

GOVERNMENT OF HIMACHAL PRADESH

PUBLIC WORKS DEPARTMENT



Diversion of 10.6019 ha. of forest land in favour of HPPWD for the Constructon of Dharli To Balag road (Km 0/00 to 18/900, within the jurisdictions of Suket Forest Division H.P.

SOIL MOISTURE CONSERVATION PLAN

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REPORT ON SOIL CONSERVATION PLAN

1.0 INTRODUCTION:

THE STATE:

INTRODUCTION:

Himachal Pradesh having world's mightiest mountain ranges is one of the hilly States situated in the Northern part of India. It is blessed with some of the most spectacular and beautiful landscapes. It came into being in November, 1966 after the re-organization of States. Earlier, it was part of the combined State of Panjab. The various hill towns in the State not only provide visitors reprieve from the heat of the plains, but offer beautiful scenic sites which are real treat to the eyes Kullu and Kangra valleys offer natural beauty which is no less than Kashmir Valley. Valleys and streams, snow clad mountains and temperate forests offer tourists and sportsmen all they want. Earlier the economy of the State mostly depended on tourism and a large number of tourist sites had been developed by the State. However, after the re-organization, the State has made big strides in the field of industrialization also. The State has good deposits of minerals like gypsum, lime stone and slate etc. It has big reserve of minerals which can be used in various types of industries. Mining of minor minerals is also, therefore, an extensive Industry in the State. Industries like Cement, Electronics, Fertilizers, Pharmaceuticals and Liquor can be found in good number at different places in the State. Hydel Power in the State has given a big boost to the Industries. A number of Industrial areas have been developed in the State, where all facilities are provided to the entrepreneurs. Parwanoo, Barotiwala, Baddi, Paonta Sahib and Raja Ka Bagare some of the important industrial areas developed by the State in the last two decades.

MANDI DISTRICT:

Not much is known about the early history prior to the formation of Suket in 765 AD. The area had been under the control of Ranas or Thakurs. The only place that has an early mention in literature is Rewalsar and it is mentioned in the Skanda Purana as a sacred place of pilgrimage. Karnpur, a small village is said to have been founded by Karan, a hero of the Mahabharata. A temple at Gumma points to the locality where the Pandavas sheltered themselves when the attempt to burn them downfield. Beyond this not much of the erstwhile state's existence can be found in classical literature. According to the Tibetan

tradition, Padam Sambhav (750-800 AD), the great Buddhist Patriarch, who was summoned by king Tisong-De-Tsen of Tibet for preaching Buddhism, hailed from Zahor, which represents the country round about Rewalsar. On the basis of this it is concluded that Mandi must have been a great place of Buddhist learning about this time.

The chiefs of Mandi and Suket are said to be from a common ancestor of the Chandravanshi line of Rajputs of Sena dynasty of Bengal and they claim their descent from the Pandavas of the Mahabharata. The ancestors of the line believed to have ruled for 1,700 years in Indraprastha(Delhi), until one Khemraj was driven out by his Wazir, Bisarp, who then took over the throne. Khemraj, having lost his kingdom, fled eastward and settled in Bengal. where 13 of his successors are said to have ruled for 350 years. From there they had to flee to Ropar in Punjab, but here also the king, Rup Sen, was killed and one of his sons, Bir Sen, fled to the hills and reached Suket. The State of Suket is said to have been founded by Bir Sen, an ancestor of the Sena Dynasty of Bengal.

The separation of Mandi from Suket took place about the year 1200 AD, Upto that time, it was the single state of Suket. The then reigning chief Sahu Sen had a quarrel with his younger brother Bahu Sen, who left Suket to seek his fortunes elsewhere. Bahu Sen after leaving Suket settled at Manglan in Kullu, where his descendants lived for 11 generations. Then the chief, Kranchan Sen was killed fighting against the Kullu Raja and his Rani, who was pregnant at that time, fled alone to her father who was the chief of Seokot, who had no son. Here she gave birth to a baby boy who was named Ban, the tree under which he was born. Ban had hardly crossed the age of 15 when he defeated the chief of Kilti who used to plunder travelers. On the death of the chief of Seokot, Ban succeeded to the chiefship of Seokot. He, after some time killed the Rana of Sakor and took possession of his lands, he then changed his residence to Bhiu, on the banks of Beas and a few miles from the present Mandi town. Mandi emerged a separate state in the beginning of the sixteenth century. Down the line of descendants of Ban came Ajbar Sen. nineteenth in descent from Bahu Sen, who founded Mandi Town in 1527 AD, the capital of the erstwhile state of Mandi and the headquarters of the now Mandi District.


Ajbar Sen was the first great ruler of Mandi. He was probably the first to assume the designation of Raja. He consolidated the territories that he had. inherited and added to them new ones that he wrested from the hands of his neighbors. He built a palace here and adorned it with four towers. He also built the temple of Bhut Nath and his Rani constructed that of Triloki Nath. Down the line of descendants was Raja Sidh Sen, who succeeded Raja Gur Sen in 1678 AD. Mandi had never been so powerful before his reign and after that never was. He captured great areas from the adjoining areas. it was during his reign that Guru Govind Singh, the tenth guru of the sikhs visited Mandi in the close of the 17th century. He had been imprisoned by Raja Singh, the chief of Kullu, from whom he had sought assistance against Mughal troops and his followers believe that Guruji escaped by using miraculous powers. Raja Sidh Sen, who is also considered to be a

possessor of great miraculous powers, entertained his with great hospitality. He built the great tank before the palace.

He also built the temples of "Sidh Ganesha" and "Trilokinath". The entire history of both the states of Mandi and Suket is littered with wars with among themselves and other adjoining states. These two states had always been rivals and generally enemies, but there was no great result of their warfare. The fertile valley of Balh was the common ground of desire and dispute. On 21st February 1846 the chiefs of Mandi and Suket visited Mr. Erskine, Superintendent of the Hill States for the British Government, owing their allegiance and securing their protection. on 9th march, 1846 a treaty was concluded between the British and Government and the Sikh Durbar whereby the whole of the Doab area between the Beas and the Sutlej was ceded to the British Government, and this included the states of Mandi and Suket also. On 1st November 1921, both the state of Mandi and Suket were transferred from the political control of Punjab Government to that of Government of India till 15th August 1947, India's Independence Day.

