which needs further study.

Social study reflects that fishing is not only the main livelihood support to the people and there is no commercial fishery in the study area. However, fish catch from the hill streams supports the nutritional as well as livelihood security to the people dwelling in the hills. Promotion of aquaculture activities in the project area would support the fish availability to the people of project area.

5.4 THE MAJOR RECOMMENDATIONS

Recommended for integrated fisheries management programme for project stretch involving the project developer, state fisheries department and fisheries research institute for effective implementation and monitoring.

- ❖ Operation of flow through snow trout hatchery for regular seed production and strengthening of existing mahseer hatchery for seed production.

- Collection of wild fish stock from the Alaknanda basin and maintenance of the brood stock at hatchery site. Breeding of the snow trout and production of fingerlings in controlled conditions at hatchery.
- Ranching of snow trout fingerlings in the stream on regular basis (100 fingerlings/km of the average size of 6-8 cm). This practice is also helpful to mitigate the genetic fatigue and loss of genetic diversity resulted due to inbreeding.
- Development of aquaculture practices with Indian and exotic carps, trout depending on altitudinal gradient and temperature suitability.
- Local Biodiversity Action Plan (LBAP) may be formulated for the habitat improvement and environmental protection.
- Ensure that the recommended mitigation measures suggested in the respective Environment Management Plan (EMP) are effectively implemented and followed strictly.
- Ensure that the suggested percentage of the lean period discharge (Minimum Environmental Flow) is maintained and that should be closely monitored every day.
- A regular study on the habitat ecology of the streams should be carried out at least for initial five years on yearly basis after the operation of the project. The study should also include any significant change in the hydrobiology and Ichthyofauna of the river.
- *In-situ* conservation of native fish species and mahseer at certain places like Birahi River to maintain germplasm and wild population is needed.
- Ranching of golden mahseer fingerlings in the stream on regular basis.
- A professional man power such as Fisheries graduate may be appointed on regular basis or any agency may be engaged for the effective implementation and monitoring of fisheries plan.

REFERENCES:

1. APHA, 1998. Standard Methods for the Examination of Water and Waste Water. 24th ed.
2. Badola SP (1979) Ecological studies on the ichthyofauna of freshwater resources of Garhwal region (India). PhD Thesis submitted to HNB Garhwal University, Srinagar (Uttarakhand)
3. Badola, S.P. and Pant, M.C., 1973. Fish fauna of Garhwal hills. Part I Ind. J. Zool. 14(1):37-44
4. Bhatt, J.P., Nautiyal, P., Singh, H.R., 2000. Population structure of Himalayan mahseer, a large cyprinid fish in the regulated foothill section of the river Ganga. Fisheries Research, 44:267-271.

BEFORE THE NATIONAL GREEN TRIBUNAL
AT NEW DELHI
MEMORANDUM OF APPEAL
APPEAL NO. 21 OF 2021

IN THE MATTER OF:

DR. BHARAT JHUNJUNWALA & ANR
…APPELLANTS

VERSUS

UNION OF INDIA & ORS **…RESPONDENTS**

Index
(Vol-2)

FILED THROUGH:

DHRUV DEWAN/HARSHITA CHOUBEY/CHANDNI GHATAK
ADVOCATES FOR RESPONDENT NO.3
C-519, SECOND FLOOR, DEFENCE COLONY, NEW DELHI - 110024
M: +91 9999776655/ +91 8769842888
E: choubey.harshita@gmail.com / chandnighatak26@gmail.com

PLACE: NEW DELHI
DATE: 29.03.2022

March, 2021

Technical Report of

Ecological Monitoring

of

Vishnugad-Pipalkoti Hydro Electric Project

(Monitoring time period June 2020-March 2021)

Sponsored by

टीएचडीसी इंडिया लिमिटेड
THDC INDIA LIMITED

Prepared by

Government Post Graduate College Gopeshwar

Chamoli Garhwal-246401, Uttarakhand

March, 2021

Technical Report of

Ecological Monitoring

of

Vishnugad-Peepalkoti Hydro Electric Project

Sponsored by

टीएचडीसी इंडिया लिमिटेड
THDC INDIA LIMITED

Prepared by

Government Post Graduate College Gopeshwar

Chamoli Garhwal-246401, Uttarakhand

//True Copy//

PROJECT TEAM

	Co-ordinator
Dr V P Bhatt	**Department of Botany, Govt PG College Karnaprayag**
	Team
Dr S P Uniyal	Department of Zoology, Govt PG College Gopeshwar
Dr Manish Belwal	Department of Botany, Govt PG College Gopeshwar
Dr Arvind Bhatt	Department of Geology, Govt PG College Gopeshwar
Dr Girja Prasad	Department of Botany, Govt PG College Gopeshwar

//True Copy//

Contents

1. Introduction

1.1 Project information

The project comprises the following main components:

Dam Site: A 65m high concrete diversion dam with spillway section having 4 No. 6.6m x 15m opening is proposed near village Helong. The reservoir will have a gross storage capacity of 3.63 million cum, out of which 2.47 million cum shall be live storage. A diversion cum spill tunnel of 10 m dia shall divert the discharge of 725 m3/sec during the construction period.

Power House Site: The power house site is located inside a hill in right bank of Alaknanda River downstream of Haat village. It will comprise of two separate underground caverns for installation of turbines and transformers. The dimensions of power house will be 127 m x 20.3 m x 50 m. The size of transformer cavern is 112 m x 16 m x 24.5 m. The power house will have 4 units of 111MW. The project would afford an annual energy generation of 1657.09 MU with 95% machine availability.

Head Race Tunnel: 13.4 km long & 8.8 m dia modified horse shoe shaped head race tunnel has been proposed on right bank of the Alaknanda River.

Tail Race Tunnel: 3.07km long & 8.8 m dia modified horse shoe shaped tail race tunnel has been proposed on right bank of the Alaknanda River.

Intake structure with 3 No. modified horse shoe shaped intake tunnel of 6m Diameter.

3 No. underground sedimentation chambers

Silt flushing tunnel of size 3.6m x 4.0m

THDC India Ltd has introduced, Tunnel Boring Machine for the portion of Head race tunnel operations. This will reduce the use of identified muck disposal sites.

1.2 Hydropower potential of Uttarakhand

The Himalaya is spanning from Jammu and Kashmir in the west to Arunachal Pradesh in the east and covering 530,795 km^2 has irreplaceable values as one of the important mountain ecosystems of the world (Singh, 2006). These young and fragile mountains of the Himalaya command high conservation significance due to their floral, faunal, geo-

hydrological, ecological, sociocultural and aesthetic values and also known as the water tower of the Earth (Valdiya, 1997), since it provides water to a larger part of the Indian subcontinent. The State of Uttarakhand is one of the States that form a part of the Himalaya, the hilly tracts of the State namely Foothills, Lesser Himalaya, Greater Himalaya and Trans-Himalaya form the eastern most part of the western Himalaya (Negi, 1995). This State uniquely endowed with glacial rivers following the natural incline/gradient has good hydro power potential and is thus recognized as a future Energy State (Joshi, 2007). Uttarakhand has a hydropower potential of the order of 20,000 MW against which only about 3,164 MW (16% approx.) has been harnessed so far through 45 Hydro Electric Projects (HEPs) of varying capacities being implemented by State and Central Government agencies and public and private sectors (IIT, 2011). Hydropower potential is one of the most important strategic assets of the State for the development of the economy (World Bank, 2011). With little or no fossil fuel resources, it is currently a net importer of power, but generates a seasonal surplus power. Since its creation, the new State, has been witnessing a sharp increase in energy demand. As the power consumption of the State has grown more than five times in the last eight years (2002-10), only 52 percent of its power needs are met from its natural resources. The State therefore plans to expand its hydropower generation capacity to become self reliant and a net exporter of surplus power (IIT, 2011). To meet this objective, a large number of Hydro Electric Projects are already in the advanced stages of planning/execution and many more projects are being proposed in the important river basins *viz.*, the Alaknanda and Bhagirathi basins, of the State. Among the various allotted Hydro Electric Projects in these two basins, 17 are commissioned Hydro Electric Projects with total installed capacity of 1851 MW; 14 projects of 2538 MW capacity are in the advanced stage of construction and 39 projects with installed capacity of 4644 MW are in different stages of planning.

1.3 Biodiversity profile of Uttarakhand

The State is well known for its rich natural resources and varied ecosystems, both terrestrial and aquatic. Four major rivers flowing through north India originate from the State, *viz.*, Ganga, Yamuna, Ramganga and Sharada. The State is endowed with a rich and diverse array of forest types from tropical to alpine types. The recorded forest area of the State is 2.43 m ha which constitutes about 45.44% of the State's geographic area. These forests can be further categorized into Very Dense Forests (20.76%), Moderate Dense Forests (52.69%) and Open Forest (26.54%). (Anno., 2019).

The major categories of forests in the State are: (i) Tropical Moist Deciduous Forests in the Terai and Bhabar tracts dominated by Sal (*Shorea robusta*) and associates *viz., Adina cardifolia, Anogeissus latifolia, Terminalia tomentosa* and a rich assemblage of shrubs interspersed with patches of bamboo, climbers and grasses; (ii) Subtropical Pine Forests with Chir Pine (*Pinus roxburghii*) as the dominant species are primarily found in the lower regions of the Himalaya (iii) Himalayan Moist Temperate Forests occurring between 1600-2900 m altitude in the Himalaya are further divisible into temperate broad leaved and conifer forests. Broad leaved forests are dominated by one or other species of oak (*Quercus* spp.) while the coniferous species are *Cedrus deodara, Picea smithiana, Abies pindrow,* and *Pinus wallichiana;* (iv) Sub-alpine and Alpine Forests exist at altitudes of 2,900 m to 3,500 m above sea level in the middle and upper Himalaya and is characterized by stunted birch-rhododendron forests, alpine scrub and meadows locally called "Bugyals". The major species of grasses in the area include *Arundo donax, Phragmites karka, Apluda mutica, Themeda arundinacea, Cymbopogon* spp., *Bothriochloa bladhii, Imperata cylindrica, Sachharum spontaneum, S. benghalense* and *S. narenga* among others. The mammalian diversity of Uttarakhand represented by more than 75 species is one of the richest in the country (Paramanand et al. 2000; Uniyal & Ramesh 2004; Chandola et al. 2008; Bhardwaj & Uniyal 2009 and Bhardwaj et al. 2010, Maheshwari & Sharma 2010). Species falling under lower risk category represent a little more than 50% indicating that the species with threatened status represent nearly half of the total species found in the State. Some of the threatened/vulnerable mammals in the State include Musk deer (*Moschus chryogaster)*, Snow leopard (*Panthera uncia*), Himalayan brown bear (*Ursus arctos isabellinus*) and Asiatic black bear (*Ursus thibentanus)*. A detailed analysis of the data shows that 37.80% of species fall under lower risk least concern category and 19.51% under lower risk not threatened status. It is estimated that about 650 species of birds (51% of India's avifauna) occur within the State (Vasudevan & Sondhi, 2010). Some of the threatened birds in the State include Western Tragopan *(Tragopan melanocephalus)*, Cheer Pheasant (*Catreus wallichi*) and Sarus Crane (*Grus antigone*). The reptile diversity in Uttarakhand encompasses over 60 species including crocodiles, turtles, tortoises, snakes and lizards. One of the endangered reptiles of the State is the Gangetic Gharial (*Gavialis gangeticus*).

The State of Uttarakhand which is a home for many perennial rivers of the country also has a good fish diversity represented by about 125 species (Badola, 2001). The Alaknanda river basins represent two important riparian ecosystems that have significantly contributed to the richness of the biodiversity of the State.

1.4 Biodiversity of Alaknanda River

The Alaknanda River is the major tributary of the river Ganga. The Alaknanda originates at a height of 3641 meters below Balakun peak 16 km upstream from Badrinath form the two glaciers of Bhagirath Kharak and Satopanth. The total catchment of the river Alaknanda upto dam site is 4672 km^2. The Alaknanda valley is U –shaped in the initial stretches: a typical feature of glacial valleys. Saraswati river joins the Alaknanda at 9 Km downstream from Mana. Khilrawan Ganga joins it below the Badrinath Shrine and Bhuynder Ganga below Hanuman Chatti. Downstream small tributaries- Helong, Garud, Patal and Birahiganga join the Alaknanda between Joshimath and Chamoli. The rivers of Chamoli district generally flow with great force in steep and narrow channels often resulting in excessive erosion and collapse of the banks.

The unique geographical location climate and topography along with latitudinal variation of the area has endowed the Alaknanda catchmnet with highly luxuriant and diverse flora. Depending upon the altitude and floristic combination Botanical survey of India, Dehradun identified 800 species of plant as a result of survey conducted in the area during past 4 years by P.K. Hajra and B. Balodi. The following major forest types have been identified:

i. Himalayan Sub tropical Pine (between 900 – 2000m)

ii. Temperate Forest (between 2000-2800).

iii. Sub alpine Forest (between 2800-3800m).

iv. Alpines land (above tree line between 3800-4500m).

v. Alpine meadows (above tree line in above 3800-4500m).

Out of the total forest cover of the Alaknanda Basin above 47% area is under dense forest (74% crown cover) followed by 35% not open cover (10-40% crown cover) and 17% under less than 10% crown cover.

1.4.1 Himalayan sub tropical Pine

This forest type occurs between 900m to 200m and is described in the section under Project Influence Area, Project Immediate Affected Area and Project Affected Area.

1.4.2 Temperate forest

Temperate Forest occurs between 2000-2800m and are of two types – Deciduous forests and Evergreen Forest Deciduous forests include deciduous broad leaved species. The common tree species are *Acer cappadocium, Juglans regia, Corylus jacquemontii, Celtis australis, Populus regia, Alnoides* and *Meliosma dilleniaefolia*. Shrubs such as *Rubus,*

Desmodium elegans, Viburnum cortinifolium, Deutzia staminea and *Arundinaria falcata* are common in the middle layer.

Evergreen forests which are found along with the deciduous forests are dominated by the Coniferous trees. *Picea smithiana, Pinus wallichiana* and *Quercus floribunda* are dominant species and middle canopy is dominated by *Sarcococca saligna, Rosa moschata* and *Arundinaria falcata.*

1.4.3 Subalpine forest

Sub Alpine Forest occur between 2800-3800m and are of two types (a) deciduous forests which are distributed in Dudh Ganga, Lata Kharak, Sainikarak, Himtoli, Dibrughetta, Deodi Trishul nullah, Ramni, Bagnidhar, and Bhujgara. *Acer acuminatum, Prunus comuta, Salix disperma, Populus ciliata* and *Sorbus foliolosa* are the dominant tree species of the forest and supported by shrubs such as *Rubes glaciale, Sarcococca saligna, Salix denticulate, Desmodium elegans, Viburnum cortinifolium, Rosa sericea, Lonicera werbiama, Rhododendron campanulatum, Syrina emodi, Sorbus foliolosa, Crotoneaster affine* and *Ailanthus nepalensis.*

Evergreen forest occurs in the same localities. These are dominated by *Abies pindrow, Abies spectabilis, Pinus wallichiana* and *Taxus baccata.* The other associates are *Betula utilis, Prunus cornuta,* and *Acer acuminatum.*

The middle layer is dominated by *Salix elegans, Rosa macrophylla, Rosa serica, Lonicera augustifolia, Sorbus foliolosa, Berberis aristara, Inula cuspidata* and *Rubes himalayensis.*

1.4.4 Alpine scrubland

Above treeline, between 3800 and 4500m scrubs namely *Rhododendron anthopogon, Rhododendron lepidotum, Rhododendron campanulatum, Juniperus indica, Juniperus recurva, Cotoneaster microphylla, Cotoneaster integrifolius, Berberis umbellate, Cassiope fastigiate, Salix karelinll, Salix hylematica, Salix calyculata, Salix lindleyana, Lonicera spinosa* and *Lonicera obovata* are found growing luxuriantly and forms peculiar associations. The common associations are:-

(a) *Rhododendron – Crotoneaster* association includes species such as *Rhododendron lepidotum, R. anthopogon, Cotoneaster microphylla* and *C. integrifolius.*

(b) *Piptanthus – Crotoneaster-Rhododendron* association includes species such as *Cotoneaster microphylla, Piptanthus nepalensis* and *Rhododendron lepidotum.*

(c) *Salix – Rhododendron* association includes species such as *Salix karelinii, S. hylematica, S. lindleyana* and *Rhododendron anthopogon.*

(d) *Juniperus – Lonicera* association includes species such as *Juniperus indica, J. recurva, Lonicera spinosa* and *L. obovata.*

(e) *Rhododendron – Cassiope* association: species are *Rhododendron anthopogon* and *Cassiope fastigiata.*

1.4.5 Alpine meadow

Alpine meadows are mainly dominated by herbaceous species. Few scrubs such as *Juniperus indica, Nicera obovata, Rhododendron anthopogon, Cassiope fastigiata, Salix hylematica* and *S. Rindleyana* are found in the meadows.

1.5 Conservation - Development

Among all types of development projects, hydroelectric dams are often seen as the most controversial. Issues linked to dams and especially to the large dams are often highly polarized. Critics of Hydro Electric Projects express their concerns about the wide range of negative environmental and related social impacts, from the destruction of unique biodiversity to the displacement of vulnerable human populations. Defenders of dams emphasize that these are often the economically least-cost source of electric power available from renewable source. However, like most other power generation technologies hydropower development also has adverse environmental impacts (Ledec and Quintero, 2003).

Opponents of water resource developments charge that dams cause significant damage to human and natural resources resulting in the impoverishment of human populations and loss of plant and animal species and their habitats. Available worldwide literature on consequences of dam development (Goldsmith and Hildyard, 1984; Graf, 1999; Adams, 2000; Berkamp *et al.*, 2000;) reveals that the impacts of dams on ecosystems are profound, complex, varied, multiple and mostly negative. By storing or diverting water, dams alter the natural distribution and timing of stream flows. This in turn, changes sediment and nutrient regimes and alters water temperature and chemistry resulting to impacts on ecosystems and biodiversity elements that these streams support and on their attendant socio-economic aspects. These ecosystem impacts may result in consequent changes in freshwater biodiversity which is already threatened on account of several other factors (Berkamp *et al.*, 2000).

However, there is a broad consensus that, when properly planned and implemented, hydropower is an affordable, reliable, sustainable and modern technology. It can help the communities, nations and regions to acquire a reliable supply of electricity, supporting economic and social development throughout the world. Hydro is a renewable energy source and has the advantages of low greenhouse gas emissions, low operating costs, and a high

ramp rate (quick response to electricity demand), enabling it to be used for either base or peak load electricity generation or both.

The Capacity addition of 444 MW through VPHEP in the Northern region will reduce peaking power shortage in the region. Out of 13% free power to the home state Uttarakhand, 1% shall be utilized for contribution towards local area development.

The project will facilitate integrated development of the region through employment, communication, education, health, tourism, development of Flora & Fauna, Greenbelt, transportation, treatment of Catchment Area etc.

1.6 Vishnugad-Pipalkoti Hydroelectric Project

The Vishnugad-Pipalkoti Hydroelectric Project (the study area), 65 m high concrete gravity dam and appurtenant structures to generate 444 MW power near village Helong, is a part of original electric generating Project, and is being constructed on river Alaknanda in cascade. A dam is to be located at village Helong in Joshimath Tehsil and an underground power house, at village Haat in Chamoli Tehsil. The regulated water so released from the reservoirs of Vishnigad-Pipalkoti HEP after flowing through the turbines will be balanced and outflow at Birahi. The project involves acquisition of public (government and forest land) and private land from titleholders located in 7 (tentetive) villages of the study area. The acquisition of land, consequent displacement due to different construction activities in the region have potential impacts on the biological environment, climate, and other environmental attributes of the affected population with specific impacts on their productive assets, sources of income, habitat, community structure, social relations, cultural identity, and traditional authority and also their potential for mutual help.

Therefore, the present study was taken to assess the ecological and environmental impacts monitoring of the Vishnugad-Pipalkoti hydroelectric project (HEP) in the Alaknanda valley and to work out a management strategy to overcome them and complete the project, involving field-level primary with the major aim of noting suitable interventions for a biodiversity management plan in the project area.

