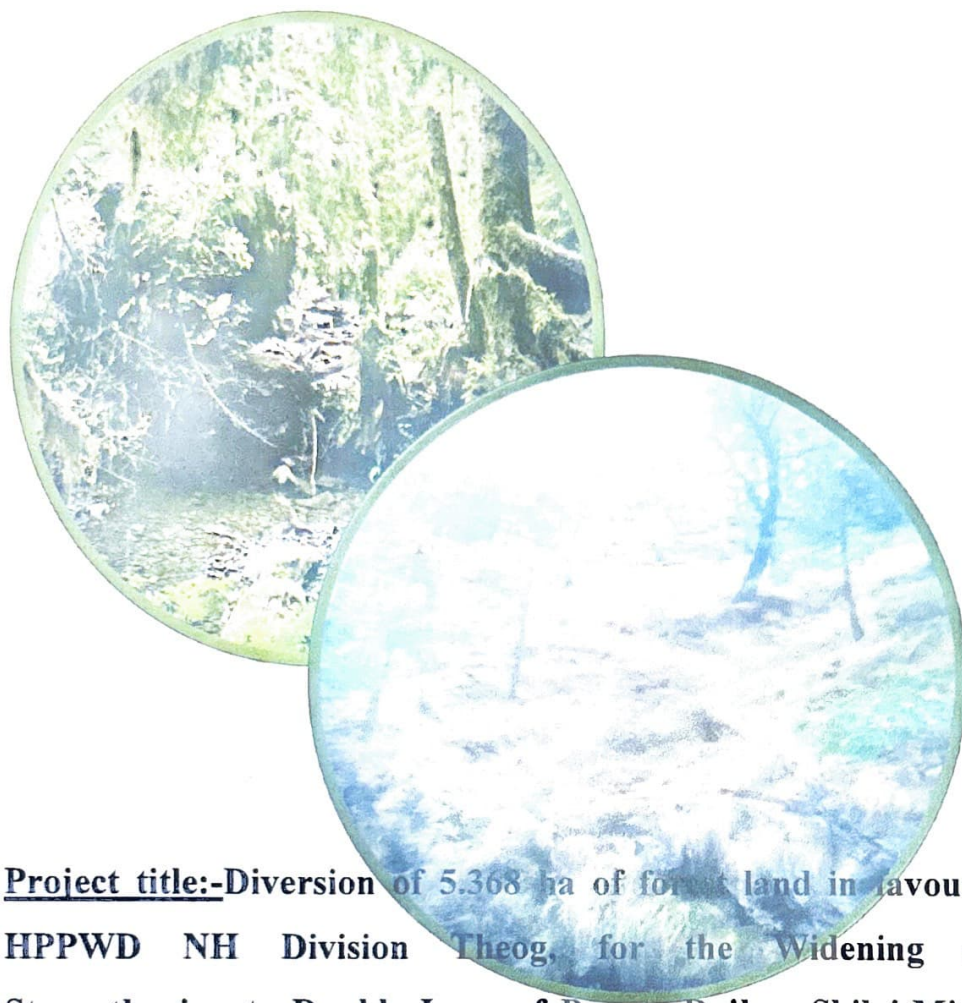


Soil and Moisture Conservation Plan



Project title:- Diversion of 5.368 ha of forest land in favour of HPPWD NH Division Theog, for the Widening and Strengthening to Double Lane of Poanta-Rajban-Shilai-Minus-Hatkoti road, Portion Snail to Hatkoti from RD 149/00 to 161/715 NH-707 (Old NH-72B), within the jurisdiction of Rohru Forest Division, Distt. Shimla HP.

Project Cost:- 9380 Lakh

Forest area:- 5.368 ha.

Non-Forest area:- 23.8274 ha.

Total Area:- 29.1954 ha.

Soil & Moisture Conservation Plan in Rohru Forest Division

Executive Engineer
NH Division HPPWD
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Rohru Forest Division,
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Soil and Moisture Conservation Plan

Diversion of 5.368 ha of forest land in favour of HPPWD NH Division Theog, for the Widening and Strengthening to Double Lane of Poanta-Rajban-Shilai-Minus-Hatkoti road, Portion Snail to Hatkoti from RD 149/00 to 161/715 NH-707 (Old NH-72B), within the jurisdiction of Rohru Forest Division, Distt. Shimla HP.