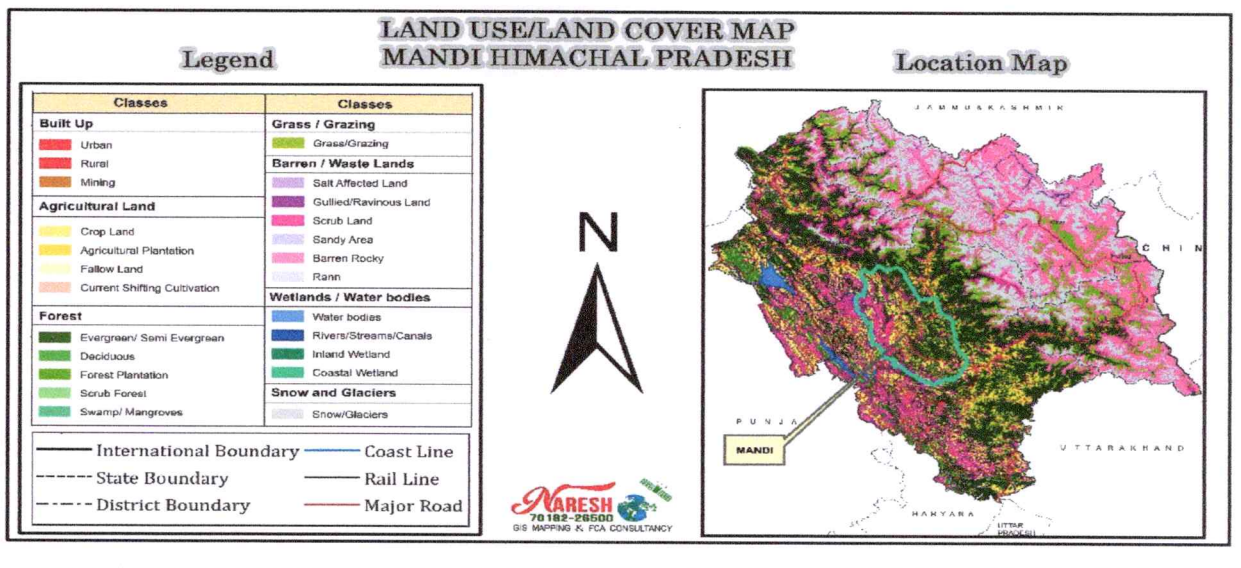
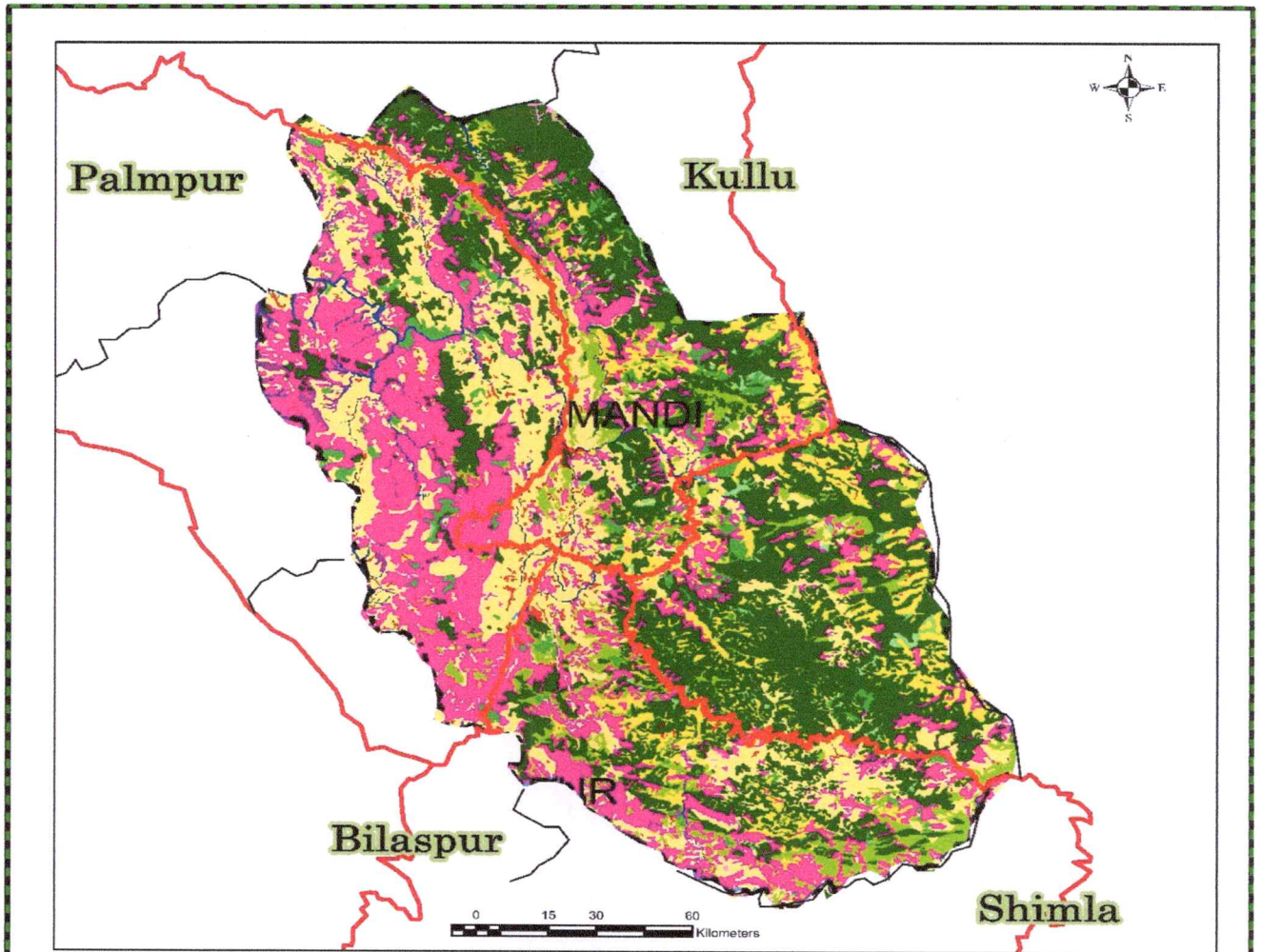
The present District of Mandi was formed with the merger of these two princely states Mandi and Suket on 15th April 1948, when the State of Himachal Pradesh came into existence. Ever since the formation of the district, it has not witnessed any changes in its jurisdiction.

Deputy Conservator of Forests
Suket Forest Division
Sundernagar Distt. Mandi (H.P.)


Executive Engineer,
Sundernagar Division
HPPWD. Sundernagar

The Mandi District is located on the 19 Survey of India Toposheet
(1:50,000) as given below in the figure.

Land use pattern and Social aspect of the area:



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Deputy Conservator of Forests,
Suket Forest Division,
Sundernagar Distt. Mandi (H.P.)

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Executive Engineer,
Sundernagar Division
HPPWD, Sundernagar

Economy:

General Information

Mandi is one of the fastest developing towns of Himachal Pradesh, located on cross junction of National Highway-20, 21 and 70. It acts as a gateway to Kullu, Lahaul, Leh Ladakh, area of Jammu & Kashmir. Being District headquarters, the entire District depends upon the city for trade & commerce services and civil administration. The economy of the region is predominately agrarian as around 79% of the total population is dependent on agriculture and activities allied to it, for earning their livelihood.

Climate:

Temperature Varies from 40° C in plains during summer -20° C in the Alpine Zone during winters. (b) Rainfall varies from 152 cms to 178 cms in outer Himalayas. Due to sufficient rainfall, unused land is covered with forests or forms rich grazing land. In the hills the forests are extensive and valuable. Deodhar, blue pine, silver fir, spruce, chil and various kinds of oak are plentiful. Below 4,000 feet the forests are not extensive, the only valuable ones consisting of chil, but there is considerable scrub jungle and the wide areas of grass covered slopes support the herds of cattle. As may be expected from the varied altitude, the climate shows large variations in the different parts of the district. It is pretty hot in the lower portion in the summer and the cold letter in the hills during the winter. And as such in every season, except the rainy season, there is some place in the season where the climate is inviting.

Agriculture:

Agriculture and the rural economy of Himachal Pradesh, particularly in villages like Nihri, Dharli, Balag and Serkothi, are dominated by small and marginal farmers who depend on mixed farming systems suited to the hilly terrain. Most households cultivate cereals such as maize, wheat and barley on terraced fields, while some also grow vegetables or engage in horticulture where altitude and climate permit. Because landholdings are typically less than one hectare and irrigation is limited, farming alone seldom sustains a family, leading villagers to rely on livestock, seasonal labour, or small cottage-based activities to supplement income. The geography of these regions restricts large-scale agriculture but supports diversified practices, making animal husbandry, horticulture and allied activities important components of the local economy. Despite agriculture's declining contribution to the state GDP, it remains the backbone of livelihood in these villages, with government schemes and rural development programmes playing a crucial role in improving productivity, income stability and adoption of modern farming practices.

Table-3:

<u>Sr No.</u>	<u>Category</u>	<u>Area in Sq.kms)</u>	<u>percentage</u>
1	Area under forest, dense and open forest	2030	35.37
2	Culturable waste	268	4053
3	Not available for cultivation, barren and un-culturable land	155	2.70
4	Land put to Non Agricultural uses	752	13.10
5	Permanent pastures	876	15.26
6	Land under miscellaneous tree crops etc.	82	1.42
7	Other Cultivated waste	1576	27.46
8	Total Area	5739	100%

Forest:

The range contains some good forests of chil pine. but the greater part of it consists of rich grass slopes. Its name is attributed to Sikander Lodhi, who, 375 years before the reign of Akbar, is supposed to have crossed it on his way to the conquest of Kangra. The range of altitudes in the district is high, with the highest point being around 13,000 feet on the Kullu border and the lowest point 1,800 feet near Sandhol where the Beas leaves the district. The only area which is similar to the plains is the Balh valley. Several of the valleys are open and are often irrigable from kuhls, or small water channels, and contain some of the most fertile land in the state. Due to the hilly terrain, some of the hills are so precipitous that cultivation in large scale is impossible. Due to sufficient rainfall, unused land is covered with forests or forms rich grazing land. In the hills the forests are extensive and valuable. Deodhar, blue pine, silver fir, spruce, chil and various kinds of oak are plentiful. Below 4,000 feet the forests are not extensive, forest cover area is about 178591 Hects.

GEOGRAPHY OF THE DISTRICT

a. Location: - The district is situated between 31-13-50 and 32-04-30 north latitude and 76-37-20 and 77-23-15 east longitude. It is bounded by Kangra on the north-west, Hamirpur & Bilaspur in the west, Arki tehsil of Solan district in the south, Shimla district in the south-west and Kullu district in the east.

b. Rivers: - The district has 2 main rivers viz. the Beas and the Satluj. The river Beas enters the district from close to Bajaura, at the boundary of Kullu and leaves the district at Sandhol. The Mandi town is also located on the banks of this river. For the greater part of its length, it runs between high banks and as it is of never great breadth, the current is swift, especially during the rains. Practically the whole

of the district drains into the Beas with only the south-east corner situated on the Satluj watershed. Within the district the principal tributaries of the Beas on the north bank are Uhl, Luni, Rana and Binu and on the south bank are the Hanse, Tirthan, Bakhli, Jiuni, Suketi, Ranodi, Son and Bakar.

LOCATION:

Mandi district covers an area of 3950 sq kms and lies in the middle portion of H.P and is bounded in the north by district Kangra, Kullu in the West in the south are the districts of Shimla & Solan, Bilaspur in the south West and Hamirpur in the North West.

