No.: Udyog Bhu SMR-Auction-Sattiwala-Tapender Singh/- 1182
Office of the Mining Officer, Nahan
District Sirmour (H.P.)
Dated Nahan 21/9/2020

To

The Divisional Forest Officer,
Paonta Forest Division,
Paonta Sahib, District Sirmour, H.P.

Subject: Diversion of 6.2255 ha. land under the possession of forest department as being riverbed proposed for mining lease (online proposal No. FP/HP/MIN/34077/2017)-regarding.

Sir,

Please refer to the subject cited above.

In this connection, it is informed that the area measuring Khasra No. 61 falling in Mauza & Mohal Sattiwala, Tehsil Paonta Sahib, District Sirmour HP measuring 73-17-00 Bighas (6-22-55 Hect.) has been auctioned as per the provisions provided under Minor Mineral (Concession) and Minerals (Prevention of Illegal Mining, Transportation & Storage) Rules, 2015 in favour of Shri Tapender Singh Saini, S/o Shri Hardayal, Village Shubhkhera, Tehsil Paonta Sahib, District Sirmour, H.P. and above area is as per consonance of District Survey Report, therefore, it conforms to the DSR (as per EMSMG-2020 and SSMMG-2016 issued by MoEF & CC) of the District Sirmaur, Himachal Pradesh. It is also submitted that the said auctioned area is recommended part of District Survey Document.

Submitted for kind information and necessary action at your end please.

Complete 22/9/2020 RK 21/9/2020

Yours faithfully,

Mining Officer,
District Sirmour at Nahan

Endst. No. As above_____dated_____
Copy to:-

Shri Tapender Singh Saini, S/o Shri Hardayal Singh, Village Shubhkhera, Tehsil Paonta Sahib, District Sirmour, H.P. w.r.t. his application dated Nil for information please.

Mining Officer,
District Sirmour at Nahan

Divisional Forest Officer Received No. 2063 Dated 22/9/2020 Forest Division Paonta Sahib

Annexure - IX

No.: Udyog Bhu SMR-Auction-Sattiwala-Tapender Singh/-
Office of the Mining Officer, Nahan
District Sirmour (H.P.)

Dated Nahan

TO WHOM IT MAY CONCERN

This is certified that riverbed quarry comprises of Khasra No. 61 measuring 73-17-00 Bighas (6-22-55 Hect.) falling in Mauza & Mohal Sattiwala of Tehsil Paonta Sahib, District Sirmour has been auctioned as per the provisions provided under Minor Mineral (Concession) and Minerals (Prevention of Illegal Mining, Transportation & Storage) Rules, 2015 in favour of Shri Tapender Singh Saini, S/o Sh. Hardyal Singh, Village Shubhkhera, Tehsil Paonta Sahib, Distt. Sirmour, H.P. and above area is as per consonance of District Survey Report.

Further, the aforesaid area which has been auctioned in favour of Shri Tapender Singh Saini is a part of river bed Yamuna and is situated on the right bank of river Yamuna. During monsoon every year Yamuna river, transport/carry carries huge quantity of mineral which get deposited along its beds including above mentioned area due to flat nature and conducive environment for replenishment and thus adequate mineral gets deposited every year which can be exploited systematically and scientifically as per Mining Plan in consonance with Environment Clearance granted. Thus due to availability of sufficient quantity of mineral, if mining activities are allowed in the aforesaid area there will be no adverse impact on the river due to its high replenishment factor. Since above area is situated in border of Himachal Pradesh & Uttrakhand and is also prone to illegal mining, therefore if this area is permitted to mining, it will not only curtail illegal mining in the area, but will also generate revenue to State exchequer.

District Mining Officer,
District Sirmour at Nahan.

Endst. No.: Udyog Bhu SMR-Auction 1487 Dated 29-11-2022

Copy to:
Sh. Tapender Singh Saini, S/o Sh. Hardyal Singh, Vill. Shubhkhera, Tehsil Paonta Sahib, Distt. Sirmour, H.P. for information w.r.t. his application dated 29.11.2022.

District Mining Officer,
District Sirmour at Nahan.

Distt. Survey Report of District Sirmour

1 Introduction:-

Minerals are valuable natural resources being finite and non-renewable. They constitute the vital raw materials for many basic industries and are a major resource for development. The history of mineral extraction in India dates back to the days of the Harappan civilization. The wide availability of the minerals in the form of abundant rich reserves made it very conducive for the growth and development of the mining sector in India. The country is endowed with huge resources of many metallic and non-metallic minerals. Mining sector is an important segment of the Indian economy. Since independence, there has been a pronounced growth in the mineral production both in terms of quantity and value. India produces as many as 87 minerals, which includes 4 fuel, 10 metallic, 47 non-metallic, 3 atomic and 23 minor minerals (including building and other materials).

Minerals are classified into two groups, namely (i) Major minerals and (ii) Minor minerals. Amongst these two groups minor mineral have been defined under section 3(e) of Mines and Minerals (Regulation and development) Act, 1957. The minor minerals are further governed by "The Himachal Pradesh Minor Minerals (concession) and Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2015". The Minor minerals include building stones, gravel, ordinary clay, ordinary sand, limestone used for lime burning, boulders, kankar, murum, brick earth, bentonite, road metal, slate, marble, stones used for making household utensils etc. and other minerals not defined as minor minerals in the said Act are treated as major minerals. They include coal, kyanite, sillimanite, barites, chromite, fluorite, quartz, sand used for stowing purposes in coal mines and many other minerals used for industrial purposes.

Based on the amendments made by the Ministry of Environment, Forests and Climate Change, Government of India, in the Environment Impact Assessment Notification, 2006 notified on 15 January 2015, the Survey document of the district Sirmaur contains the following:-

(a) District wise detail of river or stream and other sand source.
(b) District wise availability of sand or gravel or aggregate resources.
(c) District wise detail of existing mining leases of sand and aggregates.

Further, the district survey document has been prepared in accordance with the Appendix-X of the said notification. The rivers/streams were studied based on the following parameters excluding the hill slope mining:-

1. Introduction
2. Overview of Mining Activity in the District
3 The List of Mining Leases in the District with location, area and period of validity
4. Details of Royalty or Revenue received in last three years
5. Detail of Production of Sand or Bajari or minor mineral in last three years
6. Process of Deposition of Sediments in the rivers of the District

7. General Profile of the District
8. Land Utilization Pattern in the district: Forest, Agriculture, Horticulture, Mining etc.
9. Physiography of the District
10. Rainfall: month-wise
11. Geology and Mineral Wealth

It is pertinent to mention here that in the state of Himachal Pradesh, in pursuance to point 9.2 (Strategy 2) of "River/Stream Bed Mining Policy Guidelines of the State of Himachal Pradesh, 2013" for regulation and control of mining operations, a survey document of existing River/Stream bed mining in each district is also to be undertaken on the similar guidelines. In the said policy guidelines, it was provided that District level river/stream bed mining action plan shall be based on a survey document of the existing river/stream bed mining in each district and also to assess its direct and indirect benefits and identification of the potential threats to the individual rivers/streams in the State.

The District Survey Report shall form the basis for application for environmental clearance, preparation of reports and appraisal of projects.

6.1 Objectives of the New Mineral Policy-2013

a. To explore mineral wealth of the State by adopting modern exploration techniques.
b. To exploit mineral deposit by promoting adoption of mechanized and scientific mining with due regard to the conservation of mineral mine safety and environmental aspect.
c. Value addition through promotion of processing units and mineral based industries in the State.
d. To increase the employment opportunity in the mining sector, particularly in the interior/remote areas of the state.
e. To take effective measures for checking unauthorized mining and leakage of revenue.
f. To simplify and adequately modify Himachal Pradesh Minor Mineral (Concession) Revised, Rules, 1971.
g. To adhere to the guidelines issued by the Ministry of Environment and Forest (MOEF), Government of India, for exploitation of minor minerals.

Based on the action plan as mentioned above, mining leases/ contracts shall be granted in accordance to the Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of illegal Mining, Transportation and Storage) Rules 2015.

It is also imperative to mention here that though every care has been taken meticulously while identifying the area having good potential for mining. However in case, if it comes to the notice of this deptt./authority that somewhere some area having sufficient potential of minerals has either been left or not included in Distt. Survey Report due to some or other reason inadvertently, then it will be added in the Distt. Survey Report as and soon it come to the notice at any stage or as deemed fit.

a) **Geomorphological studies**

i) Place of origin
ii) Catchment area
iii) General profile of river stream
iv) Annual deposition factor
v) Replenishment
vi) Total potential of minor mineral in the river bed

b) **Geological Studies**

i) Lithology of catchment area
ii) Tectonics and structural behavior of rocks

c) **Climatic parameters**

I) Intensity of rainfall
II) Climate zone
III) Temperature variation

1.3 In addition following are the important guiding Geo morphological features of rivers considered while recommending the river/ stream bed for collection of minor minerals:-

- A stable river is able to constantly transport the flow of sediments produced by water shed such that its dimensions (width and depth) pattern and vertical profile are maintained without aggrading (building up) or degrading (scouring down)
- The amount of boulders, cobbles, pebbles, and sand deposited in river bed equals to the amount delivered to the river from catchment area and from bank erosion minus amount transported downstream each year.
- It is compulsive nature for river to meander in their beds for and therefore they will have to be provided with adequate corridor for meandering without let or hindrance. any attempt to diminish the width of the corridor (Floodway) and curb their freedom to meander would prove counter productive
- Erosion and deposition is law of nature. The river/stream has to complete its geomorphological cycles from youth, mature to old age.
- River capturing is unavoidable.
- Fundamentally the lowest point of any stream is fixed by sea level

2. Over view of Mining Activity of District Sirmour

The three types of minor mineral constituents such as sand stone and bajri are required for any type of construction apart from other material like cement and steel. In earlier times, the houses/ buildings were constructed in form of small dwellings with walls made up of mud plaster, stone and interlocking provided with wooden frames and there were negligible commercial as well as developmental activities resulting less demand of building material. However, with the passage of time when the District was carved out during new vistas of developmental activities were started. As such the demand of minor mineral in the District started an increasing trend. The increase could be gauged from the fact that during year 2002-03 the royalty receipt on minor mineral was merely Rs. 5.15 crores which has increased to Rs. 10.72 crores (Approx.) in the year 2015-16. The quantity of minor mineral consumption is a thermometer to assess the quantity of developmental activities being undertaken in a particular area.

