ACKNOWLEDGEMENT

This proposal on Catchment Area Treatment Plan of the proposed Upper Joiner Hydro-electric Project (12 MW) located in District Chamba, Himachal Pradesh, provides and account of degraded areas in the free drainage catchment of the project and suggests various measures for their treatment. The main theme of the exercise is to mitigate and reduce various degradation processes there by minimizing soil erosion in the free draining catchment of the proposed project in order to reduce silt in the Joiner nallah water. The plan also aims at treating and stabilizing various degraded areas in the catchment with activities to reduce pressure on forests with active participation of human population dwelling in the area.

The proposed envisages undertaking biological as well as engineering treatment measures for prevention of soil erosion. It provides an insight into the quantum and variety of activities to be undertaken in the program as per the proposed plan and will go a long way in achieving the goal of prevention of catchment degraded and soil erosion in Joiner nallah basin. The physical and financial targets have been spread over a period of 7 years.

Tejas Sarnika Hydro Energies LTD. record their sincere appreciation and gratitude towards various functionaries of HP Govt. as also public representatives for their blessings, cooperation and guidance in developing this CAT Plan for Upper Joiner HEP (12 MW) in Chamba Forest Division Chamba.

Amongst the Govt. we would especially record our gratitude to Hon'ble Chief Minister Shri Prem Kumar Dhumal for their blessing and guidance. We are grateful to Shri R.K Gupta(IFS), Principal Chief Conservator of Forests, Shri G.S. Walia, Addl. Principal Conservator of Forest, Dr. Goraya, Chief Conservator of Forest, Shri Rajeev Kumar. Conservator of Forests (CAT Plan) & for their valuable suggestions and guidance, efforts have been made to incorporate their aspirations and expectations in the project.

We are indebted to Dr. Suresh Kumar(IFS), Conservator of Forests, Chamba, Shri Anil Vaidya(IFS), DFO Chamba Division and his staff for their valuable association and support to the company officials.

(M. Rahul Reddy)
Managing Director

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UPPER JOINER HYDRO ELECTRIC PROJECT (12 MW)

HIMACHAL PRADESH
CATCHMENT AREA TREATMENT PLAN

Salient Features

Sr. No.	Description	Remarks
1	Project Name	Upper Joiner Hydro Electric Project
2	Location	Tehsil Churah , District Chamba
3	Latitude	32°-44' 14" to 32°-45'43" North
4	Longitude	76°-14 '-52" to 76°-12'-06 East
5	Elevation	3729
6	Installed Capacity	12 MW
7	River/Stream	Joiner Nallah which falls in Baira then in Siul River ultimately joining the Ravi.
8	Catchment Area up to Diversion Site	60.25 Sq. Km. **(Annexure-I)**
9	Under Snow Area	16 Sq. Km.
10	Catchment area upstream of Joiner- Top Project	26 Sq. Km.
11	Project Components	A Diversion Structure in the form Trench Wier 2.25m Wide, 10m long at El. 1928.0 m about 500 m U/s of confluence of Bada Nallah with Joiner Nallah, diverts the water through 40m x 5.75 x 2.6m desilting tanks, 2375m of Head Race Tunnel, and 565m of Penstock to generate electricity in a Surface Power House with Normal Tail Water Level (NTWL) at El 1628m about 150m u/s of Joiner 1 weir on Joiner stream.
12	Total Cost of Project	Rs.72.25 Crores
13	Proposed cost of CAT Plan works	Rs. 1.8 Crores

UPPER JOINER HEP (12 MW)

ABSTRACT OF COST OF TOTAL WORKS

(AS PER TECHNO ECONOMIC CLEARANCE ACCORDED)

S. No	Description	Amount (in Lacs)
i)	Civil Works	4161.68
ii)	Electro Mechanical- Works	2001.28
iii)	Transmission Works	176.75
iv)	Escalation	Nil
v)	Interest During Construction	726.32
vi)	Financial Charges	51.94
vii)	LADA	106.77
	Total	**7224.74** **Say- Rs 72.25 Crore**

INTRODUCTION

The State of Himachal Pradesh is blessed with vast hydro potential, but the Northern Region as a whole is under severe power shortage and the situation in the region is likely to deteriorate further during the 11th and 12th Plan periods unless additional schemes are taken up immediately and implemented to derive timely benefits. The Govt. of Himachal Pradesh is aware of the need for accelerated development of its resources and the responsibility it shares in meeting the power needs of the region. In this context the Himachal Pradesh State Electricity Board has a significant role to play in mitigating power shortage in the Northern Region because of easy accessibility of potential sites in the state besides being located close to the load centres. Accordingly, various major and medium hydro electric projects have been identified by the State Govt/Himachal Pradesh State Electricity Board for implementation to yield benefits during 11th & 12th Five Year Plan Periods.

The Ravi is one of the major rivers of the Indus basin draining this region, originating in the Dhauladhar ranges of the Himalayas at elevation of 5800 m above Mean Sea Level (msl). The river is formed by four major tributaries in the head reaches namely Kalihan, Budhil, Tundah and Siul. A master plan for harnessing the hydro power potential of the river Ravi within its territory has been drawn by Himachal Pradesh and schemes with total installed capacity of 2398 MW have been identified. Today, hydro-electric energy has become an essential requirement for our society and is quite important for socio-economic development, not of the region but of the country. Out of this potential, about 44% has so far been exploited in the form of Holi HEP (3 MW), Chamera Stage-II (300 MW), Bhuri Singh Power House at Chamba (450 KW), Sal Stage-II (2 MW), Baira Suil HEP (198 MW) and Chamera Stage-I (540 MW). Construction works of Hibra (231 MW) renamed as Chamera Stage-III have also been taken up by Govt. of India through National Hydroelectric Power Corporation (NHPC).

Perspective Plan for Power Development in Ravi Basin

The following schemes have been identified in Himachal Pradesh for power development in Ravi basin under perspective plan.

S.No.	Name of Schemes	River/ Tributary	Installed Capacity (MW)
1.	Bara-Bhangal	Ravi	200.0
2.	Bajoli-Holi	Ravi	180.0
3.	Holi	Holi nallah	3.0
4.	Kutehr	Ravi	260.0
5.	Kugti	Budhil nallah	45.0
6.	Harsar	Budhil nallah	60.0
7.	Bharmour	Budhil nallah	45.0
8.	Budhil	Budhil nallah	70.0
9.	Hibra/Chamera-III	Ravi	231.0
10.	Chamera Stage-II	Ravi	300.0
11.	Chamba	Ravi	126.0
12.	Sal Stage-I	Sal nallah	6.5
13.	Bhuri Singh P/ House	Sal nallah	0.45
14.	Sal Stage-II	Sal nallah	2.0
15.	Devi Kothi-I	Kanjtu &Cheni Nallah	7.5
16.	Devi Kothi-II	Balsio nallah	13.5
17.	Sai-Kothi	Baira nallah	17.0
18.	Baira Bihali	Baira	15.0
19.	Chanju Stage-I	Chanju nallah	36.0
20.	Chanju Stage-II	Chanju	17.0
21.	Suil	Suil nallah	13.0
22.	Baira Siul	Baira & Siul nallahs	198.0
23.	Chamera Stage-I	Ravi	540.0

24.	Gharola	Gharola nallah	0.05
25.	Channi	Sundrali/Thaneter N.	18.0
		Total	**2398.0 MW**

Today government is encouraging private participation which could bridge the gap between demand and supply of power.

Project Proposal

Upper Joiner has been contemplated as a run- of- the river scheme on Joiner nallah, a tributary of Baira nallah and Sub-tributary of the river Ravi. It envisages utilization of water of Joiner nallah through a maximum gross head of 300 m for generation of 12 MW of power in a surface Power House located approximately 150 m upstream of Joiner 1 HEP weir site. The project comprises of a diversion weir across Joiner nallah at about 500 m upstream of the confluence of Joiner and Bara nalla, trench Wier intakes, feeder tunnel, de-silting tank approximately 40 m long, a headrace tunnel approximately 2375 m concrete lined, a 565 m long surface penstock of 1.3 m diameter bifurcating thrice to feed Four Horizontal axis Pelton turbine generating units of 3 MW each to generate 12 MW of power in a power house utilizing a design head of 297 m and a design discharge of 5.43 m^3/s. Tail water is proposed to be discharged into Joiner nallah through a box channel. A 33 kV surface Switchyard is proposed on the Front side of the power house.

The project will be able to generate 51.96 MU of energy at the Power House bus bars in 90% dependable year at 95% machine availability. The power generated is proposed to be injected at 33KV/132 KV Sub-Station at Kurthala. This project will have only power benefits, as the scope for irrigation is negligible in these reaches.

range leaves the territory, it gives off a branch to the South-West called the

Location

The Upper Joiner hydroelectric project site is located on the Joiner nallah a sub-tributary of Baira and Suil nallah which is further a tributary of the Ravi between the longitudes 76°-14 '-52" to 76°-12'-06 East and latitudes 32°-44' 14" to 32°-45'43" North in the Chamba District of Himachal Pradesh.

Topography and Catchment

Topography

Lying mostly astride the main Himalayas and touching the Shivaliks on the southern fringe, the catchment area of the river Ravi is rugged and covered with the spurs of the high ranges. The Dhauladhar range separating the basin of river Beas from that of the river Ravi, the Pangi or Pir Panjal range dividing the water shed between the river Ravi and the river Chenab and Zaskar range bifurcating the basins of Chenab and Indus are three well defined snowy ranges, constituting the main topographical features of the area.

The Dhauladhar range running in North-West direction forms the boundary between Mandi and Kullu Districts, at the point where it gives off Bara-Bangahal branch to join the mid Himalayas. It makes a sudden bend westward and for the first time touches the boundaries of District Chamba, on the southern border. From this point, it continues for about 50 kms. forming the boundary between District Kangra and District Chamba.

The Zanskar range is the most direct continuation of the main Himalayan axis. It runs in North-West direction, dividing Ladakh from Lahaul-Spiti and then touches District Chamba, for a short distance along its northern border, separating Chamba and Lahaul-Spiti from Zanskar.

The Pir Panjal range known as the Pangi range within District Chamba after separating District Kullu from District Lahaul-Spiti, enters District Chamba on the western border of the Bara-Bangahal and traverses the district from South-East to North-West for more than 100 km. On the North-Western border, where the Pangi

range leaves the territory, it gives off a branch to the South-West called the Daganidhar which forms the boundary between Chamba and Bhadrawah of Jammu and Kashmir. At its western extremity, this branch is connected by a short ridge, in which are the Padri and the Chatardhar passes. Topographically, the Dagnidhar and the Chatardhar are different sections of one continuous offshoot, forming with the Pangi Range, the water shed between the Ravi and the Chander-Bhaga (Chenab).

River Ravi and Its Tributaries

River Ravi originates from Bara-Bangahal at an elevation of 4229 m above mean sea level, approximately 150 km North-East of historical Chamba town. It flows in steep gradient with series of loops and bends. In between, main tributaries like Kalihan, Budhil, Tundah, and Suil & Sewa contribute lot of run-off to the Ravi. Bara-Bangahal comprises of snow covered slopes at heights ranging from 3050 m to 5800 m, above mean sea level. The total length of the course of the river Ravi is about 720 Kms.

The basin represents some remarkable physical features. The river flows in a North-West direction for most of its course, rises in Baira-Balsio and continues through Traila and Chanota to Ulans, where it is joined by two of its major tributaries in the head reaches viz. Budhil and Tundah. Beyond this, upto Chhatrari, river flows through a narrow gorge whereafter it opens out. After passing through Churi, Bagga, Mehla, Chamba and Udaipur, the river approaches Rajnagar, and then flows in narrow gorge to Sherpur. The Suil river, its largest tributary, joins the river Ravi upstream of Chamera Stage-I dam site. The Sewa river flowing from the north joins the river Ravi near Khairi. It then bends to the South-West and striking the terminal spurs of the Dhauladhar range, separates Chamba from Jammu and Kashmir and finally leaves the territory of Himachal Pradesh up stream of Ranjit Sagar Dam (Punjab).

Budhil nallah has its origin on the slopes of the mid Himalays near Kugti pass. At Harsar, it receives on its left bank the small stream from sacred lake of Mani-Mahesh, situated beneath the peak called the Mani-Mahesh, Kailash at an El.

3952 m. It passes village Bharmour downstream and soon afterwards meets the Ravi near village Kharamukh.

Tundah nallah rises at Kalichtop pass, flows through Tundah valley and joins the Ravi near Kharamukh. The right bank tributaries are bigger and have more discharge as compared to the left bank tributaries except Kalihan, which originates in Dhauladhar range on the left bank and contributes a good discharge. Both Budhil & Tundah are about 54 km in length.

Joiner nallah on which the project is located consists of four nallahs namely Tanger nallah, Diyothal nallah, Mehad nallah & Bhararu nallah. Tangar nallah originates at El. ± 4556 m from Dratijot, Diyothal nallah at El. ± 4892 m, Mehad nallah at El. ± 3901 m from Duga. Bhararu nallah consists of four nallahs namely Nakal nallah, Panglod nallah, Juri nallah & Ganj nallah originating from El. ± 4278m, El. ± 5238 m, El. ± 3800 m and El. ± 4774 m respectively.

Catchment

The Upper JOINER HEP envisages the utilization of the flows of Joiner Nallah. The diversion is about 500 m upstream of the confluence of Bara and Joiner Nallahs. The total catchment area of the Joiner Nallah up to the proposed diversion site is 60.25 sq. kms, out of which 16 km² (26.25%) area is snow bound. The catchment area of Joiner Nallah basin up to Power house is 108 km².

The basin is a narrow leaf shape. The equivalent slope of the river from its origin to the proposed diversion site is about 100.50 m/km.

There are a few glaciers in the upper part of the Upper Joiner basin. There is good forest cover in the basin particularly on the left bank of the Joiner Nallah.

contribution only from base (ground water flow/ sub-surface flow) in the river.

Meteorological Characteristics

Precipitation

The precipitation in the catchment takes places in the form of snow and rain. The catchment receives good rains from June/July to September due to the South-west monsoon. In this basin, little rainfall is observed during winter (November.-February) and spring season (March-April). The precipitation during winter falls as snow, primarily due to western disturbance that pass over the North-West part of the country during this period.

The annual rainfall records are available for the 13 non-recording rain gauges of Chamba District. The normal annual rainfall and year wise annual rainfall has been recorded in millimeters at all these stations for the period 1960-2002 by the office of Director, Land Records, Revenue Department, Govt. of Himachal Pradesh.

It is observed that out of these 13 rain gauges, no rain gauge exists in the Upper Joiner basin. Tissa rain gauge is far away from the basin, but still it is relatively closer to the basin as compared to other rain gauge stations. Annual average rainfall at Tissa is available from 1960-2002, except for 4 years (1968, 1973, 1980, 2002). The annual rainfall observed at Tissa is 1050.7 mm, ranging between 32.5 and 2178.8 mm. The elevation of Tissa rain gauge is 1550 m.

About 94% of the basin lies above 2000 m altitude, which clearly shows that the major part of the basin experiences moderate to heavy snow fall during winters. However, the non-availability of records on snow precipitation at Tissa or any other station near by makes it difficult to assess the snow contribution from the basin.

Hydrological Characteristics

The Joiner Nallah receives runoff contribution from rain, snow and glaciers. The contribution from different sources and their temporal distribution make this nallah perennial in nature. The winter precipitation falling as snow accumulates in this basin and does not contribute to the stream flow immediately because melting does not take place in the basin during this period due to very cold climatic conditions. Moreover, there are no rains (or little rain) during this period. There is

contribution only from base (ground water flow/ sub-surface flow) in the river. Consequently the discharge of the Joiner Nallah dwindles down to the lowest flows during winter months (December to February).

As spring season sets in, the melting of seasonal snow accumulated in the basin starts and flow in river also starts gradually increasing by the end of February /March. The runoff generated from the melting of snow dominates the stream flow during summer months till monsoon rains are experienced in the basin. The stream flow characteristics of the river show a high discharge during monsoon months (June-September) due to rainfall as well as melting of glaciers located in the upper part of the basin. In general, July and August are the months when maximum discharge is observed, which is due to maximum melting from glaciers and high monsoon rainfall in the lower part of the basin.

Tehsil	Panchayat	Ward	Village	Human Population

SOCIAL ECONOMIC DESCRIPTION

The project is located in Kajwa Panchayait where the human population is about 2400. The economic sattus of the resident of the panchayait is that 80% of the total population is agriculturist a very few people are employes in government jobs. The population of the live stock is around 8000.

Human Population:

There is no village inside the catchment area. However, human population of nearby villages, the total population is about 2400 out of which 1370 are registered in voter list.

Tehsil	Panchayat	Ward	Village	Human Population
Churah	Kajwa	Shrigadh	Shrigadh	243
			Balwas-I	154
			Balwas-II	76
			Kandog	59
			Tuhrog	78
			Gurnia	68
			Kaiya	24
		Bihali		
			Shallan	87
			Mella	53
			Thon	98
			Bihali-I	167
			Bihali-II	95
			Kilotha	72

Tehsil	Panchayat	Ward	Village	Human Population
Churah	Kajwa		Mukwa	91
		Kandodi		
			Dhawas	232
			Khill	81
			Shekra	154
			Mundla	73
			Kartoth-I	45
			Kartoth-II	56
		Kajhwa		
			Kajhwa	276
			Guyai	167
			Goltha	24
			TOTAL	**24000**

The local communities are by and large agrarian and a few young generation members are currently working outside either in Government services or in unorganized sector. Though cultivation of wheat, rice, and potato is the traditional practice, local people have started to grow apple, walnut, pear, and other commercially viable crops. Animal husbandry (esp. rearing of sheep and goats) has been practiced by the local communities as a source of supplementary income. There are two primary school in Shrigadh and Bihali and an dispensary at Shrigadh.

Cattle population:

Population of live stock in the villages which are outside the catchment the number off livestock is around 8000.

CATCHMENT AREA TREATMENT PLAN

General

In case of some hydroelectric projects on Ravi basin, CAT Plans have been prepared and approved covering only the direct draining areas in the respective projects but in the absence of any specific directions on this aspect given by Govt. of India in their guidelines issued in 1994, entire catchment area draining up to Trench Wier diversion of Upper JOINER HEP on Joiner Nallah has been considered for formulation of catchment area treatment plan.

Catchment area treatment measures are essential not only for conservation of soil for maintaining and even enhancing productivity but also for reduction of sediment load flowing through Joiner Nallah. Apart from accelerated siltation of storage behind the dams, the increased silt load in rivers have adversely affected the turbines through corrosive action of silt particles as experienced in hydroelectric projects on Satluj river and its tributaries. Therefore, special attention has been focused on this aspect in the present report.

Estimate of Soil Loss Using Silt Yield Index (SYI) Method

The **Silt Yield Index** (SYI), considering sedimentation as product of erosivity erodibility and arial extent was conceptualized in the All India Soil and Land Use Survey (AISLUS) as early as 1969 and has been in operational use since then to meet the requirements of prioritization of smaller hydrologic units within river valley project catchment areas.

The **Erosivity Determinants** are the climatic factors and soil and land attributes that have direct or reciprocal bearing on the unit of the detached soil material. The relationship can be expressed as:

> **Soil Erosivity** = f (Climate, slope, soil parameters, land use/land cover, soil management).

Silt Yield Index: The Silt Yield Index (SYI) is defined as the yield per unit area and SYI value for hydrologic unit and is obtained by taking the weighted arithmetic mean over the entire area of the hydrologic unit.

Prioritization of Watersheds/Sub watersheds

The prioritized of smaller hydroelectric units within the vast catchments are based on the Silt Yield Indices (SYI) of the smaller units. The boundary values or range of SYI values for different priority categories are arrived at by studying the frequency distribution of SYI values and locating the suitable breaking points. The watersheds/sub watersheds are subsequently rated into various categories corresponding to their respective SYI values.

The application of SYI model for prioritization of sub watershed in the catchment areas involves the evaluation of:

a) Climatic factors comprising total precipitation, its frequency and intensity.
b) Geomorphic factors comprising land forms, physiography, slope and drainage characteristics.
c) Surface cover factors governing the flow hydraulics and
d) Management factors

The data in climatic factors can be obtained for different locations in the catchment area from the meteorological stations whereas the field investigations are required for estimating the other attributes.

The various steps involved in the application of model are;

- Preparation of a framework of sub-watersheds through systematic delineation.
- Rapid reconnaissance surveys 1:50,000 scale leading to the generation of a map indicating erosion-intensity mapping units.

- Assignment of weightage values to various mapping units based on relative silt-yield potential.
- Computing Silt Yield Index for individual watersheds/sub watersheds.
- Grading of watersheds/Sub watersheds into very high, high medium, low and very low priority categories.

The area of each of the mapping units is computed and silt yield indices of individual sub-water sheds are calculated using the following equations:
Silt Yield Index (SYI) = (Sum from i=1 to n of (A_iXW_i) X100)/Total Area considered.

The SYI values for classification of various categories of erosion intensity rates are given below:

Criteria for Erosion Intensity Rate

Priority Category	SYI Values
1. Very High	1400 and above.
2. High	1200-1399
3. Medium	1000-1199
4. Low	<1000

Source SYI Method, AISLUS

All India Soil and Land Use Survey Organization, Department of Agriculture and Cooperation, Ministry of Agriculture Govt. of India conducted rapid reconnaissance survey on delineation of priority sub watersheds for integrated watershed management in the catchment of the Ravi River valley Project above Thein Dam Punjab, J&K and Himachal Pradesh from May to July 1986.

In the total catchment area of 60.25 sq km, most of the remaining area is covered under the legal term "forest" including snow/glacial. This forestland is classified in one category i.e. Reserved Forests in forest records. The rights of local people for fodder and grazing of cattle have been recorded in revenue papers as "Charagah drakhtan" or "Charagah billa drakhtan" i.e. (grazing land with trees or grazing lands

without trees) in the protected forests around the habitations. Similarly grassland in alpine zone grazed by migrated sheep and goat for a couple of months during summer is termed as "dhars". Therefore, different nature of problems arise on varied lands depending on their locations and type of use to which they are put and thus approaches for their treatment and improvement have to be different. In this background, type of treatment required for each type of problematic categories has been described in paragraphs that follow.

A series of biological measures (including afforestation, enrichment plantations, pasture development, medicinal plant development, agriculture and horticulture) and engineering measures (gully plugging, contour cultivation, contour bunding, graded bunding, land slip stabilization and stream bank stabilization) in the regions of high erosion have been proposed as part of the catchment area treatment plan.The total catchment area of the project is 60.25 sq. km and the different SYI Value of different sub water sheeds are tabulated in the table below.

Name of sub water sheed	SYI Intensity
TF4d	High
TF4f	Very High
TF4a	Very High
TF4g	Very High

AFFORESTATION

General

Since this is mountainous tract with moderate to steep slopes, gully formation due to water/snow flows in the depressions are bound to occur. Therefore, all the afforestation works will have to be supported by anti-erosion measures like gully plugging, check dams etc. in varying extent. The following types of areas are proposed for afforestation aided by varying types and degrees of soil conservation measure and check dams:

(i) Evergreen forest blank detected through Remote Sensing.

(ii) Heavily grazed areas around habitations.

(iii) Blank area fit for bringing in vegetation and draining directly in the vicinity of diversion dam storage.

In the background of above criteria, limitation of extent of area which can be closed with the consent of local people (right holders) and in consultation with local field forest officers, it is proposed to do afforestation of 78 ha over a period of 4 years, starting from the 2nd year of CAT Plan implementation. A provision of maintenance of plantation for 3 years has been made.

PROPOSED AREAS FOR AFFORESTTION IN JOINER BLOCK
(UNDER CAT PLAN OF JOINER- I HEP) IN TIKKRIGARH RANGE
I Bara Beat

1. **Bara RF (715 HAC)**

The area in Bada village is at about 2.5 Kms from Salan village. The slope is medium. This area is suitable for plantation of Ban, Aesculus, Celtis and can be planted.The area has sparsely growth of bushes and has an easy access from forest guest house at Bara. **A total of 30 ha has been identified for afforestation in this area. And a total of 10 ha has been identified for enrichment plantation. And a total of 4 ha has been identified for energy plantation.**

2) Dang Makua RF (526 ha)

Total area is about 526 Ha. It also has southern-aspect. The Slope is medium. The area is covered with thick bushes like Indigofera, Berberis Principea, The tree species like Abies pindro, Picea smithiana & few Robinea etc also found around the area. Kail, Deodar Robinea & other B/Leave species can be tried in the area. Nearest nursery is Sallan at a distance of about 3 Kms. . **A total of 20 ha has been identified for afforestation in this area.And a total of 10 ha has been identified for enrichment plantation.**

3) Bara UPF (10 Hac.) .

