ENVIRONMENTAL SCREENING & ANALYSIS FOR ADVANCE CONSTRUCTION WORKS

EXECUTIVE SUMMARY

1.0 INTRODUCTION & BACKGROUND OF THE STUDY

The Vishnugad Pipalkoti Hydroelectric Project (VPHEP) is a run-of-the river hydro power project proposed on River Alaknanda in district Chamoli in Uttarakhand. The project envisages construction of a diversion dam near village Helong ($79^{o}29'$ 30 E and $30^{o}30'50"$ N). An underground power house is proposed at village Hat ($79^{o}24'56"$ E and $30^{o}25'31"$N), 3 km from Pipalkothi. The installed capacity for power generation is 444MW.

2.0 OBJECTIVE OF THE STUDY

The present study consists of screening of advance construction sites. The advance sites comprises of construction of approach roads to various work fronts of the project. Four approach roads are taken under the environmental screening study with the objective as given below:

- To provide information about general baseline environmental setting of the advance construction site
- To provide information on potential impacts of the road construction and the characteristics of the impacts in terms of pre- construction, construction and operation phase of the project
- To provide appropriate mitigation measures to minimize the potential adverse impacts and enhance positive impacts.
- To provide basic information for formulating management and monitoring plan

3.0 ADMINISTRATIVE AND LEGAL FRAMEWORK

The Government through specific legislations regulates the environmental management system in India. The statutory bodies responsible for ensuring environmental compliances are:

- The Ministry of Environment and Forest (MoEF), Government of India
- Central Pollution Control Board (CPCB)
- State Pollution Control Board (SPCB)

The Environment (Protection) Act, 1986, is the most comprehensive law on the subject. The law grants power to the Central Government to take all measures necessary to protect and improve the quality of environment and to prevent pollution of the environment. Following Acts, Laws, Rules and Guidelines are applicable for the study:

- Environment (Protection) Act, 1986
- EIA Notification, 14^{th} September 2006
- Air (Prevention & Control of Pollution) Act, 1981
- Water (Prevention & Control of Pollution) Act, 1974
- Noise Pollution (Regulation & Control) Rules,2003 and its amendments

- Forest (Conservation) Act, 1980 and its amendments
- Forest (Conservation) Rules, 2003 and its amendments
- Wildlife (Protection) Act, 1972
- Wildlife (Protection) Amendment Act, 2002
- Environmental Guidelines for Rail, Road & Highways Projects, 1989 (MoEF)
- EIA Manual published by Ministry of Environment & Forests, 2002

The present study is conducted in compliance with the MoEF and World Bank Guidelines.

4.0 PROJECT LOCATION

The project is located in District Chamoli in Uttarakhand. The location of dam site is at village Helong in Joshimath tehsil and power house site is at village Hat in Chamoli district. The nearest railway station is at Rishikesh about 225km from project site

Advance Construction Location

The National Highway No. 58 is on the left bank of the river whereas all the project components are located on the right side. All material and equipment for the project will be transported from the existing road network of NH-58.There is no road to reach the various work fronts. Approach road leading to work fronts is required to be constructed. Four approach roads are proposed under the project which will be taken under advance construction works.

i. Approach Road to Dam site
ii. Approach Road to Langsi adit
iii. Approach Road to Maina adit
iv. Approach Road to Power house & Colony site

5.0 BASELINE ENVIRONMENTAL STATUS

The topography is by and large rugged, the entire region is mountainous.

Land Use : The main land use in the area is 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. There are agricultural fields located at the following locations along the proposed road:

- Proposed Road to Langsi Adit - On the left side of river Alaknanda agriculture fields are located along old road route to Badrinath and on right hand side of river agriculture fields are near Tapon and Dwing Village.
- Proposed road to Maina Adit - Near, Tenduli, Math and Guniyala village
- On the proposed road Power house site - agricultural field were observed on left side of river (before crossing the river, starting from the NH-58)
- There are no agricultural fields along the approach road to Dam site.