2. Study Area

2.1 Geography:

Siyasain office of the VPHEP just below the Jaisal village and 1km behind to Haat villageProject

Geographically, the study area (Birahi, Haat, PIpalkoti, Gulabkoti, Helong and adjoining area) is located 30° 21' to 30° 32' north latitude and 78° 18' to 79° 31' east longitude and altitudinally ranges from 900m to 2000m amsl in district Chamoli. The study area is divided in four sites viz., 1) Helong (the reservoir area of HEP, 1450-2000m amsl), 2) Gulabkoti-Langsi-Duing (the first adit site, 1300- 1600m amsl), 3) Haat-Peepalkoti (power house site, 1200-1800m amsl), and 4) Birahi (4 km downstream to power house site, 900-1400m amsl). The topography is by and large rugged, the entire region is mountainous. The mountainous tracts of the whole watershed have varying altitude and relief which contribute to a great extent for the variations of the climatic conditions. Owing to orientation or steepness of slopes, there are marked micro-climatic effects due to differences in insolation. The flow of wind in the upper ridges and shaddles have a considerable local influence on the temperature and play an important role in the distribution of the flora and fauna in the region.

2.2 Meteorology:

The climatic data for VPHEP area of Chamoli district during the study period are recorded. The monthly mean-maximum temperature varies from 18.04°C (December) to 38.97°C (June) and the mean- minimum temperature fluctuates from 4.45°C (January) to 25.15°C (June). December and January being the coldest months of the study area, and is heavy frost is experienced at night.

2.3 General land use pattern in the project area

The prime land use in the area is Forest and Agriculture. All the project roads mainly passing through open type of forest land or barren land. Few patches of Agricultural land and Community plantation can be also observed. The appearance of local deep rooted grasses has been observed nearby excavated or road construction area as Lungsi adit site- on the left side of river and right hand side of river near Tapovan and Dwing village, which is good shine of recovery and amelioration practice of project agency. The loss of agricultural fields shown at the time of EIA seems to be recovering gradually.

2.4 Edaphic conditions of the project area

The soil in the region varies according to altitude and climate. Soil on the slope is generally shallow and usually has very thin surface horizons. Such soils have medium to coarse texture. Valley soils are developed from colluviums and alluviums brought down from the upper slopes and thus, are deposited in the valleys and low-lying tracts or river terraces as a process of aggradations. In general north facing slopes support deep, moist and fertile soils. The south facing slopes are exposed to denudation.

The characteristics of the soil samples analysed for the study area *i.e.* VPHEP area. The texture has great influence over soil moisture, temperature and water holding capacity. On all the sites the soil was sand predominating. The water holding capacity varied from 26.67-34.07%. In all sites water holding capacity was higher in the Birahi East (34.07%) and the average value of water holding capacity was 29.95%. Soil colour varied from brownish yellow to light yellow, brown in the upper layer and light yellowish brown to pale brown in the middle and lower layers on the study sites. It was observed that all three layers of four different sites and altitudes the average compositions which were 56.36% (Sand), 28.90% (Silt) and 15.66% (Clay). The pattern of soil texture shows of Sand>Silt>Clay, which reflects higher proportion of sand followed by silt and clay. Similarly, in all the sites the average moisture percentage was indicated 25.09%. The average moisture percentage was recoreded in Helong 27.06% and low average mosutre percentage was recorded in Haat- Pipalkoti 20.93%.

The average value of pH was 7.55, which indicated the soil was basic in nature. The pH varies from 7.30 to 7.78.

3. Need for Ecological Monitoring of VPHEP

Like many other developmental activities, the proposed project, while providing planned power generation could also lead to a variety of adverse environmental impacts. However, by proper planning at the inception and design stages and by incorporating appropriate mitigatory measures in the planning, design, construction and operation phases, the adverse impacts can be minimized to a large extent, where as the beneficial impacts could be maximized. The main objective of ecological monitoring is to assess the improvement in degraded local environment and biological wealth during the different construction phases and quality of restoration measures taken re-establishment of local environment of Project area and to suggest appropriate management plan to ameliorate the adverse impacts and enhance the positive impacts.

A post-project environmental monitoring programme is suggested to oversee the environmental safeguards, to ascertain the agreement between prediction and reality and to suggest remedial measures not foreseen during the planning stage but arising during construction and operation and to generate data for further use.

The aim of this study is to ensure the potential local environmental improvement after implementing the management plan addressed in environmental management plan (EMP) and the assessment finding are communicated to the relevant agency that will make the decisions for furtherance. Having read the conclusions of an environmental monitoring, project planners and engineers can shape the project so that its benefits can be achieved and sustained with out causing adverse impacts.

4. Vegetation Analyses

4.1 General Vegetation

The present study on the floristic composition of vishnugad-pipalkoti Hydroelectric Project is based on extensive and intensive field surveys at various localities of project area ranging from 900 – 3000 m amsl. Two hundred quadrats were laid in entire area, 100 quadrats were laid in influence zone and 100 were placed randomly in free draining catchment area in the entire project area, representing all possible vegetation type. Attempts were made to record all the possible plants of the region.

Based on the baseline data and comparison of available data, the forests of the project Influence area mainly fall in the degraded category. The forest areas are dominated by Chir-pine at right flanks of the valley while left side of the valley is dominated by Oak-mixed at higher elevation and scattered Chir-pine at lower elevation. The pine crops comprise mostly of middle age to mature trees. Young trees are generally deficient, occurring scattered or in small patches. The degeneration stage occur scattered in the Chir zone in patches where the trees are either destroyed or are unable to develop owing to excessively dry and shallow soil. Open shrub formations occupy the ground.

4.1.1 Structure and Composition

In the present field survey of the project area forming catchment of VPHEP dam, a total number of 378 plants species (tree, shrub, herbs and grasses) were recorded. Of the total species present, 142 were tree species (Table 4.1a – 4.1c), 96 shrub species and 226 were herbecious species).

In all four sites, the Helong is the site where maximum diversity was occurred with 89 species followed by Haat-pipalkoti with 77 species while lowest no of plant species 56 are contributed by Duing. Among the tree components *Pinus roxburghii and Pistacia integerrima* common to all four sites while *Abies pindow, Picea smithiana, Quercus semicarpifolia, Pinus wallichiana, Taxus baccata, Acer caesium, Neolitsea pallens, Morus serrata, Populus citiata, Aesculus indica, Swida macrophylla, Juglans regia, Fraxinus micrantha, Betula alnoids and Symplocos sp* are found only in site 1. *Lannea coromendelica, Engelharditia spicata* and *Pinus patula* are occurring only in site 4 whereas, *Quercus galuca, Prunus cerasoids* and *Aegle marmelos* are found only in Haat-Pipalkoti site. The availability and Conservation status (rare, vulnerable and endangered) of plants groups in each zone

(catchment, and influence) has also been made for influence zone of VPHEP dam and free draining catchment.

4.1.2 Impacts on catchment area

The catchment area comprise of Chamoli-Birahi to Joshimath-Tapovan and Pandukeshwar-Badrinath. Even after a big avlanch disaster in the upstream of the project site, no any negative impact has been observed in the influence and ubmerged area of the project due to following of the guidelines provided in the EMP of the project. The safeguard measures playe the vital role to contro the flood from upstream to downstream which is a significnt achievement.

4.1.3 Vegetation in the Influence Zone of Vishnugad-Pipalkoti HEP

In the influence zone of Vishnugad-Pipalkoti dam, Pine forest, mixed deciduous forests, Pine oak forest, temperate broad leaved forest, and Coniferous type of forest are found based on prilimainary survey analysis. The dominant species are: *Pinus roxburghii, Lannea coromandelica, Quercus leucotrichophora,* etc. Similarly, the shrub and herb species are common to those reported for the free darining catchment zone. The dominant shrub species *Colebrookia oppositifolia, Spermadictyon suaveolens, Pogostemon benghalensis, Adhatoda vasica and Boehmeria platyphylla* growing with common herbs of the zone was: *Nepeta* sp., *Euphorbia* spp. *Solanum nigrum, Rumex hastatus Oxalis corniculata, Achyranthes aspera, Ageratum conyzoides, Boerharia diffusa, Artemisia vulgaris, Eupatorium adenophorum, Cassia tora, C. occidentalis,* and *Parthenium hystosophorus* are commonly found in the area. *Chrysopogon fulvus, Cyperus niveus, Poa annua* grasses are common.

4.2 Aquatic biota

4.2.1Phytoplankton

As per EIA a total of 18 species of periphyton belonging to Bacillariophyceae, Chlorophyceae, and Myxophyceae family have been identified from the stretch of VPHEP project area. Whereas, the phytoplanktons represented by 10 species of families as Bacillariophyceae, Chlorophyceae, and Myxophyceae family. The present study also recorded all documented species of periphyton (18) and phytoplankton (10).

4.2.2 Zooplankton

In the study area the Zooplankton is mainly represented by Protozoans (8) followed by Crustaceans (3) and Rotifers (2). Cladocera was represented by two species; however the Copepoda was represented by only one species. Rotifera was represented by two species (*Asplanchna* sp and *Keratella* sp). Zooplankton genera showing abundance are Cyclops and Keratella which is similar to result of GRBMP 2012, Rawat, 20005, Negi 1990, Nautiyal, 2005, and EIA, 2009.

4.2.3 Ichthyofauna

The abundance of producers (phytoplankton and periphyton) and consumers (zooplankton and zoobenthos) govern the population of fish community. Since the project area is good enough in producers so that in the project area 20 fish species were recorded. Among them, *Schizothorax richardsonii* Gray, *Garra gotyla gotyla* Gray, *Barilius bendelisis* Hamilton, *Barilius bola* Hamilton, *Barilius vagra* Hamilton, *Barilius barna,* Hamilton, *Glyptothorax pectinopterus* McClelland, *Noemacheilus montanus,* McClelland, *Noemacheilus bevani* Gunther, *Noemacheilus multifasciatus* Day and *Noemacheilus zonatus* McClelland are abundant fish species in the region. The results of present study are very similar to EIA report 2009 of the project.

The above results show that either rapid improvement occured or no negetive impacts appeared on the aquatic biota of the region.

4.3 Wild animals

The present study of influence and affected area of the project reveals that the ec-ozone pertain around 12 mammals species Leopard, Wild Boar, Musk dear, Samber, Monkey, Jackal, Martin, Lagoor, Serow, Thar etc along with 19 avian species Myna, Chakor patridge, Magpie, house crow, house sparrow, spoted dove, Koklas and Monal Pheasants etc, 5 reptiles as Lizard, green pit viper etc and two amphibians as toad and frog (table 6.6 and 6.7). These species were also recorde in the EIA of the project which indicates that no any loss occured in wild animals and reptiles of the project area. This explains that the project authority has implemented the suggetion properly given in the EMP.

The domestic animals of the project area are represented by common livestock as cow, buffaloe, horse, mule, sheep, and goats etc which are also recorde in EIA of the project developed in 2009.

5. Suggestions

Biodiversity has many kinds of values and potential benefits for humans and the world as a whole. Before it is diminished, those responsible may well wish to consider the precautionary principle and take action to conserve it before components of it are permanently lost, even when the evidence for loss is not as strong as might be desired. That approach is advocated by the Convention on Biological Diversity.

One of the key underlying assumptions about biodiversity management is that native species and ecological processes are most likely to be maintained. To maintain and strengthen the local environment and biodiversity of the area the management recommendations are primarily aimed to follow.

Therefore, some suggestions have been formulated and are being suggested for the sustainability of the ecosystems in VPHE Project area.

5.1 Species Suggested for Afforestation Programme

Quercus leucotrichophora (Banj), *Q. floribunda* (Moru/Tilonj), *Q. glauca* (Phanyaat/Harinj), *Abies pindrow* (Raga), *Acer caesium* (Kanchul), *Aesculas indica* (Pangar), *Alnus nepalensis* (Ust/Uteesh), *Bauhnia variegata* (Kwiriyal/Gyuriyal), *Betula alnoids* (Saudu), *Cedrus deodara* (Devdaar), *Cupressus torulosa* (Surai), *Juglans regia* (Akhrot), *Melia azedirach* (Daikan/Bakain), *Myrica esculenta* (Kaafal), *Picea smithiana* (Rayi), *Pinus wallichiana* (Kail), *Populus ciliata* (Syaan), *Prunus cerasoides* (Panya/Padam) etc. or other indigenous plants may be given preference which are available in nearby forest/private nursery.

5.2 Pasture Development

Shepherds exert tremendous impact on pasturelands of the division by way of grazing their sheep, goat and cattle. In order to improve the pasture and to make pastures sustainable against grazing pressure the low lying areas should be taken up for pasture development. It is proposed to increase the forage availability in all the Forest Compartments by patch sowing of high yielding variety of grass etc.

5.3 Nursery Development

Nurseries of local plants should be established for proper plantation in erored and blank area of the project. Also, the seed sowing by way of dibbling of environmentally and ecologically interactive species in the compartment prone to man-animal conflict zones is proposed. Removal of unwanted plants (weeds) must be from the region of construction activities. The human intervention should be regulated in such areas where wild animals

concentration is high especially during breeding season; herbal nursery should be established in every affected Gram Panchayat of the project area. The Herbal Plant Conservation Group at local level can tie up with the ayurvedic companies in the nearby cities. Under this, group training to farmers should be given to make them aware of the use of herbal plants in animal health care also. Self help groups formed by women should be involved for the promotion of herbal drugs from the kitchen stock and rare medicinal plants.

5.4 Eco-Development Works

The Eco-development Committees and Village Conservation Committees (VCCs) should be constituted for this purpose which will help State Forest Department in capacity building and micro-planning of the various eco-developmental activities formulated for community development. The activities under this programme are aimed at improvement of livelihood of people living in the project area.

5.5 Publicity and Awareness

Education and awareness generations programmes for garnering public support for biodiversity conservation is the need of the day. Community education and involvement is a crucial component of a biodiversity conservation strategy because the condition of the environment is reflected by the manner in which the communities treat and mange the natural resources. Under this programme, various activities viz., trainings, publishing of research documents, pamphlets, brochures, hoardings, etc., should be carried out during the implementation period of operations. Training should be imparted to the school teachers in the project area for introduction of environmental education among the school children and exchange to knowledge on environment and ecology between the monastic and village schools. The basic purpose of this is to create awareness among young generation and also among the local villagers so as to protect the vegetation and wildlife for future generation.

Biodiversity education and community awareness will therefore, be strengthened in a variety of ways to reach people of all sections. Activities like opening of biodiversity register in every village and promotion of traditional farming, advertisement of hazardous effect of fire through media (press and electronic), sign boards and public meetings will form the important activities under this component.

Appendixes

Table: 4.1 List of trees in Catchment of VPHEP

S.No.	Botanical names	Vernacular names	Family	Status in Study area		Conservation Status
				Inf	C	
1	*Abies pindrow* Royle	Raga/Rai	Pinaceae	-	+	Common
2	*Abies spectabilis* (D. Don) Mirbel		Pinaceae	-	+	Common
3	*Acacia eburnean* (L.f.) Willd.	Paharikikar	Mimosaceae	-	+	Common
4	*Acacia farnesiana* (L.f.) Willd.	Vilayati kikar	Mimosaceae	+	+	Common
5	*Acacia catechu* (L.f.) Willd.	Khair	Mimosaceae	+	+	Common
6	*Acer acuminatum* Wallich ex D.Don	Kainju	Aceraceae	-	+	Common
7	*Acer caesium* Wallich ex Brandis	Kanchul	Aceraceae	-	+	Vulnerable
8	*Acer laevigatum* Wallich	Putali	Aceraceae	+	+	Common
9	*Acer oblongum* Wallich ex DC	Kanchul	Aceraceae	+	+	Endangered
10	*Adina cordifolia* Roxb.	Haldu	Rubiaceae	+	+	Common
11	*Aegle marmelos* (L.) Correa	Bel	Rutaceae	+	+	Common
12	*Aesculus indica* (Colebr ex Cambess) Hook.	Pangar	Hippocastanaceae	-	+	Common
13	*Ailanthus excelsa* Roxb.	Arua	Simaroubaceae	-	+	Common
14	*Albizia chinensis* (Osbeek) Merrill	Siris	Mimosaceae	-	+	Common
15	*Albizia julibrissin* Durazzini	Kaunera	Mimosaceae	-	+	Common
16	*Albizia lebbeck* (L.) Benth.	Siris	Mimosaceae	+	+	Common
17	*Albizia procera* (Roxb.) Benth.	Karah	Mimosaceae	-	+	Common
18	*Alnus nepalensis* D. Don	Utish	Betulaceae	-	+	Common
19	*Anogeissus latifolius* (Roxb. ex DC) Wallich ex. Richard	Dhaura	Combretaceae	+	+	Common
20	*Artocarpus lacucha* Buch.-Ham.	Dheu	Moraceae	+	+	Common
21	*Bauhinia purpurea* L.	Khairkharwal	Caesalpinaceae	+	+	Common
22	*Bauhinia racemosa* Lam.	Jhingora	Caesalpinaceae	-	+	Common
23	*Bauhinia semla* Wunderlin	Kanda	Caesalpiniaceae	+	+	Common
24	*Bauhinia variegata* L.	Guiriyal	Caesalpiniaceae	+	+	Common
25	*Betula alnoides* Buch.-Ham. Ex. D. Don	Suaru	Betulaceae	-	+	Common
26	*Betula utilis* D. Don	Bhojpatra	Betulaceae	+	+	Common
27	*Bischoffia javanica* Blume	Kau	Euphorbiaceae	-	+	Common
28	*Boehmeria rugulosa* Wedd.	Gainthi	Urticaceae	+	+	Common
29	*Bombax ceiba* L.	Semal	Bombacaceae	+	+	Common
30	*Butea monosperma* (Lam.) Kuntz	Dhak	Fabaceae	+	+	Common
31	*Casearia elliptica* Willd.	Chila	Flacourtiaceae	+	+	Common
32	*Casearia graveolens* Dalzell.	Nara	Flacourtiaceae	+	+	Common
33	*Cassia fistula* L.	Kirala	Caesalpiniaceae	+	+	Common
34	*Cassine glauca* (Rottboel) Kuntze	Dhebri	Celastraceae	+	+	Common
35	*Cedrus deodara* (Roxb. ex. D. Don) G. Don	Deodar	Pinaceae	+	+	Common
36	*Celtis australis* L.	Kharik	Ulmaceae	+	+	Common
37	*Celtis eriocarpa* Decne	Kharik	Ulmaceae	-	+	Common
38	*Celtis tetrandra* Roxb.	Kharik	Ulmaceae	-	+	Common
39	*Cinnamomum tamala* (Buch.-Ham.) Nees & Ebermaeir	Tejpat	Lauraceae	-	+	Common
40	*Cordia dichotoma* Forster f.	Lissora	Ehretiaceae	+	+	Common
41	*Cordia vestita* Hook. f. & Thomson	Bairole	Ehretiaceae	+	+	Common
42	*Cupressus cashmiriyana* L.	Surai	Cupressaceae	-	+	Common
43	*Cupressus torulosa* L.	Surai	Cupressaceae	+	+	Common
44	*Dalbergia sericea* G. Don	Bhandir	Fabaceae	-	+	Common
45	*Dalbergia sissoo* Roxb.	Shisham	Fabaceae	+	+	Common