Introduction:-

Forest is the origin for the streams and rivers, therefore it is very important to conserve soil and moisture in its catchment area. The Department has started soil and moisture conservation works such as check-dams, gully plugging, and forest tanks (Van-Talao) movement in the late nineties which still continues. Soil and moisture Conservation works have become integral part of the Forest Development.

Soil Moisture Conservation works in the forest area marked for the plantation activity are carried on watershed basis. This approach is aimed at enhancing land productivity and to increase the soil moisture availability for a longer period. The main objective of soil moisture conservation is to minimize the amount of water lost from the soils through evaporation (water loss directly from the soil) and transpiration (water loss occurring through the plants) – or combined, the evapotranspiration. Preserving soil moisture is important means to maintain the necessary water for agricultural production, and also helps minimize irrigation needs of the crops. This is especially important in areas where rainwater and/or groundwater resources for irrigation are scarce or decreasing due to climate change or other causes. It is important that a Soil and Moisture Conservation plan should provide site specific prescription for the activities to be undertaken under each heading of the SMC Plan components.

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1 | Page of 12
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General:-

There are three component of the SMC in the catchment, namely

- a. Reforestation including plantation, rehabilitation, and agro-forestry development
- b. Non-structural measures: Land use regulation, public awareness for forest, livelihood assistance/poverty alleviation, etc.
- c. Structural measures: divided into two kind of work;
 - Catchment conservation works other than water harvesting structures; Those are implemented to minimize the soil erosion around the structures. In addition those are also implemented to prolong the life span of water harvesting structures.
 - Water harvesting structures: Check dams (construction of embankment)

Since the Phase-I project, the structural measures of the SMC adopt integrated intervention, which targets the whole area from the upstream catchments so the downstream command area within the same micro watershed, for this purpose, three models, namely a) Model I (intervention in upstream parts), b) Model-II intervention in the middle parts of the micro watershed) and c)

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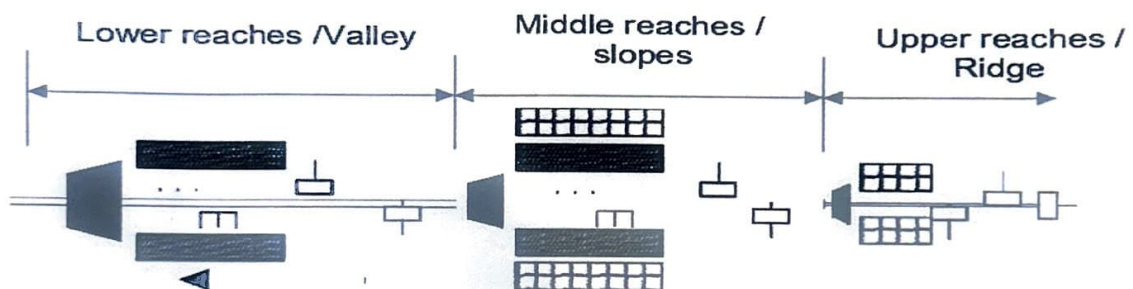
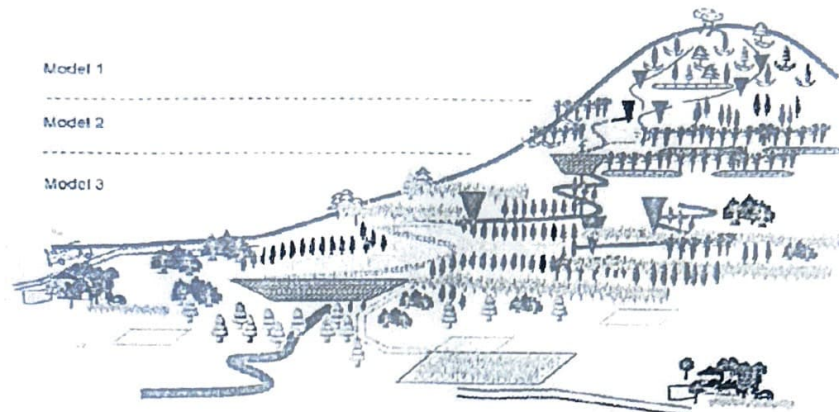
Model-III, (intervention in the downstream command area) were developed to be adapted. Brief of three models are described table below:-