Geology: The project area forming a part of Alaknanda valley exposes rocks belonging to Garhwal Group and Central Himalayan Crystalline and are composed mainly of calc arenaceous rocks with basic intrusive and migmatite bodies, while around Helong low to medium grade metamorphic rocks are exposed.

Seismology: The project area lies within seismic zone V. The north dipping Main Central Thrust (MCT) lies about 2 km northeast of the proposed dam site and the seismic status of this thrust is not properly known. The Alaknanda fault and Srinagar thrust are located about 32 km and 45 km southwest respectively of the proposed dam site.

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

Meteorology: The climate of the project area can be divided into four main seasons i.e. winter season from Dec-Feb followed by pre-monsoon or mild summer season from March to May. The monsoon season begins in June and continues upto middle of Oct. The period from second half of the October to November is the post-monsoon season.

The temperature in the area varies with elevation, rises rapidly after March and the month of July is the hottest month of the year with mean daily maximum temperature going up to 27-28^{o}C. The months of December and January are the coolest months of the year, with mean daily minimum temperature as low as 4-5^{o}C. The average annual rainfall is about 125 cm per annum.

Hydrology: The river Alaknada is the main river of the area. The hydrology of the project area is marked with small streams which are basically rainfed and become violent during rainy season. These streams are major concern in the approach road as they are susceptible to flooding during rain causing soil erosion and landslides.The approach road to Dam site has water out let below the road. There are no streams along the approach road. On the approach road to Langsi there is Tapon stream enroute to the adit site on Right Bank of the River. The stream has flooding nature and causes destruction of the adjoining areas. The bridge over the Tapon Nala has been washed away several times by the stream.

Flood was reported in River Alaknanda in 1970, Village Belakuchi settled on the left bank of the river was washed away. The road route to Badrinath was also washed away during the flood and new road route is laid from Pakhi to Langsi.

The approach road to Maina adit on right side at Math village, it is prominent one flowing throughout the year. The approach road to power house site has three small streams on left hand side. The road crosses the river Alaknanda and bifurcate Colony site and surge shaft area. One stream is located at the end of conlony area other is near the power house site.

Ambient Air quality: Ambient air quality is quite good in the area. There are no industries in or along the roads in project area hence any source of atmospheric air pollution is not expected.

Water Quality: Water quality is good. The major sources of water in the project area are streams or nallahs which flow adjacent to the habitations.

Ambient Noise Level: Noise is not a problem in the project area. The noise levels were monitored continuously for 12 hours at each location. The noise level at various sampling stations ranged from 32 to 40 dBA, which were very well within permissible limits specified for residential area.

Agriculture: The cropping pattern in this zone is built around two major cropping seasons, viz. kharif (April-October) and rabi (October-April). Paddy, maize and pulses are the major kharif crops. During rabi season, crops such as wheat, barley, mustard, peas are grown.

Flora: The approach road to dam site passes through the forest area belonging to Van Panchayat. Flora of the area is dominated by Forest Trees tree species. Dominant species comprise of Pine *(Pinus roxburghii)*, Utis (*Alnus nepalensis),* Bhandir (*Albizzia lebbek)*, Surai (*Cupressus torulosa)*, Bakel (*Princepia utilis)* and Kilmora (*Berberies aristata).* All the species found at the site are common in occurrence

On the approach road to Langsi adit Fruit trees of Aru (*Prunus persica)*, Dalim (*Punica granatum)* Akrot (*Juglans regia)* Lemon (*Citrus limon)* and Banana *(Musa paradisiaca)* were observed near Tapon and Dwing villages on agricultural land. All species found are common and found abundantly in the area.

On the approach road to Maina Adit vegetation on Left side of river is sparse with some scattered bushes. The flora of the area constitute of Pine forest, fruit trees, thorny and shrubs. **On the right side there is a dense forest after Guniyala villages as the road approaches the Maina Adit site. Three herb species *Berginia ligulata* (Silpara), *Hedychium spicatum* (Banhaldi) *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. These species are in common category and does not fall in threatened list of Red Data Book of Indian Flora.