Major part of the district lies in the lesser Himalayan region, which presents the rugged mountainous terrain. The mountains are composed of crystalline, metamorphic unfossiliferous sedimentary rocks of oldest system. Mountains are developed in different stages. Initially a Geosyncline was formed which was gradually filled up with sediments, after this Geosynclinal deposits were subjected to folding and thrusting etc. Finally, the Geosynclinal sediments were pushed up gradually to form the mountains. In Mandi district between the steeply rising mountains are the valleys. Nihri, partly Kullu valley lies between the steeply rising mountains which remain mostly under snow for most part of the year. The valleys are the result of long erosion along the medial part of elevated tracts. These valleys are known as erosional valleys which have resulted because of glacial and stream erosion. Sutlej, Beas, Uhl and Suketi are the main rivers in the district.

FLORA AND FAUNA

a. Flora

The Chills considered the prevailing conifer up to about 1950 meter when it gives place to the Deodar and the blue pines. In Mandi district the forest range between scrub, sal and bamboo forest of the low hills to the fir and alpine forests of the higher elevation. Lowest point of the southern boundary of the district is 427 meter above sea level and highest range of is at an elevation of 2658 meters in the north. The forests grown between these two extremes vary as the elevation itself. The area under consideration following are the most common trees

The most prominent varieties of trees found in the district are: Simbal (*Bombax malabaricum*) Mango (*Mangifera indica*) Tun (*Cedrela toana*) Several species of acacia and albizia Salambra (*Odina wodier*) Terminalia (*Engenia jambolana*) Bamboo The common fruit trees are banana, apple, ber, jamun, mango, mulberry, almond, peach etc Shrubs The topography, climate and nature of soil is mainly responsible for the growth of various types of trees and shrubs, which are important for making the environment of the area most suitable for the survival of living beings. The trees and shrubs grow according to the heights in higher elevations the following trees are mostly seen to grow.

Local Name

1. Bhujpatar
2. Kharsu
3. Ban
4. Brah
5. Tos
6. Dyar
7. Safeda
8. Pipal
9. Behul
10. Chil

Botanical Name

- Betula Utilis
Quercus Semecarpifolia
Quercus hicana
Rhododendron Arborcum
Abies Pindron
Cedrus Deodara
Eucalyptus Citriodorn
Ficus Religiosa
Grewia Oppositifolia
Pirths Rox-Burghii Ber and other bushes

The most common shrub at the higher elevation is Barberis, indigopera and esmodium and following other shrubs are also found.

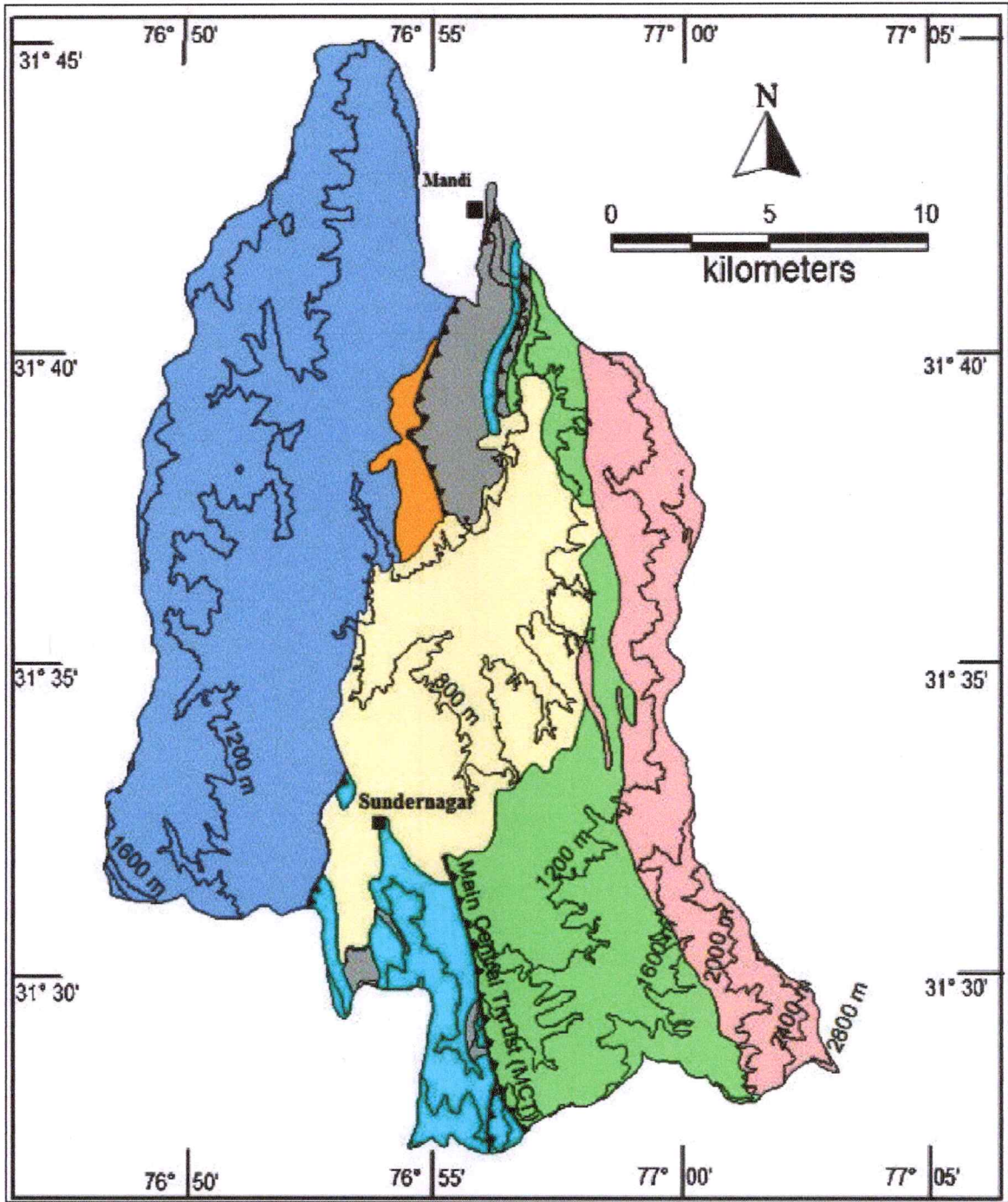
1. Vitex
2. Munj
3. Ber
4. Ipomea
5. Dodonea &
6. Bamboo.

The common fruit trees are banana, apple, ber, jamun, mango, pear, mulberry, apple, almond, cherry, peach etc.

Deputy Conservator of Forests
Suket Forest Division
Sundernagar Distt. Mandi (H.P.)

Executive Engineer,
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Geological map of the Sunder Nagar, Mandi District, Himachal Pradesh



- | | |
|---|---|
|  Alluvium/Valley Fills |  Sundernagar Group |
|  Siwalik Group |  Intrusive Dhauladhar Granites |
|  Subathu Group |  Salkhala Group |
|  Shali Group |  Thrust |
|  Contour (1200 m amsl) | |



Deputy Conservator of Forests
Suket Forest Division
Sundernagar Distt. Mandi (H.P.)

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Project Description at Glance

a. DESCRIPTION OF THE PROJECT ROAD:

Diversion of 10.6019 Ha. Forest land for The proposed road will connect Dharli, Chakauli, Ropa Bandla, Dhora, Dhar, Salag, DPF Bunga, Balag villages /habitation and it will serve approx. 3108 populations. It will connect left out area, which is deprived with road facility. The road is urgently required as people of these villages are facing great hardships to reach the nearby town Slapper. After construction of this road they will connect directly with Hospital Sunder Nagar, Medical Hospital Ner chowk, Market center Sunder Nagar and Nerchowk. At present mule transport is only mode available for transporting the goods etc, the area is quit rich in the production of cash crops and agriculture production such as Maize potato rice & seasonal vegetable etc. The land is very fertile. But heavy cost of transportation for export of surplus production and different marketing position restrain people from taking farming in a whole hearted way as such their living standard is also poor.

The construction of this Road shall increase the economy of the area with the sufficient cheap and quick transportation of possible agriculture produce easy and extended marketing facilities more over availability of emergency medical help will also improve. With increased economic activity the overall living standard of the people shall also improve quickly. The proposed alignment for the said road has been carefully finalized after considering a total No. of three alternate alignments in all the cases a portion of the road shall pass through the forest area. The construction of the road involves negligible tree cutting and as such the loss of forest produce involved in it is very meagre in comparison to the benefits of the road. The proposed alignment does not form any part of national park, wild life sanctuary, Biosphere reserve, tiger reserve etc. The alignment is so located that is involves minimum forest land, minimum cutting is involved and maximum benefit to be beneficiaries due to this road. Due to construction of this road, there will be no erosion to be remaining soil / forest land.

1	Total Length	11.340
2	Location	Tehsil Sunder Nagar , Sub-Tehsil Nihri District Mandi
3	Terrain	Hilly
4	Name of the Protected Area within 10 km of protected zone(Buffer Zone)	Nil

The area is covered in the Survey of India Topo Sheet No. 53A15 (R.F. 1:50,000) and is bounded by the co-ordinates shown in table below.