46	*Delonix regia* (Bojer ex Hook.) Rafinesque-Schmaltz	Gulmohar(blue)	Caesalpiniaceae	-	+	Common
47	*Ehretia acuminata* (Roxb.) I. M. Johnston	Nara	Ehretiaceae	-	+	Common
48	*Emblica officinalis* Gaertner	Amla	Euphorbiaceae	+	+	Common
49	*Engelhardtia spicata* Leschenault ex. Blume	Gadi Mahuwa	Juglandaceae	+	+	Common
50	*Erythrina suberosa* Roxb.	Mandar	Papilionaceae	+	+	Common
51	*Eucalyptus citriodora* Hook.	Eucalyptus	Myrtaceae	-	+	Common
53	*Ficus auriculata* Laur.	Timla	Moraceae	+	+	Common
54	*Ficus benghalensis* L.	Bargad	Moraceae	-	+	Common
55	*Ficus hederacea* Roxb.	Beduli	Moraceae	-	+	Common
56	*Ficus hispida* L. f.	Ghogsa	Moraceae	+	+	Common
57	*Ficus locar* Buch.-Ham.	Khabeed	Moraceae	+	+	Common
58	*Ficus nemoralis* Wall.ex.Mig.	Thelku	Moraceae	+	+	Common
59	*Ficus palmata* Forssk.	Bedu	Moraceae	+	+	Common
60	*Ficus racemosa* L.	Umra	Moraceae	+	+	Common
61	*Ficus religiosa* L.	Pipal	Moraceae	-	+	Common
62	*Ficus rumphii* Blume	Pilkhan	Moraceae	-	+	Common
63	*Ficus sarmentosa* Buch.-Ham.	Beduli	Moraceae	-	+	Common
64	*Ficus semicordata* Buch.-Ham.ex. J.E. Sm.	Khaina	Moraceae	+	+	Common
65	*Ficus subincisa* Buch.-Ham.ex. J.E. Sm.	Chhanchhari	Moraceae	-	+	Common
66	*Flacourtia indica* (Burm.f.) Merrilll.	Bilangra	Flacourtiaceae	+	+	Common
67	*Fraxinus micrantha* Lingelsneiom	Angu	Oleaceae	-	+	Common
68	*Garuga pinnata* Roxb.	Titnar	Burseraceae	-	+	Common
69	*Gmelina arborea* Roxb.	Gambhari	Verbanaceae	-	+	Common
70	*Grevillea robusta* A. Cunningham ex. R. Br.	Silver oak	Protaceae	-	+	Common
71	*Grewia asiatica* L.	Dhaman	Tiliaceae	+	+	Common
72	*Grewia eriocarpa* A.L. Juss	Pharsai	Tiliaceae	+	+	Common
73	*Grewia optiva* J.R. Drumm.	Bheemal	Tiliaceae	+	+	Common
74	*Jacaranda mimosifolia* D.Don	Gobrchal(red)	Bignoniaceae	-	+	Common
75	*Juglans regia* L.	Akhrot	Juglandaceae	-	+	Common
76	*Kydia calycina* Roxb.	Pula/Puli	Malvaceae	-	+	Common
77	*Lagerstroemia indica* L.	Dhaura	Lythraceae	+	+	Common
78	*Lagerstroemia parviflora* Roxb.	Dhauri	Lythraceae	-	+	Common
79	*Lannea coromandelica* (Houttuyn) Merrill	Jhingan	Anacardiaceae	+	+	Common
80	*Leucaena leucocephala* (Lam.) Dewit	Su-babool	Mimosaceae	-	+	Common
81	*Ligustrum nepalens* Wallich		Oleaceae	-	+	Common
82	*Litsea chinensis* Lam.	Hauna	Lauraceae	+	+	Common
83	*Litsea monopetala* (Roxb.) Persoon	Katmaru	Lauraceae	+	+	Common
84	*Lyonia ovalifolia* (Wall.)Drude	Anyar	Ericaceae	+	+	Common
85	*Mallotus philippensis* (Lam.) Muell-Arg.	Ruina	Euphorbiaceae	+	+	Common
86	*Mangifera indica* L.	Mango	Anacardiaceae	-	+	Common
87	*Melia azedarach* L.	Daiken	Meliaceae	+	+	Common
88	*Moringa oleifera* Lam.	Sajan	Moringaceae	+	+	Common
89	*Morus alba* L.	Sahtoot	Moraceae	-	+	Common
90	*Morus serrata* Roxb.	Kemu	Moraceae	-	+	Common
91	*Myrica esculenta* Buch.-Ham.ex. D.Don	Kaphal	Myritaceae	+	+	Common
92	*Neolitsea pallens* (D.Don) Momiyama ex Hara	Belaru	Lauraceae	+	+	Common
93	*Olea ferruginea* Royle	Bair-banj	Oleaceae	+	+	Common
94	*Ougeinia oojeinensis* (Roxb.) Hochreutiner	Sandan	Fabaceae	+	+	Common
95	*Persea duthiei* (King ex. Hook. f.) Kosterm	Kaulu	Lauraceae	+	+	Common
96	*Phoebe lanceolata* Nees.	Kekara	Lauraceae	+	+	Common
97	*Phoenix humilis* Royle	Khajoor	Arecaceae	+	+	Common
98	*Picea smithiana*	Spruce	Pinaceae	-	+	Common
99	*Pinus roxburghii* Sargent	Chir	Pinaceae	+	+	Common
100	*Pinus wallichiana* A.B.Jackson	Kail	Pinaceae	+	+	Common
101	*Pistacea integerrima* Stewart	Kakaru	Ancardiaceae	+	+	Common
102	*Populus ciliata* Wall ex. Royle	Popular	Salicaceae	-	+	Common
103	*Populus nigra* L.	Popular	Salicaceae	-	+	Common
104	*Premna barbata* Wall. ex. Sch.	Bakrya	Verbenaceae	+	+	Common

105	*Prunus armeniaca* L.	Chullu	Rosaceae	-	+	Common
106	*Prunus cerasoides* D.Don	Panya	Rosaceae	+	+	Common
107	*Prunus cornuta* (Wallich ex. Royle) Steudel	Jamnoi	Rosaceae	-	+	Common
108	*Prunus persica* (L.)Batsch	Aru	Rosaceae	-	+	Common
109	*Psidium guajava* L.	Guava	Myrtaceae	-	+	Common
110	*Pterospermum acerifolim* (L.) Willd.	Gad-udala	Sterculiaceae	+	+	Common
111	*Punica granatum* L.	Danim	Punicaceae	-	+	Common
112	*Pyrus communis* L.	Nashpati	Rosaceae	-	+	Common
113	*Pyrus malus* L.	Seb	Rosaceae	-	+	Common
114	*Pyrus pashia* Buch.-Ham. ex. D. Don	Mehal	Rosaceae	+	+	Common
115	*Quercus floribunda* Lindley ex. Rehder	Moru	Fagaceae	+	+	Common
116	*Quercus glauca* Thunb.	Phanyat	Fagaceae	-	+	Common
117	*Quercus leucotrichophora* A. Camus	Banj	Fagaceae	+	+	Common
118	*Quercus semecarpifolia* J.E.Sm.	Kharsu	Fagaceae	-	+	Common
119	*Rhododendron arboreum* Smith	Burans	Ericaceae	+	+	Common
120	*Rhododendron barbatum* Wall. ex. G. Don	Burans	Ericaceae	-	+	Common
121	*Robinia pseudocacia*	Robinia	Fabaceae	-	+	Common
122	*Salix babylonica* L.	Majnu	Salicaceae	-	+	Common
123	*Salix tetrasperma* Roxb.	Godh bains	Salicaceae	-	+	Common
124	*Salix disperma* Roxb.		Salicaceae	-	+	Common
125	*Sapindus mukorossi* Gaertner	Reetha	Sapindaceae	-	+	Common
126	*Sapium insigne* (Royle) Benth. ex. Trimen.	Khinna	Euphorbiaceae	+	+	Common
126	*Shorea robusta* Roxb. ex. Gaertner f.	Sal	Dipterocarpaceae	+	+	Common
127	*Spondias pinnata* (L.f.) Kurz.	Amra	Anacardiaceae	-	+	Common
128	*Sterculia villosa* Roxb.	Udala	Sterculiaceae	-	+	Common
129	*Swida macrophylla* (Wallich) Sojak	Khagsa	Cornaceae	+	+	Common
130	*Swida oblonga* (Wallich) Sojak	Khagsi	Cornaceae	-	+	Common
131	*Symplocos ramosissima* Wall. ex. G. Don	Lodh	Symplocaceae	-	+	Common
132	*Syzygium cumuni* (L.) Skeels	Jamun	Myrtaceae	+	+	Common
133	*Taxus baccata* L.	Thuner	Taxaceae	-	+	Common
134	*Terminalia bellirica* (Gaertner) Roxb.	Bahera	Combretaceae	+	+	Common
135	*Terminalia chebula* Retz.	Hera	Combretaceae	+	+	Common
136	*Terminalia alata* Heyne ex. Roth	Asheen	Combretaceae	+	+	Common
137	*Toona ciliata* M. Roem.	Tun	Meliaceae	+	+	Common
138	*Toona serrata* (Royle) M. Roem.	Kakuru	Meliaceae	+	+	Common
139	*Trema politoria* (Planchon) Blume	Khagsi	Ulmaceae	-	+	Common
140	*Trewia nudiflora* L.	Gutel	Euphorbiaceae	-	+	Common
141	*Wrightia arborea* (Dennstaedt) Mabberly	Dudhi	Asclepiadaceae	+	+	Common
142	*Ziziphus jujuba* (L.) Gaertner	Ber	Rhamnaceae	+	+	Common

Table: 4.1b. List of Shrubs in Catchment of VPHEP

S.No.	Botanical names	Vernacular names	Family	Status in study area		Conservation Status
				Inf.	C	
1	*Acacia gageana* Craib.		Mimosaceae	+	+	Common
2	*Acacia pennata* (L.) Willd.	Agali	Mimosaceae	+	+	Common
3	*Adhatoda vasica* Nees.	Basinga	Acanthaceae	+	+	Common
4	*Agave americana* L.	Rambans	Agavaceae	+	+	Common
5	*Agave cantula* Roxb.	Rambans	Agavaceae	-	+	Common
6	*Arachne cordifolia* (Decne) Hurusawa	Bhatiya	Euphorbiaceae	+	+	Common
7	*Asparagus adscendens* Buch.-Ham. ex. Roxb.	Jhirna	Liliaceae	+	+	Common
8	*Asparagus racemosus* Willd.	Jhirni	Liliaceae	-	+	Common
9	*Barleria cristata* L.	Saundi	Acanthaceae	+	+	Common
10	*Barleria prionitis* L.	Peela bansa	Acanthaceae	+	+	Common
11	*Barleria strigosa* Willd.		Acanthaceae	-	+	Common
12	*Bauhinia vahlii* Wight & Arn.	Malu	Caesalpiniaceae	+	+	Common
13	*Benthamidia capitata* (Wallich ex. Roxb.) Hara	Bhamora	Cornaceae	+	+	Common
14	*Berberis aristata* DC.	Kingore	Berberidaceae	+	+	Common
15	*Berberis asiatica* Roxb. ex DC.	Kilmora	Berberidaceae	+	+	Common
16	*Berberis chitria* Edwards	Chotar	Berberidaceae	-	+	Common
17	*Boehmeria platyphylla* (Gaudich.) Wedd.	Khagsa	Urticaceae	+	+	Common
18	*Caesalpinia bonduc* (L.) Roxb.	Ari/Karaunj	Caesalpiniaceae	+	+	Common
19	*Caesalpinia decapetala* (Roth.) Alston	Kingri	Caesalpiniaceae	+	+	Common
20	*Cajanus grandiflorus* Benth.ex. Baker		Fabaceae	-	+	Common
21	*Callicarpa macrophylla* Vahl.	Daiya	Verbenaceae	+	+	Common
22	*Calotropis procera* (Aiton) Dryander	Ank	Asclepiadaceae	+	+	Common
23	*Carissa spinarum* Auct. non. L.	Karonja	Apocynaceae	+	+	Common
24	*Cassia floribunda* Cav.	Pharasu	Caesalpiniaceae	+	+	Common
25	*Cascabela thevetia* (L.) Lippold	Peeli kaner	Apoocynaceae	+	+	Common
26	*Clausena pentaphylla* DC	Ratanjot	Rutaceae	+	+	Common
27	*Clerodendrum serratum* (L.) Moon	Ban bakri	Verbenaceae	+	+	Common
28	*Cocculus laurifolius* DC	Tilfera	Menispermaceae	+	+	Common
29	*Colebrookia oppositifolia* J.E.	Binda	Lamiaceae	+	+	Common
30	*Cotoneaster affinis* Lindley		Rosaceae	+	+	Common
31	*Cotoneaster bacillaris* Wallich	Ruins	Rosaceae	+	+	Common
32	*Cotoneaster lindleyi* Steudd	Dhuis	Rosaceae	-	+	Common
33	*Cotoneaster microphyllus* Wallich ex. Lindley	Bugarchilla	Rosaceae	+	+	Common
34	*Daphne papyracea* Wallich ex. Steudd	Matoi/Martoi	Thymelaeaceae	+	+	Common
35	*Daphne cannabina* Lour ex. Wallich	Satpura	Thymelaeaceae	-	+	Common
36	*Datura fastuosa* L.	Dhatura	Solanaceae	+	+	Common
37	*Datura innoxia* Miller.	Dhatura	Solanaceae	+	+	Common
38	*Datura stramonium* L.	Dhatura	Solanaceae	-	+	Common
39	*Debregeasia salicifolia* (D. Don) Rendle	Syanru	Urticaceae	+	+	Common
40	*Debregeasia velutina* Gaudich	Tusyanr	Urticaceae	-	+	Common
41	*Desmodium cephalotes* (Roxb.) Wight &Arn.	Bhatiya	Fabaceae	-	+	Common
42	*Desmodium concinnum* DC	Sakina	Fabaceae	-	+	Common
43	*Desmodium elegans* DC	Chamlai/Chamla	Fabaceae	-	+	Common
44	*Duranta repens* L.	Durenta	Verbenaceae	-	+	Common
45	*Euphorbia royleana* Boissier	Sullu	Euphorbiaceae	+	+	Common
46	*Flemingia fruticulosa* Wallich ex. Benth.	Bhatula	Fabaceae	-	+	Common

//True Copy//

47	*Flemingia nana* Roxb.		Fabaceae	+	+	Common
48	*Holarrhena pubescens* (Buch.-Ham.) Wallich ex. G. Don	Kura/Kuri	Apocynaceae	+	+	Common
49	*Indigofera heterantha* Wallich ex. Brandis	Sakina	Fabaceae	+	+	Common
50	*Lantana camara* L.	Laltane	Verbenaceae	+	+	Common
51	*Lantana indica* Roxb.	Laltane	Verbenaceae	+	+	Common
52	*Lawsoni inermis* L.	Mehandi	Verbenaceae	+	+	Common
53	*Mahonia borealis* Takeda	Khoru	Verbenaceae	+	+	Common
54	*Milletia extensa* (Benth.) Baker	Gauj	Fabaceae	+	+	Common
55	*Mucuna nigricans* (Lour.) Steudel.	Bhaisalu/Gaunchhi	Fabaceae	-	+	Common
56	*Murraya koenigii* (L.) Sprengel	Gandela/ Karipatta	Rutaceae	+	+	Common
57	*Murraya exotica* (L.)	Machula	Rutaceae	-	+	Common
58	*Nerium indicum* Miller	Kaner	Apocynaceae	-	+	Common
59	*Nyctanthes arbor-tristis* L.	Harsingar	Oleaceae	+	+	Common
60	*Opuntia dillenii* auct. Pl.	Nagphani	Cactaceae	+	+	Common
61	*Orthanthera viminea* Wight & Arn.	Mahurghas	Asclepiadaceae	+	+	Common
62	*Picrasma quassioides* (D. Don) Bennett	Tithoi/	Simaroubaceae	+	+	Common
63	*Prinsepia utilis* Royle	Bhaikul	Rosaceae	+	+	Common
64	*Pterocanthus alatus* (Clarke) Bremekemp		Acanthaceae	+	+	Common
65	*Pyracantha crenulata* (D. Don) M. Roemer	Ghingaru	Rosaceae	+	+	Common
66	*Rabdosia rugosa* (Wallich ex. Benth.) Hara	Chichhada	Lamiaceae	+	+	Common
67	*Randia tetrasperma* (Roxb.) Benth. & Hook.	Bhedra/Ghirkamoli	Rubiaceae	+	+	Common
68	*Rhamnus purpureus* Edgew	Gaunta	Rhamnaceae	+	+	Common
69	*Rhamnus persica* Boissier	Chirla	Rhamnaceae	-	+	Common
70	*Rhamnus procumbens* Edgew	Chheena	Rhamnaceae	+	+	Common
71	*Rhamnus triqueter* (Wallich) Lawson.	Gaunta	Rhamnaceae	-	+	Common
72	*Rhamnus virgatus* Roxb.	Chedelu	Rhamnaceae	+	+	Common
73	*Rhus parviflora* Roxb.	Tung	Anacardiaceae	+	+	Common
74	*Rhus cotinus* L.	Jal-Tungla	Anacardiaceae	+	+	Common
75	*Rhus javanica* L.	Tungla	Anacardiaceae	+	+	Common
76	*Ricinus communis* L.	Arandi	Euphorbiaceae	+	+	Common
77	*Rosa brunonii* Lindley	Kunja	Rosaceae	+	+	Common
78	*Rosa macrophylla* Lindley	Bangulab	Rosaceae	-	+	Common
79	*Rosa sericea* Lindley	Shedum	Rosaceae	-	+	Common
80	*Rosa webbiana* Wall. ex Royle	Shedum	Rosaceae	-	+	Common
81	*Rubus biflorus* Buch.-Ham. ex. Smith	Hinsara	Rosaceae	-	+	Common
82	*Rubus ellipticus* Smith	Hisar	Rosaceae	+	+	Common
83	*Rubus fasciculatus* Duthie	Hissar	Rosaceae	-	+	Common
84	*Rubus foliolosus* D. Don	Kala hisar	Rosaceae	-	+	Common
85	*Rubus niveus* Thunb.	Anchu	Rosaceae	-	+	Common
86	*Rubus paniculatus* Smith	Kala hisar	Rosaceae	+	+	Common
87	*Rubus pentagonus* Wallich ex. Focke	Hisalu	Rosaceae	-	+	Common
88	*Skimmia laureola* (DC.) Siebold & Zuccarini ex Walpers	Kedarpatti	Rutaceae	+	+	Common
89	*Solanum erianthum* D. Don	Ban tambaku	Solanaceae	+	+	Common
90	*Spermadictyon saveolens* Roxb.	Padera	Rubiaceae	+	+	Common
91	*Viburnum continifolium* L.	Tirmoi	Carpifoliaceae	+	+	Common
92	*Viburnum erubescens* Wallich ex. DC	Tirmoi	Carpifoliaceae	-	+	Common
93	*Viburnum nervosum* D. Don	Tirmoi	Carpifoliaceae	+	+	Common
94	*Vitex nigundo* L.	Siwali	Verbenaceae	+	+	Common
95	*Woodfordia fruticosa* (L.) Kurz.	Dhola	Lythraceae	+	+	Common
96	*Zanthoxylum alatum* Roxb.	Timru	Rutaceae	+	+	Common

Table: 4.1c. List of herbs in the VPHEP

S.No	Botanical Name	Vernacular names	Family	Status in study area		Conservation Status
				Inf	C	
1	*Abelmoschus crinitus* Wallich	Kamlya	Malvaceae	+	+	Common
2	*Achyranthes aspera* L.	Lajiri	Amaranthaceae	+	+	Common
3	*Achyrantes bidentata* Blume	Chirchata	Amaranthaceae	+	+	Common
6	*Acorus calamus* L.	Buch	Araceae	+	+	Common
7	*Aerva sanguinolenta* (L.) Blume	Safed phulia	Amaranthaceae	+	+	Common
8	*Ageratum conyzoides* L.	Gunriya	Asteraceae	+	+	Common
9	*Ageratum houstonianum* Miller	Basya	Asteraceae	-	+	Common
10	*Ajuga brachystemon* Maxim	Neelkanthi	Lamiaceae	-	+	Common
11	*Ajuga bracteosa* Wallich ex. Benth.	Neelkanthi	Lamiaceae	+	+	Common
12	*Allium stracheiyi*Baker	Pharan	Liliaceae	-	+	Vulnerable
13	*Alternanthus viridis* L.	Jangly-chaulai	Amaranthaceae	-	+	Common
14	*Amaranthus spinosus* L.	Kantelu marsu	Amaranthaceae	-	+	Common
15	*Anaphalis adnata* Wallich ex. DC.	Bugla	Asteraceae	+	+	Common
16	*Anaphalis contorta* (D. Don) Hook. f.	Bugla/Buglya	Asteraceae	-	+	Common
17	*Anemone obtusiloba* D. Don	Kanchphool/ Ratanjot	Ranunculaceae	+	+	Common
18	*Angelica glauca* Edgew.	Choru	Apiaceae	-	+	Common
19	*Argemone mexicana* L.	Satyanasi	Papaveraceae	+	+	Common
23	*Artemisia vulgaris* C. B. Clarke	Kunjha	Asteraceae	+	+	Common
24	*Artemisia mortiana* L.		Asteraceae	-	+	Common
25	*Artemisia capillaries* Thunb	Jhau	Asteraceae	+	+	Common
26	*Aster molliusculus* (Lindleyex. DC.) C. B. Clarke		Asteraceae	-	+	Common
27	*Aster pedunculari* Wall. ex. Nees	Phuyari	Asteraceae	+	+	Common
28	*Aster thomsonii* C. B. Clarke	Phulari	Asteraceae	-	+	Common
29	*Astragalus candolleanus* Royley ex. Benth.	Rudravanti	Fabaceae	-	+	Common
30	*Astragalus graveolens* Buch.-Ham. Ex Benth.	Rudravanti	Fabaceae	-	+	Common
31	*Baliospermum montanum* (Willd.) Muell.- Arg.	Janli-jamalghota/Danti	Euphorbiaceae	-	+	Common
32	*Bergenia ciliata* (Haworth) Sternb.	Silphara	Saxifragaceae	+	+	Common
33	*Bidens bipinnata* L.	Kuru	Asteraceae	-	+	Common
34	*Bidens biternata* (Lour.) Merril& Sherff	Mangrinya	Asteraceae	-		Common
35	*Blepharis maderaspatensis* (L.) Roth.	Kudee	Acanthaceae	+	+	Common
36	*Blumea aromatica* DC.		Asteraceae	-	+	Common
37	*Blumea mollis* (D. Don) Merrill in Philipp.		Asteraceae	-	+	Common
38	*Boerhavia diffusa* L.	Pundra/ Punarva	Nyctaginaceae	+	+	Common
39	*Cannabis sativa* L.	Bhang	Cannabinaceae	+	+	Common
40	*Cassia absus* L.	Chaksee	Caesalpiniaceae	-	+	Common
41	*Cassia mimosoides* L.		Caesalpiniaceae	-	+	Common
42	*Cassia occidentalis* L.	Chakunda	Caesalpiniaceae	+	+	Common
43	*Cassia pumila* Lam.		Caesalpiniaceae	-	+	Common
44	*Cassia tora* L.	Chakunda	Caesalpiniaceae	+	+	Common
45	*Centella asiatica* (L.) Urban	Brahmi	Apiaceae	+	+	Common
46	*Centipeda minima* (L.) A. Braun & Ascherson	Nak-Chhikni	Asteraceae	-	+	Common
47	*Centratherum anthelminticum* (L.) Kuntze	Ghrajhiri	Asteraceae	-	+	Common