Brief Description of Tree Models of Structural Measures

Model Name	Terrain Conditions	Major Installation Structures
Model-I Intervention of the upstream part	• Nerrowvelly • steepslop (more than 20%) • small catchment less than 5 ha.	• Plantation with staggered contour trenches. • Plantation with half-moon terraces staggered contour treches. • Mulching • Embankment: small earthen check dam
Model-II Intervention of the middle parts of the micro-watershed	• Nerrowvelly • Steep to moderate slop (10-20%) • Small catchment less than 10 ha.	• Plantation with half-moon terraces • Gully plugging Bench terracing
Intervention for the downstream command area	• Wide velly • Gentle slop (less than 20%). • Small Catchment less than 20 ha.	• Gully plugging Contour bunding Bench terracing plantation along water body, rivers and stream bank • Mulching

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3 | Page of 12
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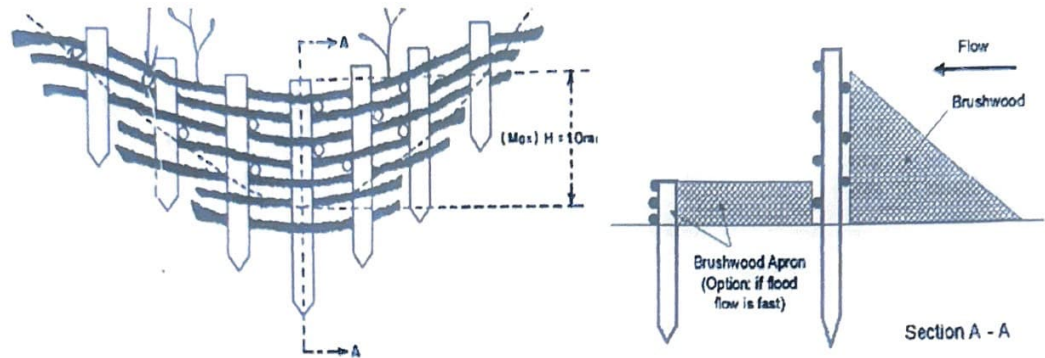


Gully Plugging Works:-

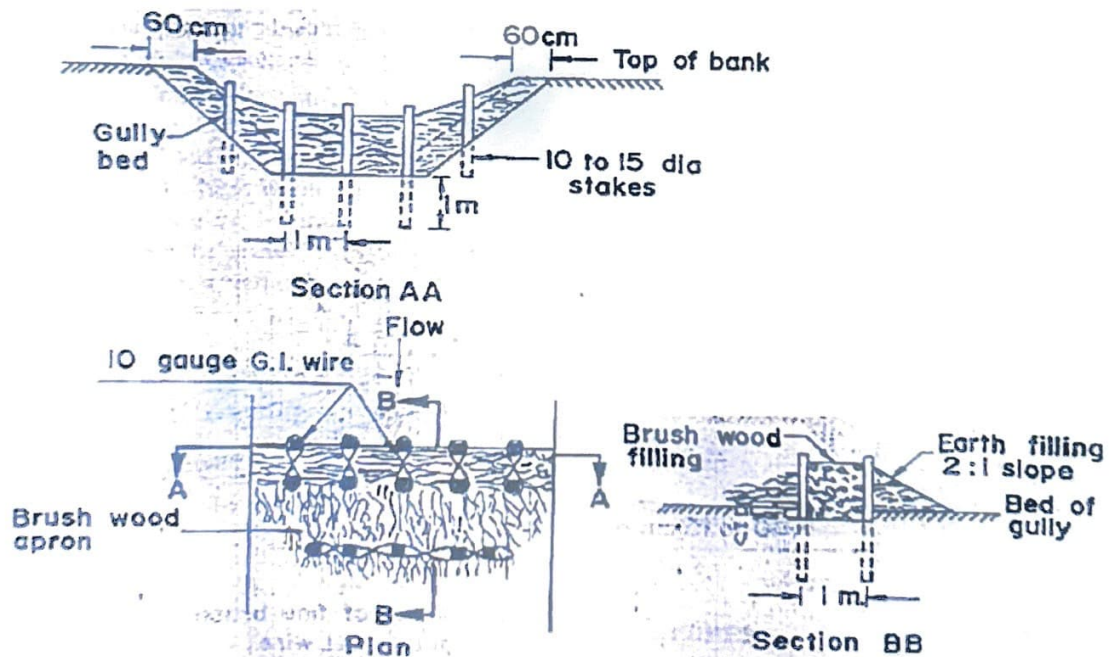
The gully plugging work are the barriers installed across the gully to reduce the runoff velocity of the gully, to retain the sediment behind them, and to reduce the gully erosion of the micro watershed. The gully plugging work consist of the barrier and the optimal downstream and upstream aprons. The following structures are used as the barriers:-