Site Coordinates

Sr.No.	Latitude	Longitude
1 Start Point	31.423094°	76.945126°
2	31.422137°	76.944155°
3	31.422078°	76.945458°
4	31.421634°	76.943916°
5	31.420049°	76.944099°
6	31.422071°	76.947088°
7	31.421104°	76.946085°
8	31.421896°	76.947616°
9	31.420403°	76.947686°
10	31.417722°	76.950345°
11	31.416048°	76.950156°
12	31.418059°	76.950393°
13	31.420103°	76.950259°
14	31.418941°	76.955504°
15	31.418188°	76.956478°
16	31.418648°	76.951455°
17	31.415183°	76.956021°
18	31.412843°	76.960397°
19	31.411713°	76.958442°
20	31.411030°	76.959899°
21	31.406567°	76.958761°
22	31.407532°	76.961212°
23	31.404430°	76.960831°
24	31.406175°	76.964857°
25	31.405889°	76.966255°
26	31.401120°	76.969107°
27	31.397716°	76.971360°
28	31.400195°	76.966534°
29	31.402941°	76.963721°
30	31.403815°	76.959002°
31	31.404926°	76.955894°
32	31.402102°	76.962323°
33	31.402582°	76.957765°
34	31.399950°	76.961008°
35	31.395554°	76.961267°
36	31.397492°	76.964329°
37	31.393884°	76.960016°
38	31.391484°	76.964816°
39	31.388403°	76.967866°
40	31.385505°	76.969629°
41	31.383624°	76.971708°
End Point 42	31.381357°	76.973449°

Project Location (District Mandi Patch)

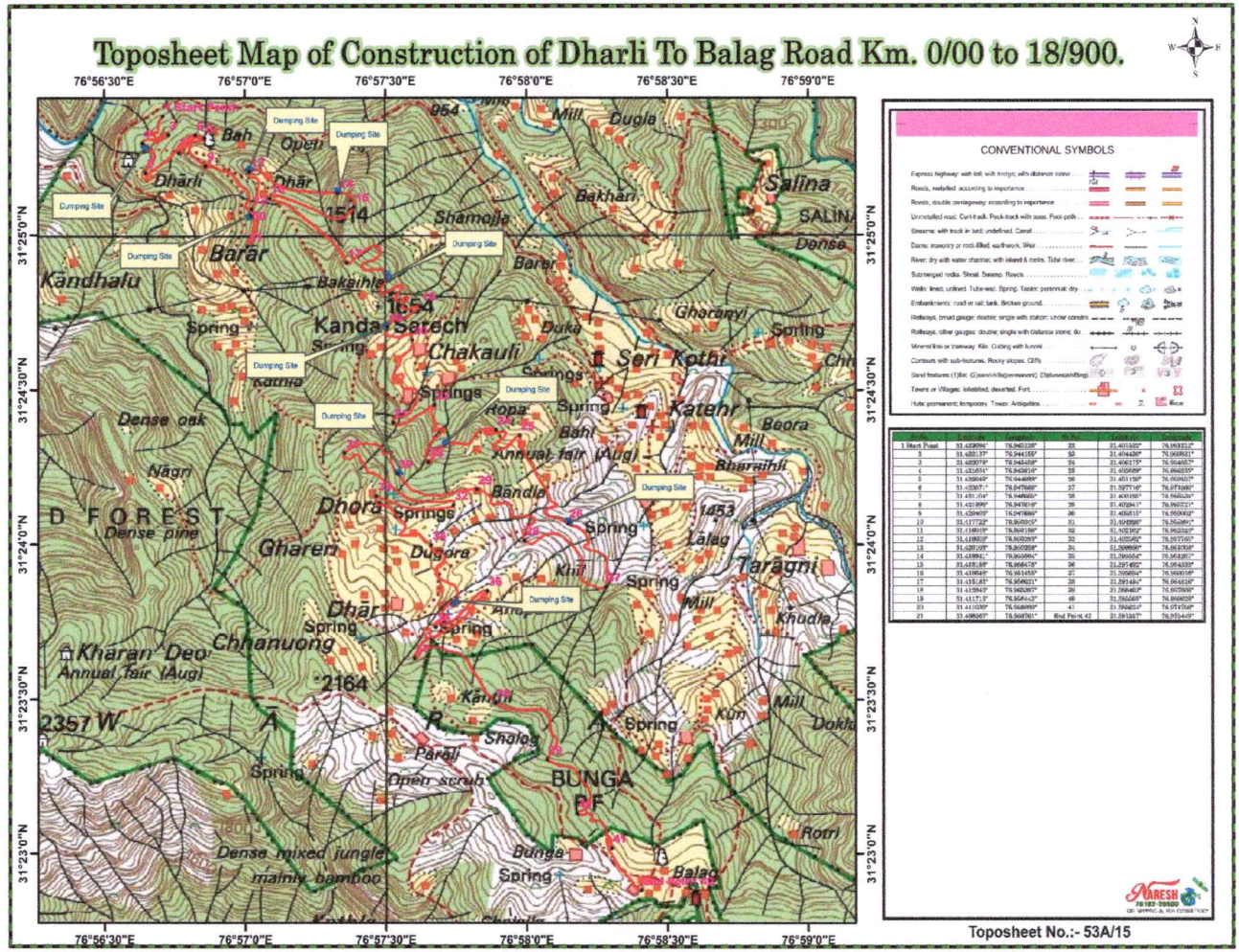
Sr.No	Aspect	Description
1.	Project	Diversion of 10.6019 ha. of forest land in favour of HPPWD for the Constructon of Dharli To Balag road (Km 0/00 to 18/900, within the jurisdictions of Suket Forest Division H.P.
2.	Location	53A/15
(i)	State	Himachal Pradesh
(ii)	District	MANDI
(iii)	Tehsil	Sunder Nagar
(iv)	Villages	Dharli, Ropa Bandla, Salag, DPF Bunga, Balag
3.	Nearest Location	31.423094°, 76.945126°
(i)	Nearest Town	Nihri, Slapper, Sunder Nagar
(ii)	District Headquarters	Mandi

1.1 General

Diversion of 10.6019 Ha. Forest land for The proposed road will connect Dharli, Chakauli, Ropa Bandla, Dhora, Dhar, Salag, DPF Bunga, Balag villages /habitation and it will serve approx. 3108 populations. It will connect left out area, which is deprived with road facility. The road is urgently required as people of these villages are facing great hardships to reach the nearby town Slapper. After construction of this road they will connect directly with Hospital Sunder Nagar, Medical college Hospital Ner chowk, Market center Sunder Nagar and Nerchowk. All three roads maintained above are connecting different area and the left out villages are to be connected by the proposed road. The Public Works Department Sunder Nagar division has been to be submitted for Stage-I approval under FCA 1980.Now for Stage-I Approval Soil Conservation Plan (SMC) is to be submitted. The proposed Road passes through Two Ranges (Kangu & Jhungi) of Forest Divisions Suket.

The location map of road passing through area of Suket Division, Range Kangu & Jhungi is given in Figure 1.1.

FIGURE 1.1 LOCATION MAP



Deputy Conservator of Forests
Suket Forest Division
Sundernagar Dist. Mandi (H.P.)

Executive Engineer,
Sundernagar Division
HPPWD, Sundernagar

2.0 CLIMATE & RAINFALL

The climate of the district varies from semi-tropical to semi-arctic. Winter varies from December to February and summer extends from March to June while July to September is rainy months. The maximum rainfall in the district occurs between July to September. The rainfall in the district during 2012 was 1106 mm. Snowfall is received in the higher reaches. The minimum and maximum temperature at Saloni in 2011 was 1.1°C and 32.9°C in January and May respectively.

3.0 GEOMORPHOLOGY & SOIL TYPES

Mandi district presents an intricate mosaic of mountain ranges, hills and valleys. It is primarily a hilly district with altitudes ranging from 550 m near Sandhol where the Beas river leaves the district, to about 3960 m amsl near Kullu border. There is a general increase in elevation from west to east and from south to north. Master slope is southwesterly. The south western part consists of Siwalik ranges having scarped slopes. There are few small intermountain valleys; prominent among them is the Sunder Nagar valley, located in the lesser Himalayan ranges, having an average altitude of about 790 m amsl and have a general slope towards NNE. The valley floor is undulating and is marked by low hillocks and terraces fringing the hills and intervening low alluvial plain. The Beas and Satluj rivers form the major drainage system in the district. The river Beas and its tributaries, drain about 70% of the district area in the northern part, whereas the area in the south is drained by the river Satluj. Byas khad and its tributaries, chiefly drain Sunder Nagar valley. The Satluj khad maintains a perennial flow, because of effluent seepage from groundwater. There are three important lakes in the district, namely Rewalsar, Prasher and Kamrunag. Two types of soils are mainly observed in the district viz. Sub-Mountainous Soil occurring in Sunder Nagar, Nihri and Karsog blocks and Mountainous Soil occurring in remaining eight blocks of the district.

The sub-mountainous soil is high in organic carbon, low in available phosphorous and medium in potash, whereas the mountainous soil is brown in colour, medium in available nitrogen & potash and deficient in available phosphorous. The soil reaction is slightly acidic to neutral and texture in general varies from loam to sandy loam, except in low valley areas being heavy Textured.

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

The rock formations occupying the district range from pre-Cambrian to Quaternary period. The generalized geological succession in the district is given below.