//True Copy//

48	*Chenopodium ambrosioides* L.	Mexican tea	Chenopodiaceae	-	+	Common
49	*Chirita biflolia* D. Don	Karaiti	Gesneriaceae	-	+	Common
50	*Colocasia affinis* Schott	Jangly pindalu	Araceae	-	+	Common
51	*Commelina benghalensis* L.	Kansura/Kanjula	Commelinaceae	-	+	Common
52	*Crotalaria albida* Heyne ex Roth	Chhunchhuni	Fabaceae	-	+	Common
53	*Curcuma aromatica* Salisbury	Ban Haldi	Zinziberaceae	-	+	Common
54	*Cynoglossum glochidiatum* Wallich ex Benth.	Lichkura/Andhahuli	Boraginaceae	+	+	Common
55	*Cynoglossum lanceolatum* Forsk.	Lichkura	Boraginaceae	+	+	Common
56	*Cynoglossum zeylanicum* (Vahl ex Hornem.) Thunb. ex Lehmann	Lichkura	Boraginaceae	-	+	Common
57	*Cyanotis cristata* (L.) D. Don		Commelinaceae	-	+	Common
58	*Cyanotis vaga* (Lour.) J.A. & J.H. Schultes		Commelinaceae	-	+	Common
59	*Desmodium gangenticum* (L.) DC.		Fabaceae	-	+	Common
60	*Drosera lunata* Buch.-Ham. ex. DC.	Mukhjali	Droceraceae	-	+	Common
61	*Ehretia laevis* Roxb.	Chamror	Ehretiaceae	-	+	Common
62	*Erigeron karvinskianus* DC.		Asteraceae	-	+	Common
63	*Eriophorum comosum* (Wallich) Wallich ex. Nees	Lichkura	Cyperaceae	-	+	Common
64	*Eupatorium adenophorum* Sprengel	Kharna/Bakura	Asteraceae	+	+	Common
65	*Euphorbia chamaesyce* L.	Dudhi	Euphorbiaceae	-	+	Common
66	*Euphorbia helioscopia* L.	Dudhya	Euphorbiaceae	-	+	Common
67	*Euphorbia heyneana* Sprengel	Dudhi	Euphorbiaceae	-	+	Common
68	*Euphorbia hirta* L.	Dudhi	Euphorbiaceae	+	+	Common
69	*Euphorbia hypericifolia* L.	Hazardana	Euphorbiaceae	-	+	Common
70	*Euphorbia pilosa* L.	Chuplya	Euphorbiaceae	-	+	Common
71	*Euphorbia prostata* Aiton	Dudhi	Euphorbiaceae	-	+	Common
72	*Evolvulus alsinoides* (L.) L.	Sankhpuspi	Convovulaceae	-	+	Common
73	*Flemengia procumbens* Roxb.	Cheena/Chauna	Fabaceae	-	+	Common
74	*Galinsoga parviflora* Cav.	Marchya	Asteraceae	-	+	Common
75	*Girardinia diversifolia* (Link) Friis.	Bhinsya-Kandali	Urticaceae	-	+	Common
76	*Gloriosa superba* L.	Kalihari	Liliaceae	-	+	Common
77	*Gnaphalium hypoleucum* DC.	Buglya	Asteraceae	+	+	Common
78	*Hedychium spicatum* Buch.-Ham. ex. J. E. Smith	Banhaldi	Zingiberaceae	-	+	Common
79	*Heracleum jacquemontii* C. B. Clarke		Apiaceae	-	+	Indeterminate
80	*Impatiens balsamina* L.	Phyaktuli	Balsaminaceae	-	+	Common
81	*Impatiens micranthum* Edgew.		Balsaminaceae	-	+	Common
82	*Indigofera astragalina* Dc.		Fabaceae	-	+	Common
83	*Indigofera glandulosa* Willd.		Fabaceae	-	+	Common
84	*Ipomoea carnea* Jacquin Enum.	Besarm	Convovulaceae	-	+	Common
85	*Ipomoea nil* (L.) Roth	Kaludana	Convovulaceae	-	+	Common
86	*Iris Kemaonensis* D. Don ex. Royle		Iridaceae	-	+	Common
87	*Lamium album* L.	Tilka	Lamiaceae	-	+	Common
88	*Launaea procumbens* (Roxb.) Ramayya & Rajagopal		Asteraceae	-	+	Common
89	*Leucas cephalotes* (Roth.) Sprengel	Dronpushpi/Gumba	Lamiaceae	-	+	Common
90	*Leucas indica* (L.) R. Br. Ex. Vatka	Guma	Lamiaceae	+	+	Common
91	*Leucas lanata* Benth.	Ada/Biskapra	Lamiaceae	-	+	Common
92	*Leucas mollissima* Wallich ex Benth.		Lamiaceae	-	+	Common
93	*Malva parviflora* L.	Sancholi	Malvaceae	+	+	Common
94	*Malva sylvestris* L.	Gurchanti	Malvaceae	-	+	Common

//True Copy//

95	*Malva verticellata* L.	Sochali	Malvaceae	-	+	Common
96	*Medicago polymorpha* L.		Fabaceae	-	+	Common
97	*Mentha piperita* L.	Piperment	Lamiaceae	-	+	Common
98	*Mimosa pudica* L.	Chui-Mui	Mimosaceae	-	+	Common
99	*Mimosa rubicaulis* Lam.		Mimosaceae	-	+	Common
100	*Mucuna pruriens* (L.) DC.	Gaunchi/ Kaunch	Fabaceae	-	+	Common
101	*Nardostachy grandiflora* DC.	Masi	alerianaceae	-	+	Vulnerable
102	*Neanotis calycina* (Wallich ex. Hook. f.) W. H. Lewis		Rubiaceae	-	+	Common
103	*Nepeta ciliaris* Wallich ex. Benth.	Nueet	Lamiaceae	+	+	Common
104	*Nepeta graciflora* Benth.	Upryaghass	Lamiaceae	+	+	Common
105	*Nepeta elliptica* Royle ex. Benth.	Tukhmalanga	Lamiaceae	-	+	Common
106	*Nepeta govaniana* (Benth.) Benth.	Dauda	Lamiaceae	-	+	Common
107	*Nepeta laevigata* (D.Don) Hand.-Mazz.		Lamiaceae	-	+	Common
108	*Ocimum americanum* L.	Jungly tulsi	Lamiaceae	-	+	Common
109	*Ocimum basilicum* L.	Marua/ Murya	Lamiaceae	-	+	Common
110	*Origanum vulgare* L.	Bantulsi	Lamiaceae	+	+	Common
111	*Orthosiphon incurve* (D.Don) Benth.		Lamiaceae	-	+	Common
112	*Oxalis corniculata* L.	Bhilmora	Oxidilaceae	+	+	Common
113	*Oxalis debilis* Humb.		Oxidilaceae	-	+	Common
114	*Parthenium hysterophorus* L.	Gajar ghas	Asteraceae	+	+	Common
115	*Phyla nodiflora* (L.) Greene		Vebenaceae	-	+	Common
116	*Phyllanthus amarus* Schumacher & Thonning	Jarmala	Euphorbiaceae	+	+	Common
117	*Physalis peruviana* L.	Rashbhari	Solanaceae	-	+	Common
118	*Picrorhiza kurrooa* Royle		Scrophulariaceae	-	+	Vulnerable
119	*Pilea scripta* (Buch.-Ham. ex. D. Don) Wedd.	Chaulu/ Chaul	Urticaceae	+	+	Common
120	*Pimpinella acuminata* (Edgew.) C. B. Clarke	Raulee	Apiaceae	-	+	Common
121	*Plantago depressa* Willd.	Luhurya/Isab gol	Plantaginaceae	-	+	Common
122	*Plantago lanceolata* L.	Luhurya	Plantaginaceae	-	+	Common
123	*Plumbago zeylanica* L.	Chitrak	Plumbaginaceae	+	+	Common
124	*Podophylum hexandrum* Royle		Podophylaceae	-	+	Common
125	*Pogostemon benghalense* (Burm. F.) Kuntze	Kala basinga	Lamiaceae	+	+	Common
126	*Polygonum chinensis* L.		Polygonaceae	+	+	Common
127	*Polygonum lanigerum* R. Br.		Polygonaceae	-	+	Common
128	*Portulaca grandiflora* Hook.	Launiya	Potulacaceae	-	+	Common
129	*Potentilla fulgens* Wallich ex.Hook.	Bajradanti	Rosaceae	+	+	Common
130	*Potentilla sundaica* (Blume) Kuntze		Rosaceae	-	+	Common
131	*Potentilla supina* L.		Rosaceae	-	+	Common
132	*Pouzolzia zeylanica* (L.) J. Bennett & Brown		Urticaceae	-	+	Common
133	*Rabdosia maddeni* (Benth. Ex. Hook. f.) Hara		Lamiaceae	-	+	Common
134	*Ranunculus arvensis* L.		Ranunculaceae	+	+	Common
135	*Ranunculus hirtellus* Royle.	Piryali	Ranunculaceae	-	+	Common
136	*Ranunculus diffusus* DC.	Angasia-jhar	Ranunculaceae	-	+	Common
137	*Rauvolfia serpentina* (L.) Benth. Ex. Kurz.	Sarpgandha	Apocynaceae	-	+	Common
138	*Reinwardtia indica* Dumortier	Phuinli	Linaceae	+	+	Common
139	*Roscoea alpina* Royle	Jilsua/ Kakoli	Zingiberaceae	-	+	Common
140	*Roscoea purpurea* J.C. Sm.		Zingiberaceae	-	+	Common
141	*Rumex hastatus* D. Don	Almora	Polygonaceae	+	+	Common
142	*Rumex nepalensis* Sprengel		Polygonaceae	+	+	Common

//True Copy//

143	*Salvia lanata* Roxb.	Ghaniya	Lamiaceae	-	+	Common
144	*Salvia nubicola* Wallich ex Sweet	Ganya	Lamiaceae	-	+	Common
145	*Saussurea lapa* (Dcne) Sch.-Bip	Kut	Asteraceae	-	+	Common
146	*Scoparia dulcis* L.		Scrophulariaceae	-	+	Common
147	*Scutellaria scandens* Buch.-Ham. ex. D.Don	Kutlaphul/ Kappu	Lamiaceae	-	+	Common
148	*Sida acuta* Burm. f.	Karenti	Malvaceae	-	+	Common
149	*Sida cordata* (Burm. f.) Borss. Waalk.	Bhiyli/Kharenti	Malvaceae	+	+	Common
150	*Solanum nigrum* L.	Makoi	Solanaceae	+	+	Common
151	*Stellaria media* (L.) Villars	Badyalu	Caryophyllaceae	+	+	Common
152	*Swertia angustifolia* L.	Chirotu	Gentianaceae	-	+	Common
153	*Taraxcum officinale* Weber	Dudhi	Asteraceae	-		Common
154	*Thalictrum foliolosum* DC.	Mamiri	Ranunculaceae	+	+	Common
155	*Thalictrum reniforme* Wallich		Ranunculaceae	-	+	Common
156	*Thymus serphyllum* L.	Vanya yavani	Thymelaeaceae	+	+	Common
157	*Trichodesma indicum* (L.) R. Br.		Boraginaceae	-	+	Common
158	*Urtica ardens* Link.		Urticaceae	-	+	Common
159	*Urtica dioica* L.	Kandali	Urticaceae	+	+	Common
160	*Urtica urens* L.		Urticaceae	-	+	Common
161	*Vallaris solanacea* (Roth) Kuntze		Apocynaceae	+	+	Common
162	*Verbascum thaspus* L.	Geedad tambaku	Scrophulariaceae	+	+	Common
163	*Vernonia anthelmintica* (L.) Willd.	Kalazeeri/Somraj	Asteraceae	-	+	Common
164	*Vernonia roxburghii* Lerring		Asteraceae	-	+	Common
165	*Viola serpens* Wallich	Banafsa	Voilaceae	+	+	Common
166	*Viola betonicifolia* J. Smith		Voilaceae	-	+	Common
167	*Viola biflora* L.		Voilaceae	-	+	Common
168	*Agrostis nervosa* Nees ex. Trinius	Grass	Poaceae	+	+	Common
169	*Agrostis pilosula* Trinius	Grass	Poaceae	-	+	Common
170	*Apluda mutica* L.	Tachhala	Poaceae	+	+	Common
171	*Arundinella nepalensis* Trinius	Tutnalia	Poaceae	-	+	Common
172	*Arundo donax* L.	Nal	Poaceae	-	+	Common
173	*Chrysopogon aciculatus* (Retz.) Trinius	Sutriyau	Poaceae	+	+	Common
174	*Chrysopogon fulvus* (Sprengel) Chiovenda	Golda	Poaceae	+	+	Common
175	*Chrysopogon gryllus* (L.) Trinius		Poaceae	-	+	Common
176	*Cymbopogon martinii* (Roxb.) W. Waston		Poaceae	-	+	Common
177	*Cynodon dactylon* (L.) Persoon	Doob	Poaceae	+	+	Common
178	*Cyperus alulatus* Kern.		Cyperaceae	+	+	Common
179	*Cyperus niveus* Ritz.	Murya ghas	Cyperaceae	+	+	Common
180	*Cyperus rotundus* L.	Motha	Cyperaceae	-	+	Common
181	*Eulaliopsis binata* (Ritz.) Hubbard	Babula	Poaceae	+	+	Common
182	*Heteropogon contortus* (L.) P.	Kumra	Poaceae	-	+	Common
183	*Poa annua* L.		Poaceae	+	+	Common
184	*Saccharum bengalensis Ritz.*	Munja	Poaceae	+	+	Common
185	*Saccharum spontaneum* L.	Kans/ Kusha	Poaceae	+	+	Common
186	*Setaria viridis* (L.) P. Beauv.	Birali ghas	Poaceae	-	+	Common
187	*Themeda triandra* Forssk.		Poaceae	+	+	Common
188	*Thysanolaena maxima* (Roxb.) Kuntze.	Naktura/ Phildu	Poaceae	+	+	Common
189	*Coix lacryma-jubi* L.	Baijayantimala	Poaceae	-	+	Common
190	*Abrus pulchellus* Wallich ex. Thwaites	Gaunchi	Fabaceae	+	+	Common
191	*Abrus precatorius* L.	Ratti	Fabaceae	+	+	Common
192	*Ampelocissus divaricata* (Wallich ex. Lawson) Planchon	Panlaguli	Vitaceae	-	+	Common

//True Copy//

193	*Clematis connata* DC.		Ranunculaceae	-	+	Common
194	*Clematis gouriana* Roxb. ex. DC.	Kanguli	Ranunculaceae	+	+	Common
195	*Cissampelos pareira* L.	Pahar	Menispermaceae	+	+	Common
196	*Coccinia grandis* (L.) Voigt	Kandaroi	Cucurbitaceae	+	+	Common
197	*Cryptolepsis buchananii* Roemer &Schultes	Dudhi	Asclepiadaceae	+	+	Common
198	*Cuscuta europaea* L.	Akash bel	Cuscutaceae	-	+	Common
199	*Cuscuta reflexa* Roxb.	Akash laguli	Cuscutaceae	+	+	Common
200	*Dioscorea belophylla* (Prain) J. O. Voigt ex. Haines	Taidu	Dioscoraceae	-	+	Common
201	*Dioscorea bulbifera* L.	Gainthi	Dioscoraceae	+	+	Common
202	*Dioscorea glabra* Roxb.	Tairu	Dioscoraceae	-	+	Common
203	*Dioscorea melanophyma* Prain & Burkill	Manglaii	Dioscoraceae	-	+	Common
204	*Dioscorea pentaphylla* L.	Kou/ Phal-alu	Dioscoraceae	-	+	Common
205	*Dioscorea pubera* Blume	Kasalu	Dioscoraceae	-	+	Common
206	*Ipomoea pestigridis* L.		Convovulaceae	-	+	Common
207	*Porana grandiflora*		Convovulaceae	-	+	Common
208	*Stephania elegans* Hook. f. & Thomson	Gindadu	Menispermaceae	-	+	Common
209	*Stephania glabra* (Roxb.) Miers	Ginjadu	Menispermaceae	-	+	Common
210	*Tinospora sinensis* (Lour.) Merrill	Giloe	Menispermaceae	+	+	Common
211	*Trichosanthes bracteata* (Lam.) voigt	Iladu	Cucurbitaceae	-	+	Common
212	*Utricularia striatula* J. E. Smith		Lentibulariaceae	+	+	Common
213	*Vigna sublobata* (Roxb.) Babu & Sharma	--	Fabaceae	-	+	Common
214	*Vitis flexuosa* Thunb.	Panlaguli	Vitaceae	-	+	Common
	Orchids					
217	*Coelogyne cristata* Lindley		Orchidaceae	-	+	Common
219	*Epipactis veratrifolia* Boissier & Hohenacker		Orchidaceae	-	+	Common
220	*Eulophia bicallosa* (D. Don) P. f. hunt 7 Summerhayes		Orchidaceae	-	+	Common
221	*Eulophia herbacea* Lindley		Orchidaceae	-	+	Common
225	*Vanda cristata* Lindley	Vanda	Orchidaceae	-	+	Common
226	*Vanda testacea* (Lindley) Reichb. f.	Vanda	Orchidaceae	-	+	Common

//True Copy//

Table: 4.6 List of wild animals in the affected influence area of project

	Influenced zone		Affected zone	
SN	**Scientific name**	**Common name**	**Scientific name**	**Common name**
		Mammals		
1	*Canis aureus*	Jackal	*Panthera pardus*	Leopard
2	*Capricornis sumataensis*	Serow	*Ursus aretos*	Brown Bear
3	*Cervus unicolor*	Sambar	*Macaca mulatta*	Monkey
4	*Martes flavigula*	Himalayan Marten	*Mus booduga*	Field mouse
5	*Moschus chrysogaster*	Musk Deer	*Caprolagus hispidus*	Hispid Hare
6	*Muntiacus muntjak*	Barking Deer	*Canis aureus*	Siyar
7	*Nemorhaedus goral*	Goral	*Muntiacus muntjak*	Kakad
8	*Panthera pardus*	Leopard	*Vulpes bengalensis*	Fox
9	*Presbytis entellus*	Langur	*Suncus murinus*	Chuchunder
10	*Sus scrofa*	Wild Boar	*Presbytis entellus*	Langur
11	*Ursus aretos*	Brown bear	*Sus scrofa*	Wild Boar
12	*Vulpes montana*	Red Fox	*Lepus nigrocolis*	Khargosh
		Reptiles		
13	*Hemidactylus frenatus*	Asian house Gecko	*Varanus bengalensis*	Monitor Lizard
14	*Varanus bengalensis*	Common Lizard	*Calotes sp*	Common Lizard
15	*Trimeresurus albolabris*	Green Pit Viper		
16	*Gloydius himalayanus*	Himalayan Pit Viper		
17	*Naja naja*	Cobra		
		Amphibians		
18	*Bufo himalayanus*	Toad	*Bufo himalayanus*	Toad
19	*Rana sp.*	Frog		

Table: 4.7 List of avian fauna in affected and influence area of the project

	Influenced zone		Affected zone	
SN	**Scientific name**	**Common Name**	**Scientific name**	**Common Name**
1	*Acridotheres tristis*	Indian Myna	*Acridotheres tristis*	Indian Myna
2	*Alectoris chukar*	Chukor Patridge	*Alectoris chukar*	Chukor Patridge
3	*Corvus corax*	Common raven	*Corvus corax*	Common raven
4	*Cissa flavirostris*	Yellow build Magpie	*Cissa flavirostris*	Yellow build Magpie
5	*Corvus splendens*	House Crow	*Corvus splendens*	House Crow
6	*Dicrurus adsimilis*	Black Drongo	*Dicrurus adsimilis*	Black Drongo
7	*Dendrocopos himalayensis*	Wood pecker	*Dendrocopos himalayensis*	Woodpecker
8	*Lanius excubitor*	Grey Shrike	*Lanius excubitor*	Grey Shrike
9	*Milvus migrans*	Pariah Kite	*Milvus migrans*	Pariah Kite
10	*Motacilla maderatensis*	Large pied wagtail	*Motacilla madaraspatensis*	Large pied wagtail
11	*Passer domesticus*	House Sparrow	*Passer domesticus*	House Sparrow
12	*Passer montanus*	Eurasian Tree Sparrow	*Passer montanus*	Eurasian Tree Sparrow
13	*Pycnonotus cafer*	Red vented Bulbul	*Pycnonotus cafer*	Red vented Bulbul
14	*Pycnonotus leucogenys*	White Cheeked Bulbul	*Pycnonotus leucogenys*	White Cheeked Bulbul
15	*Saxicoloides fulicatus*	Indian Robin	*Saxicoloides fulicatus*	Indian Robin
16	*Copsychus saularis*	Magpie Robin	*Copsychus saularis*	Magpie Robin
17	*Streptopelia orientalis*	Spotted dove	*Streptopelia orientalis*	Spotted dove
18	*Turdoides caudatus*	Common babbler	*Turdoides caudatus*	Common babbler
19	*Turdus merula*	Blackbird	*Turdus merula*	Blackbird

References

Anonymous, (2019). The national forest policy. New Delhi: Ministry of Environment and Forests, Government of India.