The slope is medium and the area has growthof Berberis Principea, Cotoneaster as bushes species like , Aesculus are also found around the area. This area is suitable for plantation and has an easy access from forest guest house at Bara. Ban & other broad leave species can be tried in the area. The area is adjacent to Bara RF. Nearest nursery is Shallan at a distance of about 2.3 Kms. **A total of 3ha has been identified for Energy Plantation in this area**

A total of 77Ha(50 ha for afforestation and 20 ha for enrichment plantation and 7 ha for energy plantation has been indentified for planting. The Details have been given at end in Annexure A and Annexure C.

Main Species to be planted are

1. Albizzia procera benth
2. Melia azedarach
3. Goon (Aesculus indica)
4. Piak (Alnus nitida)
5. Ritha (Sapindus mukrossi)
6. Robinia pseudacacia
7. Akhrot (Juglans regia)
8. Grewia oppositifolia (Bihul, Dhaman)
9. Deodar (Cedrus deodara)
10. Banoak (Quercus leucotricophora)/ Green Oak

ALBIZZI procera benth
Artificial Propagation
Ripe pods are collected before they dehisce on the tree. These are dried in the sun, beaten and winnowed to get the clean seed which is dried for a few days before storage.

For raising nursery stock, the sowing is done in April-May under irrigated conditions; the seed is put in cooling boiled water and allowed to soak for 24 hours to soften the seed coat. Sowing is done in lines about 8 cm. Apart and the seedlings are spaced about 5 cm. in the lines. About 30 gm seed is sown per square metre of nursery area. The germination of the treated seed commences in about 3-4 days and takes about 2-3 weeks to complete. Weeding and watering of nursery beds are regularly done.

The seedlings raised from April-May sowing attain a height of about 5 cm by July-August when these are planted out in 30 cm pits dug during summer months. Monsoon planting is better than either summer or winter planting. The seedlings taken out from the nursery are planted out either with balls of earth or with naked roots. In the latter case, the lateral roots of the seedlings are pruned and some lower leaves are plucked at the time of planting.

MELIA azedarach

Artificial Propagation

Melia azedarach can be raised either by direct sowing or by planting out nursery raised seedlings or stumps.

Seed Collection and Storage
Fruits are collected during January-February from the trees. They are rubbed and washed to remove the outer pulp. The stones are dried and stored.

Nursery Technique
Sowing is done in nursery beds during February-March in drills 15 cm apart. Keeping the seed in liquid farm yard manure for about a week is reported to improve germination. The seeds are sown about 2 cm deep and about 5 cm apart in the drills. About 1000 gm seed is needed to sow each square metre of the

nursery area. The nursery beds are irrigated after sowing and at regular intervals thereafter till germination are completed. Germination starts in about three week's time and may take about two months to complete. Each fruits may give rise to as many as four seedlings and at places the seedlings will appear in clumps and will have to be subsequently thinned. Regular weeding of the nursery beds is also necessary as the seedling are susceptible to weed competition on completion of germination, the seedlings should be thinned to a spacing of about 10 cm so as to have a spacing of 15 x 10 cms. The seedlings are transplanted in the nursery beds in July when these are about 2-3 months old. They are retained in the nursery for one more year when they are uprooted for planting out.

Planting Technique

The seedlings are planted out either in July or during winter months when these are leafless. For planting out entire plants in July, the seedlings are uprooted from the nursery with balls of earth. Planting is done in 30 cm3 pits dug in advance.
Stumps are prepared from 15 months old seedlings are planted in 30 cm3 pits in the same manner as entire plants.

GOON (Aesclus indica)

Goon can be raised by direct sowing. Ripe fruit is collected during October-November and sown in patches during December. About 4-6 seeds are sown in a patch. Germination starts in March-April. At the end of one season, only one best frown plant be retained in patch and remaining ones be safely cut. Regular weeding of patches can be done during first year.

PIAK (Alnus nitida)

Piak can be raised either by direct sowing or by nursery raised seedlings.
Seeds are collected during October-November rubbed and washed to get the seed which is dried in shade. Seed can also be separated by winnowing lightly.
For direct swing, the seed is mixed in fresh cow dung and then the cow dung mixed with seed and diluted with some water is broadcast over the area in thin layers during winter (December-January). This method is useful particularly in case of land slips. The seeds germinate during March-April and plants soon take possession of the ground. For nursery raised plants, the seed is mixed with some soil and sown in nursery beds in lines 22 cm apart. There is no need to further cover the seed by soil since seed is very small. Sowing is done during December. The nursery should be located in planting zone. Germination starts in March-April. Regular watering is done in dried months. Weeding too is necessary when plants become 10-15 cm high, these are spaced out about 10-15 cms. The weaklings are uprooted from lines with care and well grown seedlings are retained at a spacing of 15-20 cms. Plants become plantable when about 8-9 months old. Planting be done preferably in 45 cm pits, naked root.

RITHA (Sapindus mukrossi)

Ritha can be grown by nursery raised transplants. It is natural to the tract. It can be grown at elevations from 800-1500 m on hot aspects.
Fruits are depulped and seed which is loose inside is taken out. Seed is sown either during August-September or March-April in sunken nursery beds. Nursery should be located in planting zone. Seed is sown at a spacing of 10 x 22 cm and a

depth of 2-2.5 cm. regular watering to beds is done but flooding is to be avoided. Germination starts in about two weeks and takes 5 weeks to complete. Plants sown in August-September are pricked out in December in nursery beds at spacing 15 x 22 cm. Lines being kept 22 cm apart and plant to plant spacing is kept 15 cm. Plants of March-April sowing are pricked out in July-August. Regular watering / weeding to nursery beds is done. Pricking is done in holes made with debblers. The hole should be of sufficient depth to accommodate roots of plants. Plants become fit for planting when about 15 months old. August-September sowing is planted in next winter while March-April is planted in next monsoons. Naked root planting is done. Plant lesser than 30 cm height should be culled out in nursery and should not be planted.

Ritha can also be raised by P. Bags raised plants. For it, the nursery should be located near planting site. The P. Bag method be used for low elevation, planting (800-1200) because the plants are kept in P. Bags for a short duration (3-4 months) and may not attain plantable size (about 20 cm) at higher elevation. For monsoon planting, sowing in P. Bags is done during March-April. Sown P. Bags plants are planted during monsoon rains and planting be completed by end of July. Similarly for winter planting seed is sown in P. Bags during August/Early September sown and plants are planted during winter rains.

ROBINIA pseudacacia
Artificial Propagation
Black locust can be propagated by planting out either nursery raised seedlings or root suckers.

Seed Collection and Storage
The pods are collected from October to December. These are dried in the sun, thrashed and winnowed to obtain clean seed.

Nursery Technique
The seed requires pre-sowing treatment which may consists of immersion in sulphuric acid or dipping in hot water or soaking in cold water. Hot water treatment, which is normally adopted, consists in soaking the seed in cooling boiled water for 2 to 5 minutes and allowed to soak at room temperature for 8 to 10 hours.
Sowing is done in the nursery beds in lines about 20 cm. apart. The spacing between the seeds in the lines is about 5 cm. and depth of sowing is about 1.5 cm. Sowing is normally done in March in irrigated nurseries.
Germination starts in about 7 days and takes about 10 days to complete.

Planting Technique
The plants from March sowings become fit of planting in the following December-January months when they attain height of about 1-2 m.
Planting is done in pits of 30 cm^3 in advance. Spacing adopted is generally 2.5x2.5 m for compact block planting. Space of 2x2 m is adopted for comparatively poorer sites. Bush cutting is done at the time of planting. Naked root plants are planted out. Sometimes root suckers are also used for planting. The tap root is cut and the

lateral roots are pruned so as to accommodate the root system of the plants in 30 cm^3 pits. The plants are bundled and the roots wrapped in gunny bags during transport.

AKHROT (Juglans regia)
Seeds are collected during October-November and sown in nursery beds either during December before snow fall or during March just after snow melting. Spacing is kept 10 cm. between seed to seed and 22 cm. from line to line. Seeds germinate after snow melting and germination completes within a month. Regular watering is done to beds. Weeding too is necessary but care be taken not to disturb the plant. Plants are planted naked root in field during next winter when these are about twenty one months old. In case plants develop long taproot, then the taproot portion is cut to size so as to accommodate it in 45 cm. size pit. Planting should not be done during monsoon rains.

GREWIA oppositifolia (Bihul Dhaman)
Artificial propagation is done by planting out either nursery raised seedlings of stumps.

Seed Collection and Storage
The fruits ripen from October to December depending upon the locality. The flesh of fruits is sweet and as such these are devoured by birds. A substantial quantity of the fruit crop may be eaten away by birds if seed collection is delayed. The fruits are not borne on current year shoots. Trees lopped completely do not, therefore, bear fruits. The trees reserved for seed production should either not be lopped at all or should be lopped only partially.
The fruits are rubbed and washed in water to remove the flesh. Each fruit contains 2-4 seeds. The seeds have hard testa and store well for at least a year without any appreciable drop in vitality.

Nursery Technique
Sowing in the nursery is done in March. Pre-sowing seed treatment is necessary to hasten and improve germination as the seed testa is hard. The seed is sown in 2 cm. deep in lines 15 cm. apart. About 250 g. Seed is required to sow each square metre of nursery area. The nursery beds are irrigated after sowing and regularly thereafter till germination is over. Germination starts in about 10 days and takes about a month to complete. Regular weeding is also necessary. At the time of weeding, the seedlings are spaced about 10cm. apart in lines. The seedlings grow fairly fast and attain plant able size by July. For stump planting, seedlings of 15 months age are normally used.

Planting Technique
Planting is done in July. Late planting usually results in poor survival. The seedlings are uprooted from the nursery with balls of earth and wrapped in moist gunny bags. Planting is done in pits of 30 cm^3 dug during summers or with the beginning of rainy season.

DEODAR (Cedrus deodara)

Preparation of Nursery

The nursery should be located in low elevation in deodar zone. Natural blanks, frost holes, badly drained pockets and exposed ridges should be avoided. Soil should be deep fertile and well drained. Loamy soil be preferred. Regular water supply is very essential particularly in drier months. It is estimated that for 1000, plants about 40m^2 nursery area is required.

Seed Collection and Storage

Seed be collected from healthy, middle aged, self pruned trees of good form and quality. It is desirable to select good quantity forests stand to manage them as seed stands. Cones are collected and during October-November and dried in sun. After these have opened, the seed is separated by winnowing. Sufficient quantity of seed be stored in sealed tins in cool/dry place.

Sowing in Nursery

Sowing is done in raised nursery beds before first snowfall in November-December. Seedlings should be sown in line 10 cm. apart. Germination will take place in March-April when snow melts. Beds may be watered in May-June, if dry weather prevails. Weeding in nursery but care be taken not to disturb the roots of seedlings.

Transplanting

During July when seedlings are about 4 months old, these are transplanted in nursery at a spacing of 15x22 cms. In raised beds. Lines being 22 cm. apart and plants in lines 15 cm. apart. For transplanting, holes be made with dibblers. Regular weeding is necessary. Light watering is done in drier months. The plants are to remain in nursery till 2 years after transplanting.

Planting

Pits should be dug in March-April after slash clearance in the area is over so as to allow sufficient time for weathering of the soil and to complete the planting work in time when the rains set in. Pits should be 30 cms deep and 30 cms in diameter at the escapement of 2.5m x 2.5m approximately. Planting shall be done with the onset of rains and should be completed by the first week of August at the latest. Plants should be culled from the nursery beds with great care and this work should not be left to the labourers. In case the plants are to be carried for long distances they should be wrapped in moist gunny bags. While carrying out these operations, it is absolutely necessary to ensure that the root system does not get damaged even in the least. Grading of nursery stock is absolutely essential and all unhealthy or weakly growing stock is required to be discarded. While planting out special care is required to avoid the curling of the top of the seedlings root.

BANOAK (Quercus incana)

Propagation and Protection

The ban is best propagated by direct sowing in situ in March under cover. The growth of young seedlings is exceedingly slow under natural conditions. Working of the soil, weeding and watering assist their establishment and accelerate their

growth. Coppice shoots can be depended upon from trees only up to three feet in girth. As the Ban is of low economic importance, the nursery technique is seldom resorted to. Dry, hot, southern slopes should be avoided for raising Ban plantations.

The Ban suffers most at the hands of graziers; its leaves are avidity sought out for leaf fodder. Continuous lopping of oak forests around human habitations in the tract has led to their deterioration and therefore its growing stock is on decline. The technique adopted for artificial reproduction is as under:-

Seed Collection
Fruit, acorns are collected in November-December while still on trees. Collection is done either by plucking individual acorns which is very costly or by light lopping of the trees bearing good fruit because the fallen seed is immediately attacked by some worm/insects creating holes in the seed which renders it unfit for germination.

Seed Storage
The acorns should be dried in the shade and kept in cool place. Storage of oak acorns is difficult and efforts should be made to sow them immediately after collection.

Plantation

Choice of Species

The choice of species depends on the various factors, such as climatic, edaphic, topographic and biotic but the surviving indigenous species give a clear indication of the most suitable species. Since most of areas included in this component, are situated at lower elevations, therefore, preference should be given to indigenous, fast growing, hardy, species which can survive under the adverse condition of the locality. Sincere and strenuous efforts should be made to bring the blank areas under forest cover as early as possible. In order to cover up the blank areas expeditiously, at the earliest, the maximum area has been suggested to be taken up during the 1st & 2nd years. Soil conservation works have also been prescribed along with afforestation measures where ever necessary.

Plantation Technique

a) Site Selection

Specific sites have been suggested and location of plantation is also indicated in the above statement. However, if the deviation is absolute necessary, some changes can be done by the Divisional Forest Officer after spot inspection.

b) **Closure Notification**

Each plantation area will be notified for closure and supervision of rights, one year in advance of plantation work. According to provision made in Forest Settlement, one third of total area of forest can be closed for thirty years, but it is normally not practicable. The area should remain closed effectively till the regenerated crop reaches the stage beyond any damage due frost, drought, and weeds and needs no longer protection from animals. Hence the period of closure may be kept 10-20 years depending upon growth of species planted.

c) **Fencing**

Where necessary plantation areas where necessary will be effectively closed with 3-5 strands barbed wire fencing. Fence posts should be of durable species. These should be buried in ground along the periphery of area to be closed at suitable spacing, deep enough to withstand weight and tension in barbed wire. It should be borne in mind that loose, zigzag and haphazardly aligned barbed wire fencing would provide least resistance to animals of vicinity and efforts so made in raising plantation will, surely, be unproductive and invite unnecessary criticism of local people. It would be better if some branches of fast growing species are reinforced in fencing to provide adequate tension in the strand of barbed wire. Non-palatable fast growing shrub species like Adhetoda, Vitex, Agave, Debregeasia, etc. shall be planted along the barbed wire fence at a close spacing of 50 cm to form a live hedge.

d) **Preparation of Site**

Pits on standard size 30 cm diameter for Deodar, Kail, Fir/Spruce and 45cm is diameter for broadleaved well in advance so as to provide an interval of 2-3 months between pit digging and planting for weathering of soil.

e) **Spacing**

Planting for coniferous at space of 2.5m X 2.5m and that of broad leaved 3m X 3m is general practice and it should be continued however while treating eroded portions suitable broad leaved may be planted at the space of 1.5m X 1.5m.

f) **Sowing and Planting**

Planting should be preferred to sowing, though the later operation may be cheaper. Success is more certain and initial growth more rapid, in case sturdy nursery raised plants are used. Sowing may be carried out only on comparatively better sites, where these are expected to be easily successful. Piak (Alnus nitida) along nala and sowing of Deodar can be preferred. But certainly Piak dibbling / sowing must be carried out only in marshy lands/naals.

ENRICHMENT PLANTATION

Enrichment plantation will be carried out in degraded forest area in the Catchment, so as to increase stocking in already existing open forest. This has to be a selective process and should result in better diversity / abundance of key species. A norm of 600 plants per ha (notional) would be adopted and plants of the desired species would be planted under this component.

A total of 20 Ha has been indentified for planting including thorny brush protection guard under this scheme for a total outlay of **Rs.2.86 lacs**. The preliminary forest identified for this purpose are as under **BARA BEAT.**

ENERGY PLANTATION

Energy plantation would be carried out to fulfill the wood and fodder requirements of the local people. The locally available fuel wood and fodder plant species in various agro-climatic conditions will be planted. The energy plantation would be carried out over **7 Ha** land in the vicinity of the habitations. Owing to the increased biotic pressure in these areas, greater emphasis would be placed on effective closure and hence 3 strand barbed wire fencing would be adopted. 5000 plants per ha would be planted, but there would be no maintenance costs involved. The provisions for outlay of **Rs. 7.0637 lacs** including fencing has been considered under this scheme. **Annex.-C given at the end.**

NURSERY DEVELOPMENT

There is one old forest nurseries in the project vicinity which are considered for production of quality seedlings / rhizomes. The nurseries will also be managed to accelerate timely production of seedling required for plantation and soil conservation works in the catchment. Bulk planting of Bio-engineering species suitable for the catchment would be raised in these nurseries in addition to regular forestry species.

The existing nursery is located in Shallan in Bara Beat.

The work on raising / development of nurseries will start from first year and the plants will be maintained subsequently. Provision for vermi composting unit has also been proposed under this scheme for these nurseries. The provision for outlay of **Rs.2.00 lacs** has been kept for the development of the existing nursery.

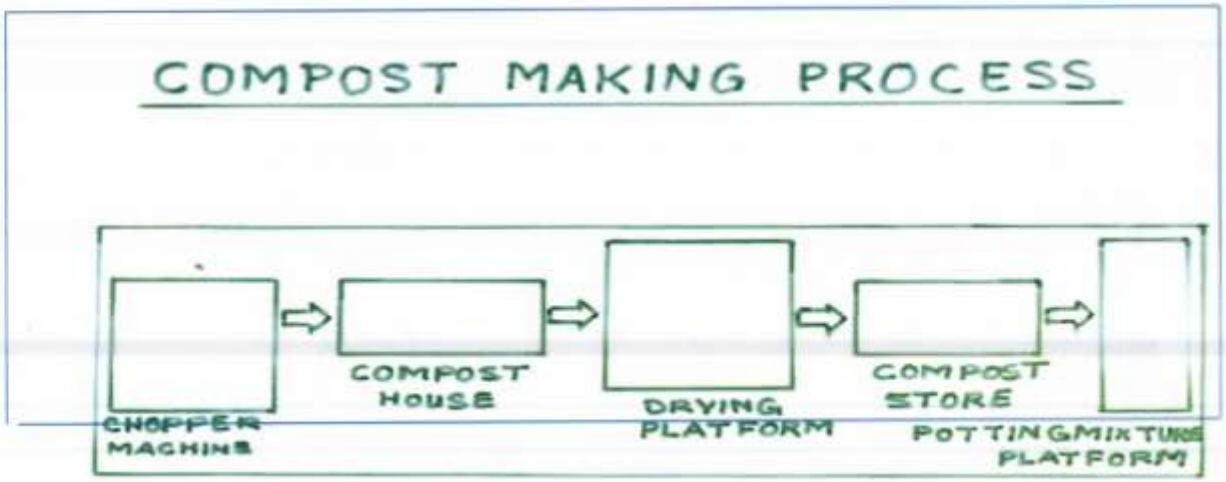
SOIL & WATER CONSERVATION

Solid Check Dams

A total budget provision of **Rs.47.085 lacs** has been made towards the Soil Stabilization and Engineering measures to be taken up in Joiner catchment. The details of different protection measures are given in **Annexure-C.(given at the end)**.

It has been observed that the main nallahs have solid stable banks, rocky beds with lot of loose stones and boulders. The nallahs are perennial with heavy water flow. Some of the nallahs have already been taken up for treatment as such the main nallahs do not require much treatment. However side branches of these nallahs require treatment. The details of various areas observed for treatment and recommended for soil & moisture conservation works in different nallahas is as under;

COMPOST MAKING PROCESS



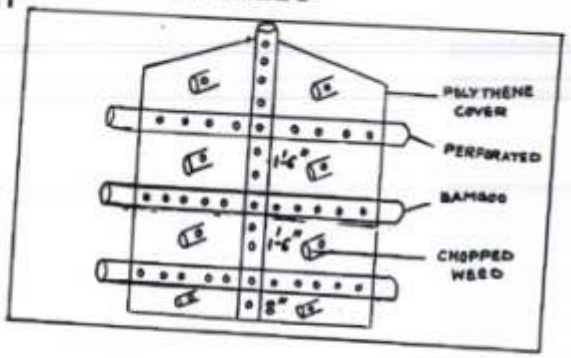
IN THE INITIAL STAGE OF PLANT LIFE, PARTICULARLY IN NURSERY STAGE, PROPER MEDIA AND NUTRITION ARE VERY IMPROTANT FACTORS WHICH DETERMINE THE FUTURE GROWTH OF PLANTS. THE COMPOST IS LIGHT, FRIABLE AND RICH IN NUTRIENTS TO SUPPORT THE YOUNG SEEDLINGS WHICH CAN BE PREPARED FROM CHOPPED WEEDS OR STRAW OR GRASS BY AEROBIC DECOMPOSITION.

Dr. Suresh Kumar, IFS
CF, Chamba.

ESTABLISHMENT OF MODREN NURSERIES WIT

The compost unit is a masonry chamber shed of fitting by 15' length 5' in width & 4 ' in height depending upon the amount of compost to be produced.

- Shed is divided into 3 chambers
- Roof of the shed and top portion is covered with transparent polythene sheets of proper thickness.
- The foundation and plinth is in masonry cement & floor is of cement concrete.
- Sheds are provided with 4 " PVC or cemented pipes with holes inbuilt for proper aeration.
- 1st pipe is kept about 8" above the ground and the second & subsequent are at 1.5' above it as shown in the diagram.
- The pipe shown criss –cross for proper circulation of air.
- Doors of the shed are made of wood.
- Material used (weeds, twigs or grasses) for making compost is mixed with approximately 1 Kg. of Urea in about 1 m^3 of chopped material and duly moisturized to give a good compost (preferably 4-5 days material is mixed for facilitating proper decomposition).
- Aerobic degradation starts in optimum temperature of 25^0 C-30^0 C. and once decomposition starts the heat is generated upto 55^0 to 60^0 C.
- During the process various chemical reactions takes place.
- Register is maintained for recording the daily temperature and amount of compost produced.
- High temperature is the indication of process of composting whereas falling temperature to the atmospheric temperature is indication of Completion of process.
- Compost will be ready in about 25 to 30 days if, suitable moisture and temperature is maintained for aerobic decomposition.
- Record for minimum & maximum temperature is maintained in a register.



AEROBIC DECOMPOSITION FOR MAKING COMPOST FROM WEEDS

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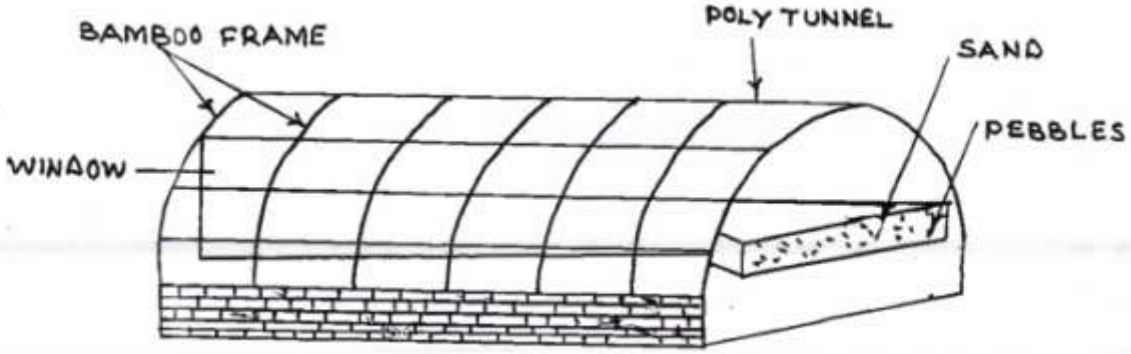

GERMINATION CHAMBER

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Dr. Suresh Kumar, IFS
CF. Chamba

Platform for drying

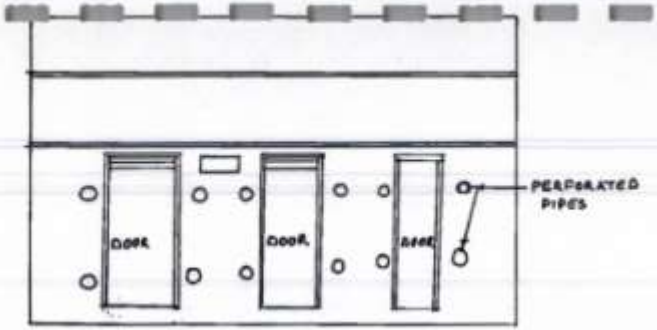
Cemented platform of 10 feet to 8 feet provided in front of composting shed.