In order to meet the requirement of raw material for construction, the extraction of sand, stone and bajri is being carried out exclusively from the river beds. The demand of sand is mainly met through by river borne sand whereas the demand of bajri/grit is either met through river borne collection or through manufactured grit by stone crushers. The demand of dressed or undressed stone is met through the broken rock material from the hill slope. The local residents used to lift gravel etc. from the river beds to meet out their bonafide requirement, however after coming into being the Himachal Pradesh Minor Mineral Concession and Minerals (Prevention of illegal mining, transportation and Storage) Rules, 2015 as the mining was allowed in accordance to the rules. Presently in this District mineral concessions are being granted through grant of mining Lease. At present 30 nos. of mining leases for minor minerals have been granted under the ibid rules in different parts of the District and the detail is tabulated below. 28 quarries of river Yamuna has put to auction on 06-05-2016 & 07-05-2016. Process to auction other riverbed quarries is also under progress.

Table Showing list of mining leases granted

2.1 DETAIL OF GRANTED MINING LEASES FOR STONE CRUSHER AND FREE SALE OF MINERALS IN SIRMOUR DISTRICT

Sr. No.	Name & Address of Lease	Khasra No. of Lease	Area (Bighas/ Kanals/ Hects.)	Mohal/Mauza	Period
1.	Smt. Shubhlata Sharma W/O Sh. Madan Sharma, House No. 214, Ward no. 10 Devinagar, Paonta Sahib	486/332/148, 336/2	1.12	Kunja	04.02.10 to 03.02.15
2.	Sh. Anil Sharma, Prop. Village	238/168 & 242/169,	1.98	Bangran	19.02.07

	Rampur Ghat, Teh. Paonta Sahib, Distt. Sirmour.	487/332/148/1, 586/473/184/2 & 584/477/188			to 18.02.12
3.	Sh. Ashish Kumar S/o Sh. Anand KumaR, 186/10, Devinagar, Paonta Sahib, Distt. Sirmour, H.P	250/228/1	18.04	Bangran	28.09.05 to 27.09.10
4.	Sh. Inder Singh Vill. Rampur Ghat, P.O. Shivpur, Teh. Paonta Sahib, Distt. Sirmour	431/322/1, 431/322/2, 638/613/590/188/4	19.84	Mohkampur Nawada	26.09.05 to 25.09.10
5.	Smt. Malini Jung, Vill. Ganguwala, P.O. Bata Mandi, Tehsil Paonta Sahib, Distt. Sirmour, H.P	53/2	2.00	Ganguwala	24.04.15 to 23.04.20
6.	M/S Chandel Associates, 186/10, Devi Nagar, Paonta Sahib, Distt. Sirmour (H.P.)	1248/1026/912/2 & 911/679/3	9.5	Manpur Devra	21.11.09 to 20.11.24
7.	Sh. Ashok Goyal-Naveen Goyal, Prop. Goyal Crushing Company, Village Manpur Devra, Teh. Paonta Sahib, Distt. Sirmour(H.P.)	638/613/590/188/1	10.4	Mohkampur Nawada	08.02.11 to 07.02.26
8.	M/S Dev Raj Stone Crusher, Village Manpur Devra, Paonta Sahib,Distt. Sirmour	638/613/590/188/7	9.56	-do-	03.02.11 to 02.02.26
9.	Sh. Madan Sharma, House No. 214, Ward no. 10, Devinagar, Paonta Sahib	638/613/590/188/8	4.9	-do-	24.05.13 to 23.05.28
10.	Mahender Singh, Devinagar, Paonta Sahib	283/13/1	10.1	Kunja	15.10.10 to 14.10.25
11.	Smt. Meera Chandel, W/O Dr. Hakam Chand Chandel, H.No. 186/10, Devi Nagar, Paonta Sahib, Distt. Sirmour (H.P.)	51,52,66,67,68,72	4-70-10	Devi Nagar	13.12.11 to 12.12.26
12.	Sh. Gajender Pal Singh S/o Sh. Surain Singh, 519 Vijay Park extension, Dehradun (UK)	637/613/188 & 639/563/480/1	10.4	Mohkampur Nawada	02.11.10 to 01.11.25
13.	M/S Yamuna Mines and Minerals,		3.75	Gojar Addain	08.10.15 to

					07.10.30
14.	Sh. Ram Pal Malik, VPO Shambhuwala, Tehsil Nahan, Distt. Sirmour, H.P.	213/43/1	3.4	Bankala	27.10.07 to 26.10.12
15.	Sh. Sumit Bansal Village Salani Katola, P.O. Sainwala, Tehsil Nahan	141/3/2	3.84	Mohalia Katola	04.04.12 to 03.04.27
16.	M/s Shiva Stone Crusher		4.01	Churan	20.11.15 to 19.11.30
17.	Smt. Pushpa Mittal W/o Sh. Ram Kumar Mittal R/o Vill. Kalaghat, P.O. Kotla Panjola, Tehsil Pachhad	40/18/1 & 40/20/1	0.41	Ganiyar	31.10.09 to 30.10.24
18.	M/s G.B. Grit Udhyog	218/2	0.91	Tikkari Kathar	10.09.15 to 09.09.30
19.	-do-	213/2	0.98	-do-	11.09.15 to 10.09.30
20.	Prem Pal	57	2.1	Mehat	27.06.09 to 26.06.14
21.	Brijender Singh	240/60, 242/60, 247/60, 248/60, 249/60, 252/60	1.1	Behral	27.08.10 to 26.08.15
22.	Savita Bhandari	6/1	2.3	Danda	28.09.10 to 27.09.15
23.	Ramesh Chand Arora	431/322/2	4.9	Mohkampur Nawada	15.10.10 to 14.10.15
24.	Vishal Aggarwal	638/613/590/188/4	4.9	-do-	20.10.10 to 19.10.15
25.	Inder Singh	638/613/590/188/5	4.95	-do-	03.11.10 to 02.11.15
26.	Sanjay Kishore	638/613/590/188/6	4.9	-do-	03.11.10 to 02.11.15
27.	Shubh Lata Sharma (Kunja)	336/2	2.2	Kunja	03.04.07 to 02.04.12
28.	Ranbir Singh	1249/1026/912/1	1.9	Manpur Devra	07.09.11 to 06.09.16
29.	Smt. Shakuntla Chandel	487/332/148/1	2.1	Rampur Ghat	31.05.07 to 30.05.12

30.	Kamal Kumar Gupta	901/674/1, 900/674	2.1	Manpur Devra	31.03.12 to 30.03.17

2.2 Detail of Royalty Received in district Sirmour

In Sirmour District royalty received from major and minor minerals since 2002-03 onwards is given ***in the following table.***

Sr No.	Year	Revenue Receipt (in Rs. Lacs)
1	2002-03	515.67
2	2003-04	535.01
3	2004-05	549.86
4	2005-06	587.13
5	2006-07	632.76
6	2007-08	815.01
7	2008-09	684.00
8	2009-10	858.95
9	2010-11	860.00 (Approx.)
10	2011-12	8.71 (In Crore)
11	2012-13	11.02
12	2013-14	7.62
13	2014-15	8.58
14	2015-16	10.72

Table : Revenue Receipt in District Sirmour.

2.3 Detail of Production of Minor Mineral

The production of minor mineral in district Sirmour since 2002-03 onwards, is tabulated in the following table.

Sr No.	Year	Production of Minor Mineral (in Tons)
1	2002-03	2,76,460
2	2003-04	1,77,673
3	2004-05	1,86,600
4	2005-06	3,32,090
5	2006-07	4,26,213

6	2007-08	4,59,199
7	2008-09	5,31,479
8	2009-10	6,08,679
9	2010-11	4,32,597
10	2011-12	3,44,330
11	2012-13	3,84,02,943
12	2013-14	2,23,71,870
13	2014-15	1,73,53,399
14	2015-16	2,24,26,480

3. Process of Deposition of Sediments in the River Bed

Deposition is the opposite of erosion. Deposition is where a river lays down or drops the sediments or material that it is carrying. Rivers carries lots of different sediments, including rocks, boulders, silt, mud, pebbles and stones. Normally, a river has the power to carry sediments. If the force of a river drops, the river cannot carry sediment. This is when the river deposits its sediment.

Constituents of minor mineral

The work done by a river consists of the following

1) Erosion
2) Transport of the material produced by erosion
3) Accumulation (deposition) of the transported material

The erosion and transport of material go hand in hand with the deposition of the latter. There is not a single river that doesn't carry fragmental material and deposit it. Even at the early stages, in the development of a river, when the erosion and transport definitely prevails over accumulation, the material carried by the river is deposited in some of the sections. During youthful stage of the river, these deposits are unstable and when the volume of water and stream velocity increases (during flood), they may start moving again downstream. The load carried by a stream includes the rock waste supplied to it by rain wash, surface creep, slumping etc. by tributaries , external agents such as glaciers, wind, together with, acquired by its own erosion work. The term load doesn't specifically mean the maximum amount of debris, that a sream could carry in a given set of

conditions, that amount is referred to as the transporting power or capacity of a river. The term load is technically defined as the total weight of solid detritus transported in unit time. The transporting capacity of a stream rises very rapidly as the discharge and the velocity increases. Experiments show that with debris of mixed shapes and sizes, the maximum load that can be carried is proportional to something between the third and fourth power of the velocity. But the fragments of a given shape, the largest size that can be moved (not the actual mass of mixed debris) is proportional to the sixth power of the velocity, provided of course that the depth of water is also adequate for the purpose. As the velocity of a river is checked, the bed load s first to come to rest with continued slackening of the flow, the larger ingredients of the suspended load are dropped, followed succevily by finer and finer particles. When the stream begins to flow more vigoursly, the finer materials are the first to move again. A river begins to sort out its load or burden as soon as it receives it. The proportion of fine to coarse amongst the deposited materials tend on average to increase downstream, but there may be interruptions of this tendency because of addition of coarse debris from tributataries or from landslides and steepening of the banks.

Both discharge and load depend on the climate and geology(litholgy, structure and relief) of the river basin concerned and both co-operate in carving out the channels down.

Size	**Rounded, Subrounded, Subangular**		
	Fragment		**Aggregate**
256 mm--	Boulder	"Roundstone"	Boulder gravel Boulder conglomerate
	Cobble		Cobble gravel Cobble conglomerate
64 mm---	Pebble		Pebble gravel Pebble conglomerate
4 mm---	Granule		Granule gravel

2 mm--	Sand	Sand sandstone
1/16 mm--	Silt	Silt Siltstone
1/256 mm----	clay	Clay Shale

General Geo-morphological Characteristics of Rivers/Streams

Transport of Sediment by Streams and Rivers

The material transported by a stream can travel as:

1. **Bed load**
2. **Suspended load**
3. **Dissolved load** (salts, chemicals

Stream capacity

- Maximum **quantity** of solid material that a stream can carry
- Related to velocity (discharge)
- Higher after a rain (more sediment in water

Stream competence (or competency)

- Measure of the maximum **size** of particles the stream can transport
- Predict erosive capabilities

Types of rivers or streams

1. **Meandering**

These streams are very sinuous, and tend to migrate back and forth across the floodplain (or meander), over time. The word "meander" comes from the name of a sinuous river in Turkey, named the Menderes.