On the approach road to powerhouse and colony site all the species are common in occurrence as found at other sites. *Ficus palmata* (Bedu), *Melia azaderach* (Dhenkan) *Phoenix humilius* (Khajoor), *Sapium insigne* (Khinna) are common trees, *Adhatoda vasica* (Basinga), *Agave Americana* (Rambans) *Cannabis sativa* (Bhang) *Eupatorium adenophorum* (Kala bansa) and *Euphorbia royleana* (Sullu)are dominant shrubs in the area. The herbs are represented by *Argemone mexicana* (Satyanasi), *Cassia tora* (Chakunda), *Cestrum verutum* (Kanjalu) *Parthenium hysterophorus* (Gajar ghas) *and Polygonum chinensis* (Syaru)

Fauna: The Advance construction site starts from NH-58 and passes close to settlement and track routes to villages on the Right bank. The wildlife is not found near the highway. However across the river on right bank wildlife movement has been reported. Public consultation was carried in the villages and incidence of domestic animals (cows & dogs) lifting by Leopard and Bear has been reported.

Fauna of the project area is represented by reptiles, birds and mammals. The common wildlife reported were the Leopard, Bear, Monkey, Deer etc .The common birds recorded during the survey were Myna, Magpai, Pigeon, Black Drongo, Grey Shrike and White Cheek Bulbul

6.0 IMPACT ASSESSMENT & MITIGATION MEASURES

Hill Cutting

The construction of new roads involve hill cutting which leads to soil erosion & landslides, generation of solid wastes in the form of debris, dust pollution, disturbance of local drainage, siltation in nearby water bodies and noise & disturbance to wildlife due to blasting. The hill cutting is also likely to trigger landslide in the area.

Mitigation Measures

- The proposed project will utilise the existing road of PWD, the road is part of 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 in left side for this section. This will reduce the impact of road construction
- Minimize hill cutting by following restricted RoW (Right of Way)to the maximum extent,
- Use of full cut method, use of debris as construction material based on their suitability and unused material should be disposed at pre-identified disposal sites.
- Appropriate bio-engineering techniques will be used immediately after hill cutting to maintain stability of slope above and below ROW.
- Work may be restricted during rainy season.

Controlled blasting techniques will be used. Warning will be given to the inhabitants to stay away from the site to avoid any mis-happening

Impact on Flora

The proposed project roads are passing through community forest, dense forest(only near Maina Adit) and open area. The construction activities affect forest by loss of vegetation due to tree cutting. Three herbaceous species *Berginia ligulata* (silpara), *Hedychium spicatum* (Banhaldi) and *Thalictrum foliolosum* (Mamiri) are found in the advance construction area on the approach road to Maina adit these species fall in vulnerable category in IUCN Red list and requires proper conservation.

Other dominant species which are affected are *Pinus roxburghii* (Pine), *Cedrela toona* (Tun), *Bauhinia variegata* (Kachnar), *Melia azaderach*(Dhenk), *Ficus palmata* (Bedu), *Sapium insigne* (Khinna), *Phoenix humilis* (Khajoor) and *Mallotus philippinensis* (Kamela), Shrubs such as *Berberies aristata* (Kashmoi)*, Eupatorium adenophorum* (Kala bansa) *Euphorbia royleana* (Shuru)*, Princepia utilis* (Bhekal) *Zanthoxylum alatum*(Timru) *and Rubus ellipticus* (Hinsar), *Colebrookia oppositifolia* (Bindu)*, Calotropis gigantea* (Aak)*, Lantana camera* (Lantana) *Urtica parviflora* (Kandali) and *Rumex hastatus* (Bhilmora) etc.

Mitigation Measures

Loss of vegetation can be minimized by carefully designing RoW and by implementing compensatory afforestation programme as per the State Forest Department Govt. of Uttarakhand regulations.