Age	Formation	Lithology
Quaternary	Alluvium; Terrace & Fluvial deposits	Alluvium, clay, sands, gravels, pebbles, boulders and cobbles
Lower Pleistocene to Middle Miocene	Siwalik Group	Clay, siltstones, sandstones, and boulder beds

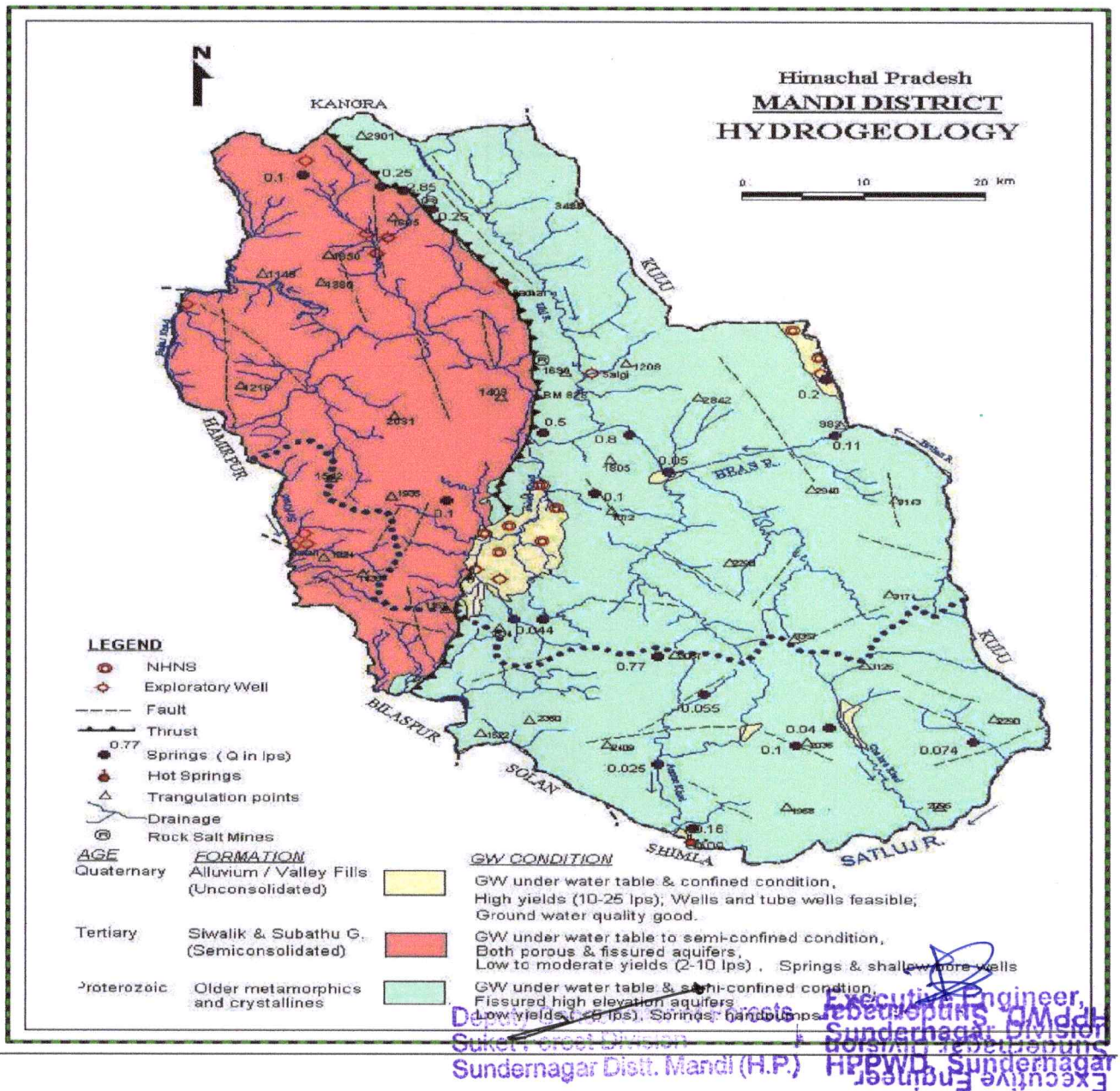
Oligocene to Lower Miocene	Dharamsala/Kasauli Formation (Sabathu Group)	Grey/green sandstones, splintery shale, clay etc.
Permian	Basic Volcanic intrusives	
Proterozoic	Shimla Group	Phyllites, Quartzites, limestone, shale and dolomite
	Shali/Sundernagar/Kullu Formation	Phyllites, Quartzites, dolomite conglomerate and limestone
	Jutogh Group	Quartzites, Schists and phyllites
		Dalhousie/Kullu granites and gneisses

Hard formations, form hilly and mountainous terrain and mainly comprises of igneous and metamorphic rocks, belonging to the Jutogh, Shali/Largi and Shimla group and occupy the major part of the area in the northern, central and eastern part. Granites and gneisses are intruded in the meta-sediments of Shali/Largi and Shimla group. In the western and southern parts sediments comprising of sandstone, shale, siltstone, conglomerate etc of Dharamshala/Sabathu group and Siwalik group of Tertiary age are observed. Alluvium, terrace deposits, fluvial deposits of Quaternary period occur in the intermontane valleys, viz., Balh valley, Sarkaghat valley etc., and constitute an important unit from ground water point of view.

Hydrogeologically, the district is divided into two distinct and well defined units viz. porous formations constituted by unconsolidated sediments and the fissured formations or hard rock formation constituted mainly by semi-consolidated to consolidated rocks.

The fissured formations include the semi-consolidated to consolidated (hard) rocks exposed in the district and are of sedimentary, metamorphic and igneous origin. These form low and high hill ranges throughout the district. Fractured and jointed sandstone, siltstone forms low potential aquifers in the area. In general, weathered and fractured hard rocks are favorable for groundwater aquifer. Fracture zones and contact zones form the important aquifers in the topographic low areas, with poor to moderate yields. These fracture or fault zones form potential ground

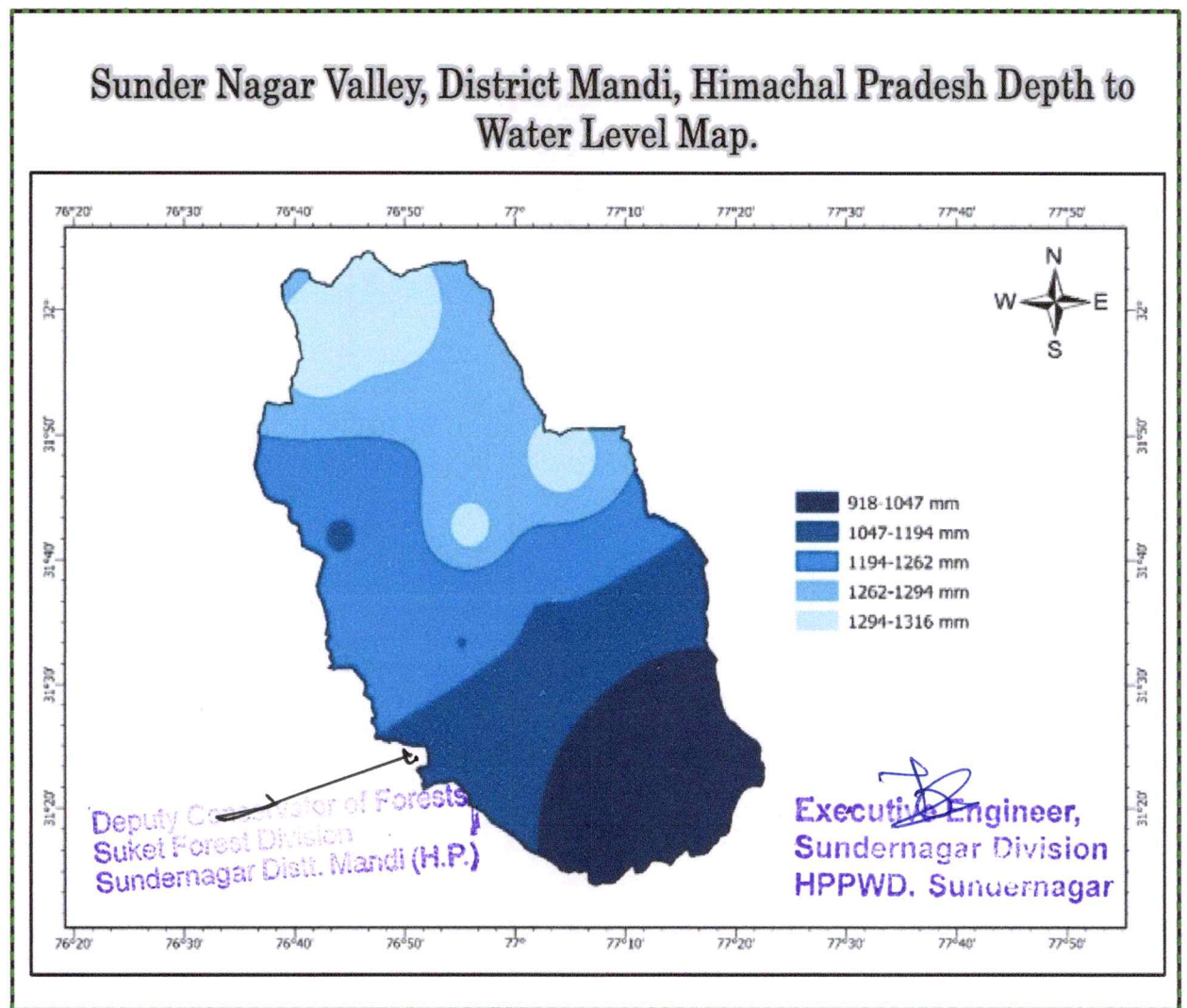
water zones. Ground water in these hilly areas oozes in the form of seepages, springs and utilized for domestic and other uses. At places, shallow boreholes fitted with hand pumps have been constructed to develop ground water. The yield of the bore wells constructed along the fault/fracture/contact zones varies from less than 1 to 30 m² hour. Weathered mantle in low topographic areas, also form poor aquifers. Borewells are constructed in oozing out spring/seepage zones for collecting water to fulfill the domestic water needs.