2. **Braided**

These streams have lots of lenticular-shaped in-channel bars. The stream channel bifurcates around these bars, and follows a pattern resembling braided hair.

Fluvial Geomorphology

Erosion is the set of all processes by which soil and rock are loosened and moved downhill or downslope. The most important process of erosion is due to running water. Erosion by running water acts in two basic forms: *overland flow* and *channel flow.*

Splash Erosion

Most running water starts off as rain. Rain drops have diameters of between 0.5 to 7 mm and hit the ground at between 1 - 9 m/sec. The force of the impact loosens material and throws it into the air. This is called **splash erosion.** In violent thunderstorms over 200 tonnes/hectare can be disturbed. On a sloping surface, soil is shifted downhill as grains are moved slightly greater distances downhill than uphill. More importantly, however, it leads to a decrease in the permeability of the surface due to openings being sealed by particles. There is therefore less infiltration and an increase in overland flow

Overland Flow

Runoff starts as a broad sheet. The sheet exerts a drag force over the ground surface and some weathered products may be removed. This is sheet erosion. Generally, after traveling a short distance, small channels or rills are formed, which coalesce into gullies, concentrating the erosive action.

The amount of erosion of a slope depends on the

- Length and steepness of the slope
- Rainfall intensity
- Permeability and structure of the surface
- Amount of vegetation cover.

Channel Flow

Stream erosion is "the progressive removal of mineral matter from the surfaces of a stream channel which itself may consist of bedrock or regolith" (Strahler). Erosion will only occur when the stream has an excess of energy. In mountainous streams, the rough channel walls may amount to 96% of the potential energy of the stream. Some energy is also spent in

transporting load previously acquired. Erosion will result if the energy available > cohesion of particles.

The quantity of water passing through the channel is termed the **discharge** (m^2/sec) and is eqaul to the channel cross-sectional area (m^2) times the average stream velocity (m/sec).

The amount of sediment carried by the stream is called the stream **load** (kg/m^3)

Sub-processes of Erosion

a. Hydraulic Action

- The force of the running water alone. This is very important in weak alluvial deposits, especially in times of flood, when fast flowing; turbulent water undermines the channel banks.

b. Abrasion,

- the scouring caused by the impact of rock particles that are being transported. Abrasion features include plunge pools, potholes and chutes. Abrasion is proportional to velocity2, so a three-fold increase in velocity leads to nine times as much abrasion. The mutual erosion of two particles is known as attrition

c. Solution (Corrosion)

- chemical reactions between ions in solution and exposed minerals. It is particularly important in limestone areas or on beds of rock salt and gypsum, but all common minerals are soluble to some extent.

Stream Velocity

Stream velocity can be estimated from Manning's equation

$$V = \frac{1}{n}\left(\frac{A}{P}\right)^{\frac{2}{3}} S^{\frac{1}{2}}$$

Where A = cross-sectional area, P = wetted perimeter, S = slope and n = roughness coefficient. The value of n will vary from around 0.02 for a smooth channel to 0.03 for rough gravel. Other factors such as surface irregularities, changes in cross-section, obstructions, vegetation and degree of meandering will also affect the roughness coefficient. In general, as you go downstream, the slope decreases (lowers velocity) and n decreases (raises velocity).

At any point along the stream's course, an increase in the depth of the stream's channel (e.g. during floods) will lead to an increase in A/P, with a consequent increase in velocity.

Erosion Velocities

The easiest grains to erode are in the fine to medium sand size range (see figure 1). Particles greater than this size have a proportionally greater volume to surface area ratio, so are harder to erode. For clays, ionic bonding leads to increased cohesion between clay particles, making them harder to erode. Clays are also platy minerals and form smooth surfaces. Laminar flow over the smooth surface decreases the ability of the stream to erode the particles. Clays also infill between larger grains and so are protected by the larger grains. Sands, therefore, may be moved during "normal" river flow, but it is only when floods increase the stream's velocity that the larger and smaller particles can be moved. Once the particles are being transported, there is an orderly deposition of particles with the largest being deposited first and clays being held almost indefinitely. Hence the sediment becomes sorted downstream.

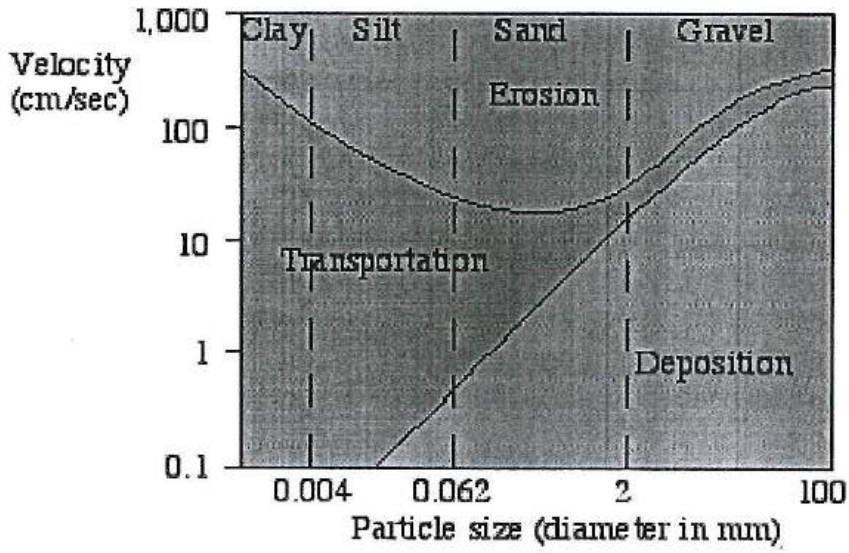


Figure 1. Diagram showing the stream velocity required to erode, transport and deposit particles of various sizes.

Transportation

The particles carried by streams is known as the **stream load**. Particles may be carried by

- **floatation**. Of very minor significance.
- **solution**. Ions of dissolved minerals that may travel downstream indefinitely. The most common are Na, Ca, K, Mg, Cl, SO_4 and HCO_3. One estimate of U.S. rivers

was that they carry 300 million tonnes of dissolved load each year, and 250 million tonnes of solid load.

- **suspension**. The temporary support of particles when turbulence is greater than the settling velocity of the particle. Clay and silt are normally transported in suspension, but sand may be carried this way in floods.
- **saltation**. Intermittent "jumping" of grains that are lifted by turbulence, but are too heavy to remain in suspension.
- **traction**. The sliding or rolling of particles along the stream floor. Particles moved in this way comprise the bed load. Bed load normally constitutes around 10% of the solid load, but may be up to 50% during floods, when the major work of the stream is done.

Transportation is aided by the buoyancy of water, eg. quartz grains are Å 2000 times the density of air, but only two and a half times that of water. Unequal velocities at the top and bottom of boulders also assists transportation, as does steep gradients.

The total load of particles of all sizes that a stream can carry is known as its **capacity**. It is proportional to discharge, which is proportional to velocity. A faster flowing stream therefore has a higher capacity. If a stream's capacity is less than its load, the stream cannot carry its load, so deposition occurs. If capacity exceeds load, the stream has excess energy (gravitational, potential energy), so it can erode more sediments. Streams switch back and forth from depositional to erosional agents, depending on load vs. capacity. A stream can erode along one stretch and deposit along another, since gradient and channel shape/size vary along the stream's course. Streams can erode during periods of higher velocity or discharge (floods) and deposit during periods of lower velocity or discharge. Anything that alters the sediment load delivered to the channel or that alters the stream's capacity to carry that load will cause the stream's gradient or channel geometry to change in response

The largest particle that a stream can transport is known as its **competence**. Assuming that there is sufficient depth to cover the particles, then competence is proportional to the square of velocity.

Deposition

Deposition will occur when a loss of energy results in a decrease in velocity. This may be due to such things as declining gradient, a decrease in water volume, an increase in cross-sectional area (particularly pools, lakes, and oceans), or by local obstructions. An excessive load produced by increased erosion in the drainage basin or tributary valleys, or from glaciofluvial outwash will also inevitably lead to deposition. The accumulations of stream deposits are called **alluvium**

Note: There is a constant interaction between erosion, transportation and deposition. During a flood, the bed of a stream at a particular point may be eroded, but as the flood subsides the bed is filled again. Similarly, in different parts of the stream, velocity differs and hence one part of the stream may be eroding its bank, while on the opposite bank deposition is taking place.

Downstream Adjustments

Overall, despite some variations, effluent streams (those that receive water from the water table) generally show the following changes downstream:

- discharge increases (due to more tributaries and a greater drainage area)
- total load increases (due to more tributaries and a greater drainage area)
- channel size increases (to cope with the increased discharge and load)
- particle size decreases (due to increased abrasion/attrition and changes in velocity)
- the smoothness of the channel increases (due to decreased particle size)
- gradient decreases

Stream velocity downstream is increased by the smoother channels, but decreased by lower gradients. Under normal conditions, velocity is proportional to discharge$^{0.1}$, so there is a slight overall increase in the average velocity of the stream - despite the appearance of faster flowing mountain streams at the headwaters. In such streams, the amount of turbulence and associated eddies and backward flowing portions of the streams means that the average velocity is lower than the smoother flowing waters downstream. During floods, however, when the major work of the stream is done, velocity is proportional to discharge^{0} (i.e. it is constant), so the increased velocity associated with floods allows the erosion and transportation of a large range of particle sizes throughout the drainage system.

It can be seen from these relationships that peak discharge conditions that occur during floods are very important in determining the form of rivers and the features associated with them, and not the "normal" river level.

These changes take place in an orderly manner and lead to a longitudinal profile that is smooth and concave. This is known as a **graded profile** (see Figure 2 and *Chernicoff & Whitney, fig, 14-7, pg 438*).

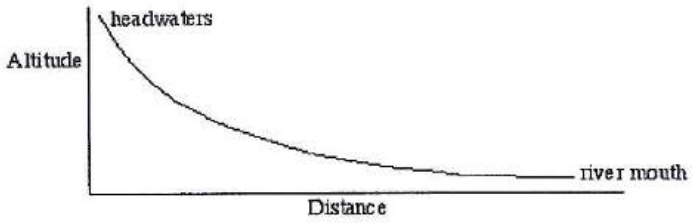


Figure 2. Long profile of a graded stream, showing a regular change in gradient.