Compost extracted from the shed is removed and put on the platform for drying.

Dry it and sieve it and will be ready for use in the route trainers.

Compost so prepared will be light, friable and riche in nutrients to support the young seedlings.

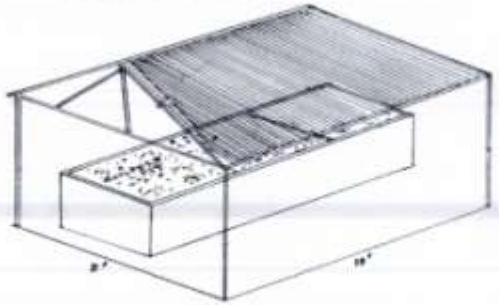
Compost so prepared is mixed with sand 1 part and compost 2 parts in route trainers, preferably the sand should be sterilized by heating before it is mixed with compost.



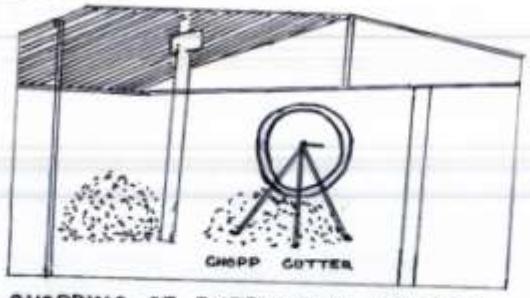
COMPOST HOUSE

Vermi –Compost Unit

- Above ground pit is constructed upto 1' & 2'.
- The twigs, grasses chopped and mixed with FYM to make slurry in big tub.
- Doom like packing are filled in the pit.
- Verms are put in the pit @ of 2 - 3 Kg. per pit developing upon the vermi compost is prepared.
- These pits is covered with grasses in order to give proper environment.
- Vermi compost is seived & colleted after 30-35 days and packed in gunny bags.
- The verms increased in number of geometric regression and number of pits be increased accordingly.

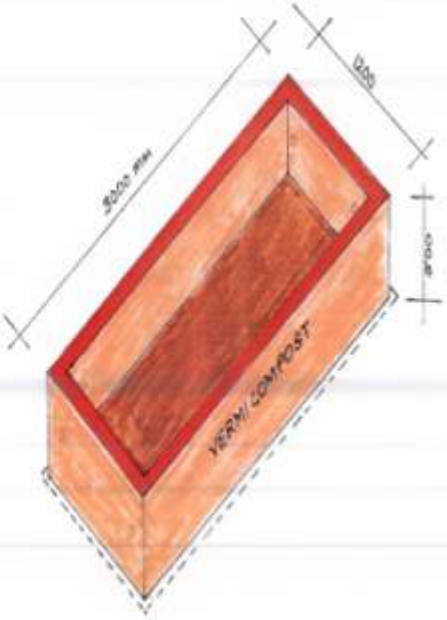


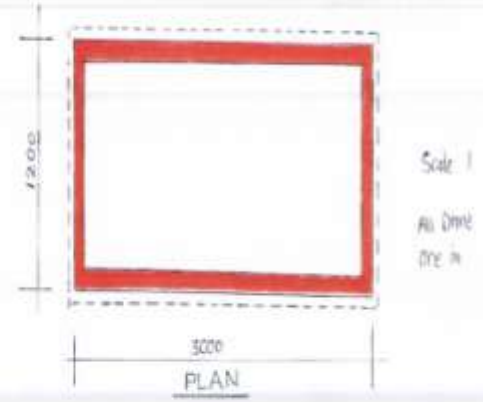
VERMI-COMPOST

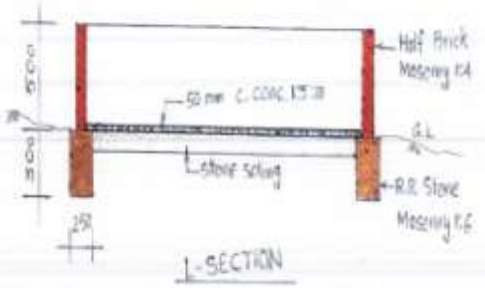


CHOPPING OF EUPETORIUM BEFORE FEEDING IN COMPOST HOUSE

Vermicompost







Agro-Net shed

This shed stands on the angle iron at a height 7 feet to 8 feet.

Shed is covered with agronets with 50 % shade.

Arrangement for sprinkler irrigation are made.

Route trainers on stand are put inside the shed.

The route trainers used to give a good height and good route system before planting in the rainy season.

Nursery beds are also prepared for consuming the extra seedlings so produced and for comparison of results in and outside.

Proper register is kept for recording the data.

SOIL & WATER CONSERVATION

Solid Check Dams

A total budget provision of **Rs.47.085 lacs** has been made towards the Soil Stabilization and Engineering measures to be taken up in Joiner catchment. The details of different protection measures are given in **Annexure-C.(given at the end)**.

It has been observed that the main nallahs have solid stable banks, rocky beds with lot of loose stones and boulders. The nallahs are perennial with heavy water flow. Some of the nallahs have already been taken up for treatment as such the main nallahs do not require much treatment. However side branches of these nallahs require treatment. The details of various areas observed for treatment and recommended for soil & moisture conservation works in different nallahas is as under;

1) GUGYANI NALA 32°50'53.38"N 76°15'35.90"E

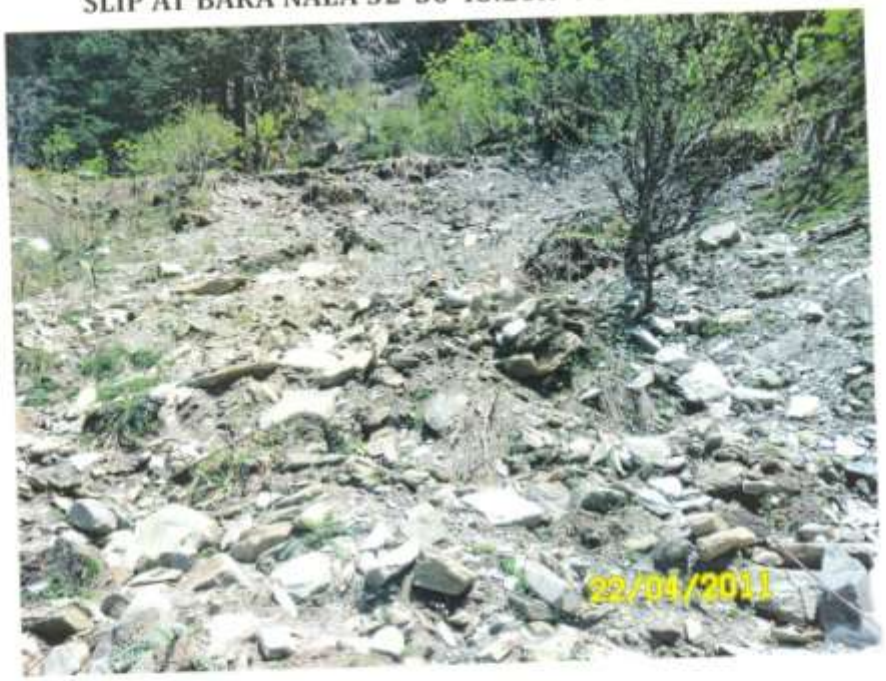
Approximate length of the nallah is about 2.5 km untill it joins Bada nala. The nallaha is totally stabilized with rocky base, good vegetation, having thick bushes and trees along the nallah on both sides. Nallah is perennial with heavy flow of water. Trees along the nallah are Rhododendron, Ban, poplar, Neolitsea (Chirindi), Corylus (Thangi), Chandrah, etc. Bushes- Berbaries, Prinsepia, Ariesma, Rosa moschata, Daphne, Sarcococca, Debrigaesia, Dhatura etc .Side retaining walls have been constructed in some portion of nallah under NAREGA. Walls have been constructed at the distance of 20 mtrs from the nallah on left side. Some portion of the nallah about 500 m length at **32°50'53.38"N 76°15'35.90"E** and height 2310 mtr is affected by soil erosion along the bank and needs side stabilization, Bioengineering measures etc.

GUGYANI

SLIDING AREA ON LEFT BANK OF BARA NALA

Sliding area falls under on the left bank of BARA nalla in BADA RF. Crate wire spurs, Protection wall and vegetative cribbed structure along with Bio Engineering measures can be adopted for this area. Neolitsea (Chirindi) cuttings, Robinia, H.C.Nut etc.Willow cutting for Crib structure and Stone pitching can also be done for slide stabilization. **SLIP AT BARA NALA IS AT 32°50'43.20N 76°15'40.93E**

SLIP AT BARA NALA 32°50'43.20N 76°15'40.93E



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2) **BADALI NALA 32°51'26.49N 76°16'1.51E**

Approximate length of the nallah is about 3.5 km untill it joins Bara nala. The nallaha is totally stabilized with rocky base, good vegetation, having thick bushes and trees along the nallah on both sides. Nallah is perennial with heavy flow of water. Trees along the nallah are Rhododendron, Ban, poplar, Neolitsea (Chirindi), Corylus (Thangi), Chandrah, etc. Bushes- Berbaries, Prinsepia, Ariesma, Rosa moschata, Daphne, Sarcococca, Debrigaesia, Dhatura etc .Side retaining walls have been constructed in some portion of nallah under NAREGA. Walls have been constructed at the distance of 20 mtrs from the nallah on left side. Large portion of the nallah about 1500 m length at **32°51'26.49N 76°16'1.51E** and height 2310 mtr is affected by soil erosion along the bank and needs side stabilization, Bioengineering measures etc.

Right Bank of Badali Nala

Left Bank at Badali Nala

3) **NAGALI NALA 32°51'4.65N 76°15'59.38E**

Approximate length of the nallah is about 1.5 km untill it joins Bara nala. The nallaha is totally stabilized with rocky base, good vegetation, having thick bushes and trees along the nallah on both sides. Nallah is perennial with heavy flow of water. Trees along the nallah are Rhododendron, Ban, poplar, Neolitsea (Chirindi), Corylus (Thangi), Chandrah, etc. Bushes- Berbaries, Prinsepia, Ariesma, Rosa moschata, Daphne, Sarcococca, Debrigaesia, Dhatura etc . Some portion of the nallah about 100 m length at **32°51'4.65N 76°15'59.38E** and elevation 2460 mtr is affected by soil erosion along the bank and needs side stabilization, Bioengineering measures etc..

NAGALI NALA 32°51'4.65N 76°15'59.38E

4) **PINDI NALA 32°50'21.94N 76°16'39.34E**

PINDI NALA joins Joiner nallah on the Left Bank. The length of the nallah from its confluence with Joiner nallah is about 3.3 Kms. Base of the nalla is mostly rocky and bouldery almost all along its length. The nala is always prone to be covered with glacier which starts at an altitude of 2125 m and at **32°50'21.94N 76°16'39.34E**. Most of the portion of this branch is rocky and stable. Only 200-250 m length starting from the base is affected by soil erosion/slip. This area can be treated by constructing Crate walls, Cribbed vegetative check dams and planting of bio Engineering species etc.

PINDI NALA 32°50'21.94N 76°16'39.34E

Pindi Nala Right Bank

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Pindi Nala Left Bank

5) MURALI NALA 32°50'34.41N 76°17'15.07E

MURALI NALA joins Joiner nallah on the Left Bank. The length of the nallah from its confluence with Joiner nallah is about 3 Kms. Base of the nalla is mostly rocky and bouldery almost all along its length. The nala is always prone to be covered with glacier which starts at an altitude of 2350 m at 32°50'34.41N 76°17'15.07E Most of the portion of this branch is rocky and stable. Only 150 m length starting from the base is affected by soil erosion/slip. This area can be treated by constructing Crate walls, Cribbed vegetative check dams and planting of bio Engineering species etc.

RIGHT BANK MURALI NALA

MURALI NALA CATCHMENT AND TERRAIN

6) **Blotaded NALA 32°50'48.36"N 76°17'31.45"E**

Approximate length of the nallah is about 1.5 km untill it joins Bara nala. The nallaha is totally stabilized with rocky base, good vegetation, having thick bushes and trees along the nallah on both sides. Nallah is perennial with heavy flow of water. Trees along the nallah are Rhododendron, Ban, poplar, Neolitsea (Chirindi), Corylus (Thangi), Chandrah, etc. Bushes- Berbaries, Prinsepia, Ariesma, Rosa moschata, Daphne, Sarcococca, Debrigaesia, Dhatura etc .Retaining walls have been constructed in some portion of nallah BY FOREST DEPARTMENT A portion of the nallah about 100 m length at **32°50'48.36"N 76°17'31.45"E** and elevation at 2480 mtr is affected by soil erosion along the bank and needs side stabilization, Bioengineering measures etc.

Rock slide opp Nabkal nala 32°50'34.66N 76°19'31.59E

JOINER 11 32°50'50.94N 76°17'54

Lal Pani Nallah 32°51'18.5.94N 76°15'58.6E

The Nallah Joiins the Badali Nallah at 50 meters below the length of the Nallah is 200 Mtrs. untill it joins Badali nala. The nallaha is totally stabilized with rocky base, good vegetation, having thick bushes and trees along the nallah on both sides. Nallah is perennial with heavy flow of water. Trees along the nallah are Rhododendron, Ban, poplar, Neolitsea (Chirindi), Corylus (Thangi), Chandrah, etc. Bushes- Berbaries, Prinsepia, Ariesma, Rosa moschata, Daphne, Sarcococca, Debrigaesia, Dhatura etc

BIOENGINEERING MEASURES

CONCEPT, APPROACH AND PRACTICABLE TECHNIQUES OF BIOENGINEERING

1 Concept of Bioengineering

Wood and living plants were the only materials for hill and slope stabilization works for hundreds of years. These days some of the old techniques have been modified and applied, which mainly use live material such as willow branches, willow cuttings, and rooted deciduous trees. The duration for implementing vegetation for slope stabilization works depend on the technique of soil bioengineering measure and the type of the plant that has been used. The techniques used in soil bioengineering are traditional and have been used since very long time ago.

Bioengineering is a sustainable approach where the combination of live and dead plants and plant parts are used as building materials for erosion reduction and upland slope prevention. This is based on engineering concept. The combination of vegetative engineering systems and civil engineering systems normally offers the most complete natural and cost effective solution to the variety of instability problems affecting a site

The overall objective is to provide better living conditions to the population by the provision of environment sound and improved sustainable mountain system so as to make a rapid economic growth in tune with economic growth of the country. Specifically bioengineering is adapted with a view to

i) examine soil bioengineering needs of project,
ii) monitor existing slope stabilization works.
iii) study plant species compositions and plant species which can be used for future soil bioengineering purpose.
iv) survey a plan of soil bioengineering activities.
v) test plant species in combination with different soil-bioengineering techniques for its suitability in winter plantations.
vi) stabilize the unstable slopes through a suitable application of vegetation in different soil-bioengineering methods, either alone or in combination with civil engineering structures.
vii) use indigenous materials, low capital costs compared to civil engineering structures.

Slope bioengineering is totally labour based approach providing benefits to the local people. It focuses on minimizing the damage to the natural environment as well as reducing the future maintenance costs. Major portion of the cost of the hill stabilization goes toward the payment of wages to the local labour. Hydro Project construction approach incorporates social, environmental and technical issues. The people's participation is most essential for the success of slope conservation works. The use of local materials motivates local people's participation. Soil bioengineering is an important and an integral part of construction, which is environment sound

and cost effective. The use of plants for land stabilization is applied either alone, or in conjunction with civil engineering structures and non-living plant materials to reduce shallow-seated instability and erosion on slopes.

2 Bioengineering Approach

Experiences have proven that without adequate planning hills are not sustainable. Evidences have also shown that in the past some hill slopes of the Himalayan region needed rehabilitation because of no maintenance or very poor maintenance. The conventional method of hydro power project construction are generally being followed and are increasingly being questioned due to the use of large scale engineering structures with high investments.

3 Practicable Ways for Technique Adoption and Construction of Nurseries

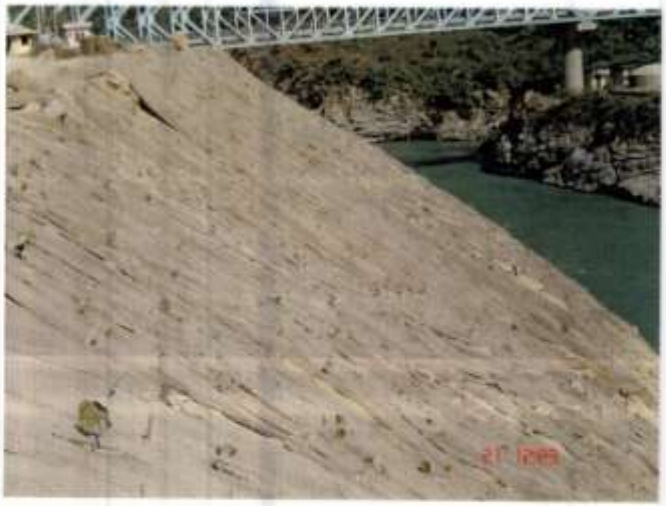
Bioengineering methods can be used to protect almost all type of slopes against erosion and reduces the instance of shallow failures. However, the establishment process may take some time. Vegetation is more dynamic than inert and takes some time to reach their maximum strength. They tend to become stronger over time. The application of soil bioengineering in combination with civil engineering structures would be most appropriate.

Dry stone walls or gabion retaining structures are built in the valley side of the road to protect the fill volume to reduce mass wasting and erosion process. Erosion control plantings are carried out on bare fill surface. Every attempt is made to maintain mass balance of hill slopes (cut and fill). The incorporation of soil bioengineering is a vital and integral part of road construction.

Cuttings and rooted plants are used during the dormant season. Various methods are available for hill side slope stabilization.

Jute and Wire Matting

The methods for seeding are dry-seeding and hydroseeding. The seed will be protected with straw in combination with bitumin or meshes of jute and wire on exposed areas. The stabilisation can be increased through transplanting stump sprout deciduous trees after revegetation with seeding. Jute matting is a tested method in many areas where soil is loose and difficult to hold as such. A few photographs has been depicted to the authenticity in Kol Dam area. This matting will be spread in between the check walls and Bioengineering works will be carried out by planting suitable local spp such as Agave, Yucca, Vitex etc. The matting will be affixed with wooden pegs and after some time this will biodegrade with the time



Loose rock slopes can be stabilized with different types of brush layering. The applications with rooted plants are known as hedge layer. The unrooted plant installations are brush layer. A combination of both is a hedge brush layer.

Dewatering and stabilization of wet slopes can be done through the use of drain and slope fascines. The fascines consist of live branches of willows that are tied together with wire.

There are numerous different hill side slope stabilization methods, which utilize plants in combination with construction of wood, stone and wire such as planted pole walls, live slope grids, live bamboo crib walls, vegetated stone walls and vegetated gabions. Choosing the right method depends on various factors such as the position of slope, ground and available material. The sections given below presents the techniques adopted in brush layer, drainage fascines, pallisade, single tree planting and grass planting. The advantages and disadvantages of each of these techniques are also given under the respective techniques.

3.1 Brush Layer Techniques

Brush Layer consists of placing live branch cuttings laid in small benches excavated into slopes. The benches can range from 2 to 3 ft wide. Live materials should be 1/2 to 2 inches in diameter. It is long enough to reach the back of the bench. The side branches should remain intact for installation.

Brush layer construction placing live branch cuttings in slopes

The cuttings are placed into slopes and oriented perpendicular to slopes. This is a more effective for earth reinforcement and mass stability of slope. It is also recommended on slopes up to 2:1 in steepness. It serves as tensile inclusions or reinforcing units. It assists in retarding runoff and reducing surface erosion.

The construction breaks up the slope length into series of shorter slopes separated by rows of brush layer. It also reinforces the soil with un rooted branch stems and reinforces the soil as roots develop, adding significant resistance to sliding or shear resistance.

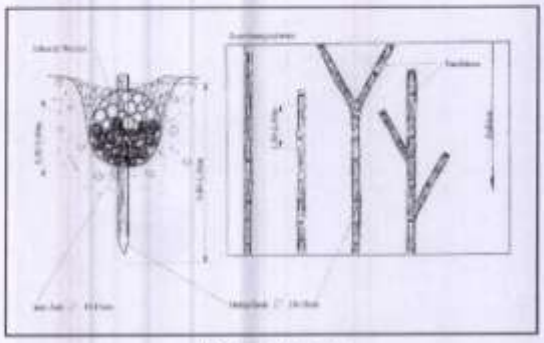
Whereas on dryer sites it helps infiltration on dry sites and drying excessively wet sites. It also adjusts the sites micro-climate, thus aiding seed germination and natural regeneration. The technique also acts as horizontal drains by redirecting and mitigating adverse slope seepage.

The construction is started at the toe of slope. Benches are excavated horizontally, on the contour, or slightly down the slope, if needed to aid the drainage. The surface of the bench slope should be constructed in such a manner that the outside edge is higher than the inside part. The live branch cuttings placed on the bench.

Branch growing tips (shoot bud) should be aligned towards the outside of the bench. The backfill is placed on top of the branches and compacted to eliminate air spaces. The brush tips should extend slightly beyond the fill to filter sediment. Each lower bench is backfilled with soil obtained from excavating the bench above.

3.2 **Drainage fascines**

Fascines are used for a variety of slope stabilization purposes. Fascines slow runoff, catch debris and reinforce the slope due to rooting. Drainage fascines in particular stabilize and drain slopes and are built into rills or small gullies. Immediately after establishment they have a draining effect because the water is channelled through the straight branches. With shoot and root development they form a strong line of vegetation. Additionally they achieve water-removal due to transpiration of plants.



Drainage fascines

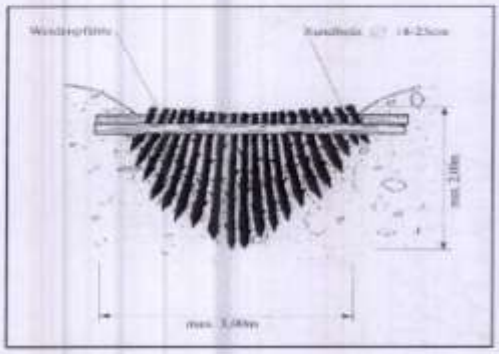
Draining fascines are long bundles of live branches or stems approximately 20 to 40 cm in diameter. The branches are placed with the butt ends pointing at the same direction into existing rills or dug trenches following the contour or desired angle precisely.

The bundles are tied together with 1.5 to 2.0 mm wire every 1 m and fixed into the ground every meter by wooden pegs or live stacks with a minimum length of about 80-100 cm. For the lower third of the fascine green branches of non-sprouting plants or gravel can be used. After placement the fascines are covered with a thin soil layer of about 3 to 4 cm. All branches should be in contact with soil to enable rooting and shoot development.

3.3 **Palisades**

Vegetated palisade constructions are ancient techniques, which were already used by the first people in Central Europe. At the beginning of the 20th century vegetated palisade constructions were still common in Bohemia, Moravia and Slovakia.

Palisades are used for protection of small but deeper, narrow gullies and shallow V-shaped rills. Immediately after construction they provide mechanical protection by catching debris, armouring and reinforcing gully floors. These effects are increasing after shoot development of cuttings. As a result of plant transpiration, they achieve water-removal from soil.



Palisades

Huge live poles are driven or dug half of their length, vertically into the ground. 5 to 20 live poles per running meter with at least 5 cm in diameter should be used. On their top they are fixed by wire on one or two cross beams, which have been anchored into the sides of the gully. The distance between the palisades depends on the steepness of the gully slope and profile of the gully floor. On slopes with less than 30° inclination 2 m are convenient, on slopes with an inclination between 30° and 60° a distance of 1 m is recommended.

3.4 **Single tree planting**

Growing shrubs and trees form a dense network of roots in the soil. Reinforcing and in the longer term anchoring, are the main engineering functions. Shrub and tree planting can be applied on almost every slope. It is often used in combination with other soil-bioengineering measures.

Rooted plants from the nursery (usually raised as polypot seedlings) are planted in off-set rows or in other specific pattern on the slope. One plant per m^2 should be enough. Main considerations are the costs of establishment and the period in which a dense plantation is required. The plants are put into a pit large enough for the rooting system. After filling soil carefully around the cylinder of roots and soil from the polypot, the soil is firmed gently around the plant. Stump-sprouting species should be preferred. Mulching, with for instance compost or chopped grass helps the young plants to grow faster by regulating the moisture and suppressing competing vegetation.