The unconsolidated sediments comprising fluvial, channel deposits, valley fills and terrace deposits and alluvial fan constitute the porous aquifers in the district. These sediments consist of sand, gravels, cobbles, pebbles and boulders interlayered with clay valley and isolated small pockets in the district, these unconsolidated sediments forming aquifer are observed. In Sunder valley, ground water occurs under phreatic to confined conditions. Dug wells form major source of

water for domestic and irrigation water supply. The depth of the wells ranges from 8 m to 26 m bgl, where depth to water level ranges from near surface 0.86m bgl to 9.92m bgl. In low plains, water levels are shallow and less than 5m and become deeper in terraces and fringe areas. Large number of tube wells, ranging in depth from 38.25 m to 140.98m have been drilled/constructed by tapping granular horizons. where water level ranges from artesian/free flow to about 19.35m bgl. The yield of the wells ranges from 15 to 999.24 Ipm for economic drawdown. Free flowing conditions are observed in low-lying areas of Byas, Satluj khad in southwestern part of Balag valley.

In Balag valley. CGWB monitors 9 hydrograph stations for groundwater regime monitoring under its National Network. The water levels are monitored four times and ground water quality once during pre-monsoon period every year. During the pre-monsoon (May 2012), depth to water level ranged between 0.86 to 9.92 mbgl. Similarly, during the post-monsoon (November 2012), depth to water level ranged between 0.37 to 5.83m bgl. Depth to water level map of pre-monsoon 2012, is given in Figure - 4.



4.2 Ground Water Resources

Rainfall is the major source of groundwater recharge, apart from the influent seepage from the rivers, irrigated fields and inflow from upland areas, whereas discharge from ground water mainly takes place through wells and tube wells; effluent seepages of ground water in the form of springs and base flow in streams etc.

Ground water resources and irrigation potential for Dharli & Balag valley in Mandi district have been computed as per the GEC-97 methodology. The resources for the year 2011, are as follows: -

1.	Area (Dharli & Balag valley) considered for GW Assessment	9500Ha.
2.	Net Ground Water Available	5942.33 ham
3.	Annual Ground Water Draft	912.77 ham
4.	Stage of Ground Water Development	15.36%

The stage of ground water development in Balh valley in Mandi district is 15.36% and falls under "Safe" category. There is thus, a scope for further ground water development.

4.3 Ground Water Quality

CGWB monitors the ground water quality of shallow aquifers through 9 National Hydrograph Stations, located mostly in Dharli & Balag valley and southernmost extension of Kullu valley falling in district Mandi. As per ground water samples collected in May 2012, the range of chemical parameters in Dharli & Balag valley is summarized below.

<i>S No</i>	<i>Parameters</i>		<i>Range</i>	
			<i>Min</i>	<i>Max</i>
1.	pH		7.38	7.89
2.	EC	uS/cm	180	1320
3.	HCO ₃	(mg/l)	67	214
4.	CL	(mg/l)	4	255
5.	NO ₃	(mg/l)	0.90	98
6.	F	(mg/l)	0.00	0.30
7.	Ca	(mg/l)	14	66
8.	Mg	(mg/l)	6	54
9.	Na	(mg/l)	11	102
10.	K	(mg/l)	2.20	16
11.	TH as CaCO ₃	(mg/l)	108	792

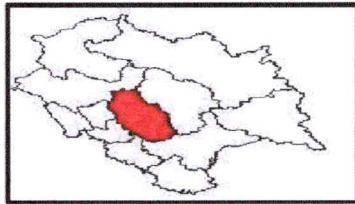
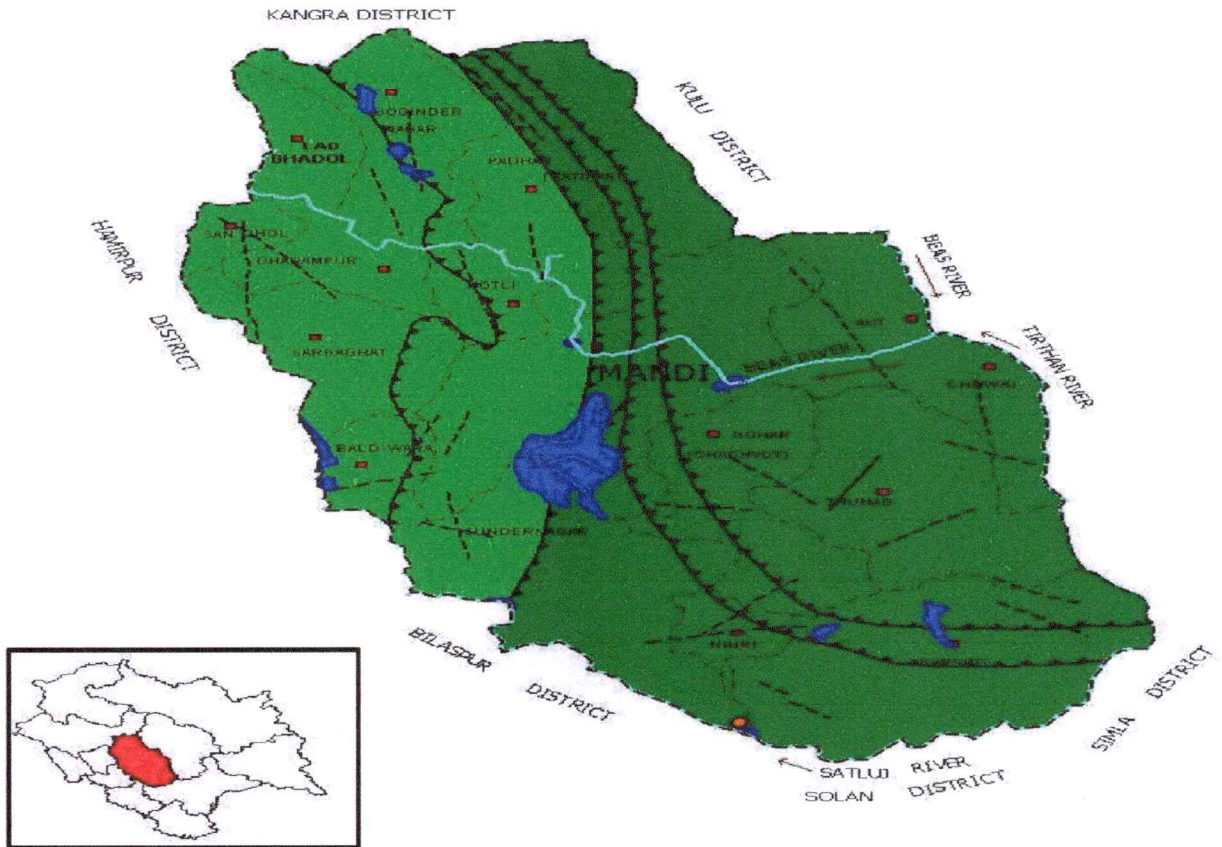
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**GROUND WATER USER MAP
DISTRICT MANDI, HIMACHAL PRADESH
CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES**



0 10 20
kilometers



	Wells feasible	Rigs suitable	Depth of Well (m)	Discharge (lpm)	Suitable artificial Recharge structures
Soft rock aquifers	Tube well	Percussion & Percussion cum Rotary Manual	100-120	1200-2500	Check dam, Check dam cum ground water dam, Recharge shaft
	Dug well		10-20	300-500	
Hard rock aquifers	Bore well	DTH with Odex	100-150	1000-2000	
	Dug well	Manual	10-20	300-500	
	Spring Development			30-2000	
▲▲▲ Thrust					
	Major drainage				
	Hot water spring (50°C) Spring				
		Fault/Lineament Tehsil boundary District boundary State boundary			

Executed
**Engineer
Sundernagar Division
HPPWD, Sundernagar**

Scope of Work:

Deputy Conservator of Forests
**Suket Forest Division
Sundernagar Distt. Mandi (H.P.)**

1. Preparation Soil Conservation Plan:

- Proper mitigate measures to minimize soil erosion and choking of streams shall be prepared.
- Planting of adequate drought hardy plant species and sowing of seeds to arrest soil erosion.