For a stream with an irregular profile, erosion will be more pronounced at places of higher than normal gradient, such as at falls and rapids, and sedimentation will occur in areas of low gradient, such as lakes. The "bumps" are therefore ironed out until the graded profile is achieved.

Over geological time, providing that tectonic forces do not change the base level, any stream, irrespective of length, discharge, and bedrock, will achieve such a state of "**dynamic equilibrium**".

It is a "dynamic" system, as there is constant re-adjustment of the channel in response to local variations in the volume, velocity and load, that leads to a local balance between the sediment being transported and the energy available. That is, short term changes of scour and fill may occur, but in the long term the gradient and velocity are such that the available load can be transported without erosion or deposition dominating in any particular place. Over geological time, erosion dominates and the whole profile is lowered until a **peneplain** is developed close to **base level**. The base level is the lowest level that a stream can erode its channel. A **temporary base level** results from obstructions such as resistant outcrops, lakes, dams etc. that lead to temporary sub-profiles

An increase in base level will lead to **aggradations**, the built up of sediment on valley floors and the development of thick deposits of alluvium.

A decrease in base level will lead to such things as nick points that migrate upstream, alluvial terraces, valley in valley topography and entrenched meanders.

The rise in sea level from 18,000 to 10,000 years ago means that most present river systems don't demonstrate ultimate base level control by modern sea level. Estuaries (in streams with minor solid loads) and deltas (large loads) demonstrate adaptations to the changed conditions.

4. GENERAL PROFILE OF SIRMOUR DISTRICT

4.1 General

Sirmour is located in the southern part of the Himachal Pradesh and is situated between 30°22'30" to 31°01'20" north latitude and 77°01'12" to 77°49'40" east longitude The district has a total area of 2,825 sq. km. which cover 5.07 per cent area of the state. The population density in the District is 162 persons per square Kms. The District has the 70.40% of literacy rate.

The district is bounded by Shimla district in the north, Solan district in north-west, state of Haryana in the south and west Whila the state of Uttrakhand make its eastern boundary.

Salient Features of the district

Geographical Area		- 2825.0 Sq. Km
Total Population		- 4,58,593 (2001 census)
Number of Sub-Divisions		- 5
1	Nahan	
2	Paonta Sahib	
3	Rajgarh	
4	Sangrah	

5 Shillai

Number of Tehsils - 6

1 Nahan
2 Paonta Sahib
3 Pachhad
4 Shillai
5 Sangrah
6 Rajgarh

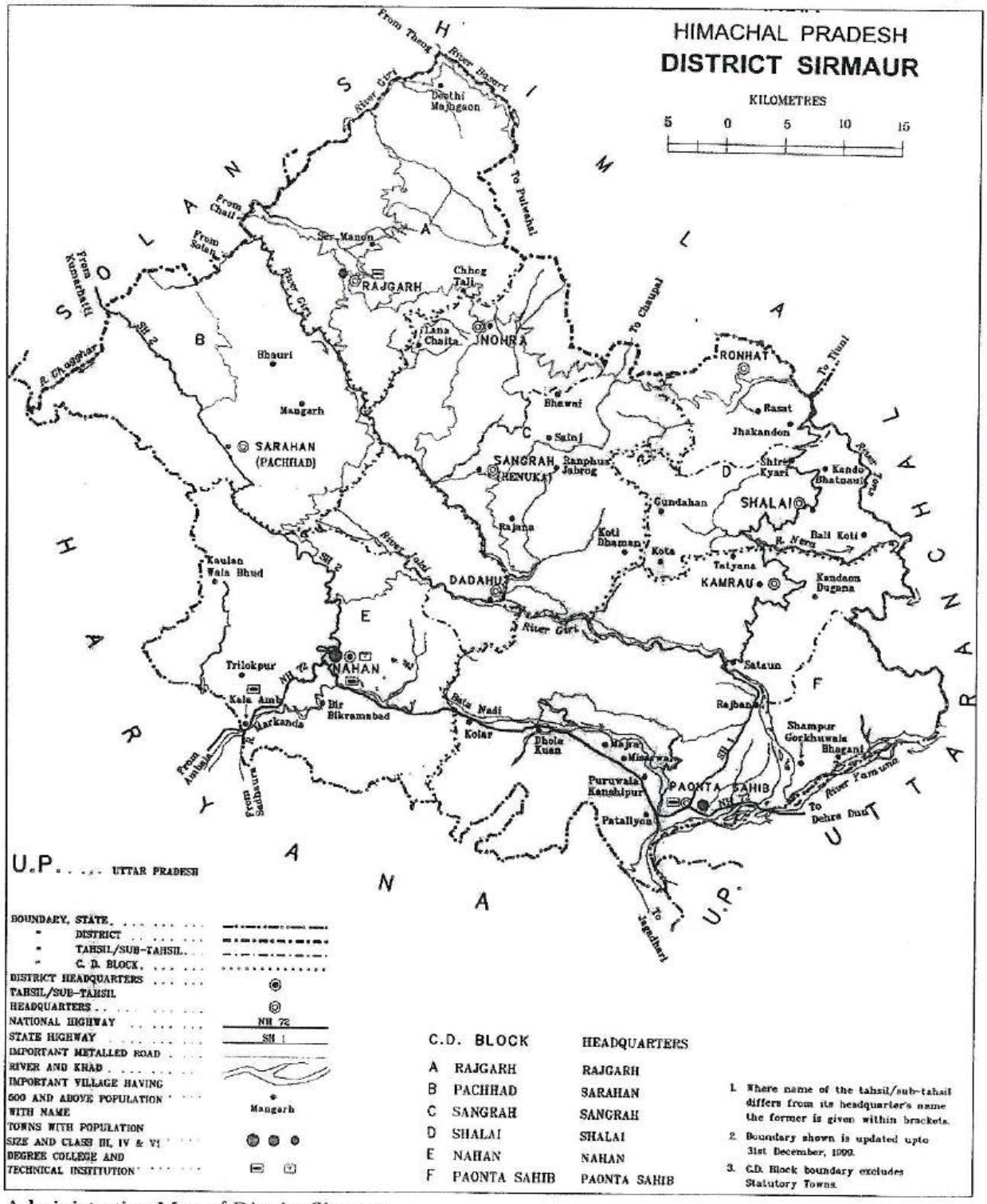
Number of Sub-Tehsils - 4

3. Dadahu
4. Nohra
5. Kamrau
6. Ronhat

Number of C.D. Block - 6

1. Nahan
2. Paonta Sahib
3. Pachhad
4. Shillai
5. Sangrah
6. Rajgarh

Number of Gram Panchayat - 228
Number of villages - 966
Total Population - 4,58,593 (2001 census)
Density per Sq Km - 162

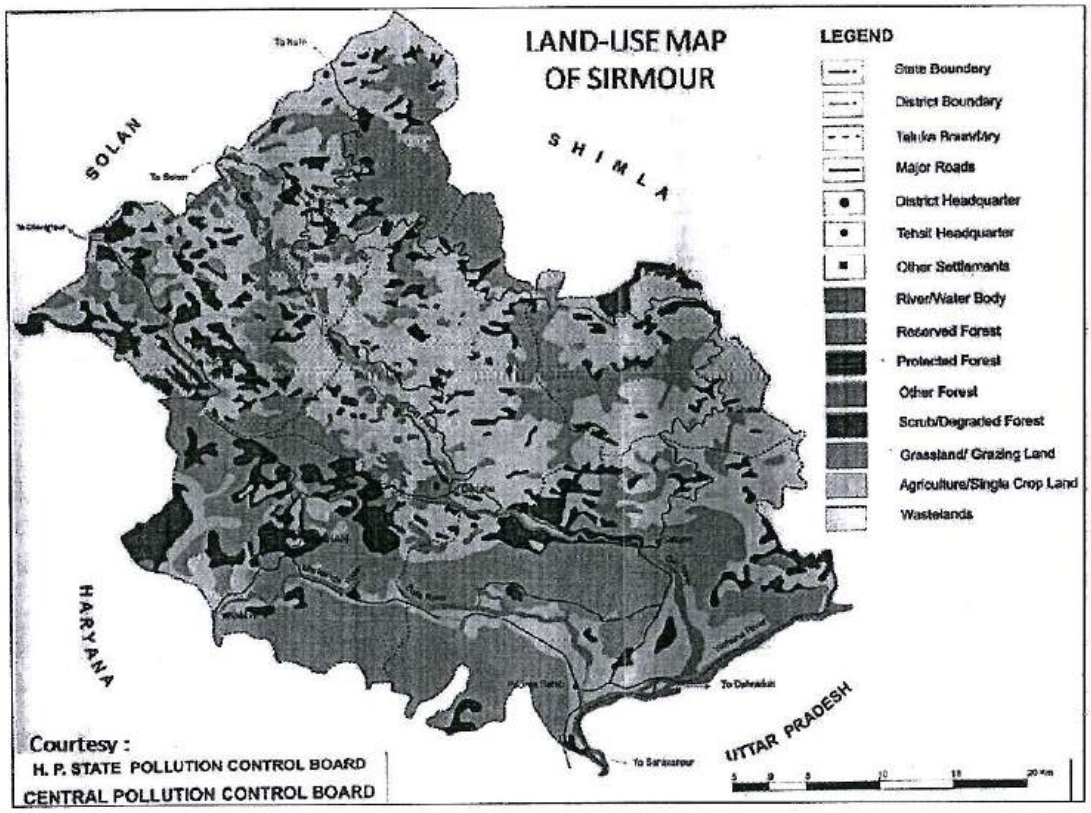


Administrative Map of District Sirmour

4.2 Land Utilization Pattern

The general land utilizationpattern of the District is as given below

Land Utilization Pattern of the District (in hects)	
Area Under Forest	48704
Irrigated Area	14,964
Unirrigated Area	32,073
Culturable waste (including gauchar and groves)	72,568
Area not available for cultivation	54,719



Map Showing Land Utilization in district Sirmour

4.3 Forest

The forests play a vital role in shaping the climatic condtions of the area. The forests provide valuable timber, medicinal herbs, raw material for large and small scale industries and also provide employment and play a vital role in conserving the soil and ensure timely and sufficient rain. The lowest point on the of the southern boundary of the

district is 427 metres above sea level and the highest range of Chur Dhar which is at an altitude of 3658 metresin the north. The forest grown between these two extremes vary as the elevation itself.