3.5 Grass planting

For grass planting, grass slips, cuttings, or clumps grown from seed are planted in lines or at random on the slope. Grass plantations protect the slope, due to rooting and by providing a surface cover. They reduce the speed of runoff, catch debris and armour the slope.

By using a planting bar holes just big enough for the roots are made. The grass slips or cuttings are placed into it, the soil filled around it and firmed gently. Grass planting is started from the top of the slope working downwards.

Different patterns of grass lines can be used as given below:

- Contour/horizontal lines: They reduce speed of runoff and catch debris thereby armouring the slope.
- Down-slope/vertical lines: Armour, reinforce and drain the slope. Used for damp sites and poorly drained materials where an intensified infiltration can lead to liquefaction of the soil.
- Diagonal lines: Main functions are armouring and reinforcing. Secondary they catch debris and drain the slope. Best compromise of horizontal and vertical planting.
- Random planting: it is often used in combination with jute netting on very steep harsh slopes where complete surface protection is needed.

The locally available grass species can be used for erosion control purpose and are useful for thatch, fodder, pasture and medicines.

FOREST PROTECTION

A total provision of **Rs. 5.00 lakhs** is being made under various heads for Forest Protection measures. The details are as follows:

1. **Construction and repair of boundary pillars**

Though the boundary pillar registers have been maintained but all of these are required to be updated. The boundary pillars of most of the DPF's have been erected randomly. At places whole rows of boundary pillars can be seen, but at other places the boundary pillars are too distantly placed. Therefore, it is necessary that a plan be prepared for construction of large and intermediate BP's in all forests. All the BP's along the cultivations shall be taken due care of and should be constructed of used Railway graders with GPS reading. A sum of **Rs.5.00 lacs** is kept under this component as shown in **Annexure-D.**

Infrastructure Development

A sum of **Rs.20 lacs** is kept under this component .

a). Buildings

Various types of buildings have been constructed in the recent past; However, there is still necessity of some more inspection huts and living quarters for field staff. Most of the field staff huts have miserably damaged and needs to be replaced. These are required to be reconstructed. The existing forest rest houses are very poorly furnished. An amount of Rs. 6 **lacs** has been kept for new buildings and maintenance/furnishing of existing buildings. APO shall be prepared and got approved before taking up activity under this head. **The repair of Bara rest house and guard quarters at shallan shall be tackled.**

Fuel Wood for Project Labour and Administrative Staff- Project Authorities responsibility.

Administrative staff with a proposed strength of about 60 will be adequately paid and will be expected to purchase kerosene and cooking gas which is readily available from existing outlets at Bhajhraru and Chamba.

During the construction of the project, it is estimated that a peak labour force of 350 will be employed but it will be gradually increased and after attaining the peak force, it will be gradually decreased towards the completion of the project. During the 42 months of planned period of construction, the labour force will be increased / decreased as under: -

Period	Labour Force
1 Year	300
II Year	350
III Year	250
Last 6 months	150

It would be the responsibility of the project authorities to provide for the requirements of their labour force & administrative staff.

OPERATIONAL SUPPORT

For an efficient management of forest resources, it is essential that operational support to the Forest Department is adequately developed. Similarly, in remote localities of the division there are no places for shelter for the staff, people and trekkers. Therefore, following provisions have been made under the CAT Plan. A budget provision of **Rs. 14 lacs** has been kept. Component of proposals are given as below:

Sr. No.	Description	Amount (Rs. in Lacs)
1.	Field Vehicle / Inspection vehicles.	8,00000
2.	Computers with Printer and Fax machine, Photocopy Machine, Scanner etc.	2,00000/-
3.	GPS	1,00,000/-
4.	Misc. Office Furniture Almirahs, File Racks etc.	1,00,000/-
5.	R&M of vehicles and machinery for 5 years @ Rs. 40000 per year.	2,000,00/-
	TOTAL	**14,00,000/-**

Sr. No. 1 to 4 to be provided in kind by the User Agency.

ENERGY SAVING DEVICES

In order to address the monitoring problem of energy scarcity and its immediate adverse fall out on the forests, the local people have to be provided energy-efficient alternatives. Under the CAT Plan, provision is being made for distribution of energy-saving devices to the BPL families & weaker section **on a cost-sharing pattern.** Under this component, LPG connections, Pressure Cookers, Fuel-efficient Solar Cookers etc. would be made available to the catchment dwellers, to reduce the pressure on the adjoining forests & to inculcate a culture of energy efficiency & environmental friendly approaches.

The total provision of **Rs. 3 la**khs is being made for the purpose.

TRAINING OF FOREST OFFICERS / OFFICIALS AND COMMUNITY

The specialized training and study tours for forest officials / officers, who are executing the plan will be provided. The objective of this training component would be to provide the officers and the staff to augment their skills, professional knowledge, capacity building to be effective and efficient. The basic components of capacity building includes:

- Developing human resources through training and education.
- Generate new information for better knowledge and understanding.
- Providing an adequate institutional framework and material support to enable acquired skills to be fully utilized.

Training for staff will be organized at the Forest Training Institutes of HP Forest Department, where services of resource persons from specialized institutions / organizations in the field of Soil & Water Conservation, Information Technology, Environment, Socio-economic issues etc. would be utilized for imparting practical training to the forest field staff & also communities.

The provision for outlay of **Rs. 1.5 lakhs** has been allocated under the scheme.

PARTICIPATORY ACTION RESEARCH FOR MINIMIZING NEGATIVE IMPACT OF TRANSHUMANCE

Chamba district is characterized by presence of transhumant groups viz-Gaddis & Gujjars, due to the presence of high altitude pastures. These groups follow a routine of moving from place to place with the change of season, in a customary usage pattern, with their flocks. Regulations on grazing lands, size of flocks permitted to graze in defined pastures, grazing rights, etc are some of the problem frequently encountered in the area, relating to migratory grazers. For in-depth understating of the real issues involved, Participatory Action Research is an effective tool and could provide workable solutions to the problem. Under the CAT Plan, provision of **Rs. 6 lakhs** is being made for undertaking Participatory Action Research (PAR) for minimizing the negative impact of Transhumance in the catchment and then implementing the good practices emerging out of this PAR.

DEVELOPMENT OF JOINER VALLEY AS ECO-TOURISM

Introduction

Ecotourism has come to be regarded as a type of responsible tourism where tourists, as individuals or in small groups, venture into lesser known destinations to enjoy the nature in its pristine form along with gaining understanding of local cultures and customs in such a way as to cause minimum impact on the nature and the local culture. Since ecotourism entails understanding of local culture, it involves local communities living in their usual lifestyles and provides them a livelihood option. Subscription to ecotourism does not envisage large scale investments on the part of local communities and it remains a low cost low impact operation. As ecotourism is essentially based on Nature and managed by the local communities, it provides an incentive to the local communities to protect and sustainably manage the landscape.

Himachal Pradesh, a paradise of scenic beauty with very hospitable local communities, forms an ideal ecotourism destination. As the word is spreading, more and more eco-tourists are thronging the State to enjoy Himalayan landscape and the variety of local cuisine and folk dances. The Government of Himachal Pradesh, realizing the potential of ecotourism in the State, has already enunciated a Policy on Development of Eco-tourism in Himachal Pradesh (2005), wherein blueprint for development of ecotourism in the State has been provided.

Ecotourism Potential in Joiner Valley

Joiner valley, lying in the lap of Pir Panjal mountain range, has an excellent potential from ecotourism point of view. The seemingly narrow valley at the point of entry suddenly opens up beyond the confluence of Joiner and Bhararu khads to offer a panoramic view of the vast tracts of lush green Oak and Conifer forests and snow clad alpine slopes. One also stands a good chance of sightings of rare temperate Himalayan wild animals in this valley.

For the trekkers, the area offers challenging treks over high altitude passes to mystic Pangi Valley. Khundi Marali, a lake located at about 3600 m above msl in the upper Joiner catchment along Tangar nala, attracts a number of pilgrims every year and forms the site of an annual fair. Similarly, the upper Bhararu catchment, along Malen ka Gharat Nallah, offers a view of more than 100 m high waterfalls.

The valley located in the interior Chamba district, still has many a remote villages that are not connected with road or other means of communication. As such the people have only limited livelihood options. The major vocation being farming and livestock rearing. The general lifestyle of the local people still remains traditional, that suits the needs of ecotourism. The houses are still constructed in the typical pahari style. The cuisine remains traditional and the people enjoy their folk dances. Promotion of ecotourism in this area would provide the local communities with an additional livelihood option as hosts, guides, porters, cooks, etc., besides strengthening their bond with Nature.

Strategy for Developing Ecotourism in Joiner Valley

In the first two years of the project a study would be conducted to access the Eco tourism potential & requirements of the area & to suggest a modus operandi for operationalizing Eco-tourism here. Therefore, the earmarked fund of Rs.1..lacs would be used in accordance with an approved action plan.

The study on Eco-tourism would form part of the study being proposed under the PES component, though the implementation of the Action Plan on Eco-Tourism, emerging out of the PES study, would be done from the **Rs. 1 lakhs** earmarked under this head.

PAYMENT FOR ENVIRONMENTAL SERVICES

Payments for Environmental Services (PES) is a tool to incentivize the local communities for sustainable and environmentally friendly use of the Catchment. The PES mechanisms suitable for the Upper JoinerCatchment area would be identified by conducting a study on the issue, to identify the most appropriate routes and activities under PES. This study should be carried out in the first two years of the Project and shall be approved by the Forest Department, before implementation. Hence, a small part of the PES funds are being allocated in the early years of the implementation of the CAT Plan for getting this study conducted.

The actual implementation of the PES mechanisms, so identified by the approved study, shall begin from the 5th year of implementation of the CAT Plan. The interventions under the Eco-tourism head would also be defined through the PES study; though provisions for its implementation have been made separately under Eco-tourism head.

A total provision of **Rs. 12. lakhs** has been earmarked under PES.

IMPROVEMENT AND DEVELOPMENT OF WILDLIFE & WILDLIFE HABITATS

Introduction

The Joiner valley, located in the Pir Panjal range forming boundary between Chamba sub-division and Pangi sub-division with altitude varying from 1190m above msl near power house to 5685m above msl at the highest point (see project area map at Map-1), falls in the North-West Himalaya (2A) Biotic Province of the Bio-geographic zone 'Himalaya'. The wide altitudinal range in the valley supports vegetation varying from sub-tropical to alpine type and is believed to form good habitat for a number of typically temperate animal species so characteristic to this biotic province.

No systematic survey in respect of the fauna of the area has ever been carried out and as such no check-list of the fauna of the area is available. During the process of preparing this CAT Plan, a rapid survey of the project area was, therefore, carried out to record the presence of wild animal species. Some of the mammal species recorded during the survey based on direct sightings are: *Hylopetes petaurista* (Flying Fox), *Mustela sibirica* (Himalayan Weasel), *Rhesus macaque* (Monkey), *Vulpes vulpes* (Indian Red Fox), *Semnopithecus entellus* (Langur), Bats, *Mos homourus* (Hill Mouse), Himalayan yellow throated Marten, and Jackals. However, indirect evidences and secondary information gathered during the survey suggest the presence of Common Leopard, Asiatic Black Bear, Indian Wild Boar, Common Langur, Leopard Cat, Porcupine, Barking Deer and Goral amongst other common mammals; and possibility of the presence of Serrow, Musk Deer and Himalayan Brown Bear amongst mammal species of conservation concern towards higher reaches.

In as far as birds are concerned, a total of 44 species of birds were recorded during the survey from the project area. Some of the common bird species recorded during the survey are: Common Crow, Hill Myna, Blue Rock Pigeon, Ring Dove, Slaty Headed Parakeet, Blue Throated Barbet, Kashmir Pied Woodpecker, Black Drongo, Western Yellow billed Blue Magpie, Scarlet Minivet, White cheeked Bulbul, Black Bulbul, Streaked Laughing Thrush, Leaf Warbler, Pied Bush Chat, Green Bee-eater, Kashmir Grey Tit and Cinnamon Tree

sparrows. In addition, occasional sighting of the Long-tailed Eastern Grey Wagtail, Blue Rock Thrush and Alpine Swift were also made.. The area also supports good population of Himalayan Griffon Vulture. Secondary information gathered from the local people also suggests the presence of the Western Tragopan and the Himalayan Monal, pheasant species of conservation concern, towards higher reaches in the valley.

In addition 3 species of reptiles, 3 species of amphibians and 49 species of butterflies were also recorded from the area during the survey. The Joiner Valley, in its entirety, is therefore quite rich in its faunal wealth. However, the area of influence due to the project is limited up to an altitude of 2200m amsl and supports fauna that is usually come across at the Himalayan foothills. No animal or bird species of conservation concern are found in this area of influence of the project.

The Joiner valley does not form part of the Protected Area Network in the State as no Wildlife Sanctuary, National Park or Conservation Reserve is located within or adjoining this valley. There is, however, a network of Protected Areas covering similar type of habitats outside the Joiner valley.

General Concerns about Wildlife Conservation

The Joiner valley, especially the area taken up under this CAT Plan, has never been a subject of focused wildlife management. As such specific problems associated with wildlife of the area have also not been documented. This CAT Plan, therefore, provides a unique opportunity to document the wildlife of the area and initiate programs for management of wildlife habitats.

The Himalayan region is witnessing a very high and increasing biotic pressure causing degradation and fragmentation of its fragile habitats and putting the survival of many a plant and animal species under threat. Whereas much of this biotic pressure is on account of increased incidence of grazing, both local and migratory, fuel and fodder removals, and extraction of herbs; developmental projects like construction of roads, hydroelectric projects and transmission lines are also making significant contribution to this habitat degradation.

Whereas the lower Joiner valley has sizeable population of domestic cattle grazing on the lower slopes all the year round, the upper Joiner valley supports vast alpine meadows that attract thousands of migratory livestock every year during summers. This domestic livestock provides stiff competition to the wild species of the Himalayan animals, especially in the already overgrazed alpine meadows. The presence of livestock in the meadows also drives away the shy wild animals from their natural habitats. Similarly, the fragmentation of the habitats due to developmental ventures, especially creation of water reservoirs, interferes with the free movement of wild animals restricting them to certain pockets affecting their genetic pool.

The developmental projects also bring in an influx of outside labour that is generally not concerned about the local environmental customs and traditions, causing damage to the local ecology through various acts of omission and commission including removal of biomass from forests and poaching. The wild animals become especially susceptible to poaching during winters when water sources tend to freeze at upper reaches and they descend to lower slopes in search of water and food.

The areas hitherto inaccessible used to provide safe havens to a variety of temperate Himalayan fauna. However, as more and more remote areas are getting connected with road network, even the remote habitats are coming under increased activity, causing threat to the populations of usually shy temperate Himalayan fauna. The area proposed to be brought under the present CAT Plan has also come under the road program and a road is under construction to upper Joiner valley through Bhararu nala, cutting across steep rocky slopes. It would need creating general awareness about conservation imperatives to ensure the long-term survival of Himalayan wildlife.

A Lump Sum provision of **Rs 9 lacs** has been made for implementation of the Wildlife related activity.

Strategies

The following strategies are suggested under wildlife activities for the Upper Joiner HEP catchment.

(a) **Wildlife/Unique Habitats Surveys and Research**: The Wildlife research may be encouraged by engaging three to five researchers who may work on surveys and natural history of endangered animals such as Brown Bear, and Musk Deer. The Wildlife research organizations located at Dehradun, Delhi, and Mysore may be invited to undertake such work. The area appears to house many unique & critical wildlife habitats such as gorges & hidden valleys which are home to many rare species. There is a need to identify & map such unique habitats & protect these. A sum of **Rs. 6 lacs** may be used for these purposes. Out of this, a provision of Rs. 1-2 lakhs be reserved for putting the findings of these surveys into practice, from the 6th years of CAT Plan implementation.

(b) Operationalzing herd insurance scheme against depradation by carnivores on line of one developed for Kibber Wild Life Santuary for **Rs. 3 lacs**.

MONITORING AND EVALUATION

Monitoring and evaluation will be developed as in-built part of the project management. Thus, a process of self-evaluation at specified intervals of time will ensure the field worthiness and efficacy of the CAT Plan. The emphasis would be on Monitoring and impact studies of the works done under the plan in order to apply the findings / lessons learnt, in the revision / recasting of the CAT Action Plan in the remaining years. It is therefore, proposed that no new works be carried out in the 6th years of the CAT Plan schedule.

A sum of **Rs. 12. lacs** has been provided for monitoring and evaluation. Under this component, independent consultants or third party evaluation will be done to make Base Line Survey, Mid-term Survey and end of project survey/evaluation to find out effectiveness of CAT Plan activities in the catchment area.

Contingencies

A total of 8 percentage of the total cost of the cat plan has been kept in contingencies for any future cost escalation. A sum of 14 lacs has been kept under this component. Outlay of the Cat Plan will not be changed further.

NOTE - Depending on the site specific requirements, changes in activities, within and across components, can be made by the field agencies with prior approval of the Principal Chief Conservator of Forests, Himachal Pradesh.

PER HECTARE COST NORMS FOR SUBSEQUENT RCC FENC[illegible] PLANTING UNDER COMPENSATORY AFFORESTATION SCHEME (1100 Plants / Ha)

Particulars of works	Unit	Quantity	Rate / unit or kit (in Rs)	Amount (in Rs)
1 Survey & Demarkation of plantation area	ha	1	67.33	67.33
2 Preparation / Purchase of RCC Fence Posts	Nos.	60	23000%	13800.00
3 Carriage of RCC Fence Posts upto 2 mt long over distance 2km	Nos.	60	907.34%	544.40
4 Preparation / Digging of holes 20-30 cm dia. & 50 cm deep	Nos.	60	604.51%	362.71
5 Fixing of RCC Fence including strutting.	Nos.	60	477.34%	286.40
6 Carriage of Barbed wire over distance 2 Km.	Qtl	1.13	54.5	23.17
7 Stretching & fixing of Barbed wire in 3 strands	Rmt	900	3.16	2844.00
8 Interlacing of Thorny Bushes along the Fence	Rmt	180	2.74	493.20
9 Barbed wire.	Qtl	1.13	7000	7910.00
			Total	26431.21
			Or say	26450.00
Planting				
1 Digging of pits 45x45x45 cm	Nos.	440	636.28%	2799.63
2 ~~Digging of pits 30x30x30 cm~~	Nos.	660	318.22%	2100.25
3 Filling of pits 45x45x45 cm	Nos.	440	182.31%	802.16
4 ~~Filling of pits 30x30x30 cms~~	Nos.	660	127.22%	839.65
5 Carriage of Plants in P.bags over distance 2 km uphill	Nos./Km	1100	145.39%	3198.58
6 Plantation of entire plants raised in P.bags	Nos.	1100	145.49%	1600.39
7 Nursery cost of Plant	Nos.	1100	3.5	3850.00
			Total	15190.67
			Or say	15200.00
			G.Total	41650.00
			Or say	41600.00

Divisional Forest Officer
Chamba Forest Division
Chamba (H.P.)

MAINTENANCE COST ESTIMATE

1st Year Maintenance 30 %

S.No.	Particulars of work	Unit	Quantity	Rate	
1	Re-digging of pits 45x45x45 cm	No	132	318.22%	420.05
2	Re-digging of pits 30x30x30 cm	No	198	159.07%	314.96
3	Filling of pits 45x45x45 cms	Nos	132	182.31%	240.65
4	Filling of pits 30x30x30 cms	Nos	198	127.22%	251.90
5	Planting of P.bag plants	Nos	330	145.49%	480.12
6	Carriage of P.bag plants distance 2 km uphill	Nos	330	145.35%	479.66
7	Nursery cost of plants	Nos	330	3.5	1155.00
8	Repair of fence	RMT	180	1.16	208.80
		Total			3551.13
				Or say	3550.00

2nd Year Maintenance 20 %

S.No.	Particulars of work	Unit	Quantity	Rate	
1	Re-digging of pits 45x45x45 cms	Nos	88	318.22%	280.03
2	Re-digging of pits 30x30x30 cms	Nos	132	159.07%	209.97
3	Filling of pits 45x45x45 cms	Nos	88	182.31%	160.43
4	Filling of pits 30x30x30 cms	Nos	132	127.22%	167.93
5	Planting of P.bag plants	Nos	220	145.49%	320.08
6	Carriage of P.bag plants distance 2 km uphill	Nos	220	145.35%	319.77
7	Nursery cost of plants	Nos	220	3.5	770.00
8	Repair of fence	RMT	180	1.16	208.80
		Total			2437.02
				Or say	2440.00

3rd Year Maintenance 10 %

S.No.	Particulars of work	Unit	Quantity	Rate	
1	Re-digging of pits 45x45x45 cm	Nos	44	318.22%	140.02
2	Re-digging of pits 30x30x30 cm	Nos	66	159.07%	104.99
3	Filling of pits 45x45x45 cms	Nos	44	182.31%	80.22
4	Filling of pits 30x30x30 cms	Nos	66	127.22%	83.97
5	Planting of P.bag plants	Nos	110	145.49%	160.04
6	Carriage of P.bag plants distance 2 km uphill	Nos	110	145.35%	159.89
7	Nursery cost of plants	Nos	110	3.5	385.00
8	Repair of fence	RMT	200	1.16	232.00
		Total			1346.11
				Or say	1350.00

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Energy Plantation cost/Ha of plantation (No Maintenance)

A) Plantation including Fencing:

S.No	Description	Unit	Rate	Cost(Rs)
1.	Survey & demarcation of plantation & area	1 Ha	67.33	67.33
2.	Preparation/ Purchase of RCC Fence post	60 No	2300	13800
3.	Preparation of RCC Fence post up to 2mt long over a distance 2km	60 No	907.34 per%	544.40
4.	Preparation /Digging of holes 20-30 cm dia. &50 cm deep	60 No	604.51 /%	362.71
5.	Fixing of RCC Fence including strutting	60No	477.34/%	286.40
6.	Carriage of barbed wire over distance 2km	1.13Qntl	54.5	123.17
7	Stretching & fixing of barbed wire with U- stapple in 3 strand	900	3.16	2844.00
8	Interlacing of thorny bushes with barbed wire	180 Rmt.	2.74	493.20
9.	Cost of Barbed wire	1.13	7000	7910
10.	Digging of pits(45x45x45) cm	5000 No.	636.28/%	31814
11	Filling of pits(45x45x45) cm	5000No	182.31/%	9115.5
12.	Carriage of plants in P. Bags from nursery to work site over an average distance of 2Km uphill	5000 No	145.39/%	7269.5
13.	Planting of plants raised in P. Bags	5000 No	145.49/%/	7274.5
14.	Nursery cost of Plants	5000 No	3.8	19000
			G.Total	**100904.71**
			Or Say	**100910**

Divisional Forest Officer
Chamba Forest Division
Chamba (H.P.)

Per Hactare Cost of Enrichment planting

A) Plantation with Thorny brushwood guard protection around individual plant (No Fencing& maintenance):

S.No	Description	Unit	Rate	Cost(Rs)
1.	Digging of pits(45x45x45) cm	600 No	763.53/%	4581.18
2.	Filling of pits(45x45x45) cm	600 No	218.77/%	1312.62
3.	Carriage of plants in P.Bags from nursery site over an average distance of 3Km uphill	600 No	174.46/%/Km	3140.28
4.	Planting of plants raised in P. Bags	600	174.58/%	1047.48
5.	Thorny brushwood guard protection around individual plant	600	7.00	4200.00
21	Total			14281.56
22	**Or Say**			**14300.00**

Divisional Forest Officer
Chamba Forest Division
Chamba (H.P.)

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Government of India
Ministry of Environment & Forests
Northern Regional Office

Bays No. 24-25
Dakshin Marg
Sector 31A
Chandigarh-160030
Dated: Friday, January 05, 2007

No. [illegible]/2006-CHA/2 [illegible]

The Principal Secretary (Forests)
Government of Himachal Pradesh
Department of Forests
Shimla

Subject: Diversion of **4.8891 hectare** of forest land in favour of M/s Tejassarnika Power Limited for construction of **5.00 MW Upper Joiner SHEP** within the jurisdiction of Churan & Chamba Forest Divisions of Chamba District of Himachal Pradesh.

Sir,

Please refer to Government of Himachal Pradesh letter No. FFE-B-[illegible]/4/2006 dated 29th June 2006 and Nodal Officer (FCA) cum CF (P&L) letter No. Ft.48-1211/2000 (FCA) dated 8th December 2006 on the above mentioned subject seeking prior approval of the Central Government in accordance with Section 2 of the Forest (Conservation) Act, 1980.