- Study of construction of check dam, retention/Breast walls to arrest sliding down of the
- excavated material along the contour.
- Additional measures to avoid the soil Erosion.

1.2 Location of the Project:

Diversion of 10.6019 ha. of forest land in favour of HPPWD for the Construction of Dharli to Balag road (Km 0/00 to 18/900, within the jurisdictions of Suket Forest Division H.P Comprising total area of 10.6019 Hectare of Forest Land has been Proposed by Himachal Pradesh Public Works Department, Sunder Nagar Division. The Location of the project is The area is covered in the Survey of India ToposheetNo.53A/15 (R.F. 1: 50,000)) and is bound by

Latitude: Longitude:

Sr.No.	Laititude	Longitude
1 Start Point	31.423094°	76.945126°
2	31.422137°	76.944155°
3	31.422078°	76.945458°
4	31.421634°	76.943916°
5	31.420049°	76.944099°
6	31.422071°	76.947088°
7	31.421104°	76.946085°
8	31.421896°	76.947616°
9	31.420403°	76.947686°
10	31.417722°	76.950345°
11	31.416048°	76.950156°
12	31.418059°	76.950393°
13	31.420103°	76.950259°
14	31.418941°	76.955504°
15	31.418188°	76.956478°
16	31.418648°	76.951455°
17	31.415183°	76.956021°
18	31.412843°	76.960397°
19	31.411713°	76.958442°
20	31.411030°	76.959899°
21	31.406567°	76.958761°
22	31.407532°	76.961212°
23	31.404430°	76.960831°
24	31.406175°	76.964857°
25	31.405889°	76.966255°
26	31.401120°	76.969107°
27	31.397716°	76.971360°
28	31.400195°	76.966534°
29	31.402941°	76.963721°
30	31.403815°	76.959002°

31	31.404926°	76.955894°
32	31.402102°	76.962323°
33	31.402582°	76.957765°
34	31.399950°	76.961008°
35	31.395554°	76.961267°
36	31.397492°	76.964329°
37	31.393884°	76.960016°
38	31.391484°	76.964816°
39	31.388403°	76.967866°
40	31.385505°	76.969629°
41	31.383624°	76.971708°
End Point 42	31.381357°	76.973449°

1.3 Location of Study Area:

INTRODUCTION TO DIVISION/RANGEWISE LOCATION SPECIFIC SMC PLAN:

It is important that a “*SOIL AND MOISTURE CONSERVATION PLAN*” should provide site specific prescription be the activities to be undertaken under each heading of the SMC Plan components.

Objective of Study

1. The broad objectives for preparation of Soil and Moisture Conservation are outlined as under;

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

3.ii) Rehabilitation of degraded forest areas through afforestation and facilitation natural regeneration 3

4.ii) Rehabilitation of degraded slopes and landslide areas.

5. “*SOIL AND MOISTURE CONSERVATION PLAN*” is the optimal use of Soil and water resources within a given geographical area so as to enable sustainable production. It implies changes in land use, vegetative cover, and ocher structural and non-structural action that are taken in SMC. The overall objectives of “*SOIL AND MOISTURE CONSERVATION PLAN*” are to;

- a. increase infiltration into soil
- b. Control excessive run off
- c. Manage & utilize run off for useful purpose
- d. Shrub Plantation

e. Grazing and Development: -

f. Grazing land development can be undertaken for treatment under silvo-pastoral model. Areas should be closed and staggered trenching should be dug over the area to be treated. Trenches should be dug per hectare. Improved variety of grass should be sown on the berm of the tranches. In the space between the reaches, fodder tree species should be raised. Suggested species for grazing land development are and rrogons quarrosus (Khas-Khas), apluda mutica, arthraxon prionodes, Brachiaria mutica, Cenchrus ciliaris, Cenchrusciliarischlorisgayana (Rhodes grass) Cymdondactylon Desmostachya bipinnata, Digitaria decumbens (Pagnola grass) etc.

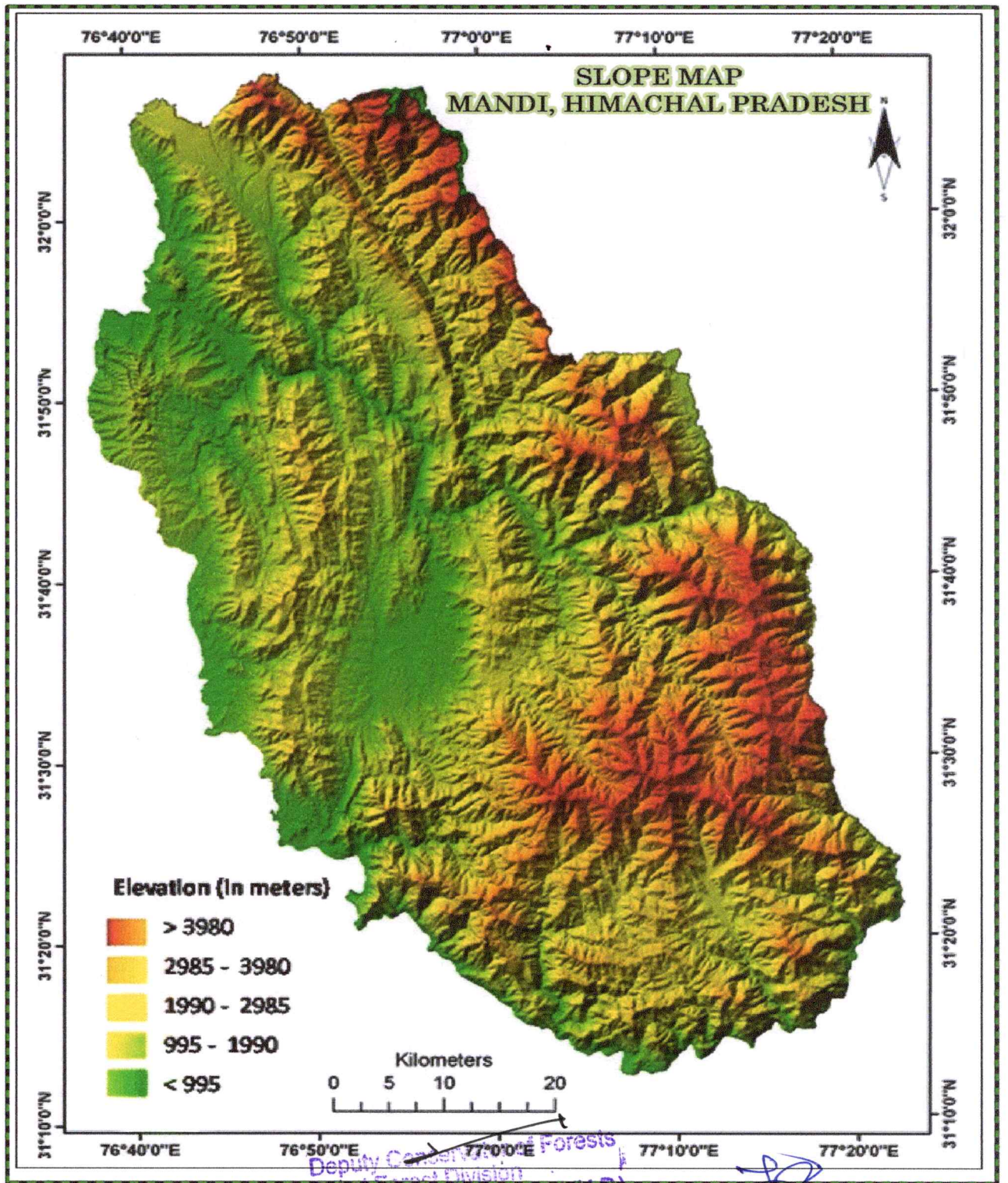
Engineering measures: -

- i) Moisture Retention measures.
- ii) Drainage Line Treatment Stabilization of landslide/landslips Slope.
- iii) 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. This 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 slops classes as per rat and Land Use Survey of India (SLUSI) The areas falling under various standard slope categories in the catchment area have been tabulated below in Table The slope map is enclosed in Figure. As seen from the table and map, maximum of the slope falls under 2.4660 to 622 mtr slope range The degree of slope is explained in the below mention map.

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SLOPE MAP



1.4 Need for Soil Conservation Plan:

Soil Conservation Plan is normally applicable for Hydroelectric and Irrigation Projects where impounding of water is proposed by construction of Barrage, Dam etc. This project is Road Project and the part of project falling Under Bahtiyat Range does not fall near to any major river.

1.5 Objective of SC Plan:

The objective of SC Plan is to rejuvenate various potential and degraded ecosystems in the Mine area. The opencast Road activities disturb large tracts of land and produced greatly increased down stream sediment load.

The objective of this report is to present the outline of Road surface erosion problem, method of modeling sediment yield, measures to be taken for reducing or controlling sediment discharges. The action plans is to be prepared for this purpose with the following objectives.

- Conservation of soil cover and to arrest the soil erosion, flood and siltation of the Project area and its tributaries if any.
- Soil conservation through biological & engineering measures to reduce sediment load in river and tributaries, thus improving quality of water.
- Increase vegetative cover and water retaining properties.