Bhatt, V P and Purohit, V K (2009). Floristic structure and phytodiversity along an elevational gradient in Peepalkoti-Joshimath area of Garhwal Himalaya, India. Nature and Science,7(9)63-74.

Bhatt, V P; Kumar, M G; Rajwar, S and M Dhaulakhandi, (2004). Community Structure and Diversity of Moist Mixed Temperate Forest of Notha –Chaurikhal of Garhwal. *Annals of forestry*, Vol. 12 (1) 81-86.

Curtis, J T (1959). The vegetation of Wisconsin. An ordination of plant communities. Univ. Wisconsin Press, Medison, Wisconsin. 657 pp.

Curtis, J T and Cottom, G. (1956). *Plant Ecology Work Book. Laboratory Field Reference Manual*. Burgess Publishing, Minnesota Co.

Curtis, J T and Mc-Intosh, R P (1950). The interrelation of certain analytic and synthetic phytosociological characters. *Ecology* 31: 434-455.

Jackson, M L (1962). Soil Chemical Analysis, Constable & Co. Ltd., London. 498 pp.

Jackson, M L. (1967). Soil Chemical Analysis, Prentis Hall of India Pvt. Ltd., New Delhi.

Misra, R (1968). *Ecology Work Book*. Oxford and IBH Publishing, New Delhi.

Phillips, E A (1959). Methods of vegetation on study. Holt. Rinehart and Winston, Inc. NewYork.

Piper, C. S. (1966). *Soil and plant analysis*, (New York: Interscience Publishers) p. 368.

Singh J S (2006) Sustainable development of Indian Himalayan Region: Linking ecological and economic concern. Curr. Sci. 90(6), 784-788.

//True Copy//

PCRI/051

प्रदूषण नियन्त्रण अनुसंधान संस्थान

भारत हेवी इलेक्ट्रिकल्स लिमिटेड, रानीपुर, हरिद्वार (उत्तराखण्ड) –249403

POLLUTION CONTROL RESEARCH INSTITUTE

(A Govt. of India - UNDP / UNIDO Project)

BHARAT HEAVY ELECTRICALS LIMITED

RANIPUR, HARIDWAR (U.K.) - 249 403

(Approved Lab under Environment (Protection) Act, 1986; EIA Consultant by NABET, QCI)

TEST REPORT

Lab Reference No: TL200336 **Date :** 05.11.2020

Indentor : Mr. Vijay Sehgal, AGM (Envt.), VPHEP, THDC India ltd., Pipalkoti

cvCustomer's Ref. No.: THDCIL/VPHEP/Envt./F-037/316 dt. 18.02.2020

Work Order No.: 20-0087-O-691

Sample Collected by: **PCRI Staff** **Collection Date:** 08.10.2020

Sample/Job: River Water Sample from 3 Km Distance to TRT

PARAMETER	UNIT	OBTAINED VALUE	STANDARD LIMITS (IS 10500:2012)	
			Acceptable	Permissible
Alkalinity	mg/L	76	200	600
Aluminium (as Al)	mg/L	ND	0.03	0.2
Ammonia (as Total Ammonia – N)	mg/L	ND	0.5	NR
Arsenic (as As)	mg/L	ND	0.01	0.05
BOD at 27^0C	mg/L	1.1	-	-
Boron (as B)	mg/L	ND	0.5	1.0
Cadmium (as Cd)	mg/L	ND	0.003	NR
Calcium (as Ca)	mg/L	28.9	75	200
Chloride (as Cl)	mg/L	8	250	1000
Chromium Total (as Cr)	mg/L	ND	0.05	NR
Colour	Hazen	<5	5	15
Copper (as Cu)	mg/L	ND	0.05	1.5
Cyanide (as CN)	mg/L	ND	0.05	NR
Dissolved Oxygen	mg/L	7.8	-	-
E. coli	MPN/100 mL	6	Absent	NR
Fecal Coliform	MPN/100 mL	16	Absent	NR
Fluoride (as F)	mg/L	0.14	1.0	1.5
Hardness (as $CaCO_3$)	mg/L	92	200	600
Iron (as Fe)	mg/L	0.01	0.3	NR
Lead (as Pb)	mg/L	ND	0.01	NR
Magnesium (as Mg)	mg/L	4.8	30	100
Manganese (as Mn)	mg/L	ND	0.1	0.3

Contd..2

6/11/20

Remarks :- (1) This report refers only to the particular sample/job submitted for testing.
(2) This report is not to be reproduced wholly or partly and can not be used as an evidence in the court of law and should not be used in any advertising media without our special permission in writing.
(3) Samples will be disposed off after one month from the date of issue of Test Certificate.

//True Copy//

PCRI/051

प्रदूषण नियन्त्रण अनुसंधान संस्थान

भारत हेवी इलेक्ट्रिकल्स लिमिटेड, रानीपुर, हरिद्वार (उत्तराखण्ड) –249403

POLLUTION CONTROL RESEARCH INSTITUTE

(A Govt. of India - UNDP / UNIDO Project)

BHARAT HEAVY ELECTRICALS LIMITED

RANIPUR, HARIDWAR (U.K.) - 249 403

(Approved Lab under Environment (Protection) Act, 1986; EIA Consultant by NABET, QCI)

TEST REPORT

Lab Reference No: TL200336 **Date:** 05.11.2020

PARAMETER	UNIT	OBTAINED VALUE	STANDARD LIMITS (IS 10500:2012) Acceptable	Permissible
Mercury (as Hg)	mg/L	ND	0.001	NR
Mineral Oil	mg/L	ND	0.5	NR
Nickel (as Ni)	mg/L	ND	0.02	NR
Nitrate (as NO_3)	mg/L	ND	45	NR
Odour	-	Agreeable	Agreeable	NR
pH	-	8.1	6.5-8.5	NR
Phenolic Compounds (as C_6H_5OH)	mg/L	ND	0.001	0.002
Selenium (as Se)	mg/L	ND	0.01	NR
Silver (as Ag)	mg/L	ND	0.1	NR
Sulphate (as SO_4)	mg/L	10.8	200	400
Sulphide (as S)	mg/L	ND	0.05	NR
Taste	-	Agreeable	Agreeable	NR
Total Coliform	MPN/100 mL	38	Absent	NR
Total Dissolved Solids	mg/L	174	500	2000
Total Residual Chlorine	mg/L	ND	0.2	1.0
Total Suspended Solids	mg/L	26	-	-
Turbidity	NTU	0.78	1	5
Zinc (as Zn)	mg/L	0.01	5	15

ND – Not Detectable NR – No Relaxation

The parameters analysed lie within permissible limits as prescribed in IS 10500:2012 for Drinking Water, except TC, FC and *E. coli*. It may be used for drinking purpose after treatment.

6/11/20

(Dr. S. Bhatnagar).

Sr. Dy. General Manager (PCRI)
डा. एस. भटनागर/ Dr. S. Bhatnagar
वरि. उप महाप्रबन्धक/Sr. Dy. General Manager
Pollution Control Research Institute
प्रदूषण नियन्त्रण अनुसंधान संस्थान
BHEL, Ranipur, Haridwar

Remarks :- (1) This report refers only to the particular sample/job submitted for testing.
(2) This report is not to be reproduced wholly or partly and can not be used as an evidence in the court of law and should not be used in any advertising media without our special permission in writing.
(3) Samples will be disposed off after one month from the date of issue of Test Certificate.

//True Copy//

PCRI/051

प्रदूषण नियन्त्रण अनुसंधान संस्थान

भारत हेवी इलेक्ट्रिकल्स लिमिटेड, रानीपुर, हरिद्वार (उत्तराखण्ड) –249403

POLLUTION CONTROL RESEARCH INSTITUTE

(A Govt. of India - UNDP / UNIDO Project)

BHARAT HEAVY ELECTRICALS LIMITED

RANIPUR, HARIDWAR (U.K.) - 249 403

(Approved Lab under Environment (Protection) Act, 1986; EIA Consultant by NABET, QCI)

TEST REPORT

Lab Reference No: TL200337 **Date :** 05.11.2020

Indentor : Mr. Vijay Sehgal, AGM (Envt.), VPHEP, THDC India ltd., Pipalkoti

cvCustomer's Ref. No.: THDCIL/VPHEP/Envt./F-037/316 dt. 18.02.2020

Work Order No.: 20-0087-O-691

Sample Collected by: **PCRI Staff** **Collection Date:** 08.10.2020

Sample/Job: River Water Sample from 1 Km Distance to TRT

PARAMETER	UNIT	OBTAINED VALUE	STANDARD LIMITS (IS 10500:2012)	
			Acceptable	Permissible
Alkalinity	mg/L	68	200	600
Aluminium (as Al)	mg/L	ND	0.03	0.2
Ammonia (as Total Ammonia – N)	mg/L	ND	0.5	NR
Arsenic (as As)	mg/L	ND	0.01	0.05
BOD at 27^0C	mg/L	0.9	-	-
Boron (as B)	mg/L	ND	0.5	1.0
Cadmium (as Cd)	mg/L	ND	0.003	NR
Calcium (as Ca)	mg/L	27.3	75	200
Chloride (as Cl)	mg/L	6	250	1000
Chromium Total (as Cr)	mg/L	ND	0.05	NR
Colour	Hazen	<5	5	15
Copper (as Cu)	mg/L	ND	0.05	1.5
Cyanide (as CN)	mg/L	ND	0.05	NR
Dissolved Oxygen	mg/L	7.9	-	-
E. coli	MPN/100 mL	4	Absent	NR
Fecal Coliform	MPN/100 mL	14	Absent	NR
Fluoride (as F)	mg/L	0.15	1.0	1.5
Hardness (as $CaCO_3$)	mg/L	88	200	600
Iron (as Fe)	mg/L	0.01	0.3	NR
Lead (as Pb)	mg/L	ND	0.01	NR
Magnesium (as Mg)	mg/L	4.8	30	100
Manganese (as Mn)	mg/L	ND	0.1	0.3

Contd..2

6/11/20

Remarks :- (1) This report refers only to the particular sample/job submitted for testing.
(2) This report is not to be reproduced wholly or partly and can not be used as an evidence in the court of law and should not be used in any advertising media without our special permission in writing.
(3) Samples will be disposed off after one month from the date of issue of Test Certificate.

//True Copy//

PCRI/051

प्रदूषण नियन्त्रण अनुसंधान संस्थान

भारत हेवी इलेक्ट्रिकल्स लिमिटेड, रानीपुर, हरिद्वार (उत्तराखण्ड) –249403

POLLUTION CONTROL RESEARCH INSTITUTE

(A Govt. of India - UNDP / UNIDO Project)

BHARAT HEAVY ELECTRICALS LIMITED

RANIPUR, HARIDWAR (U.K.) - 249 403

(Approved Lab under Environment (Protection) Act, 1986; EIA Consultant by NABET, QCI)

TEST REPORT

Lab Reference No: TL200337 **Date:** 05.11.2020

PARAMETER	UNIT	OBTAINED VALUE	STANDARD LIMITS (IS 10500:2012) Acceptable	Permissible
Mercury (as Hg)	mg/L	ND	0.001	NR
Mineral Oil	mg/L	ND	0.5	NR
Nickel (as Ni)	mg/L	ND	0.02	NR
Nitrate (as NO_3)	mg/L	ND	45	NR
Odour	-	Agreeable	Agreeable	NR
pH	-	8.1	6.5-8.5	NR
Phenolic Compounds (as C_6H_5OH)	mg/L	ND	0.001	0.002
Selenium (as Se)	mg/L	ND	0.01	NR
Silver (as Ag)	mg/L	ND	0.1	NR
Sulphate (as SO_4)	mg/L	9.2	200	400
Sulphide (as S)	mg/L	ND	0.05	NR
Taste	-	Agreeable	Agreeable	NR
Total Coliform	MPN/100 mL	34	Absent	NR
Total Dissolved Solids	mg/L	161	500	2000
Total Residual Chlorine	mg/L	ND	0.2	1.0
Total Suspended Solids	mg/L	24	-	-
Turbidity	NTU	0.68	1	5
Zinc (as Zn)	mg/L	0.01	5	15

ND – Not Detectable NR – No Relaxation

The parameters analysed lie within permissible limits as prescribed in IS 10500:2012 for Drinking Water, except TC, FC and *E. coli.* It may be used for drinking purpose after treatment.

6/11/20

(Dr. S. Bhatnagar)

Sr. Dy. General Manager (PCRI)

डा. एस. भटनागर/ Dr. S. Bhatnagar

वरि. उप महाप्रबन्धक/Sr. Dy. General Manager

Pollution Control Research Institute

प्रदूषण नियन्त्रण अनुसंधान संस्थान

BHEL, Ranipur, Haridwar

Remarks :- (1) This report refers only to the particular sample/job submitted for testing.
(2) This report is not to be reproduced wholly or partly and can not be used as an evidence in the court of law and should not be used in any advertising media without our special permission in writing.
(3) Samples will be disposed off after one month from the date of issue of Test Certificate.

//True Copy//

PCRI/051

प्रदूषण नियन्त्रण अनुसंधान संस्थान

भारत हेवी इलेक्ट्रिकल्स लिमिटेड, रानीपुर, हरिद्वार (उत्तराखण्ड) –249403

POLLUTION CONTROL RESEARCH INSTITUTE

(A Govt. of India - UNDP / UNIDO Project)

BHARAT HEAVY ELECTRICALS LIMITED

RANIPUR, HARIDWAR (U.K.) - 249 403

(Approved Lab under Environment (Protection) Act, 1986; EIA Consultant by NABET, QCI)

TEST REPORT

Lab Reference No: TL200338 **Date :** 05.11.2020

Indentor : Mr. Vijay Sehgal, AGM (Envt.), VPHEP, THDC India ltd., Pipalkoti

cvCustomer's Ref. No.: THDCIL/VPHEP/Envt./F-037/316 dt. 18.02.2020

Work Order No.: 20-0087-O-691

Sample Collected by: **PCRI Staff** **Collection Date:** 08.10.2020

Sample/Job: River Water Sample Between Tapovan Dam & Power House

PARAMETER	UNIT	OBTAINED VALUE	STANDARD LIMITS (IS 10500:2012)	
			Acceptable	Permissible
Alkalinity	mg/L	68	200	600
Aluminium (as Al)	mg/L	ND	0.03	0.2
Ammonia (as Total Ammonia – N)	mg/L	ND	0.5	NR
Arsenic (as As)	mg/L	ND	0.01	0.05
BOD at 27^{0}C	mg/L	1.2	-	-
Boron (as B)	mg/L	ND	0.5	1.0
Cadmium (as Cd)	mg/L	ND	0.003	NR
Calcium (as Ca)	mg/L	26.6	75	200
Chloride (as Cl)	mg/L	6	250	1000
Chromium Total (as Cr)	mg/L	ND	0.05	NR
Colour	Hazen	<5	5	15
Copper (as Cu)	mg/L	ND	0.05	1.5
Cyanide (as CN)	mg/L	ND	0.05	NR
Dissolved Oxygen	mg/L	7.7	-	-
E. coli	MPN/100 mL	3	Absent	NR
Fecal Coliform	MPN/100 mL	12	Absent	NR
Fluoride (as F)	mg/L	0.14	1.0	1.5
Hardness (as $CaCO_3$)	mg/L	84	200	600
Iron (as Fe)	mg/L	0.01	0.3	NR
Lead (as Pb)	mg/L	ND	0.01	NR
Magnesium (as Mg)	mg/L	4.9	30	100
Manganese (as Mn)	mg/L	ND	0.1	0.3

Contd..2

Asthana 6/11/20

Remarks :- (1) This report refers only to the particular sample/job submitted for testing.
(2) This report is not to be reproduced wholly or partly and can not be used as an evidence in the court of law and should not be used in any advertising media without our special permission in writing.
(3) Samples will be disposed off after one month from the date of issue of Test Certificate.

//True Copy//

PCRI/051

प्रदूषण नियन्त्रण अनुसंधान संस्थान

भारत हेवी इलेक्ट्रिकल्स लिमिटेड, रानीपुर, हरिद्वार (उत्तराखण्ड) –249403

POLLUTION CONTROL RESEARCH INSTITUTE

(A Govt. of India - UNDP / UNIDO Project)

BHARAT HEAVY ELECTRICALS LIMITED

RANIPUR, HARIDWAR (U.K.) - 249 403

(Approved Lab under Environment (Protection) Act, 1986; EIA Consultant by NABET, QCI)

TEST REPORT

Lab Reference No: TL200338 **Date:** 05.11.2020

PARAMETER	UNIT	OBTAINED VALUE	STANDARD LIMITS (IS 10500:2012) Acceptable	Permissible
Mercury (as Hg)	mg/L	ND	0.001	NR
Mineral Oil	mg/L	ND	0.5	NR
Nickel (as Ni)	mg/L	ND	0.02	NR
Nitrate (as NO_3)	mg/L	ND	45	NR
Odour	-	Agreeable	Agreeable	NR
pH	-	7.9	6.5-8.5	NR
Phenolic Compounds (as C_6H_5OH)	mg/L	ND	0.001	0.002
Selenium (as Se)	mg/L	ND	0.01	NR
Silver (as Ag)	mg/L	ND	0.1	NR
Sulphate (as SO_4)	mg/L	11.2	200	400
Sulphide (as S)	mg/L	ND	0.05	NR
Taste	-	Agreeable	Agreeable	NR
Total Coliform	MPN/100 mL	32	Absent	NR
Total Dissolved Solids	mg/L	154	500	2000
Total Residual Chlorine	mg/L	ND	0.2	1.0
Total Suspended Solids	mg/L	21	-	-
Turbidity	NTU	0.70	1	5
Zinc (as Zn)	mg/L	0.01	5	15

ND – Not Detectable NR – No Relaxation

The parameters analysed lie within permissible limits as prescribed in IS 10500:2012 for Drinking Water, except TC, FC and *E. coli*. It may be used for drinking purpose after treatment.