After careful consideration of the proposal of the State Government, approval of the competent authority is hereby conveyed for diversion of **4.8891 hectare** of forest land for the above mentioned subject to following conditions:

1. Legal status of the forest land will remain unchanged.
2. Compensatory afforestation will be carried out in Bara DPF over 5.5 hectare and Guwao DPF over 4.5 hectare (total 10.00 hectare) of degraded forest land as per proposed scheme. Plantation will be done within one year from the date of issue of this letter.
3. Minimum number of trees and in any case not more than 146 trees (one hundred and forty six only) will be removed.
4. The State Government shall deposit NPV and all other funds with the Ad-hoc Body of Compensatory Afforestation Fund Management and Planning Authority (CAMPA) in Account No. CA 1585 of Corporation Bank (A Government of India Enterprises), Block 11, Ground Floor, CGO Complex, Phase I, Lodhi Road, New Delhi-110 003 as per the instructions communicated vide letter No. 5-2/2006-FC dated [illegible].2006.
5. The forest land will not be used for any purpose other than that specified in the proposal.
6. An undertaking from the user agency may also be obtained stating that in case the rates of NPV are revised upwards, the additional/differential amount shall be paid by the user agency.
7. [illegible] plan will be implemented by the user agency. [illegible] and ensure that dumping sites are properly maintained.
8. [illegible] will be [illegible] not be thrown [illegible]
9. [illegible]
10. [illegible]
11. [illegible]

The Ministry may revoke/suspend the clearance, if implementation of any of the above conditions is not satisfactory. [illegible]

Yours faithfully,
[illegible]
[illegible]

Copy to:

1. The [illegible]
2. The Director (FC), Ministry of Environment & Forests, Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi.
3. [illegible] and Chamba Forest [illegible]
4. Director, M/s Tejassarnika Power [illegible]
5. [illegible]

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New TEC

HIMACHAL PRADESH STATE ELECTRICITY BOARD

OFFICE ORDER

In supersession to Office Order No. HPSEB/CE(P)-CC-Upper Joiner/2005/7741-50 dated 24.11.2005, Himachal Pradesh State Electricity Board is pleased to accord revised Techno-Economic Clearance(TEC) to Upper Joiner SHP(4 x 3.00 MW) on Joiner khad a tributary of Suil River in Ravi basin in Distt. Chamba, Himachal Pradesh allotted to "M/s Tejassarnika Hydro Energies Private Limited, Hyderabad" at an estimated cost Rs.72.25 Crores (Rupees seventy two crore and twenty five lac) only including Interest During Construction(IDC), Escalation, Financial Charges(FC) and LADC @1.5% with the following stipulations:

1.(i). The completed cost of the scheme shall not exceed the above cost except on account of the following.

a) Interest During Construction (IDC) and Financial Charges(FC) shall be as per actual but not exceeding the amount as indicated at Annex-I unless revised by HPSEB while according concurrence under Section 8 of Electricity Act, 2003 after review of financial package.

b) Change in rates of Indian taxes/ duties such as excise duty, sales tax/ VAT, custom duty and levy of any other taxes/duties subsequent to issue of Techno-Economic Clearance (TEC).

c) Change in Indian law resulting in change in cost.

ii) The abstract of the Estimated Cost approved by HPSEB is furnished at Annex-I, summary of Financial Package as considered by HPSEB is at Annex-II and the Salient Features of the scheme are at Annex-III.

2. The Techno-Economic Clearance (TEC) is subject to the fulfillment of the following conditions: -

i) Completed cost/ techno economic clearance shall not be re-opened due to the following:

a) Non-acquisition of land.

b) Non-finalization of Power Purchase Agreement (PPA).

c) Delay in financial closure.

ii) The final financial arrangement shall not be inferior to the financing arrangement projected in the Detailed Project Report (DPR) for TEC.

iii) Tariff shall be decided by the Central/State Electricity Regulatory Commission.

iv) The public issue expenses, if any, shall be reconsidered at the time of approval of completion cost based on documentary proof and in accordance with Security Exchange Board of India (SEBI) guidelines regarding regulation of public issue expenses.

v) Fulfillment of conditions stipulated in Central Electricity Authority (CEA)/ Central Water Commissions (CWC) guidelines in respect of civil works at the stage of detailed design/execution.

vi) Any increase in the cost estimate due to design modifications and geological surprises would be absorbed by the Independent Power Producer (IPP) i.e. "M/s Tejassarnika Hydro Energies Private Limited, Hyderabad".

vii) No additional cost shall be allowed due to Resettlement & Rehabilitation (R&R) Plan.

viii) Normal operation life of the hydro power plant shall be as per provisions of CWC/CEA guidelines/ CERC/HPERC Regulations.

ix) The Techno Economic Clearance(TEC) is subject to clearance of the project by MOEF from environmental and forests angle. The statutory clearances as per Annexure-IV shall be obtained before execution/implementation of the project.

x) The project shall be interfaced with 33/132KV sub station proposed at Kurthala through 33kV single circuit transmission line(0.15 Sq. In "WOLF" conductor.

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xi) The cost of providing interconnection facilities at the 33/132 kV Sub-Station at Kurthala shall be borne by the IPP for which IPP shall enter into suitable agreement.

xii) The project line shall be provided, operated and maintained by the IPP at his cost as per normal conditions after obtaining approval of the HP Govt. under Section 68(1) of Electricity Act, 2003.

xiii) The power house generating equipment as well as other electrical equipment to be provided by the Developer shall be compatible for parallel operation with the Grid after interfacing. Any loss of generation on this account shall be borne by the IPP.

xiv) The IPP shall develop, operate and maintain the project including the dedicated transmission system subject to compliance with the following:-

a) Grid Code and standard of Grid connectivity

b) Technical Standards for construction of electrical lines.

c) Norms of System Operation of the concerned State Load Despach Center (SLDC) or the Regional Load Despach Center (RLDC).

d) Directions of the concerned SLDC or RLDC regarding operation of dedicated transmission line.

xv) For disbursement of power beyond Kurthala, the IPP shall seek open access from STU (HPSEB)/ CTU for usage of Intra-state/Inter state transmission system and wheeling charges as per HPERC/CERC norms, applicable at the time of seeking open access, shall be payable by the IPP.

xvi) O&M charges for maintenance of interconnection facilities at the interconnection sub station of HPSEB shall be paid by the IPP to HPSEB throughout the period, the IPP runs the project and the same shall be reviewed at the beginning of every financial year.

xvii) The conditions on these lines shall also have to be suitably included in PPA apart from other requisite conditions.

xviii) 15% release of water immediately down stream of the diversion structure shall be ensured all the times including lean season as per Power Policy of H.P.Govt, 2006 and subsequent amendments thereof.

xix) LADC amount and activities shall be implemented as per Power Policy of H.P.Govt, 2006 and subsequent amendments thereof.

xx) The IPP shall carry out the Geological explorations before taking up project construction and submit the report to HPSEB/HP Govt.

xxi) The TEC is based on the reports and data furnished in the DPR and it is presumed that information furnished is correct and has been collected reliably after carrying out detailed field investigations and surveys under the supervision of the competent personnel The scrutiny of HPSEB does not cover the examination of the detailed designs & working drawings of project components in regard to the structural, hydraulic and mechanical performance & safety which shall be ensured by the implementing Agency/Project Authority.

xxii) The observations of HPSEB and replies thereof shall form an integral part of the DPR.

3 The project shall be completed within 24 months after award of civil works/tenders.

4 The completion cost of the scheme shall be submitted to HP Govt./HPSEB for approval as soon as possible after the Commercial Operation Date (COD) of the plant but not later than three (3) months from the COD of the plant.

5 The project promoters/project authorities would give free accessibility to the HP Govt./HPSEB officers and staff to have on the spot assessment of various aspects of the project.

xi) The cost of providing interconnection facilities at the 33/132 kV Sub-Station at Kurthala shall be borne by the IPP for which IPP shall enter into suitable agreement.

xii) The project line shall be provided, operated and maintained by the IPP at his cost as per normal conditions after obtaining approval of the HP Govt. under Section 68(1) of Electricity Act, 2003.

xiii) The power house generating equipment as well as other electrical equipment to be provided by the Developer shall be compatible for parallel operation with the Grid after interfacing. Any loss of generation on this account shall be borne by the IPP.

xiv) The IPP shall develop, operate and maintain the project including the dedicated transmission system subject to compliance with the following:-

a) Grid Code and standard of Grid connectivity
b) Technical Standards for construction of electrical lines.
c) Norms of System Operation of the concerned State Load Despach Center (SLDC) or the Regional Load Despach Center (RLDC).
d) Directions of the concerned SLDC or RLDC regarding operation of dedicated transmission line.

xv) For disbursement of power beyond Kurthala, the IPP shall seek open access from STU (HPSEB)/ CTU for usage of Intra-state/Inter state transmission system and wheeling charges as per HPERC/CERC norms, applicable at the time of seeking open access, shall be payable by the IPP.

xvi) O&M charges for maintenance of interconnection facilities at the interconnection sub station of HPSEB shall be paid by the IPP to HPSEB throughout the period, the IPP runs the project and the same shall be reviewed at the beginning of every financial year.

xvii) The conditions on these lines shall also have to be suitably included in PPA apart from other requisite conditions.

xviii) 15% release of water immediately down stream of the diversion structure shall be ensured all the times including lean season as per Power Policy of H.P.Govt, 2006 and subsequent amendments thereof.

xix) LADC amount and activities shall be implemented as per Power Policy of H.P.Govt, 2006 and subsequent amendments thereof.

xx) The IPP shall carry out the Geological explorations before taking up project construction and submit the report to HPSEB/HP Govt.

xxi) The TEC is based on the reports and data furnished in the DPR and it is presumed that information furnished is correct and has been collected reliably after carrying out detailed field investigations and surveys under the supervision of the competent personnel The scrutiny of HPSEB does not cover the examination of the detailed designs & working drawings of project components in regard to the structural, hydraulic and mechanical performance & safety which shall be ensured by the implementing Agency/Project Authority.

xxii) The observations of HPSEB and replies thereof shall form an integral part of the DPR.

3 The project shall be completed within 24 months after award of civil works/tenders.

4 The completion cost of the scheme shall be submitted to HP Govt./HPSEB for approval as soon as possible after the Commercial Operation Date (COD) of the plant but not later than three (3) months from the COD of the plant.

5 The project promoters/project authorities would give free accessibility to the HP Govt./HPSEB officers and staff to have on the spot assessment of various aspects of the project.

6 The firm financial package and tie-up of balance inputs/clearances shall be completed within six months from the date of issue of TEC.

7 In case the time gap between the concurrence of the scheme and actual start of work by the Company is three years or more a fresh concurrence of HP Govt./HPSEB shall be obtained before start of work.

8 Monthly Progress Report of the project shall be submitted to Monitoring Cell of HP Govt./HPSEB. Three (3) copies of the semi-annual physical progress report of the scheme and expenditure actually incurred, duly certified by statutory auditors shall be submitted to the HP Govt./HPSEB till the Commercial Operation of the plant.

9 The HP Govt./HPSEB reserve the right to revoke the concurrence, if the conditions stipulated above are not complied with to the satisfaction of the HP Govt./HPSEB.

BY ORDER OF THE BOARD

Chief Engineer (P&M)
HPSEB, Vidyut Bhawan,
Shimla-171004.

No. HPSEB/CE (P)/CC- Upper Joiner/2009- 81162-75 . **Dated:-** 21-11-09.

Copy for information and necessary action to the:

1. The Special Officer, HPSEB, Vidyut Bhawan, Shimla-171004.
2. Principal Secretary (MPP & Power) to H.P. Govt., Shimla-171002.
3. Principal Secretary (NES) to H.P. Govt. Shimla-171002.
4. Secretary, Ministry of Non-Conventional Energy Sources (MNES), Block No.14, CGO Complex, Lodhi Road, New Delhi-110003.
5. Director, Environmental & Scientific Technologies, Narayan Villa, Near Wood Villa, Palace, Shimla-171002.
6. General Manager, Himachal Power Transmission Corporation Ltd., Borowalia House, Khalini, Shimla-171002.
7. Chief Engineer (SP), HPSEB, Vidyut Bhawan, Shimla-171004.
8. Chief Engineer (Energy), Borowalia House, Khalini, Shimla-171002..
9. Chief Engineer (Projects cum Arbitrator), HPSEB, Vidyut Bhawan, Shimla-171004.
10. Chief Engineer (Commercial), HPSEB, Vidyut Bhawan, Shimla-171004.
11. Deputy Secretary(GE), HPSEB, Vidyut Bhawan, shimla-4 w. r. t. agenda note 9.02.
12. M/s Tejassarnika Hydro Energies Private Limited, Plot No. 125, Road No. 71, Nav Nrman Nagar, Jubilee Hills, Hyderabad, Andhra Pradesh-500033.

Chief Engineer (P&M)
HPSEB, Vidyut Bhawan,
Shimla-171004.

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Annexure-I

UPPER-JOINER SHP (4x3.00 MW) IN DISTT. CHAMBA, HIMACHAL PRADESH OF "M/S TEJASSARNIKA HYDRO ENERGIES PRIVATE LIMITED, PLOT NO. 125, ROAD NO. 71, NAV NIRMAN NAGAR, JUBILEE HILLS, HYDERABAD-500 033(AP)".

ABSTRACT OF COST ESTIMATE

Sr. No.	Description of work	Amount (Rs in lac)	
(a) 1.	Civil Works including other Misc. Expenses	4161.68	Price level January-2009
2.	Electro –Mechanical Works	2001.28	
3.	Transmission Works	176.75	
	Sub Total (a)	**6339.71**	
(b) 1.	Escalation	Nil	
2.	Interest During Construction (IDC)	726.32	
3.	Financial Charges (FC)	51.94	
	Sub Total (b)	**778.26**	
	Total (a+b)	**7117.97**	
(c)	LADC @1.5% of (a+b)	106.77	
	Grand Total	**7224.74**	
		Say Rs. 72.25 Crore	

(Rupees seventy two crore and twenty five lac only)

Chief Engineer(P&M),
HPSEB,Vidyut Bhawan,
Shimla-171004

A&N/S

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Annexure-II

UPPER-JOINER SHP (4x3.00 MW) IN DISTT. CHAMBA, HIMACHAL PRADESH OF "M/S TEJASSARNIKA HYDRO ENERGIES PRIVATE LIMITED, PLOT NO. 125, ROAD NO. 71, NAV NIRMAN NAGAR, JUBILEE HILLS, HYDERABAD-500 033(AP)".

I. Tentative Financial Package

Debt : Equity : 70 :30

Sr. No.	Description	Amount (Rs. in crore)
A	Equity by Promoter.	21.68
B	Debt. from Indian Financial Institution	50.57
	Total (Debit + Equity)	72.25

II. Terms of Loan

Sr. No	Item	Package
1.	Source of Debt	Financial Institution
2.	Loan Amount. (Rs. in crore)	50.57
3.	Interest rate	11.00%
4.	Repayment period	7 Yrs.
5.	Moratorium Period	3 years

Chief Engineer(P&M),
HPSEB, Vidyut Bhawan,
Shimla-171004

AEY/S

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Annexure-III

UPPER-JOINER SHP (4x3.00 MW) IN DISTT. CHAMBA, HIMACHAL PRADESH OF "M/S TEJASSARNIKA HYDRO ENERGIES PRIVATE LIMITED, PLOT NO. 125, ROAD NO. 71, NAV NIRMAN NAGAR, JUBILEE HILLS, HYDERABAD-500 033(AP)".

SALIENT FEATURES

1.	**LOCATION**	
	State	Himachal Pradesh
	District/Tehsil	Chamba/Churah
	River/Khad	Joiner khad, a tributary of river Siul, which is a tributary of Ravi river.
	Vicinity	Bada, Lajana, Khajwa villages in tehsil Churah
	Proposal	Weir site on Joiner khad upstream of confluence of Bada nallah with Joiner at El. ± 1928.50 and power house on right bank at El. ±1632.50 m.
	Geographical co-ordinates of project	Easting 76°15'48" Northing 32°50' 20"
	SOI toposheet	52 D/1 & 52D/5
2.	**HYDROLOGY**	
	Catchment area at diversion site	60.25 sq. km
	Design discharge	5.08 cumec
	Design flood	271.79 cumecs
3.	**PROJECT COMPONENTS**	
3.1	**DIVERSION WEIR**	
	Type	Drop type trench weir
	River bed level	El ± 1928.50 m
	Size	3.50 m wide, 10.00m long
	Design discharge	5.08 cumecs.
	Shingle flushing system	1.80 m ×2.10m, D-shaped tunnel, ± 50 m long
	Flushing discharge	1.98 cumec
3.2	**DESILTING TANK**	
	Type	Underground, Central silt gutter type.
	Size	One chamber of 55.00m × 5.50m × 6.30m size with inlet and outlet transition.
	Particle size to be removed	All particles down to 0.20 mm size.
	Flushing discharge	1.27 cumecs
3.3	**WATER CONDUCTOR SYSTEM**	
	Type	D-Shaped tunnel
	Size	1.80m x 2.10 m
	Length	± 2664 m
	Slope	1 in 750
	Design discharge	5.08 cumec
	Velocity	1.99 m/sec.

3.4	**FOREBAY**	
	Type	Surface
	Size	40.00 m × 6.50m × 4.25m
	Storage capacity	1097 cum
	Full Forebay Level	El ±1923.01 m
	Minimum Draw Down Level	El ±1921.01 m
	Peaking time	± 3 minutes
3.5	**PENSTOCK**	
	Type	Circular, surface steel penstock
	Size	1200 mm dia,
	Thickness	varying between 8 mm to 16 mm
	Length	± 565 m
	Velocity	5.43 m/sec.
	Centre line at intake	El ±1919.63 m
	Size of Bifurcations at lower end	850 mm dia. each
3.6	**POWER HOUSE**	
	Type	surface
	Size	
	i) Length	41.60 m
	ii) Width	15.00 m
	iii) Height	12.00 m
	Installed capacity	4 x 3.00 MW
	Gross Head	± 288.51 m
	Net head	± 282.90 m
	Turbine	
	Type	Horizontal shaft Pelton turbine
	Number of units	four
	Capacity	3000 KW each
	Overload capacity	15%
	C/L of jet	±1632.50 m
	Generator	
	Type	Horizontal axis Synchronous
	Capacity	3333.33KVA
	Excitation system	Brushless
	Power factor	0.9 lag
	Frequency	50 Hz.
	Overload capacity	15%
3.7	**TAIL RACE**	
	Type	RCC box section
	Size	2.10 m ×1.80 m
	Length	± 50 m

Chief Engineer(P&M),
HPSEB, Vidyut Bhawan,
Shimla-171004

AE Y/S

Annexure-IV

UPPER-JOINER SHP (4x3.00 MW) IN DISTT. CHAMBA, HIMACHAL PRADESH OF "M/S TEJASSARNIKA HYDRO ENERGIES PRIVATE LIMITED, PLOT NO. 125, ROAD NO. 71, NAV NIRMAN NAGAR, JUBILEE HILLS, HYDERABAD-500 033(AP)".

LIST OF STATUTORY CLEARANCES REQUIRED

Sr. No.	ITEM	AGENCY	REMARKS
1.	WATER AVAILABILITY	1. State Govt. 2. CWC	Interaction between State Govt. Deptt. & CWC required. Relevant Irrigation Act of the State & Central Water Commission.
2.	SEB CLEARANCE	1. SEB 2. State Govt.	Section 44, E (S) Act, 1948 repealed by Electricity Act, 2003.
3.	POLLUTION CLEARANCE WATER AND AIR	State/ Central Pollution Control Board	Water (Prevention & Control of Pollution) Act, 1974, Air (Prevention & Control of Pollution) Act, 1981.
4.	FOREST CLEARANCE	1. State Govt. 2.Min. & E&F GOI	Coordination with State Forest Deptt./ Min. of Environ. & Forest (MOE&F) regarding Forest (Conservation) Act, 1980.
5.	ENVIRONMENT	1. State Govt. 2. Min. of E&F GOI	As per item (3) & (4) and Govt. Policy in force.
6.	REGISTRATION	Registrar of Companies	Under Indian Companies Act, 1950.
7.	REHABILITATION & RESETTLEMENT OF DISPLACED FAMILIES BY LAND ACQUISITION	1. State Govt . 2. Min. of E&F GOI	
8.	EQUIPMENT PROCUREMENT	DGTD, CCI&E	Import & Export Acts.

Chief Engineer(P &M),
HPSEB,Vidyut Bhawan,
Shimla-171004

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HIMACHAL PRADESH 00AA 609302

IMPLEMENTATION AGREEMENT

This Agreement executed on this 7th day of the month of August two thousand Eight between the Governor of Himachal Pradesh, through **Shri Ajay Mittal**, Principal Secretary, Department of Multipurpose Projects and Power, Government of Himachal Pradesh, having its office at Civil Secretariat, Shimla-171002, (hereinafter referred to as "**First Party**"), which expression unless repugnant to the context or meaning thereof, shall include its successor(s), administrator(s) or permitted assigns, of the **FIRST PART**;

AND

M/s Tejas Samika Hydro Energies (P) Ltd., having its registered office **Plot No. 125, Road No. 71, Navanirman Nagar Colony, Jubille Hills, Hyderabad** (hereinafter referred to as "**Second Party**") which expression shall, unless repugnant to the context or meaning thereof, include its successor(s), administrator(s) or permitted assigns, through **Mr. M. Ramesh Reddy, Director** who has been duly authorised by the Second Party vide their resolution dated **18th October, 2008** to execute this agreement, of the **SECOND PART**.

WHEREAS the First Party in accordance with its power policy had entered into a Memorandum of Understanding (MOU) on **12th January,2005** with **M/s Tejas Samika Power, Plot No. 125, Road No. 71, Navanirman Nagar Colony, Jubille**

Pr. Secretary (Power) to the Govt. of Himachal Pradesh, Shimla-171002

For Tejas Samika Hydro Energies (P) Ltd.
Director

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Hills, Hyderabad to carry out detailed investigations, techno-economic studies, submission of a Detailed Project Report (DPR) for the implementation of **Upper Joiner** Hydro Electric Project (HEP) **5.00** MW installed capacity, located in District **Chamba**, of Himachal Pradesh (hereinafter referred to as the "Project"); and

WHEREAS **M/s Tejas Sarnika Power** has carried out the necessary detailed investigations of the Project and submitted a Detailed Project Report for installed capacity of **5.00 MW** to the First Party and both the Parties have satisfied themselves about the techno-economic viability of the Project; and

WHEREAS, the Implementation Agreement (IA) was signed between the First Party and **M/s Tejas Sarnika Power** on **6th September, 2006**. ; and

WHEREAS, M/s Tejas Sarnika Power incorporated the company known as M/s Tejas Sarnika Hydro Energies (P) Ltd., Plot No. 125, Road No. 71, Navanirman Nagar Colony, Jubille Hills, Hyderabad which is a Generating Company within the meaning of Section 2(28) of the Electricity Act, 2003 ; and

WHEREAS, M/s Tejas Sarnika Power intended to transfer / assign all the assets, obligations, liabilities, rights, privileges and benefits of the project to M/s Tejas Sarnika Hydro Energies (P) Ltd., accrued to it under the Implementation Agreement dated 6th September, 2006 ; and

WHEREAS, the First Party has consented through Order reference No. MPP-F(2)29/2002 (NES) , dated 27th January, 2007 to change in name from M/s Tejas

For Tejas Sarnika Power (P) Ltd.
Director 2

Secretary (Power) to the Govt. of Himachal Pradesh, Shimla-171009

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shall include any amendment thereof or any replacement in whole or in part.