In Sirmour district the forest range between scrub, sal and bamboo forest of the low hill to the fur and alpine forest to the higher elevations. The following are the main forest type in the district:-

- Deodar
- Chir pine
- Oak
- Fur
- Spruce
- Kail
- Pine
- Bamboo

4.4 Fauna

Due to wide variation in the altitude a large variety of fauna is available in the forests of the district. The species of animals and birds commonly found in the District are;-

- Leopard
- Musk Deer
- Black Beer
- Ghoral (Himalayan Goat)
- Barking Deer (Kakar)
- Langoors
- Red Jungle Fowl
- Black Partridge
- Grey Partridge
- Hare
- Jackal
- Monkey
- Sambar
- Chakor
- Woodpecker
- Birds
- Crow

4.5 Agriculture

Agriculture is the main stay of the economy of the district. About 82 percent of the population is mainly dependent on the agriculture. Generally the soil in the district varies from light sany to heavy clay and in Paonta Sahib valley it ranges from sandy to sandy loam. The terrain throughout the district except Paonta Tehsil, is hilly and posses diverse climatic condtions. The holdings are very small and scattered. The yield of various crops is below the norm. Major food crops are grouped in three categories, namely cereals, pulses and other food crops like chillies, ginger, sugarcane and turmeric. Non-food crops of two kind i.e. oil seeds and othr non-food crops such as cotton, tobacco and fodder crops. The following are the main crops in the District;-

- Wheat
- Maize
- Paddy
- Oil seed
- Pulses
- Potato
- Sugercane
- Ginger
- Vegitables (Peas, Tomato, Capsicum, Cabbage, Culiflower)
- Spices (Peper and Coriander)

4.6 Horticulture

The topography and agro-climatic conditions of the district are quite suitable for the production of various fruits. The topography of the district can be grouped into three categories namely high hill area, located at an higher elevation, mid hill area and low lying valley area. Fruits of different varieties, depending upon the terrain, climatic conditions and soil are grown in the district. Following are important fruits grown in the District:-

- Apple
- Plum
- Mandarins
- Peach
- Apricot
- Pear
- Dry Fruits (Almond and walnut)
- Citrus fruits (sweet orange, lemon, Kinnow and Kagzi lime etc)
- Sub tropical fruits like Mango, Guava, Lichi, Papaya etc.

4.7 Animal Husbandry

Animal Husbandary plays a ley role in boosting the economic conditions of the people besides providing milk, meat and manure. Following are important livestock in the District

- **Cow**
- Buffalo
- Sheep
- Goat
- Ponies
- Pig
- Poultry

4.8 Fisheries

The district is bestowed with some perennial river/streams spread over in 284 kms of length which includes big river like the Yamuna, the Giri and small streams like Bata, Jalal, Nera, Markanda and Roon. Tor Putitora (Mahaseer), Schizothorax Plagiostomus (Gungli), Bata, Gid, Labeo-doro, and goonch etc. are the important varieties of fishes found in these rvers and streams.

5. PHYSIOGRAPHY

Located on the southern most portion of the Himachal Pradesh, Sirmour district borders with Haryana State in the south and in the east with the Uttrakhand. The district lies between 30°22'30" to 31°01'20" north latitude and77°01'12" to 77°49'40" east longitude. The district is bounded by Shimla district in the North, the river Tons and Yamuna in the East, Ambala District of Haryana in the South-West and Solan district in the North-West.

The area in general is the part of the lesser Himalaya and predominantly mountainous (except Dun Valley called as Kiar-da-dun in Tehsil Paonta Sahib) with deep valleys lying between ranges of varying elevation from 400m. towards South East to 3640m. toward North.

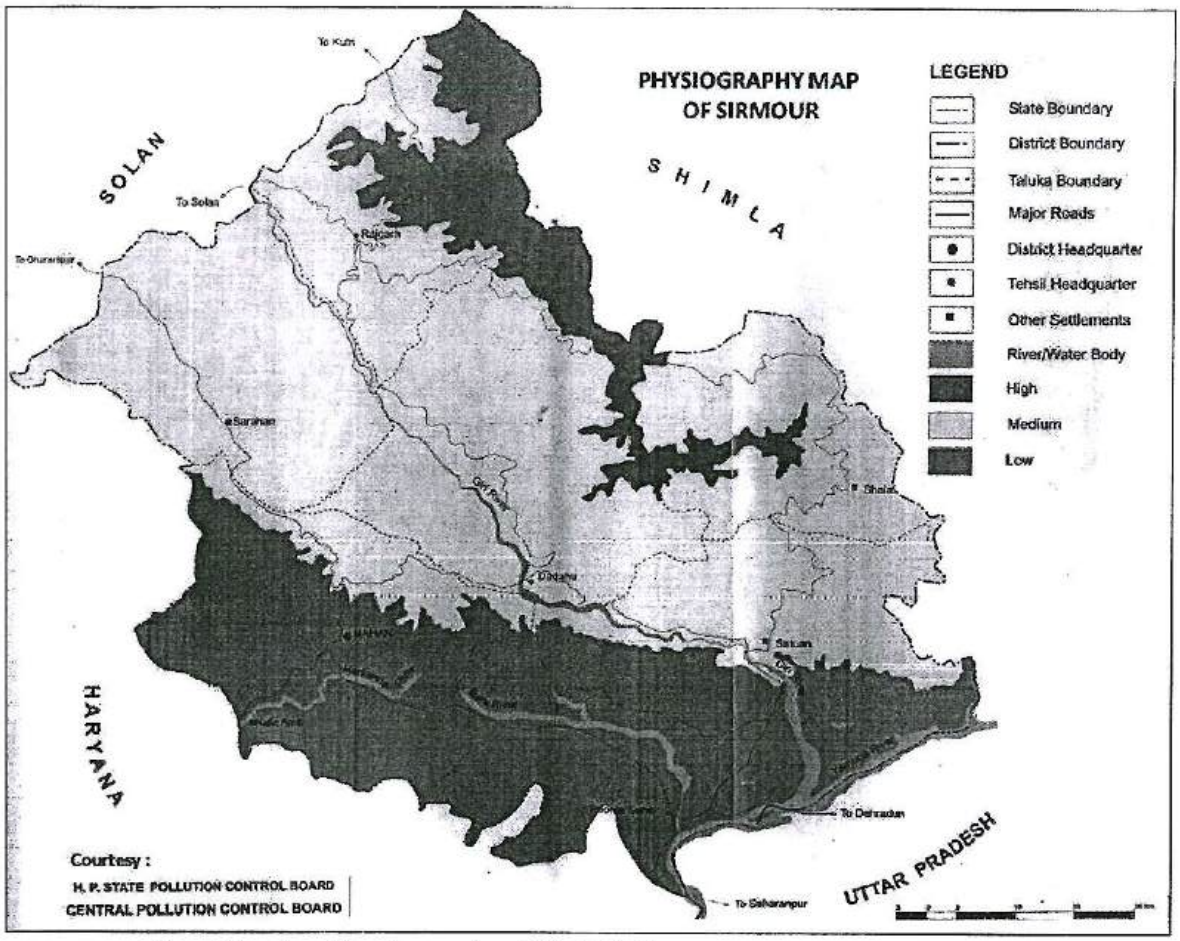
Broadly speaking the district is hexagonal in shape with longest length from west to east being 77 km. and maximum width from north to south being 80 km. Geographically the district can be divided into three parts.

1. The Trans –Giri (Giri Par Region) (46% of the total area)
2. The Cis –Giri (Giri War Region)
3. Plains of Kiar-da-dun or Dun Valley

The Trans –Giri (Giri Par Region)consist of high mountains culminating into Chur Peak with altitude of 3647 mtrs. From this lofty mountains, run two ranges, one in

north west and other south west direction toward Haripurdhar. The second range agains deivdes into two, one which run almost east of the river Tons and the other range run south east under the name of Dhar Nigali and then turns east under the name Dhar Kamru. The Dhar Shillai run parallel to this in northern side and these two form the valley of Naira nallah which ultimately fall in the tons river.

The Cis –Giri (Giri War Region) is intersected by three main ranges which run from north-west to south-east. Of them, first is the Sain Dhar which runs parallel to the river Giri and second is the Dharthi Dhar. Between these to Dhar flows river Jalal. The third is quite a low range, which runs from around Kala Amb (to the south of Nahan) and forms an open valley with Dharthi Dhar. In the western half of this range flows the markanda river. Between the eastern extreme of the Dharthi range lies open wide valleyknown as Kiar-da-dun or Dun Valley, which borders the Yamuna and Giri river in the east and form the boundary of the district with the Uttrakhand. It also touches western portion of Tehsil Nahan. This flat valley is irrigated by the Bata riverwhich flows from east to west originating from Dharthi ranges.



Map Showing Physiography of district Sirmour

6. Rainfall

The rainy season usually begins from the third week of June and lasts till the middle of September. A shower or two are received in April and may also. The April and May rains may also bring hail stroms. During monsoon season rains are more active during July and August. These months accounts for 80% of the rain fall during the season. The average annual rainfall of the district is 1670 mm.