- Plantation work by bamboos (for small and narrow gullies)
- Brushwood check dam (Single or double row post)
- Small earthen check dam (Semi-permanent check dam)
- Stone check dam

Single row brushwood check dam
(Design of Measure Work in gully plugging)



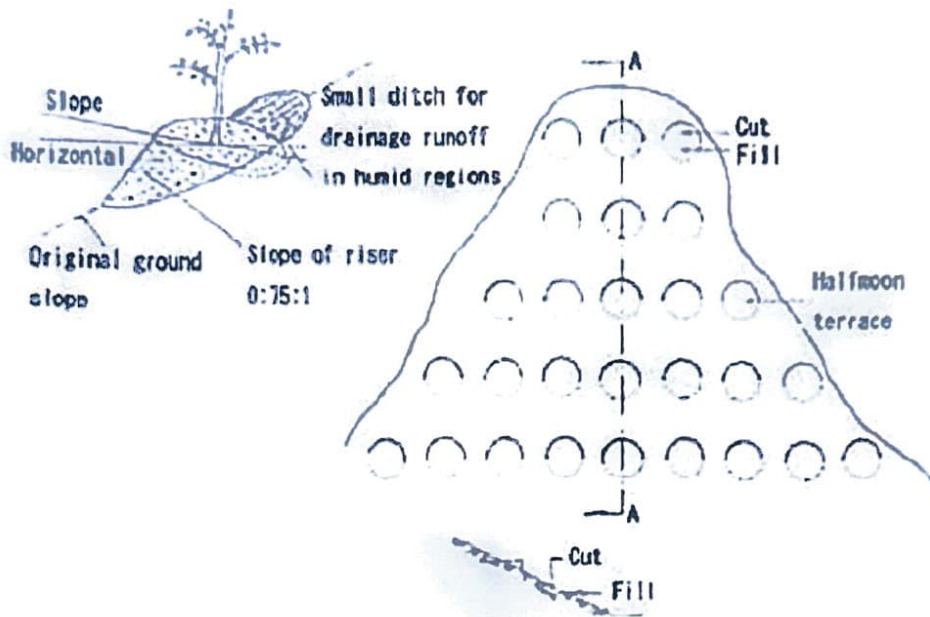
Double rows brushwood check dam
Design of Measure Works in Gully Plugging



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Design of Half-moon terraces



Mulching:-

Mulching is a SMC practice in which a covering of cut grass, crop residues or other organic materials is spread over the ground between rows of crops or around the trunks of trees. This practice helps to retain soil moisture to intercept the direct impact of raindrops on bare soil to reduce runoff and soil loss, to prevent weed growth, to reduce labor costs of weeding and enhance soil structure. The application of the mulching depends on locally available materials. If the materials are available, plantation with mulching shall be applied.