6/11/20

(Dr. S. Bhatnagar)

Sr. Dy. General Manager (PCRI)

डा. एस. भटनागर/ Dr. S. Bhatnagar

वरि. उप महाप्रबन्धक/Sr. Dy. General Manager

Pollution Control Research Institute

प्रदूषण नियन्त्रण अनुसंधान संस्थान

BHEL, Ranipur, Haridwar

Remarks :- (1) This report refers only to the particular sample/job submitted for testing.
(2) This report is not to be reproduced wholly or partly and can not be used as an evidence in the court of law and should not be used in any advertising media without our special permission in writing.
(3) Samples will be disposed off after one month from the date of issue of Test Certificate.

//True Copy//

PCRI/051

प्रदूषण नियन्त्रण अनुसंधान संस्थान

भारत हेवी इलेक्ट्रिकल्स लिमिटेड, रानीपुर, हरिद्वार (उत्तराखण्ड) –249403

POLLUTION CONTROL RESEARCH INSTITUTE

(A Govt. of India - UNDP / UNIDO Project)

BHARAT HEAVY ELECTRICALS LIMITED

RANIPUR, HARIDWAR (U.K.) - 249 403

(Approved Lab under Environment (Protection) Act, 1986; EIA Consultant by NABET, QCI)

TEST REPORT

Lab Reference No: TL200339 **Date :** 05.11.2020

Indentor : Mr. Vijay Sehgal, AGM (Envt.), VPHEP, THDC India ltd., Pipalkoti

cvCustomer's Ref. No.: THDCIL/VPHEP/Envt./F-037/316 dt. 18.02.2020

Work Order No.: 20-0087-O-691

Sample Collected by: **PCRI Staff** **Collection Date:** 08.10.2020

Sample/Job: River Water Sample from U/s of Dam Site

PARAMETER	UNIT	OBTAINED VALUE	STANDARD LIMITS (IS 10500:2012)	
			Acceptable	Permissible
Alkalinity	mg/L	68	200	600
Aluminium (as Al)	mg/L	ND	0.03	0.2
Ammonia (as Total Ammonia – N)	mg/L	ND	0.5	NR
Arsenic (as As)	mg/L	ND	0.01	0.05
BOD at 27^{0}C	mg/L	1.3	-	-
Boron (as B)	mg/L	ND	0.5	1.0
Cadmium (as Cd)	mg/L	ND	0.003	NR
Calcium (as Ca)	mg/L	24.0	75	200
Chloride (as Cl)	mg/L	6	250	1000
Chromium Total (as Cr)	mg/L	ND	0.05	NR
Colour	Hazen	<5	5	15
Copper (as Cu)	mg/L	ND	0.05	1.5
Cyanide (as CN)	mg/L	ND	0.05	NR
Dissolved Oxygen	mg/L	7.6	-	-
E. coli	MPN/100 mL	4	Absent	NR
Fecal Coliform	MPN/100 mL	14	Absent	NR
Fluoride (as F)	mg/L	0.14	1.0	1.5
Hardness (as $CaCO_3$)	mg/L	84	200	600
Iron (as Fe)	mg/L	0.01	0.3	NR
Lead (as Pb)	mg/L	ND	0.01	NR
Magnesium (as Mg)	mg/L	5.7	30	100
Manganese (as Mn)	mg/L	ND	0.1	0.3

Contd..2

Amrohaty 16/11/20

Remarks :- (1) This report refers only to the particular sample/job submitted for testing.
(2) This report is not to be reproduced wholly or partly and can not be used as an evidence in the court of law and should not be used in any advertising media without our special permission in writing.
(3) Samples will be disposed off after one month from the date of issue of Test Certificate.

//True Copy//

PCRI/051

प्रदूषण नियन्त्रण अनुसंधान संस्थान

भारत हेवी इलेक्ट्रिकल्स लिमिटेड, रानीपुर, हरिद्वार (उत्तराखण्ड) –249403

POLLUTION CONTROL RESEARCH INSTITUTE

(A Govt. of India - UNDP / UNIDO Project)

BHARAT HEAVY ELECTRICALS LIMITED

RANIPUR, HARIDWAR (U.K.) - 249 403

(Approved Lab under Environment (Protection) Act, 1986; EIA Consultant by NABET, QCI)

TEST REPORT

Lab Reference No: TL200339 **Date:** 05.11.2020

PARAMETER	UNIT	OBTAINED VALUE	STANDARD LIMITS (IS 10500:2012) Acceptable	Permissible
Mercury (as Hg)	mg/L	ND	0.001	NR
Mineral Oil	mg/L	ND	0.5	NR
Nickel (as Ni)	mg/L	ND	0.02	NR
Nitrate (as NO_3)	mg/L	ND	45	NR
Odour	-	Agreeable	Agreeable	NR
pH	-	8.1	6.5-8.5	NR
Phenolic Compounds (as C_6H_5OH)	mg/L	ND	0.001	0.002
Selenium (as Se)	mg/L	ND	0.01	NR
Silver (as Ag)	mg/L	ND	0.1	NR
Sulphate (as SO_4)	mg/L	11.6	200	400
Sulphide (as S)	mg/L	ND	0.05	NR
Taste	-	Agreeable	Agreeable	NR
Total Coliform	MPN/100 mL	34	Absent	NR
Total Dissolved Solids	mg/L	148	500	2000
Total Residual Chlorine	mg/L	ND	0.2	1.0
Total Suspended Solids	mg/L	18	-	-
Turbidity	NTU	0.61	1	5
Zinc (as Zn)	mg/L	0.02	5	15

ND – Not Detectable NR – No Relaxation

The parameters analysed lie within permissible limits as prescribed in IS 10500:2012 for Drinking Water, except TC, FC and *E. coli*. It may be used for drinking purpose after treatment.

6/11/20

(Dr. S. Bhatnagar)

Sr. Dy. General Manager (PCRI)

डा. एस. भटनागर/ Dr. S. Bhatnagar

वरि. उप महाप्रबन्धक/Sr. Dy. General Manager

Pollution Control Research Institute

प्रदूषण नियन्त्रण अनुसंधान संस्थान

BHEL, Ranipur, Haridwar

Remarks :- (1) This report refers only to the particular sample/job submitted for testing.
(2) This report is not to be reproduced wholly or partly and can not be used as an evidence in the court of law and should not be used in any advertising media without our special permission in writing.
(3) Samples will be disposed off after one month from the date of issue of Test Certificate.

//True Copy//

टीएचडीसी इंडिया लिमिटेड
THDC INDIA LIMITED

(भारत सरकार एवं उ. प्र. सरकार का संयुक्त उपक्रम)
(A Joint Venture of Govt. of India & Govt. of U.P.)
CIN : U45203UR1988GOI009822

सूचना का अधिकार
RIGHT TO INFORMATION

सं० टीएचडीसी/ऋ०/सा०एवं पर्या०/फ०-117/85-ED

दिनांक : 20-07-2021

सेवा में,

Shri Pankaj Agarwal, IFS
Deputy Director General of Forests (C)
पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय,
उत्तर केन्द्रीय क्षेत्रीय कार्यालय,
25, सुभाष रोड, देहरादून – 248001

2.) सदस्य – सचिव,
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय,
आई.ए. डिवीज़न (आर.वी. एवं एच.ई.पी.),
वायु विंग, कमरा सं० 303, इंदिरा पर्यावरण भवन
जोर बाग रोड, नई दिल्ली - 110 003

विषय: 15th Six monthly progress report (Jan'2021 to June'2021) on environmental aspects of Vishnugad Pipalkoti Hydroelectric Project (444 MW) located at Distt. Chamoli, Uttarakhand - reg.

Sir,

In compliance to Point (vii) of Part B: General Conditions of Environment Clearance letter No. J-12011/29/2007-IA.I dtd. 22.08.2007 issued by MoEF&CC, please find enclosed herewith the 15th Six monthly progress report on environmental aspects of Vishnugad Pipalkoti Hydroelectric Project (444 MW) located at Distt. Chamoli,Uttarakhand for your kind perusal and record please.

Thanking You,

20/07/2021

(विपिन थपलियाल)
वरि० प्रबंधक (पर्यावरण)

संलग्नक: उपरोक्तानुसार

प्रतिलिपि: सादर सूचनार्थ

1. अधिशासी निदेशक (एम०पी०एस०), टीएचडीसीआईएल, ऋषिकेश
2. महाप्रबंधक (परियोजना), टीएचडीसीआईएल, पीपलकोटी
3. महाप्रबंधक (सामाजिक एवं पर्यावरण), टीएचडीसीआईएल, ऋषिकेश

//True Copy//

Period Jan' 2021 to June' 2021

1.	**Name of the Project**	**VISHNUGAD PIPALKOTI HYDRO ELECTRIC PROJECT (444 MW)**
2.	**Type of the Project**	Hydroelectric Project
3.	**Clearances OM No. & Date**	
	a) Environment Clearance	i) Letter No. J-12011/29/2007-IA.I, Dated 22.08.2007 ii) Corrigendum regarding Catchment Area, letter no. J-12011/29/2007-IA.I, Dated 18.01.2008 iii) Amendment regarding minimum environmental flow, letter no. J-12011/29/2007-IA-I, Dated 31.05.2011 iv) Extension of validity of Environment Clearance till 21.08.2020, letter no. J-12011/29/2007-IA.I, Dated 25.04.2018. v) Extension of validity of Environment Clearance till 21.08.2021, vide MoEF&CC notification no. S.O. 221 (E) Dated 18.01.2021. vi) Extension of validity of Environment Clearance till 31.12.2021, vide vide MoEF&CC notification no. S.O. 2346 (E) Dated 16.06.2021.
	b) Forest Clearance	i) Stage-II Forest Clearance (Final) Letter No. F.No.8-65/2009-FC, Dated 28.05.2013
4.	**Locations**	
	a) District(s) **b) State (s)** **c) Latitude (Dam Site)** **d) Longitude (Dam Site)**	**a)** Chamoli **b)** Uttarakhand **c)** 79°29'30" E **d)** 30°30'50" N
5.	**Address for Correspondence** a) Address of concerned Project Head (with pin code and telephone / fax nos.)	**a)** Sh. J.N. Singh, GM (Project), VPHEP, THDCIL, Alaknandapuram, Siyasain, Pipalkoti, Distt. Chamoli (Uttarakhand). Pin code: 246472 Tel (O): 01372-256200 Fax (O): 0137-256203
	b) Address of concerned HOD in Corporate Office (with pin code & telephone/ fax no.)	**b)** Sh. P.K. Naithani, GM (S&E), THDCIL, Bypass Road, Pragatipuram, Rishikesh (Uttarakhand) Pin code: 249201 Tel (O): 0135-2433454 Fax (O): 0135-2439404
6.	**Details of Environmental Management Plan**	Attached as **Annexure - I**
7.	**Break - up of the Project area** (land details) a) Dam and Submergence area	Total land Acquired by Project - 141.568 Ha. (Includes Private & Forest Land) **a)** Dam and Submergence area

	(forest & non-forest) b) Others	Forest: 28.478 Ha. Non-Forest: - **b)** Others **(Exclusive of above 'a')** Forest: 71.912 Ha. Non-Forest: 31.639 Ha. (Private) Transferred to Project by PWD : 9.539 Ha.
8.	**Breakup of the Project affected population with enumeration of those losing houses / dwelling units only, agricultural land only, both dwelling units and agricultural land and landless laborers / Artisans.** **a) SC /ST /Tribal's** **b) Others**	Attached as **Annexure - II**
9.	**Financial details** **a) Project cost as originally planned and subsequent revised estimates and the years of price reference.** **b) Actual expenditure incurred on the Project so far.** **c) Allocations made for Environmental Management Plan.**	**a)** Investment approval to the project amounting to Rs. 2491.58 Cr at March, 2008 Price Level was accorded by CCEA on 21.08.2008. Revised RCE of Rs. 3860.35 Cr (including IDC & FC) at Feb'19 PL has been vetted by CEA on 20.03.2020. **b)** The expenditure incurred on VPHEP Project till June' 2021 is Rs. 2265.68 Cr. **c)** Rs. 76.24 Crs (As per EMP of VPHEP formulated during Nov., 2009)
10.	**Forest Land requirements** **a) Status of approval for diversion of forest land for non -forestry use** **b) The status of clear felling in forest land**	**a)** Vide letter no. F.No.8-65/2009-FC dated 28.05.2013, stage-II Forest clearance was accorded by MoEF, GoI. **b)** The details of 812 Number of Tree Felling is under: Dam - 555, Approach Road (TRT to Siyasain to Durgapur) – 200, Approach Road (Siyasain Road to Dhobi Ghat) – 07 & Dumpyard (Siyasain) - 50
11	**Status of construction** a) Date of commencement (actual and/planned) b) Date of completion (actual or planned)	a) 17.01.2014 b) Planned: 16.07.2018 (54 months from date of commencement of construction work). Revised: The completion of the Project is expected in June-2024.
12.	**Reason for the delay if the project is yet to be started.**	NIL
13.	**Details of site visit** a) By Monitoring Committee	a) Vide order dated 17.10.2014, District

		Magistrate, Chamoli has constituted the Environment Monitoring Committee. Second meeting of committee was conducted on 22.02.2016. Based on the suggestions of the Additional Director, MoEF&CC, R.O. Dehradun (Jan' 2017 visit), the Multi-Disciplinary Committee has been re-constituted vide MoEF&CC letter no. J-12011/29/2007-IA-I dated 10.10.2017. The reconstituted Multi-Disciplinary Committee (MDC) under the chairmanship of PCCF-HoFF, Uttarakhand has visited the project site on 28.07.2018. The 2nd meeting of reconstituted MDC under the chairmanship of PCCF-HoFF, Uttarakhand was held on 28.02.2020 at Van Bhawan, Dehradun. The R&R Monitoring Committee has been constituted by District Magistrate, Chamoli on 09.11.2009.
	b) By Regional Office	a) Dr. S.C. Katiyar, Addl. Director (S), MoEF&CC, North Central Regional Office, Dehradun visited the VPHE Project on 09.01.2017 & 10.01.2017. b) Dr. S. C. Garkoti, Advisor, MoEF&CC, New Delhi along with Dr. S. C. Katiyar, Addl. Director (S), MoEF&CC, North Central Regional Office, Dehradun has visited the VPHEP site on 02.08.2017 & 03.08.2017. c) Dr. S.C. Katiyar, Addl. Director (S), MoEF&CC, North Central Regional Office, Dehradun has visited the VPHE Project on 28.07.2018. d) Sh. Pankaj Agarwal, Addl. PCCF and Dr. S. C. Katiyar, Addl. Director, MoEF&CC, Regional Office, Dehradun has visited the VPHE Project on 11-12 Nov 2018. e) Dr. Krishnendu Mondal, Scientist – C, MoEF&CC, Regional Office, Dehradun has visited the VPHEP Project on 12-13 Oct' 2020.
14.	**Brief Note on the status of Compliance of the conditions stipulated by MoEFCC**	A brief note on status of conditions stipulated by MOEF is enclosed as **Annexure - III.**

//True Copy//

ENVIRONMENTAL MANAGEMENT PLAN
(PHYSICAL ACHIEVEMENT IN REPORTING PERIOD)

S. NO.	PLAN	ACHIEVEMENT
1	Development of Herbal Garden	• Based on recommendations of HRDI, Mandal, Gopeshwar, Herbal garden has been developed in the VPHEP colony over an area of 1800 sqm. approx. Also, two nos. dedicated manpower/gardener has been deployed for the maintenance of Herbal Garden. • Approx. Rs. 18.43 lakhs have been incurred on various works related to the development of the Herbal Garden. • Medicinal plants like Harad (Terminalia Chebula), Lemon Grass (Cymbogogonfelxuosus), Sarpgandha (Rauvolfia Serpentiina), Aloe Vera etc. planted.
2	Road Side Plantation	• Requisite funds have been deposited under CAMPA for implementation. • Matter is under persuasion with CAMPA and State Forest Deptt. for start of works.
3	Wildlife Protection (related to NDBR & KWLS)	• **Wildlife Protection:** – Two (02) nos. Watch Towers have been installed at identified locations at Powerhouse and TBM sites nearby the boundary of KWLS. – Ten nos. Camera Traps were procured on the recommendation of E&S panel. Out of which,08 nos. Camera Traps handed over to Forest Department (Nanda Devi National Park) for installation in NDBR on 20.03.2018 and has been installed in NDBR by Forest Department at appropriate location. Balance 02 nos. of Camera Traps have been handed over to Forest officials on 12.06.2019. – Controlled Blasting techniques are being practiced and the same is being monitored by construction contractor through Central Institute of Mining & Fuel Research (CIMFR), Roorkee. Report up to Apr' 2021 have been received. – Environment Awareness was spread amongst villagers during Band Vikas Mela being held every year in Pipalkoti during December month. – Environment Awareness Program has been organized at GIC, Gadora, Chamoli during Feb' 2020 in the presence of noted Environmentalist Sh. Jagat Singh Chaudhary alias "*Jungli Ji*". – Awareness Programs are being organized from time to time. The awareness programs will be organised once the COVID-19 situation gets normal.
4	Compensatory Afforestation in 120.27 Ha	• Compensatory Afforestation and other works (Roadside Plantation, construction of 4 feet high pillar etc.) is being done by the State Forest Department, GoUK. Requisite funds have already been deposited by THDCIL in CAMPA. However, the funds yet to be released by the CAMPA to the concerned Forest Deptt. • THDCIL is continuously pursuing the issue with Senior Forest Officials at Dehradun and at Divisional Level. • Issue was also discussed in the meeting of Multi-Disciplinary Committee constituted by MoEF&CC, New Delhi under the chairmanship of PCCF-HoFF, GoUK held on 28.02.2020 at Van Bhawan, Dehradun.