Secretary (Power) to the Govt. of Himachal Pradesh, Shimla-171001

For Tejas Sarnika Power (P) Ltd.
Director

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Sarnika Power to M/s Tejas Sarnika Hydro Energies (P) Ltd. and transfer of assets, liabilities, rights , obligations and benefits arising out of the Implementation Agreement dated 6th September, 2006 **; and**

WHEREAS, to give effect to the above change fo name, a Tripartite Agreement was executed between the Government of Himachal Pradesh , M/s Tejas Sarnika Power and M/s Tejas Sarnika Hydro Energies (P) Ltd. on **18th May, 2007** ; and

WHEREAS, the Second Party , upon carrying out further more investigations found that the capacity of the Project is more than is estimated and hence, submitted a fresh Detailed Project Report (DPR) for an enhanced capacity of **12.00 MW** and both the Parties have satisfied themselves about the techno-economic viability of the Project; and

WHEREAS the Second Party has agreed to provide to the First Party or its agent **15% of the Deliverable Energy of the Project for the period starting from the date of synchronization of the first generating unit and extending upto 12 years from the date of Scheduled Commercial Operation of the Project, 21% of Deliverable Energy of the Project for a period of next 18 years and thereafter 33% of the Deliverable Energy for the balance agreement period beyond 30 years.** The royalty in the shape of free power shall start accruing to the First Party from the Scheduled Commercial Operation Date/synchronization of the first generating unit whichever is earlier; and

WHEREAS the Second Party has confirmed that a Generating Company within the meaning of section 2(28) of the Electricity Act,2003 named **M/s Tejas Sarnika Hydro Energies (P) Ltd.,** having its registered office at **Plot No. 125, Road No. 71, Navanirman Nagar Colony, Jubille Hills, Hyderabad** has been incorporated, for implementation of **Upper Joiner (12.00 MW) HEP**, and has accepted and taken overall assets, liabilities, obligations, rights, privileges and benefits arisen out of the Implementation Agreement between the parties, for which a separate Tripartite Agreement shall be executed on **18th May, 2007**.

NOW, THEREFORE, in consideration of the promises and mutual covenants and conditions set forth herein, it is agreed by and between the parties hereto as follows:

1. INTERPRETATIONS AND DEFINITIONS

1.1. INTERPRETATIONS:-

1.1.1 The nomenclature of this agreement, headings and paragraphs numbers are for convenience of reference only and shall be ignored in construing or interpreting this agreement.

1.1.2 References to persons and words denoting natural persons shall include bodies corporate and partnerships, joint ventures and statutory and other authorities and entities.

1.1.3 References to any enactment, ordinance or regulation or any provision thereof shall include any amendment thereof or any replacement in whole or in part.

Secretary (Power) to the Govt. of Himachal Pradesh, Shimla-171002

For Tejas Sarnika Hydro Energies (P) Ltd.

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1.1.4 Reference to Recitals, Articles, Clauses, Sub-Clauses or Annexures shall unless the context otherwise requires, be deemed to include the Recitals, Articles, Clauses, Sub-Clauses or Annexures of this Agreement.

1.1.5 The words importing singulars shall include plurals and vice versa as may be necessary.

1.1.6 Terms beginning with capital letters and defined as per Clause 1.2 of this agreement shall have the same meaning ascribed thereto and the terms defined in the Annexures and used therein shall have the meaning ascribed thereto in the Annexures.

1.1.7 The Annexures and Schedules to this agreement form an integral part of this agreement and shall be in full force and effect as if they were expressly set out in the body of this agreement.

1.1.8 Any reference at anytime to any agreement, deed, instrument, license or document of any description shall be construed as reference to that agreement, deed, instrument, license or other document as amended, varied, supplemented, modified or suspended at the time of such reference provided that this Clause shall not operate so as to increase liability or obligations of any Party hereunder or pursuant hereto in any manner whatsoever.

1.1.9 Any agreement, consent, approval, authorisation, notice, communication, information or report required under or pursuant to this agreement from or by any Party shall be valid and effectual only if it is in writing and under the hands of duly authorised representative of such Party in this behalf and not otherwise.

1.1.10 Any reference to any period commencing "from" a specified day or date and "till" or "until" a specified day or date shall include both such days or dates.

1.2 **DEFINITIONS:-** In this Agreement, the following words and expressions, unless repugnant to the context or meaning thereof, shall have the meanings hereinafter respectively as assigned to them as under:-

1.2.1 "Act" means the Electricity Act, 2003;

1.2.2 **"Acquired Land"** shall have the meaning set forth in Clause 4.3;

1.2.3 "Agent" means the Board/appropriate State Power Utility or such other authority as may be appointed by the First Party for the purpose of this agreement;

1.2.4 **"Agreement"** means this agreement together with all its Appendices and Annexures and any amendments thereto made in accordance with the provisions herein contained;

1.2.5 **"Agreement Period"** shall have the meaning as specified in Clause-3;

1.2.6 **"Board"** shall mean the Himachal Pradesh State Electricity Board;

1.2.7 **"CEA/Authority"** means the Central Electricity Authority as defined under section 2 (6) of the Electricity Act, 2003 or its successors;

For Tejasvinita Hydro Energy (P) Ltd.

Director

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1.2.8 **"Central Transmission Utility (CTU)"** means any Government Company which the Central Government has notified under sub-section (1) of section 38 of the Act;

1.2.9 **"Commercial Operation"** means the state of Unit/Project when Unit/Project is capable of delivering Active Power and Reactive Power on a regular basis after having successfully completed the commissioning tests as per Prudent Utility Practices;

1.2.10 **"Commercial Operation Date (COD)"** means the date on which the Commercial Operation of Unit/Project as the case may be is achieved by the Second Party;

1.2.11 **"Company"** means **M/s Tejas Samika Hydro Energies (P) Ltd.**, a generating company within the meaning of section 2 (28) of the Electricity Act, 2003 and registered under Companies Act, 1956;

1.2.12 **"Contractor"** means any person, firm or body corporate engaged by the Second Party for the implementation of the Project;

1.2.13 **"Control Centre" or "State Load Despatch Centre" or "SLDC"** means the State Load Despatch Centre located at Shimla or such other control centre designated by the Board/State Transmission Utility/First Party from time to time (but not more than one at a time) from which the Despatch Instructions will be issued to the Second Party at the Station;

1.2.14 **"Debt"** means the amount of any loan, non-convertible debenture or other similar obligation, contracted or raised and received by the Second Party under the Financing agreements, and actually expended (or to be expended) for the Project and which shall not be greater than the principal amount of debt specified in the applicable currency in the estimate of Capital Cost of the Project;

1.2.15 **"Deliverable Energy"** means the electrical energy generated at the Station, as measured at generator(s) terminals less the summation of the following:-

(i) actual auxiliary consumption for the bonafide use of auxiliaries, lighting and ventilation in the Power Station and intake works and the transformation losses (from generation voltage to transmission voltage) of the step up transformers at the power house switchyard; and

(ii) transmission losses at actuals, which shall be the difference of the electrical energy measured at sending and receiving ends of the transmission line (i.e. the power station end and the Interconnection Point);

For this purpose and subject to above, the energy meter reading shall be taken on monthly basis at the Interconnection Point;

1.2.16 **"Despatch"** means to schedule and control the generation of the Project in order to commence, increase, decrease or cease the electrical output as delivered to the Grid System in accordance with the Board's/State Transmission Utility's instructions from the Control Centre in conformity with the agreement and Prudent Practices;

For Tejas Samika Hydro Energies (P) Ltd.

Director

Secretary (Power) to Govt. of Himachal Pradesh Shimla-171002

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1.2.17 **"Despatch Instruction"** shall mean an instruction issued by the Control Centre to the Second Party for the Despatch of power by message/fax/email to be confirmed in writing by Control Centre as per the operating procedure developed by the Parties to operate the Project in accordance with the terms of this agreement, technical limits and Prudent Utility Practices including-

(a) an instruction to target active/reactive power output to be maintained by the Project;

(b) an instruction to synchronise or desynchronise a unit at a particular time;

(c) an instruction to defer or cancel a scheduled outage or maintenance outage; and

(d) an instruction for backing down the active/reactive power due to Grid conditions;

1.2.18 **"Detailed Project Report (DPR)"** means the Project Report submitted by the Second Party and as finally approved by the competent authority;

1.2.19 **"Dis-incentive Energy"** shall have the meaning set forth in Clause 5.32.

1.2.20 **"Dispute"** shall have the meaning as specified in Clause 11.1;

1.2.21 **"Effective Date"** means the date of signing of the agreement;

1.2.22 **"Equity"** means the aggregate of all subscribed and paid up share capital of the Second Party in different currencies as converted into Rupees, by application of the procedure approved by the Authority/GOI, as invested in the Project and held by one or more shareholders in the Second Party, which shall be in accordance with the financial plan;

1.2.23 **"Financial Closure"** means the first business day on which substantial funds are made available to the Second Party under the terms of the Financing Agreement;

1.2.24 **"Financing Agreement"** mean the loan agreements, notes, indenture, security agreements, letters of credit and other documents relating to the financing (including refinancing) of the Project and the capital cost of any part thereof, as amended, supplemented or modified from time to time and approved by the First Party;

1.2.25 **"Force Majeure"** shall have the meaning as ascribed thereto in Clause 7;

1.2.26 **"Government"** means the Government of Himachal Pradesh;

1.2.27 **"GOI"** means the Government of India;

1.2.28 **"Grid/Grid System"** means the network of power system interconnecting different power generating stations, transmission lines and sub-stations for transmitting the electrical output from the Interconnection Point upto main load Centre(s);

1.2.29 **"HPERC"** means the Himachal Pradesh Electricity Regulatory Commission;

1.2.30 **"Incentive Energy"** shall have the meaning set forth in Clause 5.31;

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1.2.31 **"Interconnection Facilities"** means all the facilities which shall include without limitation, switching equipment, communication, protection, control and metering devices etc. at the Interconnection Point(s) to be installed and maintained at the cost of the Second Party to enable evacuation of power output from the Project in accordance with this agreement;

1.2.32 **"Interconnection Point(s)"** shall mean the physical touch point at sub-station(s) of the Board/State Transmission Utility/Central Transmission Utility where the Project's transmission line for evacuating the power from the Project is connected to the Grid;

1.2.33 **"Local Area Development Committee (LADC)** shall mean the Committee constituted by the Government and entrusted with the function as specified in Clause 4.18;

1.2.34 **"Law"** means any Act, rule, regulation, notification, order or instruction having the force of Law enacted or issued by any competent legislature, Government or statutory authority in India;

1.2.35 **"MOEF"** means Ministry of Environment & Forests, Government of India or its successor authority/agency;

1.2.36 **"Month"** means English Calendar month;

1.2.37 **"Net Saleable Energy"** means the electrical energy in KWh, delivered by the Second Party at the Interconnection Point, less the First Party Supply;

1.2.38 **"NRLDC"** means "Northern Regional Load Despatch Centre" or its successor entity;

1.2.39 **"PGCIL"** means Power Grid Corporation of India Ltd.;

1.2.40 **"Parties"** refer to the First Party and the Second Party collectively;

1.2.41 **"Party"** shall refer to the Government and/or the Company individually;

1.2.42 **"Permanent Works"** means the permanent Works forming part of the Project that are required to be constructed/installed and maintained as such for the implementation of the Project for at least the Agreement Period and shall also include housing facilities for staff to be engaged for operation and maintenance of the Project;

1.2.43 **"Power Purchase Agreement (PPA)"** means a contractual agreement to be signed by the Second Party with a party for sale of power from the Project to that party;

1.2.44 **"Project Affected Areas"** means areas/ villages surrounding/ falling in the catchment/ watershed areas extending from the Reservoir to the Tail Race of the Project.;

1.2.45 **"Project"** means **Upper Joiner** Hydroelectric Power Project proposed to be established on **Joiner stream** in the **Chamba** District of Himachal Pradesh, India including complete hydroelectric power generating facility covering all components such as dam, intake works, water conductor system, power station, generating units, Project roads, bridges, offices, residential facilities,

Director

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stores, guest houses, police station and other connected facilities including the Interconnection Facilities.

1.2.46 **"Prudent Utility Practices"** means those practices, methods, techniques and standards that are generally accepted internationally from time to time by electric utilities for the purpose of ensuring safe, efficient and economic design, engineering, construction, commissioning, testing, operation and maintenance of various components of the Project of the type specified in this agreement and which practices, methods and standards shall be adjusted as necessary to take account of:-

(i) installation, operation and maintenance guidelines recommended by the manufacturers of plant and equipment to be incorporated in the Project;
(ii) the requirements of Indian Law; and
(iii) physical conditions at the Site;

1.2.47 **"Royalty"** shall have the meaning set forth in Clause 5.4;

1.2.48 **"Security Deposit"** shall mean the sum as prescribed in Clause 2.

1.2.49 **"Scheduled Commercial Operation Date"** means the date by which the Second Party shall have achieved the Commercial Operation of the Project and shall as per the Techno-Economic Clearance;

1.2.50 **"Site"** means the site of Project appurtenances, generating plant including land, waterways, roads and any rights acquired or to be acquired by the Second Party for the purposes of the Project;

1.2.51 **"State"** means Himachal Pradesh ;

1.2.52 **"Station"** means the **Upper Joinor Power House** for generating electricity, including any building and plant with step up transformer, switchgear, switchyard, cables or other appurtenant equipment, if any, used for that purpose;

1.2.53 **"State Transmission Utility (STU)"** means the Board or the Government company specified as such by the First Party under sub-section(1) of section 39 of the Act;

1.2.54 **"Temporary Works"** means all temporary Works of any kind required in connection with the implementation of the Project and that are incidental and ancillary to the design, engineering and construction of the Project and are constructed/installed and maintained till the Commercial Operation Date for the Project, and not forming part of Permanent Works;

1.2.55 **"Transmission Licensee"** means a licensee authorized by the Appropriate Electricity Regulatory Commission to establish or operate transmission lines;

1.2.56 **"Unit"** means one hydro turbine generator including ancillary equipment and facilities thereto; and

1.2.57 **"Works"** means all works of civil, electrical and mechanical nature and including design, engineering, services, supplies and other work activities required and necessary for the implementation of the Project and shall also include the Permanent Works and the Temporary Works.

Secretary (Power) to the Govt. of Himachal Pradesh, Shimla-171001

For Tejasvini Hydro Energies (P) Ltd.

Director

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2. **SECURITY DEPOSIT/UPFRONT PREMIUM**

2.1 The Upfront Premium deposited by the Second Party at the time of submission of its proposal for enhancement of capacity Rupees one lac (Rs. 1,00,000) per Mega Watt totaling Rs.12,00,000/= (Rupees Twleve Lakh Only) shall continue as non-interest bearing "Security Deposit" with the First Party during the implementation period.

2.2 This Security Deposit shall remain valid till 6 (Six) months after the Commercial Operation Date of the Project and shall thereafter be immediately released/refunded to the Second Party, free of interest.

2.3 The Second Party shall be responsible for the payment of any taxes, charges and fees in connection with the Security Deposit.

3. **TERM OF THE AGREEMENT**

3.1 **Effectiveness:-** This Agreement shall come into force on the Effective Date.

3.2 **Agreement Period:-**

(a) This Agreement shall remain in force upto a period of 40 years from the Schedule Commercial Operation Date of the Project,(Agreement Period) unless terminated earlier in accordance with the provisions of the agreement.

(b) On completion of the Agreement Period, the Project shall revert to the First Party free of cost without any encumbrances.

3.3 Survival:- The termination or expiry of this agreement shall not affect the accrued rights, obligations and liabilities of either Party under this agreement, nor shall it affect any continuing obligations which this agreement provides, whether expressly or by necessary implication.

4. **OBLIGATIONS OF THE FIRST PARTY**

4.1 **Granting Consents/Permissions and Assistance in Obtaining Clearances:-** The First Party hereby agrees to grant to the Second Party all consents, permissions, statutory/non-statutory, within its purview as required by the Second Party to undertake, establish, operate and maintain the Project, for which the proposal shall be furnished by the Second Party within a period of eight (8) months from the Effective Date. The First Party shall assist the Second Party for expediting the various statutory/non statutory clearances required for the implementation of the Project, from various competent authorities of the First Party/Central Government or the Board/appropriate State Power Utility. The First Party shall forward all relevant proposals received from the Second Party to the GOI/Governmental authorities and shall assist so that all sanctions are accorded/got accorded from the competent authority within a period of ten (10) months from the date of submission of proposal by the Second Party the progress of which shall be monitored by the Multi-Disciplinary Committee (MDC) under the Chairmanship of Hon'ble Chief Minister, Himachal Pradesh. In case the sanctions/approvals are not accorded by the Government of Himachal Pradesh or got accorded by it from the competent authority, the First Party shall correspondingly extend the scheduled Commercial Operation Date of the Project, if it is prevailed beyond doubt that there have been no available delays on the part of the Second Party.

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4.2 **Use of materials:-** The First Party shall permit the Second Party, in accordance with the Law to collect and use boulders, stones, shingles, limestone and other building materials, except precious and semi-precious materials, from the river beds, and/or from the land acquired for or transferred to or leased out to the Second Party for the Project, on payment of royalty in accordance with the Government rules/rates in force from time to time.

4.3 **Acquisition and transfer of land:-**

(a) The First Party shall acquire, at the request and expense of the Second Party, and in accordance with the provisions of Land Acquisition Act, 1894 and other applicable laws, such private lands within the State of Himachal Pradesh as may be required by the Second Party for Permanent Works. The Second Party shall within a period of eight months submit such request to the First Party and the First Party shall finalize/settle such acquisition cases within ten months thereafter by resorting to the compulsory acquisition provision of Land Acquisition Act, 1894. In case of non-settlement /finalization of such cases within the stipulated period, the First Party shall correspondingly extend the Scheduled Commercial Operation Date of the Project. The Second Party shall at its own risk also be allowed to acquire such land through direct negotiations with the owners in accordance with the prevailing laws, rules and regulations in the State. However, failure of the Second Party to acquire such land through direct negotiations shall not entitle the Second Party for automatic extension in Scheduled Commercial Operation Date of the Project.

(b) The First Party shall provide necessary assistance to the Second Party in obtaining permission of the competent authority for the removal of trees standing on the Acquired/leased Land and on the Government lands which in its reasonable opinion are required to be felled or removed for the Implementation of the Project.

4.4 **Lease of Land for Permanent Works:-** Upon the request of the Second Party and subject to the provisions of laws in force, the First Party may, on such terms and conditions and rates prescribed by the First Party from time to time, provide for, on a long term lease, the Government land required for Permanent Works, as may be necessary for the construction, operation and maintenance of the Project.

4.5 **Lease of land for Temporary Works:-** Upon the request of the Second Party and subject to the provisions of laws in force, the First Party may provide, on such terms and conditions and rates as may be prescribed by the First Party from time to time, on a short term lease for a period not exceeding ten (10) years, such Government land required for Temporary Works, as is considered reasonably necessary by the First Party.

4.6 **Rehabilitation and Resettlement Plan:-** The First Party shall, subject to the approval of the GOI or any other competent authority, prepare a rehabilitation and re-settlement plan in association with the Second Party for local residents likely to be adversely affected or displaced due to construction of the Project at the Site as on the Effective Date. The cost of preparation and implementation of the above plan shall be borne by the Second Party.

Pr. Secretary (Power) to Govt. of Himachal Pradesh

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4.7 **Upgradation of Roads and Bridges:-** The First Party may, at the request and cost of the Second Party, construct, widen and strengthen such roads and bridges within the State of Himachal Pradesh as are considered reasonably necessary by the First Party. The First Party permits the Second Party to construct roads, bridges, culverts as considered necessary for the Project in the Project lands. The First Party may also permit the Second Party to construct roads, bridges, culverts as are considered reasonably necessary by the First Party in the interest of the Project on a case-to-case basis.

4.8 **Other Approvals:-** If any approval is required under the Law by the Second Party, the lenders, or Contractor(s) with respect to the Project, upon application therefore being made by the Second Party, First Party may take all reasonable and appropriate steps within its administrative power and as permissible by Law, to ensure that such approval is granted in a time bound manner mutually agreed between the parties.

4.9 **Communication:-** The First Party shall provide due assistance to the Second Party to obtain, in accordance with the prevailing Law and regulations, necessary permits to install and use suitable radio communication systems, including satellite communication equipment and walkie-talkies. Any system connecting with the national telecommunication system or any international telecommunication system will be subject to the approval/license from the relevant authorities, for the issuance of which First Party shall assist.

4.10 **Explosives:-** The First Party shall provide due assistance to the Second Party, under the Law and regulations, to obtain permission to procure, store and use such explosives which are required for the Project; provided that the responsibility of obtaining such a clearance and making the necessary arrangements rests with the Second Party.

4.11 **Import License:-** The First Party shall provide due assistance to the Second Party in obtaining all necessary import licenses for the Project from the relevant GOI authorities to the extent permissible by Law. The Second Party shall submit a list of such equipment required to be imported for the Project to the First Party for approval.

4.12 **Upstream/Downstream Projects:-** The First Party, through its own departments/Boards or IPPs shall be entitled to survey, investigate and implement any river valley power generation scheme upstream or downstream of the Project. The First Party shall put in place a Committee comprising of experts from the relevant field for determining the impact, if any, on the existing Projects due to allotment of any upstream and/or downstream Project. In the event of a dispute, the decision of First Party in the matter shall be final and binding on all the parties.

4.13 **Monitoring Committee:-** The First Party will constitute a Multi-Disciplinary Committee under the Chairmanship of Chief Minister. Other members shall be State Power Minister (Vice Chairman), Minister/MLAs of the area where Projects are being executed, representatives of the Second Party, representatives from various concerned departments of the Government, Chairman/Managing Director of the concerned Power Utility and Chairman, Local Area Development Committee (LADC). The Committee shall be monitoring the issues arising during the implementation of the Project. Employment related monitoring, Relief and Rehabilitation, review of Progress of LADC schemes, implementation of Catchment Area Treatment (CAT) Plan, Compensatory Afforestation, Environmental Management Plan, Environment

Secretary (Power) to the Govt. of Himachal Pradesh

For Karcham Hydro Corporation (P) Ltd.

Director

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Impact Assessment (EIA) Plan, and restoration of facilities which get damaged because of the implementation of the Project, quality control mechanism of the Projects, the Committee shall also review the recommendations and implementation thereof of the Forum of Hydroelectric Power Producers. The Committee shall review the progress of all statutory clearances, time and cost overruns of the Project, if any. The Committee shall also draw up the methodology to regulate the payments to be made by the Company to the various departments of the Government in connection with the implementation of the Projects. The Committee shall meet at such intervals, preferably quarterly at such places as is decided by it.

4.14 **Authority of Hydro Project Safety, Quality Control & Water Management:-** The First Party shall create an Authority of Hydro Project Safety, Quality Control & Management of water Flows and Discharge in due course. The First Party shall nominate suitable technical and professional persons in the Authority. The issues concerning Hydro Project's safety & management of water flows and discharges have assumed critical importance because of the recurrence of floods, earthquake, avalanches, glaciers, tunneling, piping, aging, terrorism etc. Un-regulated water flows and discharges particularly during the rainy seasons have been causing havoc downstream. The authority shall prepare safety regulations and guidelines and prepare safety management manual with respect to the Projects being executed by various Second Parties on the lines of International Commissions of Large Dams (ICOLD) and other Hydro Power Countries like Canada, US etc. The authority shall conduct continued surveillances on safety requirements right from the inception of the Project such as:-

(a) Monitoring & access to quality of construction and designs of each Project and recommend the use of modern and appropriate technologies like Tunnel Boring Machines etc.

(b) It shall ensure that such Hydro Projects operate normally and maintain emergency preparedness.

(c) Shall ensure periodic Hydro Project Safety & Management System Audit.

(d) Shall ensure dam safety assessment, traditional good practices and risk assessment.

(e) Shall prepare regulatory environment and ensure dam owners accountability including corporate man slaughter.

(f) To monitor the releases downstream of the diversion and ensure availability of minimum flow of water immediately downstream of the trench/barrage/dam for downstream requirements.

(g) Shall impose fines/penalties for violations as may be prescribed by the First Party.

(h) May resolve the inter Project disputes, if any.

The Second Party agrees to abide by the guidelines of above authority.

Pr. Secretary (Power) to the Govt. of Himachal Pradesh, Shimla-171002

For [illegible] Hydro Power (P) Ltd.

Director

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4.15 **Subsidiary Company:-** The First Party may provide possible assistance to the Second Party in the incorporation of the new subsidiary Company provided that the registered office of such a Company is within Himachal Pradesh.

4.16 **Local Area Development Committee:-** The First Party shall constitute a Local Area Development Committee (LADC) for Project (s) being implemented in each river valley. The Deputy Commissioners shall be the Chairman of the LADC and other members shall be nominated by the First Party, which will include the representatives of the HEPs also. Concerned SDM shall be the Member Secretary. The LADC shall be entrusted with, but not limited to, the following activities in the Project Affected Areas, which are those areas/ villages surrounding/ falling in the catchment/watershed areas extending from the Reservoir to the Tail Race of the Project :-

(a) Oversee the restoration of facilities adversely affected due to implementation of the Project.

(b) Oversee the implementation of Rehabilitation and Relief Plan.

(c) Oversee the implementation of Catchment Area Treatment (CAT) Plan and Compensatory Afforestation.

(d) Local Development activities related to development of Agriculture, Horticulture, Animal Husbandry, Fisheries, Rural Development, I&PH, Health, Forest, Education, PWD, Power and other social, religious and cultural activities etc.

The Deputy Commissioner may co-opt any other member as he deems fit.