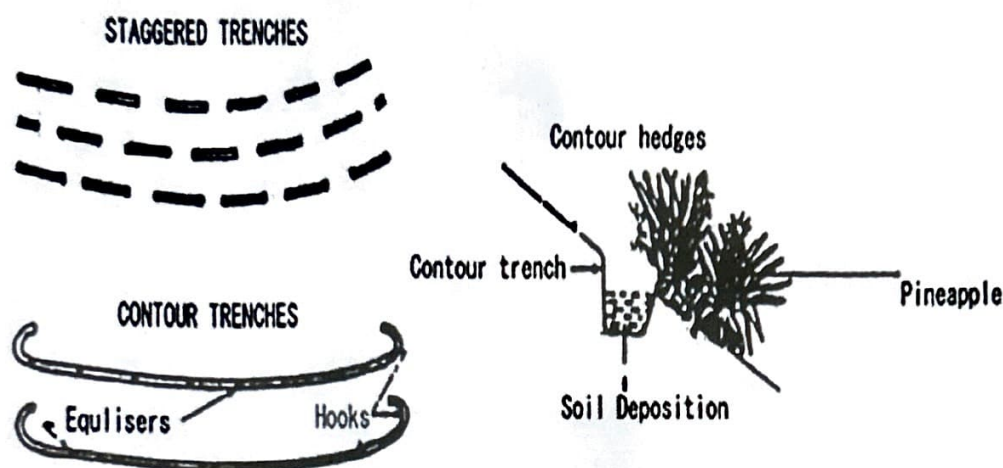
Objective of Study:-

The broad objectives for preparation of Soil and Moisture Conservation are outlined as under:

- i. Checking soil erosion and land degradation by taking up adequate and effective soil conservation measures, both engineering as well as biological, in erosion prone area (mainly under very severe and severe erosion intensity categories)

Contour Trench Work:-

The contour trench works are the method of constructing the trenches along the contour lines of the slop with 10-30%. Objectives of the trench works are to retain water and sediment on the slop, to increase the water infiltration, to improve local soil moisture, and as the result, to reduce the runoff discharge and sediment to the downstream watershed. There are three (3) types of the contour trenches, that is, continuous trenches, and interrupted (line and staggered) trenches. The continuous contour trenches are essentially used for moisture conservation in low rainfall areas.



Half-Moon Terraces:-

On the moderate slopes (10-20%) and steeper slopes (>20%), half moon terraces (60 cm diameter and 30 cm in depth) are to be established for water harvesting purposes around the ridge of hills. Economic tree species, NTFP species and other species are to be plated in the basins. The potential sites of the half-moon terraces are the slop around the ridge of hills, in which the planting is difficult due to steep slope. The representative design and technical specifications are shown in Figure:-

- ii. Rehabilitation of degraded forest areas through afforestation and facilitation natural regeneration.
- iii. Rehabilitation of degraded slopes and landslide areas.

Soil Erosion:-

Lack of vegetal cover is contributing factor for accelerated soil erosion in the tract as also for environment degradation. While ideally, dense tree cover or forests would have been the best insurance against soil loss and environmental degradation, the condition in the tract are otherwise, large area are either blank or bear thin tree crop. The lower reaches of the tract along the river are generally barren and devoid of any tree growth. The good forests are defined to upper reaches. Thus these natural conditions are all limiting factor in addressing the problem of soil erosion and environmental degradation. Nevertheless remedial measures can be undertaken minimize their impact to some extent.



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8 | Page of 12
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Slope:-

The slope has a great influence on the soil and water loss from the area and thereby influences the land use capability. The slope determines the erosion susceptibility of the soil depending on its nature. It helps in classifying various lands in suitable capability classes which enables us to formulate suitable conservation measures for the prevention of soil erosion. The degree slope was divided into different slope classes as per Soil and Land Use Survey of India (SLUSI). Total length of breast wall=2500 meter



1. Construction of Hillside paved shoulder with PCC M20 on the entire length of the road.
2. Gunting concrete surface with cement mortar at various land slide prone areas.