- Double no. of trees may be planted in lieu of trees felled. Implementation of approved Compensatory Afforestation Plan in accordance with Forest (conservation) Act 1980 and Uttarakhand Forest Policy.
- The vulnerable species *Berginia ligulata* (silpara), *Hedychium spicatum* (Banhaldi) and *Thalictrum foliolosum* (Mamiri) found in the area will be developed in separate herbal garden. **THDC will undertake development of Herbal garden at suitable place in consultation with Forest Department.** Besides the three species other species of medicinal value may be also encouraged.
- Proper protection measures should be taken for the plantation work carried under the project. Van Panchayats may be involved in afforestation activity and monitoring of the plantation work. Compensation will be given to Van Panchayats for the land, standing crops and fruit bearing trees per R&R policy. Compensation will be provided before initiating construction activity
- Trees falling outside the ROW should not be felled

Impact on Fauna

The wildlife is likely to be disturbed during construction phase due to various activities.

- The construction activity is likely to affect the movement of the animal
- Increase in noise may affect the feeding, breeding and movement of wildlife near forest area. Felling of trees is likely to affect the avifauna.
- Fragmentation of the habitat is not envisaged as the road does not divide any habitat area.

Mitigation Measures

- Poaching will be strictly banned in the Forest area. It may be ensured by the Contractor that no hunting is practiced at the site by any of the worker and that all site personnels are aware of the location, value and sensitivity of the wildlife resources
- The project area is located in the transitional zone of Nanda Devi Biosphere reserve. Movement of wildlife is reported in the area therefore monitoring units be established in the project sites in consultation with Forest Department.
- Plantation of tree species which are major sources of fodder for wildlife in consultation with Forest Department in degraded and open areas.
- Awareness program on Environment and Wildlife Conservation should be provided to the work force. Forest Act and Wildlife Act may be strictly adhered to.

Impact on Land and Soil

The construction activities may lead to soil erosion and landslide. Extraction of rocks and sand for the construction work from quarry sites will degrade the area.

Mitigation Measures

- Bioengineering measures will be applied for slope stabilization. Plantation of grasses, shrubs and trees will be undertaken for slope stabilization. Plant Species recommended for slope stabilization and rehabilitation of quarry and borrow areas

are *Agave americana* (Rambans), *Eupatorium adenophorum* (Basinga), *Euphorbia royleana* (Shuru) *Opuntia dilleni* (Nagphani), *Carissa spinarium* (Karonda), *Zizyphus mauritiana* (Ber), *Rumex hastatus* (Bhilmora) *Colebrookea oppositifolia* (Bindu) and *Bauhinia variegata* (Kachnar)

- Provision for culverts will be given in design near water bodies and proper drainage will be provided along the road
- The extraction of material will be done from the identified quarry site only. The quarry area will be reclaimed back. The pits formed will be backfilled by construction waste and site will be stabilized. Top soil removed during excavation work will be stored separately in bunded area and may be utilized during plantation or refilling of excavated area.
- Construction work may be avoided during rainy season to evade erosion and spreading of loose material.

Impact on Air Quality

The construction activity is likely to impact the air quality due to generation of dust and emission from equipments and vehicles. However the impact will be temporary and limited to construction site.

Mitigation Measures

- 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 may 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 confirm to relative dust emission standards of CPCB.

Noise Level

The noise level of the construction site is likely to increase due to various activities, which may cause disturbance to the inhabitants and fauna in the area. However this impact would be insignificant as the increase in noise shall be intermittent and temporary.

Mitigation Measures

- The machineries, vehicles and equipments use in construction shall strictly confirm to CPCB standard.
- All vehicles equipment machinery used in construction shall be fitted by exhaust silencers. Equipments will be maintained regularly and soundproof gadgets should be used.
- Head phones, ear plugs will be provided to the workers at construction site.
- Blasting shall be carried out as per the statutory laws, regulation and rules pertaining to acquisition, transport, storage, handling and use of explosives

Water Quality

The water bodies near the construction site are likely to be polluted due to runoff from the construction site or spilling of construction material and Turbidity of the water will increase. Four bridges are proposed over river Alaknanda, the quality of the river is likely to be affected during construction. However the impact will be temporary and reversible