SOIL CONSERVATION PLAN

Mitigative Measures

Mitigative measures to minimize soil erosion can be undertaken by two plan

- 1) Biological Conservation Plan,
- 2) Engineering Conservation Plan

5.1 Biological Conservation Plan:

5.1.1 Approach Plan

The following biological conservation plan can be adopted to mitigate soil erosion.

- Proper Dumping of Muck Generated. Dumping of soil and clayey material should be done away from the working area that is on farther end of the dump so that formation of weak planes is avoided.
- Afforestation by planting trees will help a lot in improving stability of dumps by preventing erosion.
- Provision of jute mesh for facilitating grass or vegetative growth on slopes, Provision of good soil mixed with manure and subsequent irrigation for growth of grass for anchorage on slopes. Plantation mixed with indigenous and fast growing plant species
- The degraded area can be reclaimed and rehabilitated with local species of plantation in a phased manner,
- Plantation should be carried out on waste dumps;
- The haulage roads should be flanked by trees on either side; and

- A belt of trees with thick canopy should be created along the mine boundary to intercept dust, gaseous pollutants and noise.

60 COST ESTIMATE

Cost of Mitigative Measures to arrest Soil Erosion & Top Soil Management Plan in respect of both Biological and Engineering plans are as proposed.

Cost estimate for Engineering Plan:

6.1 Total cost of Mitigative Measures for Soil Conservation:

The area of Diversion falling under Suket Division, Jhungi and Kangu Range is 10.6019 Hectare of forest land in favour of HPPWD for the construction of Dharli to Balag road (Km 0/00 to 18/900), within the jurisdictions of Suket Forest Division H.P. The area falling under the project is prone to Landslides and the sites to treated is mentioned in the list attached below with various SMC related activities proposed,

Hence as decided by the recent Guidelines of MoEFCC dated 07-06-2022, sum of Rs. 1,75,000/ will be deposited as per the cost of SMC accordingly to the % age of the Forest Land Diverted.

REFERENCE AND DATA SOURCE

- GOVERNMENT OF INDIA MINISTRY OF WATER RESOURCES, CENTRAL GROUND WATER BOARD, GROUND WATER INFORMATION BOOKLET, MANDI DISTRICT, HIMACHAL PRADESH.
- Survey of India.

Sr No	Name of block	Name of beat	Detail of work proposed	Name of area	Unit	Phy.	Amount	GPS		Re
								Lat.	Long	
1	Batwara	Gehru	Retaining Wall	Dharli	No.	1	250000	31.42189 6°	76.94761 6°	
2	Batwara	Gehru	Retaining Wall	Ropo Bandla	No.	1	200000	31.41604 8°	76.95015 6°	
3	Batwara	Dhawal	Culvert	Ropo Bandla	No.	1	150000	31.40903 4°	76.95874 0°	
4	Batwara	Dhawal	Culvert	Salag	No.	1	105000	31.40441 7°	76.96090 2°	
5	Trachh	Balag	Culvert	DPF Bunga	No.	1	110000	31.40020 8°	76.96657 2°	
6	Trachh	Balag	Culvert	Balag	No.	1	250000	31.39386 9°	76.96001 5°	

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1.Introduction:

The proposed road will connect Dharli, Chakauli, Ropa Bandla, Dhora, Dhar, Salag, DPF Bunga, Balag villages /habitation and it will serve approx. 3108 populations. It will connect left out area, which is deprived with road facility. The road is urgently required as people of these villages are facing great hardships to reach the nearby town Slapper. After construction of this road they will connect directly with Hospital Sunder Nagar, Medical Hospital Ner chowk, Market center Sunder Nagar and Nerchowk. All three roads maintained above are connecting different area and the left out villages are to be connected by the proposed road. The proposed road will facilitate the moment of people and it will also help to upgrade the living standard of the people of the area. Due to the proposed development, some of the existing trees are to be felled. To offset this impact, compensatory afforestation programme through tree plantation, median plantation, horticulture and landscaping strategy is proposed,

2. OBJECTIVE

The main objectives are as follows:

- Reducing the impacts of air pollution
- Natural noise barrier
- Arrest of land erosion
- Prevention of vehicle glare from vehicles coming from opposite direction
- Enhancement of aesthetic view of the corridors
- climatic amelioration
- Defining of ROW especially at sharp curves during night

Roadside vegetation is any vegetation growing along the roads. Planting trees, shrubs und grasses along the road can create a productive asset and can alleviate the negative effects of roads on the local environment. Negative effects include erosion, loss of fertile soils, gully formation that undermines road foundations, heavy dust, and more. In particular, dust lifted by vehicles, especially along unpaved roads, has a direct effect on the health of people mal livestock living near the roads and on crop production.

3.SPECIES SELECTION

Grasses, shrubs and trees are the main species that are readily available in India. Wherever possible, the use of non-native species should be avoided since they can out compete and displace native ports leading to loss of native biodiversity. To maximize the chances of success of survival of species, selection of species shall be done according to environmental conditions of the project site. Care should also be taken to select species with root systems that match the nature of the soil movement at the project site. Homogenous avenues of trees should be selected for long stretches as it provides

aesthetic qualities in the landscaping. One should also consider the economic and other social benefits while selecting the species for plantation. During the selection of species, preference should be given towards rapid growing, pollution tolerant and pest & disease resistant species. Shrub species, which are dwarf and pollution ant, are to be planted in the median to prevent the glare of traffic moving in opposite direction. Flowering, ornamentals plants and climbers can also be planted in urban areas to provide beauty. For this purpose, the species may be decided by interaction with local forest authority and local populace. Few species are recommended in the table below.

Table 1: Species Recommended

Scientific name	Common Name	Quality/Specification
Ailanthus excelsa	Maharukh/Adu Neem	Pollution Sink, Noise Barrier
Alstonia scholaris	Saptaparni	Pollution Sink, Aesthetic Value, Medicinal Value
Azadirachta indica	Neem	Noise barrier, Pollution sink, Economic & Medicinal Value
Bombax ceiba	Semal	Aesthetic Value, Economic Value
Butea monosperma	Dhak	Aesthetic value, Pollution sink
Calistemon viminalis	Bottle Brush	Aesthetic value, Pollution sink
Cassia fistula	Amaltas	Landscaping, Flowering plant, Pollution sink, Medicinal Value
Dulbergia sissoo	Sheesham	Economic Value, Pollution Sink
Ficus bengalensis	Bargad	Noise barrier, Pollution sink, Medicinal Value & Religious value
Ficus religlosa	Peepal	Noise barrier, Pollution sink, Religious values
Mellu uzeduruch	Bakain	Noise Barrier, Pollution Sink, Economic and Medicinal value
Moringa oleiferu	Sahajana	Economic Value, Medicinal value
Pongumia pinnata	Karanj	Economic Value, Medicinal value
Syzygium cumini	Jamun	Pollution sink, Economic Value

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4. Plantation Model:

Since the proposed road is new construction to motorable with paved shoulder configuration, and the area being hilly, no avenue plantation has been proposed. But still plantation according to IRC:SP:21-2009 norms on suitable area will be done.

Table 2: Area identified for landscaping & tree plantation

Sr.NO	Type of plantation	Location(Km)	Remarks
1	Shrubs	In median except structures	Ornamental type plantation shall be provided
2	Landscaping	All service areas interchanges O&M centers	Ornamental type plantation shall be provided
3	Plantations	Available open land along Row	About 1100 nos, of trees to be planted preferably indigenous species like Jamun, Neem, Habul, Peepal, Shisham etc.

RECOMMENDATIONS

Due care should be taken to ensure that a greenbelt is developed around the plant. All areas devoid of Vegetation and having low density should be systematically and scientifically afforested. Greenbelt will be a set of rows of trees planted such a way that they form an effective barrier between the plant and the surroundings. The persistence of plantation plan is to contribute to the following factors:

- To attenuate noise levels generated from the plant.
- To improve the aesthetics of the plant area:
- To trap the vehicular emissions and fugitive dust emissions;
- To maintain ecological homeostasis;
- To prevent soil erosion and to protect the natural vegetation;

- To utilize the treated effluents.

The plantation species should be considered based on the following:

- Adapted to the Geo-climatic conditions of the area;
- Mix of round, spreading, oblong and conical canopies,
- Different heights ranging from 4 m to 20 m.
- Tolerance to specific conditions or alternatively wide adaptability to Eco physiological conditions;
- Rapid growth;
- Capacity to endure water stress and climate extremes after initial establishment;
- Differences in height and growth habits;
- Pleasing appearances;
- Providing shade.

5. Cost Estimate:

Cost of Plantation for different heads including Maintenance

Heads	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year	Total Cost (Lakhs)
Cast of Saplings	52212	35266	17862	17862	17862	141064
SMC work Plantation cost	40000	40000	40000	40000	40000	200000
Survey Demarcation & Fencing Tree Guard	34991	34991	34991	34991	34991	174956
Plantation	51571	51571	51571	51571	51571	257855
Misc	13100	13100	13100	13100	13100	65500
Contingency	11257	11257	11257	11257	11257	56285
Total Cost (Lakhs)	203131	186185	168781	168781	168781	895660

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