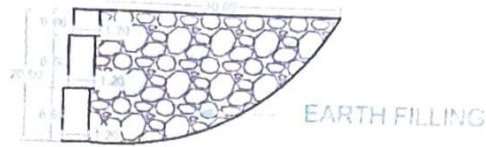
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9 | Page of 12
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DUMPING SITE 1



PLAN NOT TO THE SCALE

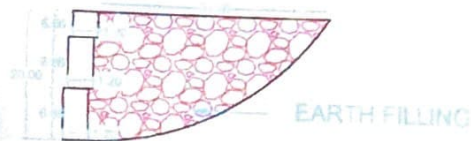


TOTAL DUMPING =	L	W	H	NO.S	QTY
DUMPING SITE =	67	30.00	20.00	1	40200.00 CUM

DUMPING SITE 2



PLAN NOT TO THE SCALE



Total area=1016 per dumping

TOTAL DUMPING =	L	W	H	NO.S	QTY
DUMPING SITE =	97.00	30.00	20.00	1	58200.00 CUM

Environmental Benefits:-

- The benefits of many soil conservation methods, depending on the material used, may also include better control of weeds, provision of additional nutrients to the soil, soil temperature control and protection of soil surface from the impacts of heavy rain and wind.
 - Active reuse of waste organic materials also reduces waste management needs, returning the residue crops and plants to the soil through decomposition.
- Socioeconomic Benefits.

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- c. Potential to reduce water irrigation needs, increase crop productivity and improve soil quality.
- d. By extension, reduced irrigation needs may also reduce the costs and energy requirements of water pumping for irrigation.