//True Copy//

		• In the said meeting, DFO, Badrinath Forest Division (Nodal Officer) appraised that slow progress is due to non-inclusion of activities in the Annual Plan of Operation (APO) by Forest Department. • The Chairman - MDC, PCCF-HoFF, has directed the concerned Forest officials to take all-out efforts to for early completion of these activities. • Till Mar'21 Compensatory Afforesation works in 31.5 Ha areas has been completed by State Forest Department. Balance 90 Ha area is to be done by Forest Department.
5	Catchment Area Treatment Plan	• Total Implementation value for CAT is Rs. 47 Crs., the total amount of Rs. 47 Crs stands deposited by THDCIL in CAMPA fund. DFO Badrinath Forest Division is the Nodal Officer for CAT Plan. • Vide letter dtd. 30.12.2017, Final approval has been granted to DPR along with Micro plans for CAT Plan of VPHEP by Forest Deptt., GoUK. • State Forest Deptt., Uttarakhand is executing activities as per approved DPR. An expenditure of Rs. 23.18 Cr (approx.) has been made by Forest Deptt. till June' 2021 under CAT Plan of VPHEP. • Issue of slow progress of CAT Plan was also discussed in the meeting of Multi-Disciplinary Committee constituted by MoEF&CC, New Delhi under the chairmanship of PCCF-HoFF, GoUK held on 28.02.2020 at Van Bhawan, Dehradun. • In the said meeting, DFO, Badrinath Forest Division (Nodal Officer) appraised that slow progress is due to non-inclusion of activities in the Annual Plan of Operation (APO) by Forest Department. • The Chairman - MDC, PCCF-HoFF, has directed the concerned Forest officials to take all-out efforts to for early completion of these activities. • DFO Badrinath, Nodal Officer has been requested for earliest completion of works under CAT Plan of VPHEP.
6	Muck Management Plan	• Dumping of muck is being done at designated / identified area & well above the high flood level. Engineering measures such as construction of gabion faced reinforced earth wall with uniaxial geo-grid reinforcement are adopted at dumping site. Benches are being developed to discontinue the slopes in dumpyard. • Work of plantation of Vetivar (Chrysopogon Zizanioides) grass as slope stabilization measure at Siyasain dumping site (DY-4) has been started in September 2018. • Plantation in approx. 10,000 sqm. area has been completed at DY-4. • M/s HCC Ltd. has been instructed to ensure necessary reclamation works at all Disposal sites. • Details of muck till June' 2021, is as under; ➢ Muck generated (Approx.) = 20.93 Lacs m^3 ➢ Muck utilized (Approx.) = 3.51 Lacs m^3 ➢ Muck dumped (Approx.) = 17.42 Lacs m^3
7	Fish Management Plan	• The Consultancy Services for preparation & supporting Implementation of Fish Management Plan for VPHEP have been awarded to Directorate of Coldwater Fisheries Research (ICAR-DCFR), Bhimtal. • For framing the appropriate fish management plan, ICAR-DCFR has conducted a series of fish survey and water sampling work along River Alaknanda from Vishnupyarag to Karan Prayag. • Final Report has been received from ICAR-DCFR. ICAR-DCFR has recommended to construct Snow Trout Fish

		Hatchery. A MoU has been signed with M/s UPRNN for a total value of 268.26 lakhs for construction of Fish Hatchery nearby Jaisal Nala at some part of DY-5 area. Construction work is under progress. • Also, A one week training on Aquatic Biodiversity in Feb' 2020, was conducted for the Executives of Environment Deptt. at College of Fisheries, GB Pant University of Agriculture & Technology (GBPUAT), Pantnagar by HRD, Rishikesh.
8	Green Belt Development Plan (Plantation of approx 12500 trees)	• Green Belt Development is being implemented under the Consultancy of noted Environmentalist Sh. Jagat Singh Chaudhary alias "Junglee". Broad Leaved, Fast Growing plant species have also been planted as suggested by "Jungli Ji" and Forest Deptt. • Till June' 2021, cumulatively 8500 nos. (approx.) trees are planted. Maintenance of plants is being done regularly.
9	Restoration of Quarry Site	• Till June' 2021, no Quarry site has been opened for excavation / mining. • All statutory clearances for Gadi Quarry have been obtained. The Form MM-10 for operating Gadi Quarry has been issued on 28.05.2021 after signing of Lease Deed. The Quarry site will be operational after Monsoon season and after obtaining CTE/CTO from UKPCB. • The quarrying is yet to commence. However, the quarry areas will to be restored after completion of quarrying operations.
10	Solid Waste Management	**VPHEP COLONY** – **Organic Waste** – An electrical composter has been procured for composting of organic waste. – **Inorganic Waste** is stored and transported through THDCIL vehicle for handing over to Nagar Panchayat, Chamoli for safe disposal. • Necessary infrastructure for SWM facility constructed nearby the VPHEP colony area. • Roadside Bins (Separate bins for Organic and Inorganic Waste) etc. have been procured and installed at appropriate locations for proper collection of waste. • Additionally, 01 nos. dumper has been procured through CSR and donated to Nagar Panchayat – Pipalkoti. As per mutual agreement Nagar Panchayat – Pipalkoti is collecting the solid waste of VPHEP for safe disposal. **M/S HCC LTD. – WORKER/LABOR CAMPS** • Necessary provisions have been kept for Waste Collection, Handling, Segregation, Disposal process under the contractor's EMP. • Separate bins are placed at labor camps and construction sites for biodegradable and non-biodegradable wastes. • The waste collected is handed over to Nagar Palika / Panchayat. • Wastes (Hazardous/E-waste/others) being stored in storage yard for safe disposal and handed over to authorized vendors only.
11	Road Construction	• During Road Construction all precautionary measures for soil erosion, slope stability, drainage to be taken care as per Indian Standards

//True Copy//

		• Regular Water Sprinkling is being done for dust suppression. • Provision for water drainage along the road line is provided where ever required.
12	Sanitary Facility Labor Camp	• HCC has constructed the camps for its staff / workers and for PRW workers at Helang for the persons engaged at Dam site activities and also at Haat & Batula (Haat-Kauria Road) for the Power House activities. • Also, HCC has hired various private accommodations / hotels for accommodating the officers and workers at site. • The total number of staff / workers presently residing in these accommodations is 701. • All the accommodations are provided with Toilets, Bathrooms and community mess. Septic cum Soak pit tank have also been constructed at camp sites for safe disposal of sewage.
13	Fuel	• Community kitchen for labor / worker at camps being run on LPG. • Usage of approx. 9526 nos. LPG cylinders have been reported by the contractor up to June' 2021.
14	Public Health Delivery Plan	**Public Health Delivery system** **– VPHEP, THDCIL** • At VPHEP Complex, a Dispensary is operational with adequate number of beds. • Medical Staff includes Doctor, Nurse, Para medical staff, Dresser etc. • Additional facilities by engaging staff on contractual basis deputed. Ambulance deployed. • The Medical Facilities are extended free of cost among Project Affected people apart from local Population as well. **– M/s HCC** • 01 nos. First Aid Centres operational at each at Power House, TBM and Dam site. • 01 nos. Dispensary located at Swami Vivekanand Hospital, Mayapur, Pipalkoti. • Para Medical Staff & facilities deployed at First Aid Centers. • Ambulance facilities available at Power House, TBM and Dam. • Necessary treatment including required vaccination is being given to labors from time to time.
15	Environmental Monitoring Plan	The monitoring on Environment Parameters (Air/Water/Noise/Effluents/Indoor Air/Emissions from DG Sets/Emissions from Vehicles/Noise from Construction Machinery/Meteorology etc.) to be monitored by the construction contractor. Blasting is being done in a controlled manner and monitoring of the same is being done through the reputed organization *Central Institute of Mining and Fuel Research, Roorkee*. Various monitoring includes; **Monitoring of Air/Water/Noise etc. by contractor:** The monitoring being conducted at different time intervals. Report from M/s HCC for Ambient Air, Indoor Air, Drinking water, Effluent water & Noise level monitoring conducted during the period Jan'21 to Mar' 21 has been received and all parameters are found within the permissible limits.

		Monitoring of Incidence of Water Related Diseases: MoU signed with CMO, District Hospital Gopeshwar Chamoli in 2015 for a period of 04 years. Monitoring of water related diseases was carried out and various HIV awareness programs have been organized in affected villages as per MoU through CMO, District Hospital Gopeshwar Chamoli. A Fresh MoU has been signed with CMO, District Hospital Chamoli on 23.05.2020 for further 03 years. Quarterly Monitoring reports upto Mar' 21 have been received. **Ecological Monitoring:** MoU was signed with Post Graduate College, Gopeshwar for a period of 4 years. Annual Progress Report for the years 2015-16, 2016-17, 2017-18 & 2018-19 has been received. A Fresh MoU has been signed with Post Graduate College, Gopeshwar on 19.05.2020 for further 03 years. Monitoring is under progress. **River Water Quality Monitoring:** Monitoring is being conducted at regular intervals through M/s PCRI BHEL Haridwar. Last set conducted recently during Oct' 2020, Parameters within permissible limits. **Meteorological Monitoring:** Automatic Weather Stations (AWS) for Recording of Temperature, Wind Speed & Direction, Humidity & Rainfall has been installed at PH Site/Colony during mid-February 2016. AWS at Dam Site has been installed on 26.04.2016 at HCC Camp, Helang. An AWS dismantled from MJ-JT HEP is proposed to be reinstalled at Siyasain, VPHEP colony campus.
16	ISO 14001 & OHSAS 18001	• VPHEP project unit is ISO 9001:2015, ISO 14001:2015 & OHSAS 18001 certified unit.
17	Archaeological Management Plan	As per the EMP, following actions are to be taken, i.e. • The Laxmi Narayan Temple at Village Haat is to be preserved through ASI Dehradun. • A 10 Member Committee comprising 8 Members from Village Haat has been constituted by DM, Chamoli and 1st meeting of committee was held on 17.01.2015. • ASI Dehradun was requested vide letters dated 11.02.2016, 01.06.2016, 05.09.2016 and 26.12.2016 for visit and consultancy. • Meanwhile, the ASI team has visited the project on 21.02.2016. It was discussed with ASI team to provide the Action Plan and consent for executing the work. • Thereafter, the ASI team visited the project on 18th March 2017 for site visit and assured that the necessary proposal shall be prepared and submitted very soon. • A preliminary report has been obtained from ASI Dehradun. • A meeting under the chairmanship of District Administration in presence of representative from ASI and The

		World Bank has been conducted between THDCIL and the representatives from Haat village on 23.04.2019 at VPHEP for protection and beautification works of Laxmi Narayan Temple at village Haat. The preliminary report of ASI Dehradun along with further protection plan suggested by The World Bank has also been shared and discussed with the Temple Committee and others during the meeting. • Drawings as per the suggestions of the World Bank have been issued by Design Department, THDCIL, Rishikesh. • Necessary action has been initiated at various levels of department. Further, Remains of Archaeological importance also need to be preserved or conserved. • An Archaeological Chance Find Card has also been issued to the contractor to report Chance finds, if any. • No chance finds reported till date. An Archaeological museum is proposed to be opened in the project area for display of Archaeological findings, if any.

//True Copy//

Annexure - II (as on June, 2021)

Details of SC/ST/OBC/Others Titleholder of Project Affected Villages Loosing House/Land

Sl	Name of Village	Titleholder Loosing House					Titleholder Loosing Land					Titleholder Loosing Land & House					Landless Labour					Artesian
		SC	ST	OBC	Other	Total	SC	ST	OBC	Other	Total	SC	ST	OBC	Other	Total	SC	ST	OBC	Other	Total	
1	Jaisaal	0	0	0	0	**0**	0	0	4	97	**101**	0	0	0	12	**12**	0	0	0	0	**0**	0
2	Haat	2	2	0	0	**4**	20	3	0	87	**110**	40	8	4	87	**139**	0	0	0	0	**0**	0
3	Tenduli Chak Haat	0	0	0	0	**0**	4	0	0	0	**4**	0	0	0	0	**0**	0	0	0	0	**0**	0
4	Guniyala	0	0	0	0	**0**	0	0	0	25	**25**	0	0	0	0	**0**	0	0	0	0	**0**	0
5	Batula	0	0	0	2	**2**	4	1	0	42	**47**	0	0	0	0	**0**	0	0	0	0	**0**	0
6	Naurakh	0	0	0	0	**0**	7	0	0	60	**67**	0	0	0	0	**0**	0	0	0	0	**0**	0
7	Gulabkoti	0	0	0	0	**0**	48	0	0	0	**48**	0	0	0	0	**0**	0	0	0	0	**0**	0
Total		**2**	**2**	**0**	**2**	**6**	**83**	**4**	**4**	**311**	**402**	**40**	**8**	**4**	**99**	**151**	**0**	**0**	**0**	**0**	**0**	**0**

//True Copy//

ANNEXURE-III

STATUS OF CONDITIONS ON ENVIRONMENT CLEARANCE

SL. NO.	BRIEF DESCRIPTION OF CONDITIONS	STATUS AS ON JUNE' 2021
MoEF&CC LETTER Dated: 22.08.2007		
PART - A: SPECIFIC CONDITIONS		
1.	**6202 hectare degraded Catchment Area of high category to be treated. CAT as has been proposed should be completed in three years.**	• Total Implementation value for CAT is Rs. 47 Crs., the total amount of Rs. 47 Crs stands deposited by THDCIL in CAMPA fund. DFO, Badrinath Forest Division is the Nodal Officer for CAT Plan. DPR for CAT along with micro plans has been approved during December 2017. • Forest Deptt. is executing activities as per approved DPR. An expenditure of Rs. 23.18 Cr (approx.) has been made by Forest Deptt. till June' 2021 under CAT Plan of VPHEP. • Matter was also discussed in the 2nd meeting of Multi-Disciplinary Committee constituted by MoEF&CC, New Delhi under the chairmanship of PCCF-HoFF, GoUK held on 28.02.2020 at Van Bhawan, Dehradun. • In the said meeting, DFO, Badrinath Forest Division (Nodal Officer) appraised that slow progress is due to non-inclusion of activities in the Annual Plan of Operation (APO) by Forest Department. • The Chairman - MDC, PCCF-HoFF, has directed the concerned Forest officials to take all-out efforts to for early completion of these activities. • DFO Badrinath, Nodal Officer has been requested for earliest completion of works under CAT Plan of VPHEP.
2.	**346 project affected families are likely to lose their agriculture land. All the PAFs would be compensated as per the rates that would be assessed and decided by the district authorities. Over and above these compensation, the PAFs will be given" land for land" or "Vocation / job" or "financial assistance "in addition to various rehabilitation benefits as per the NRRP - 2003.**	Land Compensation as assessed & decided by Land Acquisition Officer is being disbursed through Special Land Acquisition Officer (SLAO) in accordance to the provisions of LA Act. About 94% PAF's have received payment from SLAO. Besides SLAO Payment, Project is extending various other benefits to the Project Affected Families in accordance to the R&R Policy of Project, framed based on NRRP-2007 & considering the World Bank Operational Policy. The Affected Families are getting cash benefits in the form of various Grants.

//True Copy//

		Apart from above, Project is complying with the Social Obligation & the details are annexed at ***Annexure A-1***.
3.	**A Monitoring Committee for R & R should be constituted which must include representatives of project - affected persons from SC/ST category and a woman beneficiary.**	Monitoring Committee has been constituted by DM, Chamoli; vide Order No. 725/26-MB (2008-09), Dt. 09.11.2009.
4.	**All the equipment which are likely to generate high noise levels are to be fully mollified (Noise reduction measures) in view of the proximity of the project to Nanda Devi Biosphere Reserve.**	The PUC certificate for the Light, Heavy Vehicles including for hired one and other construction equipment are being undertaken as per prevailing Guidelines, Rules and acts & renewed from time to time. The controlled blasting is being undertaken involving non electric delay detonation technique. Blasting is done during day time at pre-notified time only. Blast pattern & vibration is monitored by Central Institute of Mining and Fuel Research (CIMFR), Roorkee. No blasting is done during night & no disturbance is created for wild life habitat. Monitoring Agencies M/s PCRI-BHEL, Haridwar and M/s Harayana Test House, Panipat recognized by MoEF&CC has been engaged to monitor the Environmental Parameters that includes Noise as well. The monitoring is being conducted at regular intervals as stipulated. The last set of monitoring was conducted through M/s PCRI-BHEL, Haridwar in Oct' 2020 and also monitoring was conducted through M/s Haryana Test House, Panipat by M/s HCC during Mar' 2021. Reports have been received and all parameters are within permissible limit.
5.	**Minimum Water Flow of 15.65 Cumecs (Revised by letter dtd. 31.05.2011) should be released downstream during lean season.**	MEFR shall be ensured as per latest Gazette Notification dtd. 10.10.2018 of MoWR,RD&GR, GoI.
6.	**Consolidation and compilation of the muck should be carried out in the muck dump sites and the dump sites should be above high flood level.**	Dumping of muck is being done at designated / identified area & well above the high flood level. Engineering measures such as construction of gabion faced reinforced earth wall with uniaxial geo-grid reinforcement are adopted at dumping site. Benches are being

		developed to discontinue the slopes in dumpyards. Biological measures such as formation of Micro –benches (kyaries), laying of top soil, plantation of vetivar grass, manuring etc. are also being undertaken at site for slope stabilization. Plantation of Vetivar (*Chrysopogon Zizanioides*) in approx. 10,000 sqm area has been completed till June' 2021 at DY- 4.
7.	**The project area is situated in close proximity to Nanda Devi Bio-Sphere Reserve, the possibility of the endemic flora cannot be ruled out completely. Hence suggested the plantation of those species which come under Rare, Endangered and Threatened (RET) category, if any, should be planted during the implementation of CAT and Compensatory Afforestation Works.**	The Implementation of CAT Plan & Compensatory Afforestation are being undertaken by State Forest Department, Uttarakhand. State Forest Department is executing the plantation of appropriate species as per their approved DPR of CAT Plan of VPHEP. Matter was also discussed in the 2nd meeting of Multi-Disciplinary Committee constituted by MoEF&CC, New Delhi under the chairmanship of PCCF-HoFF, GoUK held on 28.02.2020 at Van Bhawan, Dehradun. The Chairman - MDC, PCCF-HoFF, has directed the Nodal Officer, Forest Deptt. to take immediate necessary action and expedite the matter.
8.	**Commitment made during public hearing should be fulfilled.**	The status towards Commitments made during Public Hearing is annexed as ***Annexure – A***.
PART - B: GENERAL CONDITIONS		
1.	**Adequate free fuel arrangement should be made for the labour force engaged in the construction works at project cost so that indiscriminate felling of trees is prevented.**	Contractor is running Community mess for its employees & work force. As per contractor report, approx. 9526 nos. Commercial LPG Cylinders have been utilized in the Community Mess up to June' 2021.
2.	**Fuel depot may be opened at the site to provide the fuel (kerosene / wood / LPG). Medical facilities as well as recreational facilities should also be provided to the labors.**	• Community Kitchen established in Camps for Contractors Employees & Workforce. • 01 nos. First Aid Centres operational at each at Power House, TBM and Dam site. • 01 nos. Dispensary located at Swami Vivekanand Hospital, Mayapur, Pipalkoti. • Para Medical Staff & facilities deployed at First Aid Centers. • Ambulance facilities available at Power House, TBM & Dam area. • Necessary treatment including required vaccination is being given to labors from time to time. • Recreational facilities have been provided at labor camps by the contractor.

//True Copy//

3.	**All the labourers to be engaged for construction works should be thoroughly examined by health personnel and adequately treated before issuing them work permit.**	Pre-Employment Medical checkup is undertaken before induction and issuing Work Permit to the labours. Also, Medical examination & vaccination of workmen is done from time to time. Treatment as & when required is also administered.
4.	**Restoration of construction area including dumping site of excavated materials should be ensured by leveling, filling up of burrow pits, landscaping etc. The area should be properly treated with suitable plantation.**	Proper re-vegetation provisions exist in EMP and will be ensured after accomplishment of Dumping activity & at appropriate time. Biological measures such as formation of Micro –benches (kyaries), laying of top soil, plantation of vetivar grass, manuring etc. are also being undertaken at site for slope stabilization. Plantation of Vetivar (*Chrysopogon Zizanioides*) in approx. 10,000 sqm area has been completed till June' 2021 at DY- 4.
5.	**Financial provision should be made in the total budget of the project for implementation of the above suggested safeguard measures.**	Budget Provisions of Rupees 76.24 Crores have been earmarked towards implementation of Environment Management Plan (EMP) by Project.
6.	**A Multi-Disciplinary Committee should be constituted with representatives from various disciplines of forestry, ecology, wildlife, soil conservation, NGO etc. to oversee the effective implementation of the suggested safeguard measures.**	District Magistrate, Chamoli, vide order dated 17.10.2014, constituted the Environment Monitoring Committee under the Chairmanship of Chief Development Officer (CDO), District Chamoli. The 1st Meeting was undertaken on 20.03.2015. The 2nd Meeting of committee was conducted on 22.02.2016. Based on the suggestions of the Additional Director, MoEF&CC R.O. Dehradun (Jan 2017 visit), the Multi Disciplinary Committee has been re-constituted vide MoEF&CC letter no. J-12011/29/2007-IA-1 dated 10.10.2017. The 1st meeting of Multi-Disciplinary Committee under the chairmanship of PCCF-HoFF, GoUK held on 28.07.2018 at Project site. The 2nd meeting of Multi-Disciplinary Committee was held on 28.02.2020 under the chairmanship of PCCF-HOFF, GoUK at Van Bhawan. Dehradun. The Chairman - MDC, PCCF-HoFF, has suggested that Forest Deptt. and THDCIL should jointly work together as a team for successful implementation of EMP.