However, PWD/ other roads leading to the Project areas shall not form part of LADC activities.

The activities of the LADC during execution shall be financed by the Project itself and for this purpose the Second Party shall make a provision of 1.5% of final cost of the Project. The LADC activities shall be financed from the above provision and not from free power as royalty.

The amount on account of Local Area Development shall be paid by the Second Party to the Deputy Commissioner of the Project Affected Areas (Chairman LADC) in equal annual installments during the Construction Period of the Project and shall be payable in 1st quarter of every financial year, starting from the date of financial closure.

The Second Party shall keep the First Party informed of any change in the Construction cost of the Project and for any increase in the construction cost of the Project from time to time, the Second Party shall release the installments accordingly

4.17 The Second Party shall build such infrastructural development works that are required for the project implementation in the vicinity for the Project area that may be essentially required for the benefit of local population. The expenditure on such works shall be incurred by the Second Party. These developmental works may be mutually decided with the First Party.

4.18 **Mortgaging of Land:-** The First Party agrees to permit mortgaging of land acquired/diverted for the Project as per rules in favour of the Financial

For Karcham Wangtoo Power Company (P) Ltd.

Director

Institutions/Banks/Lenders in order that the Financial Closure of the Project is achieved /expedited.

4.19 **Recruitment of Staff:-** The implementation of the provisions in respect of recruitment of staff on the Project made under Clause 5.5 of this agreement shall be monitored by the Department of Labour & Director, Employment and in case of infringement of provisions of employment Clauses by the Second Party, the Labour and Employment Department shall initiate any stringent legal action as they may deem fit. The Secretary (MPP & Power) to the Government of Himachal Pradesh shall also simultaneously initiate any punitive action in the form of withdrawal of approvals/clearances in respect of the Project, including disconnection of power/water supply etc. to the Project and other facilities in the Project area.

4.20 **Comprehensive Insurance:-** The First Party/Department of Labour and Employment shall monitor from time to time, the validity of the Comprehensive Insurance executed by the Second Party during the construction and O&M stage of the Project.

5. **OBLIGATIONS OF THE SECOND PARTY**

5.1 **MILESTONES TO BE ACHIEVED:-** The Second Party agrees to implement the Project strictly as per the schedule/milestones stipulated by the First Party.

Following milestones shall be achieved by the Second Party failing which consequential action as mentioned will be taken by the First Party.

S. No	Milestones	Time Period	Consequential Action.
		For Projects where DPR/PFR ready.	
1.	2.	3.	4.
1.	Submission of necessary inputs for obtaining TEC proposal (s) for obtaining other statutory/non-statutory clearances (Diversion of Forest Land, Environmental & Forest Clearance, Pollution Clearance) and Acquisition of Land by the Second Party to the First Party	Within 8 months from the date the IA is signed.	Termination of Implementation Agreement and forfeiture of Security Deposit deposited.

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For Himachal Pradesh Power (P) Ltd.

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2.	To obtain required sanctions/ approvals/clearances to the proposals submitted by the Second Party as per 1 above.	Within 10 months from the date of submission of proposal(s) by the Second Party	Extension of prescribed period in the MOU subject to deposit of prescribed Extension fee of Rs.10,000/- per MW per month subject to a maximum of 6 months.
3.	Achieving Financial Closure, signing of PPA, establishment of site office etc. and start of construction work on the Project.	Within 24 months from the date of signing of the IA or six months of obtaining the approvals/clearances mentioned at 2 above whichever is earlier.	Termination of the IA in case the construction work on the Project is not started and forfeiture of Security Deposit deposited.
4.	Project commissioning (scheduled Commercial Operation Date of the Project)	As per Techno-economic Clearance of the DPR.	Disincentive as per Clause 5.32.
5.	Handing over of the Project to the First Party free of cost.	The date falling 40 years after the Scheduled Commercial Operation Date of the Project.	Action as deemed fit.

In case the Second Party is unable to achieve Financial Closure within the time limit specified above, the Second Party agrees to start construction work on the Project positively within the time limit specified above by investing from its equity component. The Financial Closure shall be concluded within six months of start of the construction work on the Project.

5.2 **Submission of reports/documents:-**

5.2.1 The Second Party shall submit monthly progress report and the status of employment in the Project at the stage of obtaining statutory/non-statutory clearances and achieving Financial Closure of the Project. The Second Party shall also provide two copies each of the clearances/approvals as and when the same are obtained. The First Party will be at liberty to cancel the IA after affording due opportunity to the Second Party in case the First Party is not satisfied about the progress made by the Second Party.

5.2.2 The Second Party shall submit to the First Party two copies (hard and soft) each of the Project related agreements including in particular the Construction Contracts / EPC Contract, if any, the Financing Documents and the O&M Contract, if any. The Second Party shall ensure that these Project related agreements do not in any way hold the First Party liable to the Second Party or

For Tejasvini Hydro Electric (P) Ltd.

Pr. Secretary (Power) to the Govt. of Himachal Pradesh

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any Contract in any manner whatsoever and shall be without prejudice to the rights of the First Party

5.2.3 During the construction period of the Project, the Second Party shall submit progress report and status of the employment at the end of every calendar quarter along with videography covering the construction of the Project in that quarter. Such progress report and video recording shall be provided not later than fifteen days after the close of each quarter.

5.2.4 All the reports and documents mentioned in Clauses 5.2.1, 5.2.2 & 5.2.3 shall be submitted by the Second Party to the officer/agency designated by the First Party. The First Party shall constitute a team of experts to scrutinize such reports/documents, to carry out inspection of the Project site to submit its report to the First Party. The designated officer/agency shall provide all assistance to facilitate the functioning of the Committee.

5.2.5 The First Party may inspect the Construction Works and the Project in association with the representatives of the Second Party. The Second Party shall, at all times, afford access to the Site to the authorized representatives of the First Party and to the persons duly authorized by any Governmental Agency having jurisdiction over the Project, including those concerned with safety, security or environmental protection to inspect the Project Site and to investigate any matter within their authority and upon reasonable notice, the Second Party shall provide to such persons reasonable assistance/necessary information to carry out their respective duties and functions with minimum disruption to the construction, operation and maintenance of the Project consistent with the purpose for which such persons have gained such access to the Site.

5.3 **Mode of sale of power:-** The Second Party agrees that the Government of HP/ HPSEB shall have right of first refusal on sale of winter power on tariff to be determined by the H.P. State Electricity Regulatory Commission or any other appropriate commission as per the commitment made by it vide its letter No. TSHEPL/HP GOVT/2008-09/4300 dated 31st July, 2008. The Second Party will sell total energy generated from the project during the period from 1st November to 31st March every year to the HPSEB (after meeting the free power royalty commitment , which it is to supply to the HP Government for the entire year will also be supplied to the HPSEB during the above winter months)

5.4 **Royalty:-**

5.4.1 The royalty in the shape of free power shall be levied **@ 15% Free Power** of the Deliverable Energy of the Project for the period starting from the date of synchronization of the first generating unit and extending upto 12 years from the date of Schedule Commercial Operation of the Project, **@ 21% Free Power** of Deliverable Energy of the Project for a period of next 18 years **and @ 33% Free Power** of the Deliverable Energy for the balance Agreement Period beyond 30 years. The royalty in the shape of free power shall start accruing to the First Party from the Scheduled Commercial Operation Date/ synchronization of first generating unit, whichever is earlier.

5.4.2 In case the First Party levies any duty/tax on generation and supply of power, the same shall be borne by the Second Party except for royalty power which shall be borne by the First Party.

For Tehri Hydro Development Corp. (I) Ltd.

Director

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5.5 **Recruitment of Staff:-**

5.5.1 The Second Party agrees to provide employment to bonafide Himachalis whose names are registered on live register of any Employment Exchange located in the State of Himachal Pradesh, in respect of all the unskilled/skilled staff and other non-executives as may be required for execution, operation and maintenance of the Project, through the local Employment Exchanges or from other than such live registers from anywhere within the State or outside the State who are bonafide Himachalis or through the Central Employment Cell at Shimla. However, the first preference shall be given to oustees. In the event of non-availability of the requisite skilled manpower at various levels with requisite qualification and experience, non-availability certificates shall be obtained from the Labour Commissioner/Director Employment, Himachal Pradesh and only thereafter the Second Party will be free to recruit such persons from outside the State of Himachal Pradesh.

5.5.2 The Second Party agrees to ensure employment to bonafide Himachalis in all the unskilled/skilled and other non-executive categories of staff with the Contractors and Sub-Contractors as may be required for implementation of the Project. The Second Party shall ensure that all the unskilled/skilled staff and other non-executives as may be required for implementation of the Project, after deployment of surplus workers from other Projects of the Second Party located within Himachal Pradesh, shall be recruited through Central Employment Cell. Whenever, the Central Employment Exchange Cell to whom the vacancies have been notified in pursuance of the provisions of this Clause, fails to sponsor suitable candidates for the posts so notified within four weeks of receipt of the request, then the Second Party may resolve the other modes of recruitment. If it is not possible to recruit 100% staff from Himachalis for justifiable reasons, only then the Second Party shall maintain not less than 70% of the total employees/officers/executives from bonafide Himachalis persons.

5.5.3 The Second Party shall satisfy the Government that the Contractors/Sub-Contractors engaged by them for the Project shall give employment to local people/Himachalis for appointment as supervisors, workmen and labourers/workers in the Project.

5.5.4 In regard to direct recruitment of engineers and other executives, other things being equal in terms of eligibility criteria, qualification, experience etc, the Second Party shall give preference to the candidates well conversant with customs, culture, language and dialect of Himachal Pradesh. The advertisement regarding employment shall be issued in two English dailies and three Hindi daily papers having wide circulation within Himachal Pradesh, besides advertising through Parsar Bharti and Giriraj.

5.5.5 The Second Party shall ensure the deployment of Himachalis in respect of Executive/ Non-executive/skilled/non-skilled categories at any stage of the Project implementation. If it is not possible to recruit 100% staff from Himachalis for justifiable reasons, only then the Second Party shall maintain not less than 70% of the total employees/officers/executives from Bonafide Himachali persons.

5.5.6 The Second Party shall provide employment to one member of each of the displaced families or adversely affected as a result of the acquisition of land for the Project, during construction of the Project. During the operation and maintenance of the Project, the Second Party shall give preference to members of the displaced families for employment in the Project.

5.5.7 The petty contracts of the road work, retaining walls, buildings construction, carriage of construction material like sand, aggregate, cement, steel etc. engagement of all categories of other service providers, taxis for the staff deployed to the sites, engagement of other light and heavy vehicles, running of canteens/mess, engagement of security personnel through ex-servicemen cell normally be awarded to locals/Himachalis.

5.5.8 The Second Party shall also be required to provide in-house training programme to the locals affected by the Project so that they are in a position to get employment against various technical/administrative jobs in the Project.

5.5.9 The Second Party shall provide mandatory employment related information to the Labour Department of the Himachal Pradesh Government on the lines of instructions issued by the First Party in this regard within one month of signing of IA and thereafter on monthly basis.

5.5.10 The entire skilled/unskilled/supervisory manpower required for the execution, operation and maintenance of the Project by the Second Party or their Sub-contractors shall be recruited through the local employment exchanges. In case skilled workers/Personnels are not available locally the Second Party shall be required to recruit such personnel at the start of the Project implementation from the local area only and provide to them the necessary job related training to acquire the required skills.

5.6 **Consultancy:-** The Second Party agrees to take engineering services of a reputed design consultancy organization to oversee the Project planning, its layout design of various Project components and quality of construction to ensure safety of the Project components/structures during execution and operation of the Project in such a way that there is no loss of human life, property of the people, energy generation etc.

5.7 **Project Performance:-** The Second Party shall ensure that the execution, operation and maintenance of the Project is in conformity with the Project concept as per Detailed Project Report (DPR), Prudent Utility Practices and the manufacturer's specifications. The Project/Unit(s) shall be capable of meeting the load dispatch requirements. The Second Party shall follow the directives of the Control Centre/NRLDC in the interest of integrated grid operation. Any Dispute with reference to the directives of the Control Centre/NRLDC shall be referred to State Electricity Regulatory Commission whose decision in such a matter shall be final. Pending the decision of State Electricity Regulatory Commission, Control Centre's/NRLDC's directives shall prevail in the interest of smooth operation of the grid.

5.8 **Rehabilitation and Resettlement plan:-** The Second Party shall execute the rehabilitation and resettlement plan prepared by the First Party, pursuant to Clause 4.6 at its cost and also pay for the cost of preparation of the same to the First Party as stipulated under Clause 4.6. The amount so incurred shall form part of the Project cost required for dam projects only.

5.9 **Safety measures:-** The Second Party shall share the detailed engineering drawings of the Project and equipment installed whenever directed by the First Party to do so, to ensure transparency, safety, quality control and timely remedial action in case of operational problems.

For Tejassarnika Hydro Projects (P) Ltd.
Director

For & on behalf of the Govt. of Himachal Pradesh

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5.9.1 The Second Party shall ensure proper quality control and safety measures during implementation of the Project including any geological study, construction and testing at the site. During execution of the work the Second Party shall ensure all kinds of safety measures as per standard practice for safety of manpower and property including all the required safety measures for underground works. The First Party at the cost of the Second Party shall have the right to institute an appropriate mechanism to ensure the compliance by the Second Party in this regard. Second Party shall also ensure essential first aid facilities at all Project sites.

5.9.2 The Second Party shall ensure that the residential camps for all categories of manpower are situated at safer locations by taking into consideration the occurrence of probable flash floods and other eventualities like cloudbursts etc. The Second Party shall also ensure the well interconnectivity of the whole Project area through effective communication and transportation arrangements.

5.9.3 The Second Party shall ensure that all the Project vehicles and the access to roads are properly maintained and fully safe for use.

5.9.4 The Committee constituted under Clause 5.2.4 shall also monitor the safety measures as mentioned under Clause 5.9.

5.10 **Maintenance of Project/Project Safety:**-The agreement shall remain in force upto a period of 40 years from the Scheduled Commercial Operation Date of the Project, thereafter, the Project shall revert to the First Party free of cost and free from all encumbrances. The Project assets will be maintained by the Second Party in a condition that would ensure a residual life of the Project at the rated capacity for at least 30 years at any point of time during the 10th, 20th, 30th & 35th years of operations. The First Party or one of its appointed agencies would carry out a mandatory inspection of the Project site to ensure that the Project assets are maintained to the required standards to ensure the specified generation capability and residual life of the Project.

If such inspections find that the Project capacity and/or life are being undermined by inadequate maintenance, the First Party would be entitled to seek remedial measures from the Second Party. If the Second Party fails to comply with the requirement, the First Party would have the right to take over the commercial operation of the Project and shall have full right upon the sale of power including Second Party share. The cost on account of suggestive remedial measures shall be deducted including the operation & maintenance cost for such a period till the Project's assets are restored to the required standards to ensure the specified generation capability and residual life of the Project as specified above. Thereafter, the Project shall be handed over to the Second Party.

5.11 **Existing / Alternative facilities:-** In case any existing facilities including, but not limited to, irrigation systems, water supplies, roads, bridges, buildings, communication system(s), power systems and water mills are adversely affected because of the implementation of the Project, the Second Party shall be responsible for taking remedial measures to mitigate such adverse effects. The cost of the above remedial measures shall become a part of the Project cost. Such facilities shall be as mutually identified and agreed upon between the Second Party, the First Party and LADC. The Second Party shall not interfere with any of the existing facilities till an alternate facility, as identified, is created.

For Tidong Power Projects (P) Ltd.

Director

Secretary (Power) to the Govt. of Himachal Pradesh

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The Second Party shall make suitable financial provisions for mitigation of adverse impacts as per the approved EIA plan and mitigation of degradation of environment due to disturbance of eco-system in watershed area, at the cost of Project.

5.12 **Compensatory Afforestation:-** The Second Party shall pay to the First Party the cost of raising compensatory afforestation and its maintenance for a period and the extent of area, as may be determined by Ministry of Environment and Forests (MOEF), GOI.

5.13 **Catchment Area Treatment Plans:-** The Second Party shall make suitable financial provisions in the Project cost for the Catchment Area Treatment Plans, as may be determined by the MOEF, GOI. The cost involved on this account shall be paid by the Second Party to the Forest Department of the Government of Himachal Pradesh as per Forest and Environment clearance accorded by the GOI.

5.14 **Environmental Impact Assessment:-**

5.14.1 The Second Party shall be liable to carry out Environmental Impact Assessment as required under the Environmental (Protection) Act, 1986 and Wild Life Protection Act through Consultant(s)/Experts drawn from a reputed National/International organisation and obtain the consent of State Pollution Control Board under the Water (Prevention and Control of Pollution) Act, 1974 or any other environmental statute, Wild Life Protection statute as may be applicable.

5.14.2 The Second Party shall be responsible for mitigation of adverse impacts as per the approved EIA Plan and mitigation of degradation of environment due to disturbance of eco-system in watershed area. The cost of the same will be entirely borne by the Second Party.

5.15 **Disaster Management Plan:-** The Second Party shall prepare Disaster Management Plan and its implementation taking into consideration the different flood eventualities, cloudbursts or any kind of natural calamity at various stages of construction and operation of the Project and their mitigation measures. The Second Party shall include this in the DPR to be submitted to the First Party.

5.16 **Maintaining Ecological Balance:-** The Second Party shall be responsible for maintaining the ecological balance by preventing deforestation, water pollution and defacement of natural landscape in the vicinity of Works. The Second Party shall take all reasonable measures to prevent any unnecessary destruction, scarring or defacement of the natural surroundings in the vicinity of the Works. Any damage caused shall be made good by LADC at the cost of the Second Party.

5.17 **Ensuring Flow of Water:-** The Second Party 'if ROR Project' shall ensure minimum flow of 15% water immediately downstream of the diversion structure of the Project all the times including lean seasons from November to March, keeping in mind the serious concerns of the State Govt. on account of its fragile ecology & environment and also to address issues concerning riparian rights, drinking water, health, aquatic life, wild life, fisheries, silt and even to honour the sensitive religious issues like cremation and other religious rites etc. on the river banks. However, the Second Party is at liberty to install mini hydel

Pr. Secretary (Power) to the Govt. of Himachal Pradesh, Shimla-171002

For Tejassarnika Hydro Projects (P) Ltd. Director

Projects to harness such water for their captive use, for their utilities, systems and colonies.

5.18 **Protection of Fish Culture:-** The Second Party shall take appropriate steps, as may be required, for the protection of fish culture as per environmental requirements. The Second Party shall enter into a separate agreement on protection of fish culture with the First Party, if it is considered necessary by the Fisheries Department of the Government of Himachal Pradesh.

5.19 **Fishing, Recreational and Navigational Rights:-** The fishing, recreational and navigational rights in the river, water, channels, reservoirs, lakes shall remain vested in the First Party subject only to such restrictions as may be necessary for the operational requirements, safety and security of the Project.

5.20 **Water requirement for construction:-** The Second Party shall ensure that the water requirement for construction of the Project including potable water shall be generally arranged and harnessed by them from the river source.

5.21 **Dumping of Excavated Material:-** The Second Party shall follow environmental related issues concerning disposal of blasting muck and soil etc. In Himachal Pradesh because of the peculiar topography, the availability of land is scarce to have dumping sites. The Second Party agrees to use such material for the Project and the remaining material shall be allowed to be used by other development departments like PWD, I&PH and several others for the execution of their area developmental schemes including the channelization of the river waters by the concerned development agencies. Not only this, even private crusher owners etc. and other private users shall also be allowed to remove such material from the site free of cost. The prescribed norms shall be available with the Pollution Control Board.

The Second Party agrees not to dump such material on the Project site or any other inappropriate place which flows further to downstream and rivers causing serious environmental concern, which shall attract punishment under various laws of Pollution Control Board. The Second Party shall ensure that the material excavated from the site shall be dumped in the area duly approved by the MOEF, GOI/State Pollution Control Board.

5.22 **Improvement of Existing Roads:-** The Second Party shall bear the cost of improvement/widening of the existing roads if required to be used for the construction of the Project.

5.23 **Use of Facilities:-** Subject to availability, security, safety, law and order and operational factors being met, the Second Party shall permit free use, by the First Party and the general public, of all service roads/bridges constructed and maintained by it. Other facilities like hospitals, post offices, schools etc. shall also be extended to the local public in this regard based on the objective of providing such facilities.

5.24 **Consumptive Use of Water:-** The First Party shall have the right for withdrawal of water from the river course for the consumptive use by pumping or by gravity for the purpose of potable water supply and irrigation to the affected population.

5.25 **Local Area Development:-** The Second Party shall build such infrastructural development works that are required for project implementation in the vicinity for the Project area that may be essentially required for the benefits of local

For [illegible] (P) Ltd.

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Director

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population. The expenditure on such works shall be incurred by the Second Party. These developmental works may be mutually decided with the First Party.

5.26 **Forum of Hydro Power Producers:-** It has been observed that after the setting up of various Hydroelectric Projects in Satluj basin, numbers of technical and socio-economic problems have arisen due to post effects of Hydroelectric Projects in the State. To mitigate any eventuality with regard to the execution of Hydroelectric Projects in the Satluj Valley, a forum of Hydro Power Producers of Satluj basin has come into existence on 5.11.2005. The main function of the forum relates to (i) Environment (ii) Operation of Power stations and Sharing of Technical Expertise & Experience (iii) Data Sharing (iv) Disaster Management and Planning and (v) Common Issues with First Party & Government of India. The guidelines of the forum wherever applicable, the attempt shall be made to abide by the recommendations of Forum and applicable to all the Power Producers/Second Partys in the State of Himachal Pradesh. If however, any such more forums are constituted for other river basins, the guidelines of the same shall also be applicable on Second Partys/Power Producers, executing Projects in that area.

5.27 **Police Station/Chowki and Labour Office:-** The Second Party shall open a Police Station/Chowki and a Labour office in Projects above 50 MW at their own cost in the Project area. The Second Party shall also bear the cost of deployment of Police Personnel during the construction phase of the Project. For the Projects between 5 MW to 50 MW the Second Party shall inform the local Police Station and the Labour Office about the details of the labourers and other work force engaged who are both from within the State, Country or outside the Country, regularly.

5.28 **Protection of water rights**

The Second Party shall ensure to protect the water rights of the local inhabitants for drinking and irrigation purposes etc. by verifying the revenue entries and activities of I&PH Department of the Government of Himachal Pradesh so as to ensure that such rights are not infringed upon. Any dispute in the matter shall be referred to a Committee to be appointed by the First Party involving Irrigation & Public Health and Revenue departments. However, the decision of the First Party shall be final and binding on all the parties.

5.29 The IPPs have an option to develop such Projects either as run of the river (ROR) schemes or storage Projects. However, in case of a storage Projects, approval of the First Party shall ensure that such Projects cause minimum submergence of habitations and agricultural holding of the people of the area.

5.30 **Equity Participation:-**

5.30.1 The Second Party has been selected for the Project on the basis of the equity participation in implementation of the Project as under:-

Sr. No.	Name of Company/Consortium	Equity participation
1.	M/s Tejas Sarnika Hydro Energies (P) Ltd. & its holding companies.	100%

For Tejas Sarnika Hydro Energies (P) Ltd.
Director

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5.30.2 The Second Party agrees that they shall retain the above equity participation till three years after commissioning of the Project. Any change in the Consortium/Equity participation would automatically result in termination of this agreement and the Project shall revert back to the First Party. No compensation whatsoever shall be payable by the First Party in this regard. It may be further noted that all the correspondence shall be made with the party which signs the I.A. till such time as the authority vested in gives authorization to any other person with valid authorization of Board of Directors of the Second Party.

5.30.3 The First Party may consider the request of the Second Party for changing the name of the Second Party or Consortium subject to the condition that the Principal Promoter shall retain the controlling interest i.e. 51% equity in the new entity. In the event of any contravention, the First Party shall terminate the I.A. forthwith at any stage.

5.30.4 The Second Party shall be permitted to incorporate a Special Purpose Vehicle for the implementation of the Project with its Registered Office within Himachal Pradesh with the same equity participation as given in Clause 5.30.1. All rights and obligations under this agreement shall thereafter be transferred to the new company by entering into a Tripartite Agreement between the parent Company and Special Purpose Vehicle and the First Party. The new Company shall ensure that **M/s Tejas Sarnika Hydro Energies (P) Ltd.** shall retain controlling interest in the equity of the new company upto the Commercial Operation Date of the Project and three years thereafter.

5.31 **Incentive For Early Commercial Operation of The Project:-** In case the Commercial Operation of the Project is achieved prior to the Scheduled Commercial Operation Date, the quantum of free power to First Party shall be as under:-

(1) Commencing from date of synchronization of the first unit up to the COD of the Project, 12% of Deliverable Energy.