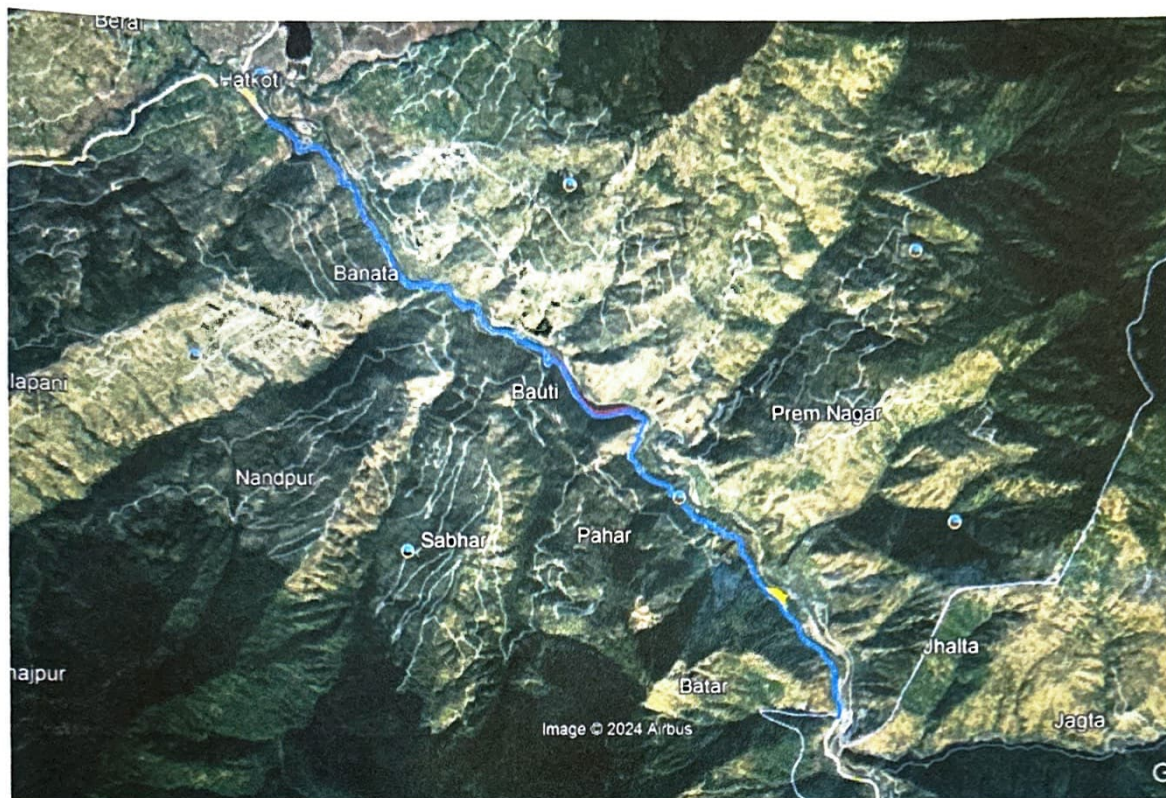
Landcover:-

For the preparation of land use/land over classification of the catchment area, forest cover data for the year 2017 has been procured from Forest Survey of India (FSI) has classified the area into five classes viz very dense forest, moderately dense forest, open forest, scrub land and non forest. The forest cover is broadly classified in 3 classes namely very dense forest, moderately dense forest and open forest. The other classes included scrub and non-forest. These classes are defined as below:

- a. Very Dense Forest: All Lands with tree cover of canopy density of 70% and above.
- b. Moderately Dense Forest: All lands with tree cover of canopy density between 40% and 70% above.
- c. Open Forest: All lands with tree cover of canopy density between 10% and 40 %
- d. Scrub: All forest lands with poor tree growth mainly of small or stunted trees having canopy density less than 10%.
- e. Non Forest: Any area not included in the above classes.

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11 | Page of 12
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All the classes except non forest classified by FSI were used as it is and the non forest area was further classified into grazing land, agricultural land, settlement, barren land and waterbody. These classes are defined as below:

- a. Agriculture Land: These are the lands primarily used for farming and for production of food, fiber, and other commercial and horticultural crops.
- b. Settlement: It is an area of human habitation developed due to non-agricultural use and that has a cover of buildings, transport and communication, utilities in association with water, vegetation and vacant lands, It consists of urban as well as rural areas.
- c. Grazing: These are the areas of natural grass along with other vegetation, predominantly grass like plants and non-grass like herbs. It includes natural/semi-natural grass/ grazing lands of Alpine/Sub-Alpine and manmade grasslands.
- d. Barren Land: These are rock exposures of varing lithology often barren and devoid of soil and vegetation cover.
- e. Waterbody (River): Rivers/streams are natural course of water flowing on the land surface along a definite channel/slop.

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12 | Page of 12
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ABSTRACT OF COST FOR WIRE CRATE

Providing Wire Crate Wall for SMCW w.r.t. Widening & Strengthening to double lane of Poanta-Rajban-Shilai-Minus-Hatkoti Road, Portion Snail to Hatkoti from RD 149/00 to 161/715 NH-707 (Old NH-72B), District Shimla, H.P.

Sr. No.	Description of work	Qty.	Unit	Rate	Amount
1	Earth work in excavation for structure as per drawing and technical specification clause 305.1 I/c setting out, construction of shoring and bracing removal of stums and other deleterious materials and disposal upto a lead of 50 metre, dressing of sides and bottom and back filling in tranches with excavated suitable material.	16.88	Per cubic metre	441.17	7444.74
2	Providing and laying of boulder apron laid in wire crates with 4 mm dia GI wire conforming to IS:280 and IS:4826 in 100 mm x 100 mm mesh (woven diagonally) including 10 per cent extra for laps and joints laid with stone boulders weighing not less than 25 kg each as per drawing and technical specifications Clause 1301	140.63	Per cubic metre	2,946.55	414358.59
				Total:-	421803.33
				Say	422000.00


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Detail of Measurement

Sub Head:- C/O Crate Walls

Sub head: C/C Crate Walls

Sr. No.	Description	No.	L	B	H	Qty	
1	Earth work in excavation for structure as per drawing and technical specification clause 305.1 I/c setting out,construction of shoring and bracing removal of stums and other deleterious materials and disposal upto a lead of 50 metre, dressing of sides and bottom and back filling in tranches with excavated suitable material.						
Construction of B/Wall							
	RD From	To	No.	L	B	H	Qty
1	0	45	1	45	1.25	0.30	16.88
					TOTAL		16.88
2	Providing and laying of boulder apron laid in wire crates with 4 mm dia GI wire conforming to IS:280 and IS:4826 in 100 mm x 100 mm mesh (woven diagonally) including 10 per cent extra for laps and joints laid with stone boulders weighing not less than 25 kg each as per drawing and technical specifications Clause 1301						
Construction of B/Wall							
	RD From	To	No.	L	B	H	Qty
1	0	45	1	45	1.25	2.50	140.63
					TOTAL		140.63