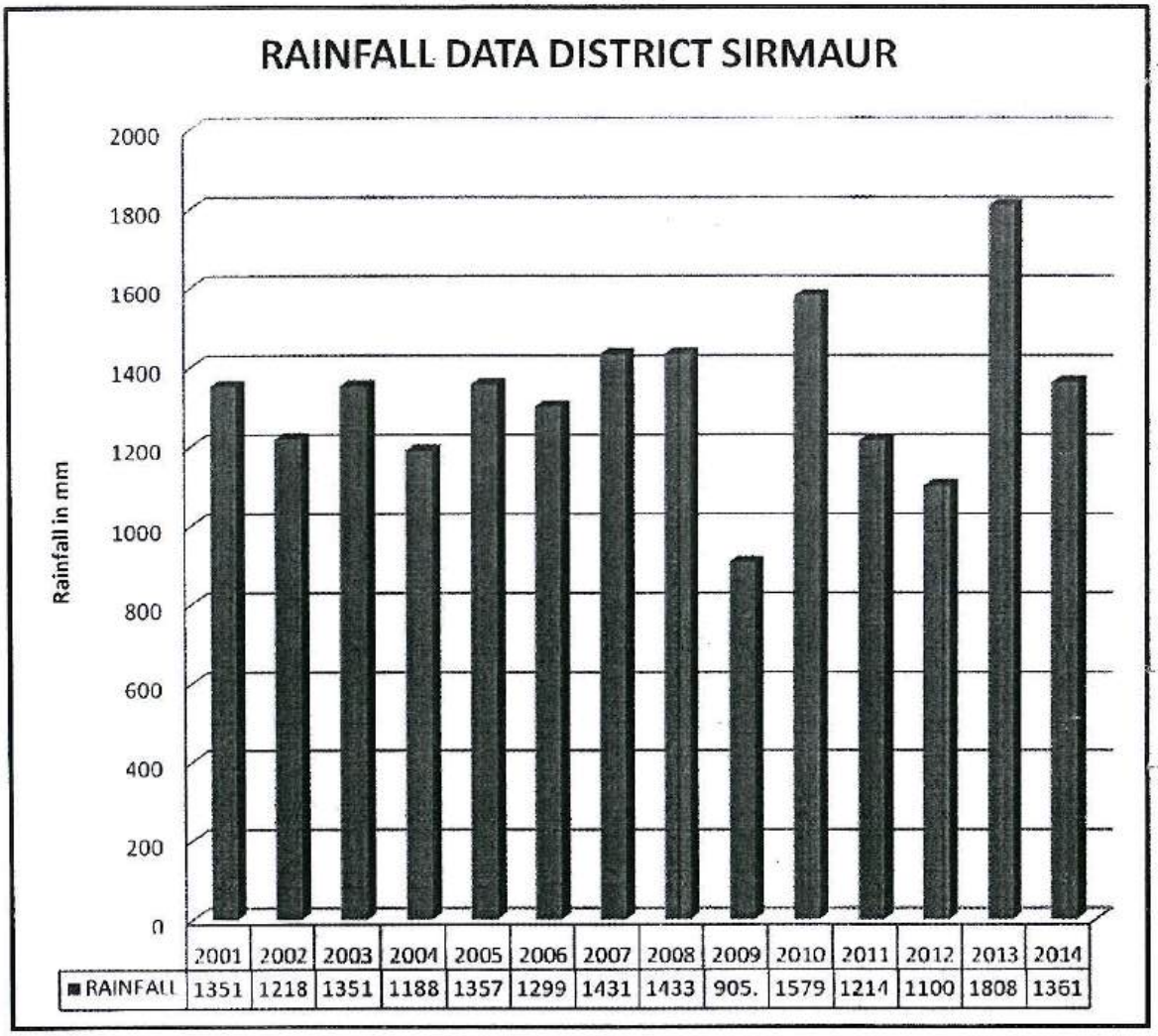


Figure 1: Rainfall (in mm) in district Sirmour during 2001-2014

7. Geology

District Sirmour forms part of the Shiwalik and Lesser Himalaya ranges and it exhibit a rugged mountainous terrain with moderate relief. The rocks found in the area comprise sandstone, shale, limestone and schist deposited during past 600 million years.

Various litho-units ranging from Proterozoic to recent era are found to occur in Sirmour district. Among all, typical Mesozoic era formations cover most of the parts and Quaternary formations occupy southern part of the district.

Granite Gneisses of Jatogh Formation belonging to lower Proterozoic is located in the northern part of the district while Deoban Formation of upper Proterozoic is confind to the eastern part in limited extent. Jaunsar and Simla Group of lower Proterozoic to upper Proterozoic period cover middle portion of the district which encircles Tal, Krol and Infra-Krol formation of Triassic period respectively. Among which the Krol Formation of Triassic period is known for its limestone deposits. Subathu and Dharamshala Formation of Oligocene cover a major portion of the southern area.

Main boundary foult of the Himalayas, extending from Indus to Brahmputra, runs through the south central portion of the district. The major tectonic break here is called Nahan thrust, and along this foult plane the older rocks rest on the younger Shiwalik rocks. A marked plane of structural discordance exists as a district linear feature between the Nahans (Lower Shiwalik) to south and the older Tertiary (Subathu-Dagshai group of rocks) to its north.

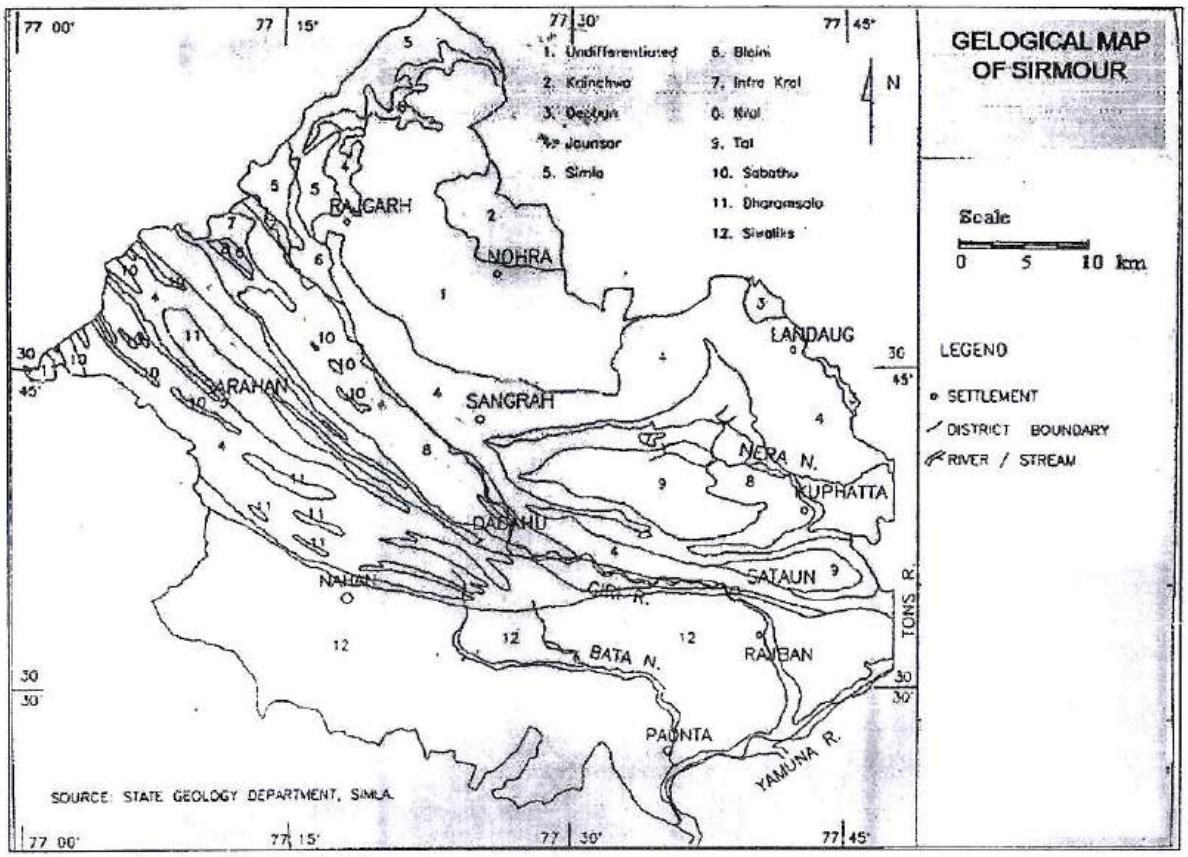
The Pre-tertiary limestone deposits(Sataun Formation), Where exposed, occurs as discontinued lensoid outcrop along the northern fringes of the Nahan thrust and sandwiched in between the Nahan and the Subathu. Generally, all the Formations trend in WNW-ESE direction with moderate to high northerly dip.

Generalised stratigraphic Successions of the district is given in the following table.

Age	**Formation**		**Lithology**
Middle Miocene to Pleistocene	Shiwalik	Upper Shiwalik	Predominantly conglomerate with minor sandstone and earthy buff and brown clay stone.
		Middle Shiwalik	Predominantly sandstone, medium to coarse grained , soft pebbly with subordinate variegated clay stone. And minor lenticular conglomerate band toward top.
		Lower Shiwalik	Alteration of fine to medium grained, occasionally pebbly and reddish brown nodular claystone and silt stone.
Lower Upper Eocene to Middle Miocene	Dharamshala	Upper Dharamshala	Greenish grey fine grained sand stone, subordinate green and mauve clay and clay stone.
		Middle Dharamshala	Purple shale, lenticular limestone subordinate argillaceous sandstone.
Paleocene to Lower upper Eocene	Subathu		Nummulitic shale, lenticular limestone and subordinate

		argillaceous sandstone.
Cretaceous and Jurrasic	Tals	Thick quartzites, greywacks chert band shales etc.
Permo-Carboniferous	Krol series	Limestone and shales
	Infra Krol	Bleached shales, grey to dark grey slaty shales
Upper Carboniferous	Blaini	Boulder-beds, slaty shales and cream coloured limestone
Lower Paleozoic	Shimla Series	Slate and micaceous sandstone
Purana	Jaunsar Series	Slate and quartzites
Archean	Jatogh Series	Quartzites , carbpnaceous slates and limestone, garnetiferous mica schists, and quartzites
	Granites	Porphyritic granitic etc.

Table showing Generalised Stratigraphic Successions of Sirmour District



Geological Map Of District Sirmour

7.1 Mineral wealth of Sirmour district :

Limestone

The chemical, cement and dolomitic grade of limestone deposits in different parts of this district. The limestone bearing horizon in Sirmour can be classified in 18 sectors as Naura Area, Sangrah area, Bhootmari area, Pamta area, Baldawa area , Bagan Dhar area , Malani Shilla areaMilla area, Tatiyan area , Kamroo area, Chowki Marigwal – Korga area , Banor Bharli area, Bohar Khatwar area, Poka- Bhadrog area, Manal area , Koti Dhaman area, Biala area, Dolomitic magnesia limestone horizon of the Parara area.

The total limestone reserve of Sirmour district are (as per Geological Survey of India) is about 1200 million tones. The detail of some of the limestone deposit is given below in the following table.

Table showing Reserve and chemical analysis of some of the limestone of District Sirmour

Limestone deposit	Reserve	Chemical Analysis
Naura Sub- Tehsil Datwari (30^0 46' 45" : 77^0 28'00") Chunvi (30^0 46'30" : 77^0 24'10")	Potential 101.36 million tonnes, Inferred 21.44 million tonnes	CaO 53.93 %, MgO 0.61 %
Naura Sub- Tehsil Hathna(30^0 48' 00" : 77^0 25'15") Olana (37^0 48'00" : 77^0 26'00")	Probable 29.87 million tonnes	CaO 53.90 %, MgO 0.66 %, Al_2O_3 0.22% and Fe_2O_3 0.19%
Naura Sub- Tehsil Dida-(30^0 46' 45" : 77^0 25'20") Bhanra (30^0 46'15" : 77^0 26'00") Shangoli (30^0 46' 40" : 77^0 26'45")	Reserve upto 100 metres = 34.56 million tonnes	CaO 53.22 %, MgO 14.1 %,
Naura Sub- Tehsil Naura -(30^0 47' 10" : 77^0 24'10") Hindga (30^0 48'40" : 77^0 23'30")	Reserve upto 60 metres = 6.26 million tonnes	CaO 53.95 %, MgO 0.88 %,
Naura Sub- Tehsil Bulain Dhar -(30^0 47' 10" : 77^0 24'10")	Reserve upto 60 metres = 1.94 million tonnes	CaO 53.60 %, MgO 0.95 %,
Bhatrog (30^0 32' 45" : 77^0	48.84 million tonnes	CaO 50 %, MgO 1 %,

38'53") Baila (30^0 34' 42" : 77^0 28'19") Section		
Sataun-Kamroo- Banor – Bharli –Pamta- Shilla – Sangrah sector	Reserve upto 30 metres = 446 million tonnes	CaO 55 %,

The limestone bearing belts of the Sirmour District are shown in the following figure.