(2) From COD of the Project upto the Scheduled Commercial Operation Date of the Project, such percentage of Deliverable Energy as is equal to the following:-

(i) 12% less two tenth (0.2) percentage points for each period of seventy three (73) days (or part thereof) falling between the COD of the Project and Scheduled Commercial Operation Date of the Project.

(ii) 12% of the Deliverable Energy for a period of twelve (12) years from Scheduled Commercial Operation Date of the Project.

5.32 **Disincentive For Delayed Commercial Operation of The Project:-** In the event that the Commercial Operation Date of the Project is delayed beyond the Scheduled Commercial Operation Date, the quantum of free power to the First Party shall be as under:-

(1) Commencing from date of synchronization of the first Unit up to the Scheduled Commercial Date of the Project, twelve (12) percent of Deliverable Energy.

(2) Commencing from scheduled COD of the Project and for such number of days by which the Commercial Operation of the Project is delayed beyond the Scheduled Commercial Operation Date of

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the Project, such percentage of Deliverable Energy as is equal to the following:-

(i) 12% plus two tenth (0.2) percentage points for each period of seventy three (73) days (or part thereof) falling between the Scheduled COD of the Project and Commercial Operation Date of the Project.

(ii) From Commercial Operation Date of the Project up to the date falling twelve (12) years from the Scheduled Commercial Operation Date of the Project, 12% of the Deliverable Energy.

(iii) The Second Party shall pay the amount of free power component as mentioned at Sr. No. (2)(i) above in 10 equal monthly installments from actual COD of the Project, in addition to normal free power due.

5.33 **Usage of Land:-** The Second Party shall ensure that the land is used only for the Project. Any land exceeding the bonafide requirement of the Project shall be taken over by the First Party free of cost.

5.34 **Precious material found during execution of Project:-** During the implementation of the Project, in case any object of archaeological importance is found by the Second Party or by any of its employees/Contractors, the Second Party shall arrange to hand over the same to the First Party free of cost, provided that, in case any precious or semi-precious material is located, the Second Party shall inform the First Party immediately and shall then abide by the instructions of the First Party which shall be communicated within a period of two (2) months from the date of receipt of such intimation from the Second Party.

5.35 **Adherence to laws:-** The Second Party shall follow all the relevant laws, including, but/ without limitation, all labour laws, and shall also provide for safety provisions as per the Electricity Act, 2003, Factories Act, 1948, Mines Act, 1952 and such other statutory provisions relating to the safety of the Projects and any subsequent amendments made thereto.

5.36 **Trees in the Land transferred to the Second Party:-** The Second Party shall pay to the Forest Department of the First Party, the price of the trees as are required to be felled or are damaged in the execution of the Project, at prevailing market rates as may be notified by the First Party from time to time. The responsibility of felling and removing of the trees shall be of the First Party. The net sale proceeds of the trees shall be made over to the Second Party.

5.37 **Project Maintenance:-** The Second Party shall ensure that the Project is in good working condition as per the Prudent Utility practices during the Agreement Period.

5.38 **Tax Deduction at Source:-** The Second Party shall ensure that it makes the payments for works within the State of Himachal Pradesh and deposits the tax deducted at source with the offices of the Income Tax Department located within the State of Himachal Pradesh.

5.39 **Indemnity:-** The Second Party shall be fully responsible for any damage or loss arising out of the construction, operation or maintenance of the Project to any property or person.

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5.40 **Site investigations:-** The Second Party shall be deemed to have conducted a due diligent exercise in respect of all the aspects of the Project, including a detailed survey of the site. The failure to investigate fully the Site or sub-surface conditions shall not relieve the Second Party from its responsibility for successfully implementing the Project.

5.41 **Expenditure incurred by Board on Investigations:-** The Second Party shall reimburse to the Board/appropriate State Power Utility the amount, spent by the Board upto the Effective Date, on investigations and infrastructural works of the Project along with compound interest @ 10% per annum on year to year basis from the date of incurrence of such expenditure upto the date of actual reimbursement, within two years from the Effective Date or three (3) months of the Financial Closure whichever is earlier. This shall form a part of the Project cost. The First Party shall intimate all such expenditure within three months of the Effective Date not required as this project is self identified.

5.42 **Upstream/Downstream Project:-** The Second Party shall have no claim on any Project upstream and downstream of the Project.

5.43 **Misrepresentation:-** The Second Party assures the First Party that there is no mis-representation in the information supplied by it to the First Party at any stage. The First Party reserves the right to cancel the IA after giving an opportunity to the Second Party in case it is found that there was some such misrepresentation by the Second Party and/or in the event of breach of any of the provisions of this IA.

5.44 **Comprehensive Insurance:-** The Second Party shall be bound to execute total comprehensive insurance of the whole Project covering loss of human life, property etc including third partly losses, during construction and O&M of the Project.

5.45 **Green House Gas/Carbon Credits:-** In Himachal Pradesh, electricity is generated only from Hydroelectric Projects which help in reduction of emission of "Green House Gases". The Second Party shall carryout development of the Project so that these qualify for carbon credits at the National/International levels. Sale of such equivalent Carbon credits by the Second Party on account of development of Project shall be through competitive process amongst buyers, in order to derive the maximum benefits.

5.46 The Second Party agrees to abide by the provisions as contained in the Hydro Power Policy of the Government of Himachal Pradesh.

6. TERMINATION AND TAKING OVER OF THE PROJECT:-

6.1 The First Party reserves the right to terminate the agreement if the Second Party fails to achieve the milestone as stipulated in Clause 5.1.

6.2 In the event it is eventually confirmed as impossible or impractical to start construction work on the Project on or before the expiry of period mentioned in Clause 5.1 of this agreement, for the reasons other than those solely attributable to the First Party, the First Party reserves the right to terminate the agreement and forfeit the Security Deposit.

6.3 In the event of continuous stoppage of construction on the main Project components by the Second Party for a period of more than three months for

Pr. Secretary (Power) to the Govt. of Himachal Pradesh, Shimla-171002

For [illegible] Hydro [illegible] (P) Ltd.

reasons not covered under Force Majeure and for reasons attributable to the Second Party, the First Party shall, after giving due opportunity to the Second Party, have the right to terminate this agreement. In such event, the Security Deposit furnished by the Second Party as per Clause 2.1 of this agreement, shall stand forfeited and the site shall revert to and vest in the First Party without any compensation. Notwithstanding any vestment in the First Party under this Clause, the Second Party shall be liable to pay all the dues owed to the First Party by the Second Party in pursuant to this agreement.

7. **FORCE MAJEURE:-**

7.1 For the purpose of this agreement, "Force Majeure" shall mean an event which is unforeseeable, beyond the control of the Second Party and not involving the Second Party fault or negligence. Such events may include acts of the First Party /GOI either in its sovereign or its contractual capacity, war, civil war, insurrection, riots, revolutions, fires, floods, epidemics, quarantine restrictions, freight embargoes, radioactivity and earthquakes.

7.2 If a Force Majeure situation arises, the Second Party shall promptly inform the First Party in writing of such conditions and the cause thereof. Unless otherwise directed by the First Party in writing, the Second Party shall continue to perform its obligations under the agreement, as far as is reasonably practical, and shall seek all reasonable alternative means for performance, not prevented by the Force Majeure event.

7.3 In the event, a Party is rendered unable to perform any obligation required to be performed by it under this agreement by Force Majeure, the particular obligations shall, upon information to the other Party be suspended for the period of Force Majeure. The time for performance of the relative obligations suspended by Force Majeure shall be extendable by the period of delay which is directly attributable to Force Majeure.

8. **CONFIDENTIALITY:-** Each Party hereto agrees that it shall not divulge any trade, commercial or technical secrets or confidential matters of one another to any third party, except for the purpose of implementation, operation and maintenance of the Project.

9. **GOVERNING LAW:-** The rights and obligations of the Parties under or pursuant to this Agreement shall be governed by and construed according to Law. This Agreement shall be subject to the jurisdiction of the competent courts of Himachal Pradesh.

10. **VIOLATION PENELTY:-** Any violations of the above mentioned issues concerning Policy parameters, MOU/IA may result into monetary penalty including cancellation of the Project.

11. **RESOLUTION OF DISPUTES:-**

11.1 The Parties shall attempt to resolve any dispute in relation to, arising out of or in connection with the agreement (hereinafter referred to as the Dispute) by mutual discussions.

11.2 Any difference and/or disputes arising at any time between the parties out of this MOU/PIA/IA or interpretation thereof shall be endeavored to be resolved by the parties hereto by mutual negotiations, failing which the matter shall be referred to the Arbitrator to be appointed as per the provisions of the Arbitration &

For [illegible] (P) Ltd.

Director

Conciliation Act, 1996. However, all disputes shall be settled within the jurisdiction of Courts of Himachal Pradesh.

11.3 During the pendency of the court proceedings, both Parties shall continue to perform their respective obligations under this agreement, unless the performance of such obligation itself is subject of such proceedings.

11.4 No party shall be considered to be in default under this IA for any breach of any of the terms thereof due to the imposition of restrictions and onerous regulations by any Government or statutory authority or agency or other cause beyond its reasonable control.

11.5 All legal proceedings arising in connection with this agreement shall be subject to the jurisdiction of the Himachal Pradesh High Court and its subordinate courts in the State of Himachal Pradesh irrespective of the place of performance/execution of the Agreement.

12. **ASSIGNMENT AND AMENDMENTS:-** The Second Party may, only for the purpose of arranging or rearranging finance for the Project, assign or otherwise transfer all or any portion of its rights and benefits with prior written approval of the First Party, but not its obligations under the agreement to any other person or entity. No amendment or waiver of any provision of the agreement, and no consent to any departure by either Party herefrom, shall in any event be effective unless the same is in writing and signed by each of the parties.

13. **COMMUNICATION:-**

13.1 Any communication/notice by one Party to the other Party under this agreement shall be deemed to have been served if sent by cable, fax or Email followed by a confirmation letter delivered by hand or by registered mail to the respective addresses.

13.2 Communication should be addressed as below:-

If to the Company
M/s Tejas Samika Hydro Energies (P) Ltd.
Plot No. 125, Road No.71,
Nav Nirman Nagar,
Jubilee Hills, Hyderabad,
Andhra Pradesh.
Telephone: 040-23541604
Fax: 040-23541603

If to the Government
Pr.Secretary (MPP & Power),
Government of Himachal Pradesh,
Shimla, H.P. India.
Telephone No.0177-2621903
Fax No.0177-2621903

13.3 Either Party may change the address and/or addresses to which such communications/notices are to be delivered or mailed by duly informing the other Party.

For Tejas Samika Hydro Energies (P) Ltd.
Director

Pr. Secretary (Power) to the Govt. of Himachal Pradesh
Shimla-171002

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14 The Implementation Agreement dated 6th September, 2006 read with the Tripartite Agreement dated 18th May, 2007 shall stand lapsed henceforth with immediate effect, but will be an integral part of the this IA.

In witness whereof, the Parties hereto have executed and delivered this agreement at Shimla, Himachal Pradesh on the date first written above.

For and on behalf of the Government of Himachal Pradesh

(Ajay Mittal)
Pr. Secretary (Power) to the Government of Himachal Pradesh
Shimla.

For and on behalf of Company M/s Tejas Sarnika Hydro Energies (P) Ltd

For Tejas Sarnika Hydro Energies (P) Ltd.
Director

(M. Ramesh Reddy), Director

WITNESSED BY:

1. 7/11/08
(G.K. SRIVASTAVA)
Sr. Secy (NES) MPP Power)

2. (Sakon Mehta)
Sr. Asstt
MPP & Power Section

WITNESSED BY:

1.

2.

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ANNEX.-A

Upper Joiner HYDRO ELECTRIC PROJECT (12 MW)
CAT PLAN WORKS-AFFORESTATION SCHEME

Sr. No.	Description	Remarks
1.	Area in Hectare	70 Ha
2.	Executing Agency	Forest Department
3.	Distance from adjacent Forest	The afforestation shall be carried out in DPF/RF/UPF itself.
4.	Name of Division	Chamba Forest Division
5.	Name of Rang	Tikri Range
6.	Block	Tissa
7.	Beat	Bada
8.	Legal Status	1. Bada RF :40. Ha, 2. Dang MakuaRF:30 Ha,. **Total: 70 Ha.**
9.	Average Elevation	1000 m above msl.
10.	Species to be planted	Ban / Broad Leaved Plants
11.	Estimated Cost of Afforestation including maintenance.	Rs.38.17 Lacs
12.	Number of years for which maintenance of compensatory afforestation provided.	Three Year

ANNEX.-B

UPPER JOINER HYDRO ELECTRIC PROJECT (12 MW)
CAT PLAN WORKS-SOIL & WATER CONSERVATION

Sr. No.	Description	Remarks
1.	Executing Agency	Forest Department
2.	Distance from adjacent Forest	The SWC works shall be carried out in DPF/RF/UPF itself
3.	Name of Division	Chamba Forest Division
4.	Name of Rang	Tikri Rang
5.	Block	Tissa
6.	Beat	Bada
7.	Legal Status	1. Providing Wire Crate Work. 2. Stream Bank Protection, 3. Stone Masonary Check Dam, 4. Gully Plugging. 5. Vegetative Dam are being proposed for following nallahs in the Catchments: 1)GUYANI 2)BARA 3)BADALI 4)NAGALI 5)PINDI 6)MURALI 7)BLOTED 8)LALPANI
8.	Average Elevation	1000 m above msl.
9.	Estimated cost of SWC Works.	23.7 Lacs

Annex.-B

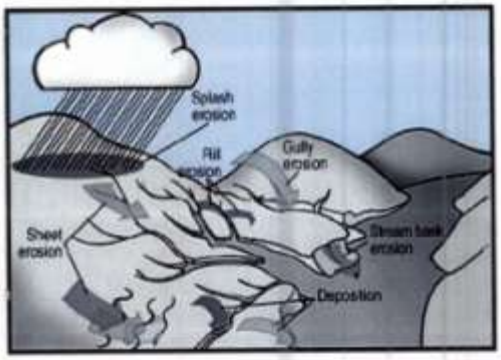
SOIL EROSION

Definitions

The loss of soil by wind and water or gravitational creep is known as erosion. Two categories are commonly recognized. **Normal erosion** - which proceeds at a pace much slower, than the process of soil formation? It is beneficial, as it checks soil senility. **Accelerated erosion** is excess of the normal and is chiefly due to changes in the nature and density of native vegetation by human activities. The process is invariably harmful as it leads to the removal of fertile top soil at the rate greatly exceeding that of soil formation. The discussion that follows is, therefore, mainly concerned with accelerated erosion.

Type of Erosion

The natural agencies chiefly responsible for accelerated erosion are wind and water. Since wind is not responsible for any serious erosion in this part of the land. We are mainly concerned with the latter. Erosion by water involves hydraulic action, abrasion, solution and transportation of soil. The velocity of flow has an important bearing on its erosion power. The following categories are recognized: -



Sheet Erosion

This applied to the removal of a more or less uniform layer of surface soil. The general contour of the land surface remains unaltered and so the insidious effects so unnoticed until most of the top soil have been lost. Sheet erosion is most active on cultivated lands but is unimportant in forests where unincorporated organic matter covers up the soil.

Rill Erosion (fingering or incipient gullying)

This implies the formation of small channels in the land surface. It represents an intermediate stage between sheet and gully erosion. In forest areas, this type of erosion is generally seen along the extraction paths and in fire brunt areas.

Gully Erosion

This refers to the formation of large channels or gullies. This develops in situation where concentrated run off attains sufficient volume and velocity to cut deep into the soil body. Gullies have their origin in rills, side roads, trials, cattle treads of natural depressions. Gullying commonly proceeds by waterfall erosion at its head. If the material is easily eroded, the gullies tend to be deep and narrow but if the substratum is hard, the gullies are shallow with sides gently sloping. As a rule, gullies carry water only during or immediately after the rains.

Stabilization of Land Slips

Relatively weak geological structure of the terrain and its disturbance through road and other on-land construction programme disturb the strata and many a time results in landslips. Left unattended some of these get naturally stabilized whereas others aggravate to such an extent that special efforts are needed to stabilize these.

Landslides seen in the catchment area which can be stabilized with engineering and vegetative measures.

Stabilization of Stream Banks

The stretch of streams causing bank erosion has been identified. In the identified stretch it is necessary to provide crate wire structure on both banks to save the banks and simultaneously provide spurs so as to train the flow of water in a specified course. Forty structures are estimated to be needed along the banks and also spurs. There may be need for some odd bank protection structure or a spur here and there, which can also be adjusted within these funds.

Gullied Area

In totally degraded land, gullies can make up for a large part of the area. The objective of reclaiming these gullies is to prevent further erosion and utilize the land again for protective and productive use. Effective closures and afforestation will promote vegetational growth and retard further growth of gullies. However, to increase sedimentation to fill up the gulley gradually, check dams may have to been constructed where even seasonal water flow is still expected. Typical measures for reclamation of small gullies include brushwood plugs and loose stones. Their function is to reduce the velocity of the flood and 'comb out' the sediments so that gulley is gradually silted up.

Brushwood plugs

At first trenches which should follow the contour is dug 40 to 60 cm deep across the gulley bed and the banks. Seen from above the layer will be more or less V-shaped. The brushwood which must be of sprouting species is placed upright and tightly together on the downstream side of the trench. Afterwards the trench is refilled and tamped.

Loose stone plugs

Smaller gullies of less than one meter in depth can often be stabilized by plugging them with loose stones, which may be simply heaped in the gully. It can be in combination with bushy brushwood which may not even be sprouting species.

Nallas

Large gullies and nallas have to be treated to prevent further deepening and widening. This is done mainly by various types of check dams.

The purpose of check dam is to reduce the gradient and break the velocity of the flow. Through check dams the water is conducted safely from a higher to a lower point without causing erosion at the gulley/nalla bed and banks. The water pools behind the dams promote the percolation of water into the soil. Check dams still serve their purpose even when they are completely silted up by reducing the gradient inside the gulley/nalla. Longer life-span should be aimed in case of check dams to be constructed in nallas. They should be constructed in places where the bed is narrow and the banks are firm. Curves or sites within or just below gulley/nalla junctions must be avoided.

In an ideal case, check dams should be spaced in such a way that the bottom of the upper check dam is in level with the top of the next lower one. In steep area as in the Himalayan region, this is difficult to achieve because too many check dams will be required. If the section between two successive check dams cannot be made level, the gradient should at least not exceed 5 percent for greater success.

The height of the dams influences their spacing. There is the alternative of constructing a few high or many low dams on a certain gradient. High check dams have to resist a greater pressure than the low ones and, therefore, are more liable to damages. While concrete or masonry dams can be built to any height, dry stone or brushwood dams should be low.

Check dams must be well anchored in the ground and particularly in the banks to prevent under-scouring and scouring between the dame and the banks. The flow is directed through a water spill or notch in the center of the dam. Below the dam where the water hits the bed, a protective apron must be constructed. For additional strength the check dam is filled up to the notch with soil on the upstream side.

Types of check dams are distinguished according to the material used.

Dry Masonry Check Dam

These are generally constructed in upper reaches of eroding nalas to reduce the bed slope, stabilize the grade and check the bed scouring and retain silt, sand and pebbles.

Depending upon the size of the dam depth of foundations may vary from 30cm to 60cm. Foundation should be dug across the nalla width extending well into the banks. The soil is piled up-stream to be used later for the refill. The largest stones are placed in the bottom layers. Larger check dams with steps in front are stronger, safer and more useful. In every layer of stones a step of 15 to 20 cm is left on the downstream side, so that width is reduced from base to top. The advantage is that the flow is gradually conducted down to the apron. Two wing walls with appropriate foundation are often constructed at the upper side to force the flow into the water spill or notch and prevent it from damaging the banks. The wing walls should form an angle of about 30° with the banks.

In the center of the "crown" a notch of concave shape is to be provided which must be wide enough to cope with the peak run-off. Generally a length of half the span of the dam and depth of 20 to 30 cm are considered appropriate.

Below the dam an apron has to be constructed with stones. On the up-stream side the dam has to get an earth fill for greater strength. Finally, the structure is supplemented by planting seedlings and cuttings of suitable species along the banks on the upstream side. Alnus & willows, form good species for this purpose. Such check dams are provided in areas closed for afforestation.

In bouldery nallas, with or without some water flow, check dams may be constructed of gabions, masonry with mortar or concrete. Each situation will have to be looked into for the type of dam that needs to be constructed.

ANNEX.-C

UPPER JOINER HYDRO ELECTRIC PROJECT (12 MW)
CAT PLAN WORKS-ENERGY PLANTATION SCHEME

Sr. No.	Description	Remarks
1.	Area in Hectare	7 Ha
2.	Executing Agency	Forest Department
3.	Distance from adjacent Forest	The Energy plantation shall be carried out in DPF/RF/UPF itself.
4.	Name of Division	Chamba Forest Division
5.	Name of Rang	Tikri Range
6.	Block	Tissa
7.	Beat	Bada
8.	Legal Status	1. Bada RF: 4 Ha, 2.Bada UPF 3ha **Total: 3 Ha.**
9.	Average Elevation	1000 m above msl.
10.	Species to be planted	Ban / Broad Leaved Plants
11.	Estimated Cost of Energy Plantation including maintenance.	Rs.7.06 Lacs

ANNEX.-D

UPPER JOINER HYDRO ELECTRIC PROJECT (12 MW)
CAT PLAN WORKS-FOREST PROTECTION

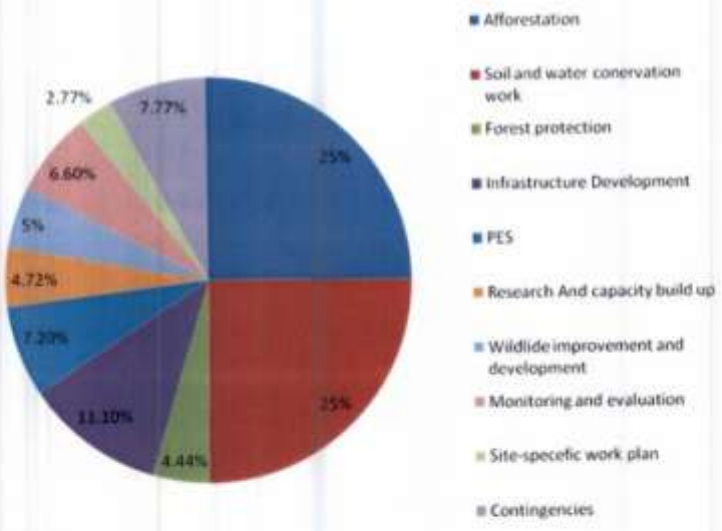
Sr. No.	Description	Remarks
1.	Executing Agency	Forest Department
2.	Distance from adjacent Forest	The forest protection including construction / Repair of Boundary Pillars & Fire protection shall be carried out in DPF itself.
3.	Name of Division	Chamba Forest Division
4.	Name of Rang	Tikri Rang
5.	Block	Tissa
6.	Beat	Bada
7.	Legal Status	**BOUNDARY PILLARS:** 1. Danga Makua RF 21 2. Bara UPF 13 3. Bara RF 29
8.	Elevation	1200m above msl.
9.	Works to be done.	Forest protection including construction / repair of boundary pillars.
10.	Estimated Cost of Energy Plantation including maintenance.	Rs. 5.0 Lacs

ANNEX.-E

UPPER JOINER HYDRO ELECTRIC PROJECT (12 MW)
CAT PLAN WORKS-INFRASTRUCTURE DEVELOPMENT

Sr. No.	Description	Remarks
1.	Executing Agency	Forest Department
2.	Name of Division	Chamba Forest Division
3.	Name of Rang	Tikri Rang
4.	Block	Tissa
5.	Beat	Bada
6.	Legal Status	**Repair of Forest Rest House:** 1. Bara **Repair of Forest Guards Huts:** 1. Shallan 2. Kalwala
8.	Average Elevation	1500 to 2400 m above msl.
9.	Estimated Cost of Energy Plantation including maintenance.	Rs.6 Lacs

Detailed break-up CAT activities upper joiner CAT PLAN.



Bifurcation of the total money as per different activities as per CAT Guidelines

Activity	Percentage	Amount in Lacs.
Afforestation measures	25	45.2401
Soil and water conservation measures	25	47.085
Payment for environmental services including Eco Tourism	7	13
Research training and capacity build up	5	7.5
Infrastructure and forest protection	15	28
Wildlife measures	5	9
Monitoring and evaluation	7	12
Support for preparing specific work plan	3	5
Contingencies	8	14
TOTAL	100	1.8083 Croers.