Mitigation Measures

- Provision of temporary drainage arrangement due to construction activities will be made by Contractor and clause will be incorporated in General Conditions of Contract document for its effective implementation.
- Silt fencing may be provided near water bodies.
- Discharge of waste from construction/labour camp into water bodies may be strictly prohibited.
- Construction methodologies with minimum or no impact on water quality may be adopted, disposal of construction wastes at designated sites and adequate drainage system may be provided
- Construction activity may be prohibited during rainy season near water bodies.
- Water quality monitoring will be conducted during construction phase

Impact due to Establishment of Labour Camp

During construction phase Construction / Labour Camp will be located along the project area. Large numbers of labour population is likely to influx in the project area. The establishment of labour camps is likely to have significantly affect on environment through improper waste (Solid & Garbage /Sewage) disposal, negative impacts on public health unfriendly use of community resources, poaching of wildlife and leaving dirty & waste material after shifting from one site to another site. Labours may cut trees for cooking purpose.

Mitigation Measures

- Construction of camps will be located at least 500 meters away from habitation and forest areas.
- Adequate supply of fuel in the form of kerosene or LPG may be provided to construction labours to avoid felling of trees for cooking and other household activities. A common community kitchen can be also established. No open fires should be allowed in camps.
- Adequate sanitary facilities may be provided within every camp. The place will be cleaned daily and kept in strict sanitary condition. Separate latrine will be provided for women. Adequate supply of water will be provided. Health camp will be organized to bring awareness about communicable diseases.
- Reference to the illegally cutting trees, hunting and other prohibited activities will be included in the contract document.
- During construction labours/ workers may be hired from local communities also or other part of the villages as far as possible to avoid social conflict in the construction camp and thereby minimizing resources conflict.

- On completion of work it will be ensured that clean area left behind.

7.0 MANAGEMENT ISSUES - CONSTRUCTION AND OPERATION PHASE

The environmental issues during construction stage generally involve safety and public health issue. 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. Environmental pollution during the construction phase will be less but control of pollution during this phase is of considerable importance.

The EMP constitutes of Emission and Dust Management Plan, Construction / Labour Camp Management, Borrow Area Management Plan, Public Health and Safety, Green Belt Development. The mitigation measures during the operation phase will be implemented by Environmental incharge of THDC. Thus the overall responsibility for the implementation of mitigation measures will be with the Construction Contractor during the construction phase and THDC during operation phase. The various agencies responsible for implementation of mitigation measures are summarized below.

S.No	Environmental Issue	Mitigation measures Implementation Agency	Supervision Agency
Construction Phase			
1.	Hill Cutting	Construction Contractor	Site In-charge / Environmental in-charge, THDC
2.	Flora	Construction Contractor	Forest Dept/ Environmental in-charge, THDC
3.	Fauna	Construction Contractor	Forest Dept/ Environmental in-charge, / Project in charge
4.	Land & Soil conservation	Construction Contractor	Environmental in-charge, THDC
5.	Air Quality	Construction Contractor	Environmental incharge, THDC
6.	Noise	Construction Contractor	Environmental in-charge, THDC
7.	Water Quality	Construction Contractor	Environmental in-charge, THDC
8.	Solid Waste	Construction Contractor	Environmental in-charge, THDC
9.	Safety measures	Construction Contractor	Environmental in-charge / Project incharge ,THDC
Operation Phase			
1.	Maintenance of Plantation	Environmental in-charge THDC	Forest Dept
2	Safety System	Environmental in-charge THDC	Project In-charge THDC
3	Maintenance of Drainage	Environmental in-charge THDC	Project In-charge THDC

Water Quality, Air Quality and Noise level monitoring will be carried at construction location by the Construction Contractor as per CPCB guideline. The monitoring activities will be supervised by THDC/Supervision Consultant. Monitoring budget provided under consolidated EA Report

Environmental Budget **Rs.9.0 million**/- has been estimated, tree plantation is included under Green belt development and Compensatory afforestation, provided under consolidated EA Report

Item	**Cost (Rs. million)**
Clearing and grubbing	4.0
Provision of breast walls, construction of catch water and interceptor drains	3.0
Provision of drainage system along roads	2.0
Total	**9.0**