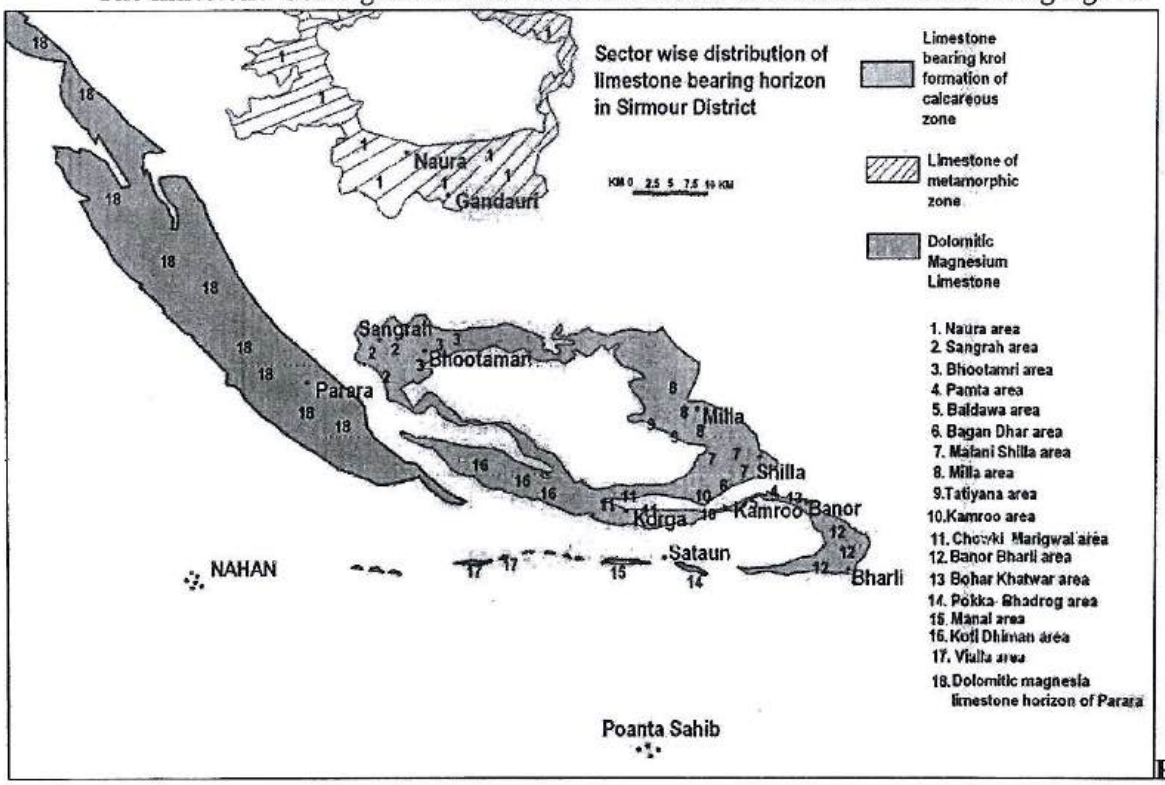


Figure: Limestone bearing belts of the Sirmour District

Baryte

The barytes deposits in Sirmour district is usually associated with Krol limestone and appear to have formed by the process of replacement. The mineral occur in either pure form of admixed with dolomite of the Krol Formation. In the Jogar- ka- Khala however it is associated with Balaini Boulder beds

i) Kanti (30^0 37' N – $77^0$38' E)

The deposit is situated about 1 km SSE of Kanti on the northern slope of the hill. The mineral occurs associated with Krol limestone in the form of a vein which has an average width of 7 metres and is traceable for about 50 metres. Further to east three or four other small outcrops of barytes are met with the same strike but these are comparatively small and the mineral is also greatly admixed with dolomite. In some cases the specks of galena mineral were also found

associated with barytes .The deposit was first prospected by the Sirmour Mineral Development Co. when five or six trenches were put in the main vein across the deposit.
The mineral is white in colour and fine grained in texture. For the greater part of the deposit it is pure but near margin it is admixed with some dolomite. The material form the outcrop to further east of the main vein is poor being mixed with country rock. The average chemical analysis of the deposit is as given in the following table.

Table Showing chemical analysis of the Kanti Baryte

	%age
SiO_2	0.08
R_2O_3	0.30
MgO	0.15
CaO	trace
SO_3	33.81
BaO	64.64
Loss	0.39

The total reserve upto the depth of 7 metres was calculated as 15000 tonnes. The mining lease for the extraction of Barytes from this deposit was granted to M/S Ram Narayan & Bros, in the early sixties and was abandoned after full recovery of the deposit.

ii) Tatyana (30° 38' 30"N – 77°38' E)

The deposit is situated about one km south east of Tatiyana Village on the northern slope of limestone hillock near a spring. This occurrence is similar to nature to that at Kanti with the difference that here the mineral is very much admixed with dolomite. The zone of barite covers over an area of 350 X 120 metre on the slope of the hill. This area was also first investigated by the Sirmour Mineral Development Co. On the whole the mineral is impure and mixed with dolomite. There are few pockets of baryte also but the quantity in these is very limited. The chemical analysis is as given below in the following table.

Table Showing chemical analysis of the Tatyana Baryte

	%age		
SiO_2	0.38	0.20	0.6
R_2O_3	0.59	0.34	0.50
MgO	12.45	14.44	4.16
CaO	18.07	20.90	6.31
SO_3	14.29	11.10	27.49
BaO	25.97	20.79	51.51
Loss	27.31	31.64	9.36

The baryte is also reported near Rajpur ((30° 33'N – 77°44 E) & Jagar -Ka -Khala (30° 37' 30"N – 77°28' E)

The mineral baryte is mined in District Sirmour and the only underground mine in private sector is in Himachal Pradesh.

Bauxite

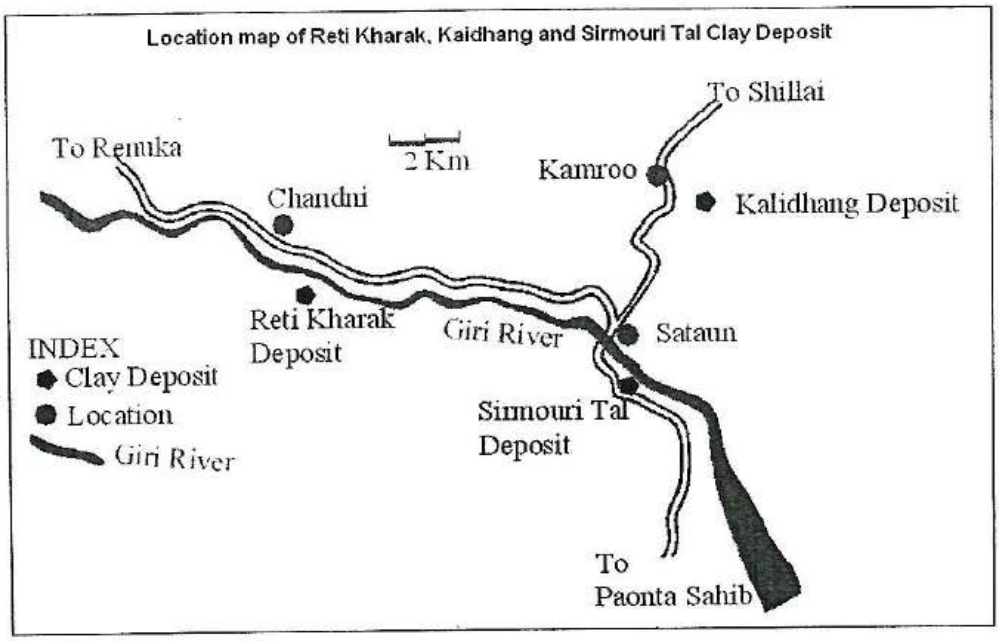
In Bench area (30°47' : 77°37') in _Sirmaur district, bauxite occurs in isolated patches at the base of Eocene/Palaeocenc rocks i.e. Kakra and Subathu Formations. The deposit contains low alumina and high silica. Bauxite at Nahan (30° 33' :77°16'). Its outcrop is buried under a landslide.

Clays

Clay occurrences in Himachal Pradesh can be broadly classified into (i) lacustrine and fluvial, (ii) residual associated with granite and (iii) associated with the Middle and Upper Siwaliks.

Brick -clay of fluvial origin occurs at and around Sirmur Tal (30° 32' 30": 77° 39' 20"), 16 kms north of Paonta Sahib. Similar clay also occurs along the Nimba -ka - Khala, The occurrence extends for 500 metres with an average width of 80m. The average thickness is 3.38m with 1.2m thick overburden. Other occurrences of this type of day are at Rati Kharak (30° 31' 00": 77°32' 10") and Kalidhang (30° 36'30": 77° 39' 30"). At Rati Kharak the clay occurs in an area, 480m in length and 120m in width. The thickness of the clay is two metres. In Kalidhang area, the clay occurs on both sides of Khasuda Ka Khala. The deposit is 540m in length and 180m in width. Its thickness varies from 20m to 30m. The deposit contains clay bands of varying colours. The clay bands are inter layered with bands of gravel, pebbles and sandy loamy soil. The varved nature of the clay deposit indicates that the clay is of lacustrine origin. The reserves of the clay around Kalindhang are about 2.93 million tonnes upto a depth of 20m.

Probably, frequent floods in the river Giri have resulted in depositing the banded colluvial clay in Sirmur-Tal and Reti-Kharak at its southern bank providing a promising cultivable land for the area. Physical studies reflect that Nahan and Mandhali Formations through which the river Giri flows are the main provenance. The black and light varved clay deposit near Kalidhang is of lacustrine type. The tectonic movements in relatively recent past perhaps resulted in change of geomorphic features forming a temporary small lake in which the deposition of this clay took place.