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Pohru Forest Division,


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NH Division HPPWD
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**Proposed Physical and financial outlay under wildlife conservation & Minitigation Plan and Soil & Moisture Conservation Plan for
WIDENING & STRENGTHENING TO DOUBLE LANE OF POANTA-RAJBAN-SHILAI-MINUS-HATKOTI ROAD,
PORTION SNAIL TO HATKOTI FROM RD 149/00 TO 161/715 NH-707 (OLD NH-72B), DISTRICT SHIMLA, H.P.**

Activity	1st year		2nd year		3rd year		4th year		5th year		G. Total	
	Phy	Fine. (Rs.)	Phy	Fine. (Rs.)	Phy	Fine. (Rs.)	Phy	Fine. (Rs.)	Phy	Fine. (Rs.)	Phy	Fine. (Rs.)
(A) Habitat Improvement												
(i) New Plantation of native flora	2	20000	2	20000	2	20000	2	20000	0	0	8	80000
Pasture Development (grasses & Legumes)	2	3000	2	3000	2	3000	2	3000	2	3000	10	15000
(ii) Maintenance of old plantations		0	2	2000	4	2000	6	1500	8	1500	20	7000
(iii) Nursery development		0		0		0		0		0	0	0
(iiiia) Water storage tank	0	0		0	0	0		0	0	0	0	0
Total		23000		25000		25000		24500		4500		102000
(B) Community Development through Participation												
(i) Providing Eco-tourism Guide training to local youth		0		0		0		0		0		0
(ii) Human Helth Camps in fringe villages		0		0		0		0		0		0
(iii) Community welfare activities for poor household (Providing Solar lights, Solar Geyers, LPG etc.		15195		2500		2500		2500		2500		25195
Total		15195		2500		2500		2500		2500		25195
(C) Office Expenses												
(i) Computers and accessories		20000		2000		2000		2000		0		26000
(ii) Stationary Electricity bills etc.		0		0		0		0		0		0
(iii) Maintenance of Vehicles/POL		7000		7000		9000		9000		9000		41000
Total		27000		9000		11000		11000		9000		67000
(D) Soil & Moisture Conservation												
(i) Bio-engineering interventions for slope stabilization		0		0		0		0		0		0
(ii) Plantation of Deodar etc. (ha.)		125000		30000		17000		14000		15000	0	201000
(iii) Dry stone protection wall		0		0		0		0		0	0	0
(iv) Dry stone terrace wall		0		0		0		0		0	0	0
(v) Gabion retaining wall		422000.00		5000		5000		4000		4000	0	440000
(vi) Spur with crate wire		0		0		0		0		0	0	0
(vii) Small water harvesting ponds		0		0		0		0		0	0	0
Total		547000		35000		22000		18000		19000		641000
Grand Total		612195	0	71500	0	60500	0	56000	0	35000	0	835195

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Rohru Forest Division,
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Executive Engineer
NH Division HPPWD
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Abstract of proposed activities and financial outlay under wildlife conservation & Mitigation Plan and Soil & Moisture Conservation Plan for Widening & Strengthening to double lane of Poanta-Rajban-Shilai-Minus-Hatkoti Road, Portion Snail to Hatkoti from RD 149/00 to 161/715 NH-707 (Old NH-72B), District Shimla, H.P.

Activity	1st year	2nd year	3rd year	4th year	5th year	Total
	Fine. (Rs.)	Fine. (Rs.)	Fine. (Rs.)	Fine. (Rs.)	Fine. (Rs.)	Fine. (Rs.)
(A) Habitat Improvement	23000	25000	25000	24500	4500	102000
(B) Community Development through Participation	15195	2500	2500	2500	2500	25195
(C) Office Expenses	27000	9000	11000	11000	9000	67000
(D) Soil & Moisture Conservation	547000	35000	22000	18000	19000	641000
Grand Total	612195	71500	60500	56000	35000	835195

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