//True Copy//

		The 3rd meeting of reconstituted MDC was scheduled to be held on 10.072021 at VPHEP, Pipalkoti, but due to some unforeseen circumstances PCCF-HoFF has postponed the meeting. Fresh date will be shortly given by PCCF-HoFF for organizing the 3rd meeting.
7.	**Six monthly monitoring reports should be submitted to the Ministry and its Regional Office, Lucknow for review.**	Last Six Monthly report was submitted to concerned office vide letter dated 15.01.2021.
OTHER CONDITIONS		
4.	**Officials from Regional Office MOEF, Lucknow who would be monitoring the implementation of environmental safeguards should be given full cooperation, facilities and documents / data by the project proponents during their inspection.**	Full Logistic supports as and when required will be ensured by Project. a) Dr. S.C. Katiyar, Addl. Director (S), MoEF&CC, North Central Regional Office, Dehradun visited the VPHE Project on 09.01.2017 & 10.01.2017. b) Dr. S. C. Garkoti, Advisor, MoEF&CC, New Delhi along with Dr. S. C. Katiyar, Addl. Director (S), MoEF&CC, North Central Regional Office, Dehradun has visited the VPHEP site on 02.08.2017 & 03.08.2017. c) Dr. S.C. Katiyar, Addl. Director (S), MoEF&CC, North Central Regional Office, Dehradun has visited the VPHE Project on 28.07.2018. d) Sh. Pankaj Agarwal, Addl. PCCF and Dr. S. C. Katiyar, Addl. Director, MoEF&CC, Regional Office, Dehradun has visited the VPHE Project on 11-12 Nov 2018. e) Dr. Krishnendu Mondal, Scientist – C, MoEF&CC, Regional Office, Dehradun has visited the VPHEP Project on 12-13 Oct' 2020.
5.	**The responsibility of implementation of environmental safeguards rests fully with the THDC Ltd. & Government of Uttarakhand.**	THDCIL ensures Implementation of environmental safeguards as applicable.
6.	**In case of change in the scope of the project, project would require a fresh appraisal.**	There is no change in Project Scope.
MoEF&CC LETTER Dated: 25.04.2018		
1.	**The project proponent (PP) should ascertain that there shall not be any**	Retaining structure of suitable load bearing capacity has been developed at each dumping sites, so that there shall not be any wash off during rainy season.

//True Copy//

	wash off during the rainy season beyond the retaining wall, PP should monitor the silt flow at the downstream and upstream of the river during monsoon season. Similarly, PP should provide adequate width having intermittent retaining bunds so that silt is collected at the retaining bunds during rainy season and silt is let out in to the river.	Terraces at dumpyards has been developed and benches are being developed to discontinue the slopes in dumpyards. Also, to control silt wash off Biological measures such as formation of Micro –benches (kyaries), laying of top soil, plantation of vetivar grass, manuring etc. are also being undertaken at site.
2.	**The PP should opine that as and when any active dumps/muck disposal sites are getting inactive, intermediate measures like both engineering and biological to be carried–out so that no silt is going into the downstream of the river.**	Benches are being developed to discontinue the slopes in dumpyards. Engineering measures such as construction of gabion faced reinforced earth wall with uniaxial geo-grid reinforcement are adopted at dumping site. Biological measures such as formation of Micro –benches (kyaries), laying of top soil, plantation of vetivar grass, manuring etc. are also being undertaken at site for slope stabilization. Plantation of Vetivar (*Chrysopogon Zizanioides*) in approx. 10,000 sqm area has been completed till June' 2021 at DY- 4.
3.	**The PP should ensure that in case of generation of any top soil, a site exclusively for topsoil dumping and also make commitment that collection of topsoil and prevention of the same be made so that nutrient value of the soil is retained and utilized subsequently at the time of plantation, reclamation of muck dumps, etc.**	Necessary provision has been made and same is being complied with. Topsoil generated from different sites, if any is being used for biological stabilization measures at Dumping site.
4.	**There should be benching of dumps of appropriate height and stabilization of slopes so that spoils of muck etc. are not created during rainy season. In critical**	Benches are being developed to discontinue the slopes in dumpyards. Engineering measures such as construction of gabion faced reinforced earth wall with uniaxial geo-grid reinforcement are adopted at dumping site.

	areas, use of geo-textile along the slopes and provision of garland drains on the toe of dumps are to be provided for better stabilization and biological measures. This has to be strictly adhered to.	
5.	**All the terms and conditions of the Environmental Clearance stipulated in Letter J-12011/29/2007-IA.I dated 22.08.2007, 18.01.2008 and 30.11.2011 remains unchanged.**	Details of the same are provided above.

//True Copy//

ANNEXURE-A

COMMITMENTS OF PROJECT DURING PUBLIC HEARING ON 09.01.2007

S. No	ISSUES RAISED	STATUS AS ON JUNE, 2021
1	Negative impact on Environment due to Project's Activities shall not take place and provisions shall be made as per the standards and approval from competent level shall be obtained.	As per Environmental studies undertaken, no significant impacts have been noticed. However, EMP envisages precautionary measures in order to prevent occurrence of negative impacts and action is being taken accordingly.
2	Geological structures around the project area shall not be affected, In this regard, permission from concerned department shall be taken after Detailed investigations and implementation of recommendations shall be ensured.	• Work is being undertaken only in areas where approval has been accorded by concerned authorities / agencies. • No Incidence or deviation noticed during Reporting period • Work in project area is done with due precautions such as mechanical excavation, controlled blasting, vibration monitoring etc.
3	Minimum water flow shall be ensured in river Alaknanda in such a way that the aquatic fauna is not adversely affected and also there is no impact on water quality.	MEFR shall be ensured as per latest Gazette Notification dtd. 10.10.2018 of MoWR,RD&GR, GoI.
4	There shall be no negative impact on Area's Forest resources, Flora, Fauna and life style of the people, due to Project's activities. In this regard, proper appropriate measures shall be taken and permission from concerned department shall be taken.	• Environment Management measures are properly taken care off. Entry of workforce is restricted in forest area. • Contractor is running Community mess for workforce. • Labors camps have been constructed at different locations and in isolation from local villagers. Meanwhile hired accommodation and community mess is being provided by contractor. • Nevertheless awareness programmes are being conducted to safeguard flora and fauna.
5	During all stages of Project, Local people shall be given job opportunities on priority basis.	Based on the requirement, direct & indirect job opportunities are being extended among local people on priority basis at THDCIL & Contractors Level. Employment opportunities includes:

		• Direct/Indirect job opportunities in THDCIL & with Contractor • Award of petty Contracts • Hiring of Vehicles • Allocation of Shops Details are indicated at ***Annexure-A1*** under Employment.
6	Arrangements as per standards/policy shall be ensured for Project Affected Persons and Complete compensation of the acquired land shall be released to the concerned in time.	Land Compensation as assessed & decided by Land Acquisition Officer is being disbursed through Special Land Acquisition Officer (SLAO) in accordance to the provisions of LA Act. About 94% PAF's have received payment from SLAO. Besides SLAO Payment, Project is extending various other benefits to the Project Affected Families in accordance to the R&R Policy of Project, framed based on NRRP-2007 & considering the World Bank Operational Policy. The Affected Families are getting cash benefits in the form of various Grants. Apart from above, Project is complying with the Social Obligation & the details are as per ***Annexure-A1***.
7	The explosives in construction related activities shall be used only in avoidable situations in minimum required quantity.	• Explosive used in avoidable situations only & in minimum quantity. • The controlled blasting is being undertaken involving non electric delay detonation technique • Blasting is done during day time only and at pre-notified time. Blast pattern & vibration is monitored by Central Institute of Mining and Fuel Research (CIMFR), Roorkee.
8	Various facilities developed for the project shall be available for the people of the area and community development works shall be carried out in nearby villages.	Various facilities, awareness programmes etc. under Community Development have been made available for the Project Affected Villages including surrounding villages that comprise of; Construction of Pathways, Waiting shelters, Community buildings, Road widening, Hill side slope protection works, Solar street lights for villages, furniture & sports kits for community, water supply schemes, Teaching aids & furniture to schools, Construction of additional classrooms & toilets, promotion of sports & cultural activities, awareness camps on social & environmental aspects, health camps & awareness camps on HIV

		AIDS, Pulse Polio etc.
9	A Comprehensive Disaster Management Plan shall be prepared for the project and the recommendations of the Plan shall be complied.	A Comprehensive Disaster Management Plan has been prepared.
10	THDC shall ensure the development of Affected villages Forest Rehabilitation, as per directions of Uttarakhand Government and with the help of Local People.	• The development activities like construction of pathway, minor water supply schemes etc. under affected villages are being executed through involvement of local people. • A provision of involving local population also exists under CAT plan.
11	Labors and their families, working in the construction works of the Project shall be properly vaccinated.	Medical examination of workforce is done prior to induction and properly vaccinated whenever needed. Medical camps are also organized for labors.
12	The proper development of religious places and Shamshan Ghats nearby the river bank shall be ensured.	The aspect has been covered under Community Development activities at Point No. 8 above.
13	The treatment of sewage generated by the Labors engaged in construction works of the Project shall be ensured by means of Septic Tank and soak pits.	At each camp site; One Community latrine per 20 persons was provided. Each camp is equipped with septic cum soak pits. The effluent is being disposed-off in septic cum soak tanks.
14	In order to provide all necessary Project related information to local people, a Public Information Centre shall be established and completed information shall be provided to the people.	Project has established Public Information Centers (PIC`s) at two locations under Project area. Necessary information related to Technical, Social & Environmental aspects are displayed and are available in PIC`s.
15	Complete details related to the project shall be published through Press and the views /opinions of the people shall properly solve.	Project related information is being published in the local newspapers from time to time. Grievance Redress Mechanism resolves the issues of affected population in accordance to R&R Policy of VPHEP.

ANNEXURE-A1

SOCIAL RESPONSIBILITIES:

CONSTRUCTION OF COMMON PROPERTY RESOURCES:

In addition to the compensation / Grants provided by SLAO/ THDCIL, common property resources like Pathways, Drinking water facility, Street Light, Primary School, Panchayat Ghar, Anganwari Kendra etc has been constructed at self resettlement sites.

LOSS OF FUEL & FODDER:

Each entitled house hold in the affected habitation is being paid 100 days of Minimum Agriculture Wages per year for a period of 5 yrs. On the recommendations of the World Bank, THDCIL has increased disbursement of Fuel & Fodder Grants from 5 years to 8 years. The amount is paid as a grant / assistance towards the loss of fuel and fodder. Around 2700 households are getting benefited through this assistance.

COMMUNITY DEVELOPMENT WORKS:

Under Community development various works have been taken up in the Project affected villages ie; construction of Pathways, Waiting shelters, Community buildings, Road widening, Hill side slope protection works, Solar street lights for villages, furniture & sports kits for community, water supply schemes, Teaching aids & furniture to schools, Construction of additional classrooms & toilets, promotion of sports & cultural activities, awareness camps on social & environmental aspects, health camps & awareness camps on HIV AIDS, Pulse Polio etc.

LIVELIHOOD ACTIVITIES:

Various activities have also been taken up to create livelihood opportunities. These are Dairy Development, Poultry, Tailoring & Stitching, Wool Knitting, Bee Keeping, Mushroom cultivation, vermin composting to promote organic farming, plantation etc. Awareness programs for Project affected people are also organized with the help of various State Govt. Deptts ie; Horticulture, Agriculture, Tourism, Animal Husbandry etc to give awareness on various schemes, subsidies, technical assistance etc to convince local youth to opt for self employed income generation activities. Around 500 beneficiaries are benefited through these programs.

On the recommendations of the World Bank, the work towards "Engagement of Specialized Agency to help Prepare Livelihood Development / Employment Generation Plan & its Implementation in relation to VPHEP" awarded on M/s Mirda Renergy & Development Pvt. Ltd, New Delhi commenced on 03.01.2020. The agency has completed Draft Base line survey/final base line survey & Submitted draft strategy report on 31.03.2021.

VOCATIONAL TRAININGS:

Apart from above, Vocational Trainings in hotel management, Excavator operator, Electrician, Fitter, Refrigerating & Air Conditioning and other skill enhancement activities, etc. are also

undertaken, in coordination with various institutes like GMR Foundation, Dr. Reddy Foundation, and Industrial Training Institutes in nearby areas. Around 300 beneficiaries are benefited through these programs.

EDUCATION:

To promote Education the Project has undertaken various activities ie; Scholarship to Project affected Meritorious/Poor/ Girls students, Construction of additional class rooms & toilets, providing teaching aids & uniform, Assistance for getting admission in ITIs, assistance to schools for cultural activities etc. Around 1400 students having approx. 800 girls have been benefitted through scholarship program of THDCIL till Academic year 2018-19. The above assistance has been kept on hold as the schools are presently closed due to COVID-19 pandemic.

HEALTH:

The project is helping PAPs by facilitating them to THDCILs Dispensaries (Allopathy & Homeopathy) established in the Project Campus. OPD / IPD facility including medicines is given free of cost to PAPs. In addition to this Medical health camps are organized in project affected villages and Ambulance facility is also provided to the needy PAPs free of cost. The Health camps have been immensely beneficial for local population & nearby areas that include people from project affected villages of Project. Approx. 18000 beneficiaries having approx 5000 females have been administered treatment in Allopath and approx. 24600 benefited in Homeopathy.

1 Hopper Dumper Tipper TATA ACE 1.8 CUM has been handed over to Nagar Panchyat, Pipalkoti, District Chamoli on the 9th June, 2020 through SEWA, THDCIL, Rishikesh under Corporate Social Responsibility (CSR). The vehicle is used for transportation of Garbage to Disposal sites under their control. The Garbage generated at THDCIL, Project Complex, VPHEP is also being addressed by Nagar Panchayat, Pipalkoti.

EMPLOYMENT:

Keeping in view that the Hydro Projects are capital intensive with the State of the Art Technology and therefore do not offer much employment opportunity, particularly in unskilled category, the option of providing job with THDCIL as per policy is not considered as a rehabilitation option. However, as on date around 1118 persons have been provided direct / indirect employment opportunities in Project HCC / THDCIL/ Contractors/ Hiring of vehicles/Lease land for various purposes etc.

ANNEXURE-R/3/-16

CHAPTER – 1

WATER POWER STUDIES

1.1 GENERAL

The power potential studies have been carried out for Pipal Koti Vishnugad Hydel Scheme, situated on the river Alaknanda in Chamoli District, Uttranchal State of India. This is a run-of-the-river type development with diurnal storage and would utilize a net rated head of water of 212.46 m. The plant would operate as peak load station.

1.2 FIXATION OF FRL/MDDL

The FRL of the pondage behind the diversion structure has been fixed at EL 1267 m. The MDDL has been fixed at EL 1252.5 m keeping the requirement of minimum cushion of water above the intake for head race tunnel (HRT) to rule out the air entrainment into the HRT as well as silt considerations in the river. The live storage between FRL and MDDL is 2.47 M Cum. The storags at FRL and MDDLare shown at **Amex-1.**

1.3 FIXATION OF TAIL RACE WATER LEVEL (TWL)

The maximum and minimum tail race water levels have been fixed as EL 1030.0 m and 1028.2 m respectively keeping in view the maximum pond level of downstream Bowala Nand Prayag H.E. Project which is at EL1028.2 m. The average value of TWL is taken as EL 1029.10 m.

1.4 WATER AVAILABILITY

The available data of water flows on 10 daily basis has been analyzed. Hydrological data is available for 33 years from 1971-72 to 2003-04. Water flows series for all 33 years have been utilized for computing power benefits. The water inflow series for 33 years is shown in Annex – 2.

BEFORE THE NATIONAL GREEN TRIBUNAL

AT NEW DELHI

MEMORANDUM OF APPEAL

APPEAL NO. 21 OF 2021

IN THE MATTER OF:

DR. BHARAT JHUNJUNWALA & ANR

...APPELLANTS

VERSUS

UNION OF INDIA & ORS **...RESPONDENTS**

VAKALATNAMA

KNOW ALL to whom these presents shall come that I, Mr. **Pradeep Kumar Naithani**, the authorized representative of **M/S THDC INDIA LIMITED, i.e. RESPONDENT NO.3** in the above named matter do hereby appoint **MR. DHRUV DEWAN**, MS. HARSHITA CHOUBEY AND MS. CHANDNI GHATAK, **C-519, SECOND FLOOR, DEFENCE COLONY NEW DELHI-110024**" hereinafter called the Advocates to be our Advocate's in the above noted case and authorise the above named Advocates to :

To act, appear and plead in the above noted case in this Tribunal.

To sign, file, verify and present pleading, applications, appeals, cross-objections or petitions for execution, review, revision, withdrawal, compromise or other petition, replies, objections affidavits or other documents as may be deemed necessary or proper for the prosecution of the said case in all its stages.

To file and take back documents.

To withdraw, or compromise the said case or submit to arbitration any differences or disputes that may arise touching or in any manner relating to the said case.

To take out execution proceedings.

To deposit, draw and receive moneys, cheques and grant receipts therefor and to do all other acts and things which may be necessary to be done for the progress and in the course of the prosecution of the said case.

NOTARY Anil Kumar GOVT. OF UTTARAKHAND

महाप्रबंधक (सामा. एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

To appoint and instruct any other Legal Practitioner authorising him to exercise the powers and authorities hereby conferred upon the Advocate whenever he may think fit to do so and to sign the power of attorney on my/our behalf.

And I/we the undersigned do hereby agree to ratify and confirm acts done by the Advocates or their substitute in the matter my/our own acts as if done by me/us to all intents and purposes.

And I/we undertake that I/we or my/our authorised agent would appear in the court on all hearings and will inform the Advocate for appearance when the case is called.

And I/we the undersigned do hereby agree not to hold the Advocates or their substitute responsible for the result of the said case in consequence of his absence from the court when the said case is called up for hearing, or for any negligence of the said Advocates or their substitute.

And I/we the undersigned do hereby agree that in the event of the whole or any part of the fee agreed by me/us to be paid to the Advocates remaining unpaid, he shall be entitled to withdraw from the prosecution of the said case until the same is paid up. If any costs are allowed for an adjournment, the Advocates would be entitled to the same.

IN WITNESS WHERE OF I/we do hereunto set my/our hand to these presents of which have been understood by me/us this 28 day of March 2022

ACCEPTED:

DHRUV DEWAN

CLIENT

महाप्रबंधक (सामाजिक एवं पर्या.)
General Manager (Soc. & Env.)
टीएचडीसी इण्डिया लि., ऋषिकेश
THDC India Ltd. Rishikesh

D6402/2017

HARSHITA CHOUBEY

Identified by me:
Chandni Ghatak
Advocate

CHANDNI GHATAK

(ADVOCATES FOR RESPONDENT NO.3)

टीएचडीसी इंडिया लिमिटेड
THDC INDIA LIMITED
(भारत सरकार एवं उ.प्र.सरकार का संयुक्त उपक्रम)
(A Joint venture of Govt. of India & Govt. of UP)
CIN : U45203UR1988GOI009822

No. THDC / RKSH / ED (Technical) / 130

Date: 28.03.2022

TO WHOM SO IT MAY CONCERN

Shri Pradeep Kumar Naithani, GM (Social & Environment), for protecting the interest of THDC India Limited, is hereby authorized to sign vakalatnama, replies, affidavits and any other documents submitted on behalf of THDC India Limited before National Green Tribunal, New Delhi, in appeal no. 21 of 2021 titled as "Dr. Bharat Jhunjhunwala & anr. vs. Union of India &Ors". In this appeal THDC India Limited is arrayed as Respondent No. 3.

(Pawan Kr. Aggarwal)
Executive Director (Technical)

पी.के. अग्रवाल
P.K. AGGARWAL
अधिशासी निदेशक (तकनीकी)
Executive Director (Technical)
टीएचडीसी इण्डिया लिमिटेड, ऋषिकेश
THDC India Limited, Rishikesh

Gmail Chandni Ghatak <chandnighatak26@gmail.com>

Advance Service: Reply on behalf of Respondent No.3 in Appeal No. 21 of 2022

1 message

Chandni Ghatak <chandnighatak26@gmail.com> Tue, Mar 29, 2022 at 12:50 PM
To: ankur.sood@soodandco.com, soodankur85@gmail.com, parul.lawyer@gmail.com
Cc: Dhruv Dewan <dhruv@dhruvdewan.in>, Harshita Choubey <choubey.harshita@gmail.com>

Dear All,

We are concerned for THDC India Limited, i.e. Respondent No. 3 in the captioned appeal filed and currently pending before the NGT Principal Bench (New Delhi).

Please find enclosed Vol 1 & Vol 2 of the reply filed on behalf Respondent No.3 (accessible through enclosed Google Drive Links) for your reference. The same is being served upon you in advance by way of the present email in keeping with the extant rules of the NGT.

Kindly note the present communication shall be used as proof of service.

Regards,
Chandni Ghatak
Advocate for Respondent No.3

VOL 1 - Reply on behalf of R3 in Appeal No. 21 ...

Vol 2- Reply on behalf of R3 in Appeal No. 21 o...

--
Chandni Ghatak,
Advocate
Contact Number : +918769842888