A few clay pockets occurring within the weathered rocks of Chor Granite Complex have been reported at Kanda ($30_0$50'30": $77^0$24' 15"), Roundi ($30^0$49'30"; 77° 27'00"), Kotiyan (30° 49'08"; 77° 27'15") and Gudag, ($30^0$46' 30" : 77° 29' 15"). The clay is dirty white to white in colour. It is sticky when wet and powdery when dry. The length, width and thickness of the pockets varies from three metres to 22m, 0.5 to two metres and 0.5 to five metres respectively. An occurrence of China clay is known from one kilometre north of Rajpur (30° 35': 77° 44').

Coal

In Sirmour District at Deothal (31° 51': 77° 10') in the tributary of Kewal Khala there is occurrence of coal in the Subathu Formation, but due to folding in the rock it has been greatly crushed and it occurs in soft powder form.

Copper

e) Sirmour district:

In Sirmour District at Sataun (30^0 33' ; 77^0 38'), copper mineralization occurs in the carbonaceous shales and quartzites of the Blaini Formation. The mineralisation zone is 25m wide along a road section and consist of stringers and disseminations of pyrite and chalcopyrite. Copper values range from 0.13% to 4.40%. One zone has analysed and showed 2.27% Cu along 1.30 (m true) width.

Galena

In Sirmour District Massive lode of a minor deposit comprising galena and sphalerite has been reported at Anyar (30° 44': 77° 44'). The samples from old working have been analysis indicating lead 0.75% and zinc 0.21 % Another sample gave 10% zinc/content.

Three old working (adits) exist at Anyar in the Infra Krol phyllites, slates and limestonnes. The middle shows mineralisation and is 2.80 m long extending in N 60^0 W direction after which it becomes narrow and is caved. This audit is located in yellowish – brown friable phyllite trending N 70 ^{0} W- S70^0E and dipping 65^0 to NE. The ore body consisit of massive load comprising pyrite, minor specks of galena and sphalerite. The load is 0.70 m thick and strikes in N50^0 W –S50^0E directory and dips 35^0 to 65^0 to the NE. The load appears to be localized along the anticline trending N70^0W- S70^0E. Another small lode about 0.30 m thick occurs to the hangwall side.

The northern old mine occurs at the contact of phyllite and grey limestonne. This audit is 3.70 m long and inclined at an angle of 30^0 in a N50^0E direction.

(ii) Synsedimentary, polymetallic sulphide mineralisation occurs within an interbedded slate-limestonne sequence near the Deoban-Shimla Group contact in Dathyari- (30° 41' : 77° 45') - Chamri (30° 43': 77° 44')- Auri ($30^0$42' : 77° 44') area. Three mineralised lodes 20cm to 150cm thick ranging in length from 75m to 80m have been delineated over a strike length of nearly 340 metres. One sulphide zone trending N70^0W-S70^0E occurs along a shear zone in slates. Another sulphide vein runs sub-parallel to this zone and strikes in N60^0W-S60^0E direction. The sulphide mineralisation mostly comprises marcasite with galena, sphalerite, pyrite and chalcopyrite. The mineralized zone analysis shows 3.09% Pb, 3.01 Zn over a true width of 1.25 m. This value hold good for a length of 10 meter. Two old working existing in Chamri area.

(iii) Small lenses and veins of quartz with galena are observed in slate and phyllite exposed in the Amba area (30^0 38 : $77^0$27'). Large pebbles with rich galena mineralisation are a common sight all along the Amba *Nala*. Small gossanised band measuring 4m x 1m occurs in sandstonne and shale of subathu Formation, one ilometre east of Chapla (30° 58': 77^0 27') in Dabur God. Lead value varies from 0.9 to 0.38%. Old workings of lead ore have been reported at Danheri ($31^0$00': $77^0$00') and Panuh (30° 50' : $77^0$08').

Garnet

Garnet occurs in abundance in the mica schists so conspicuously developed all along the base of Chor mountain in Sirmour District. It is commonly seen on the top hills comprising mica schist and in the beds of nalas that flow through the mica schist. For the most part garnet is small in size but in a few places e.g. Kehdi ka Dhar it attain the size of 4 cm in diameter. The garnets met within the nalas are usually rounded through rolling action.

Gold

Placer gold has been reported from the Siwaliks and is reported in different part of the district. The Geological Survey of India had done detailed investigation in the Ujjal Ki Nadi, Gumti Nala, Trilokpur Nadi, Khiari Ka Khala, Bharion Khala, Matar ka Khala, Jamni Nala , Somb River , Salauni ki Nadi etc. The investigation shows that all these river sediments are auriferous.

Gypsum

In Sirmour District, Gypsum occurs at several places in massive form in the Krol Limestonne and as selenite crystals associated with the carbonaceous shales in the Nahan Sandstonne. The deposits of the former type are comparatively large whereas those of the latter are usually very small. A brief account of the gypsum deposit in District Sirmour are as given below:

Korga (30^0 37' 30" : $77^0$28'0"

Gypsum occurs in steep and precipitous escarpments about 3 km southwest of Korga along the thrust plane. The mineralization zone which contains a mixture of anhydrite and gypsum strikes east-west cutting the Niri –Ka- Khala almost at right angle and dipping steeply toward southeast. Gypsum is associated with red shale, bleached shale, limestonne and dolomite of Krols and occurs in the form of lenses, pockets and thin bends. For the greater part of the deposit the mineral is admixed with dolomite and shale but occasionally pockets of pure gypsum are also present. Sometimes crystalline dolomite is also associated with the gypsum. At places specks of native sulphur are also seen. The Gypsum is usually white, grey or reddish, the former two varieties being mostly associated with dolomite and the letter with red shale of Krols.

The mineral occurs in three vains

1. The northern vein
2. The central vein
3. The southern vein

The northern vein extends east – west continuously for a distance of about 300 metres with an average width of 50 metres to West, after a gap of 600 metres it again traceable near

Purla for a distance of about 120 metres with an average width of 27 metres. The northern part of the vein is associated with red shales and the southern part with dolomite and shales. For the greater part of the deposit the gypsum is admixed with dolomite and shale but at few places as in southern part , in western gorge of the Niri- Ka -Khala , the concentration of the gypsum is more and the samples analysed from this region shows 60 to 80% gypsum in the rock while in other areas the gypsum contents are less than 60%

The central vein extends for a distance of about 380 metres with an average width of about 35 metres. In the eastern gorge of the Niri- Ka -Khala it is about 60 metres. A large part of the vein on both sides of the Niri –Ka- Khala has been eroded away and the rock in situ are covered with debris. Gypsum occurs in thin bands, pockets and lenses. There are small pockets of pure gypsum but these are seldom more than one metres in dimension.

The southern vein extends for a distance of nearly 400 metres with an average width of about 30 metres. Further to west after a break of about 200 metres it is again picked up and can be traced for another 80 metres. The nature of occurrence of mineral is similar to that of central vein. The mineral is comperatively more concentrated in the easternmost part of the vein where the gypsum content is about 70% while in other parts of the vein it is only 35 to 40 %.

As per estimate the reserve of the deposit containing above 60% of Gypsum and which can be sorted upto 80% by hand picking is about 90000 tonne and material containing below 60% of Gypsum is about 900000 tonne, but this is too much contaminated with dolomite and shale and can not be sorted.

Bharli (30^0 33' : $77^0$45')

Gypsum occurs as an escarpment about 1 km NNW of Bharli village on the Paonta-Bharli-Banor Road.The mineral occurs as pockets, lenses and bands associated and greatly admixed with the dolomites and shales of the Krol Formation. The zone bearing gypsum extends NNE-SSW for a distance of about 400metres with average thickness of about 50 metress.In the greater part of the deposit the rock mineral is admixed with dolomite and shale. The deposit is of inferior quality and may contain about 281, 250 tonne of gypsum

Shilorna ($30^0$36' : $77^0$37')

Small deposit of inferior quality of Gypsum occurs about 1.5 Km southwest of Silorna. The quality of deposit is poor and deposit is not of much economic importance

Kulthiana ($30^0$33' : $77^0$42')

There are small patchs of gypsiferous rocks in the Krol Limestonne near Kulthian. The rocks are too much admixed with dolomite and the deposit is very small in nature.

Ridana ($30^0$34' : $77^0$45')

Gypsum in this are is exposed at three places one in the Puruwala Khala and other two in the stream draining the eastern gorge of the Puruwala Khala. At all the places the gypsum is lenticular and admixed with shale and dolomite.

Bhaunrari ($30^0$34' : 77^0 14')

In this area small pocket of poor quality gypsum is also reported.

Nahan ($30^0$33' : 77^0 18')

Small crystals of selenite occurs associated with the carbonaceous rocks, about 3 km northeast of Nahan on the Nahan- Sarahan road is also reported. The deposit is very small and is of inferior quality.

Iron Ore

In Sirmour District Magnetite occurs as lenticles in quartzite of Jutogh Group at Lana Cheta (30^0 47': 77^0 22') - Kanhari ($30^0$47': 77^0 21') area ,known as Lana Cheta Iron ore.

Lana Cheta Iron ore deposit

Lana Cheta area is situated on the borderline of the Renuka and Rajgarh Sub-division of District Sirmour.The area is situated at an altitude of about 1300 meter above mean sea level, along the either bank of Nait Khala, with two parallel ridges on either side. The Nait Khala flows in South Western direction and cuts across the strike of the Formation. It is a perennial stream. It is fed by seasonal transverse tributaries which run mostly parallel to the strike formations. The valley is comparatively broad, especially in quartzite zone, which is quite unusual in the Lesser Himalayan topography.

The Iron ore deposit of Lana Cheta had been known since long and were possibly worked by the local blacksmiths for the manufacture of their tool etc. The erstwhile Raja of Sirmour Estate, during 19th century , made certain experiments on this ore for use in Nahan Foundary but due to heavy cost of transportation and poorness of ore, it was abandoned.

The iron ore occurrences south and south-east of Kanhari village are popularly known as Lana-Cheheta iron ore deposits. They are exposed along the banks of Nait Khala. The mineralization is restricted at the base quartzites of Jutog Group. No mineralization is seen in the carbonaceous slate& and schist.

Lower horizon:- The lower horizon is only a few metres away from the contact of the quartzites and carbonaceous horizon and has better concentration and worked in the past.. There are two main localities namely Kanhari old workings and Fumaria old workings. Kanhari old workings are situated along the northern scarp of the Nait Khala, about 800 metres south of Kanhari village. There are two old workings; one being just along the foot-path and the other is about 20 metres SW of the first one. The mineralization is restricted to the old workings only and there is hardly any lateral

Extension. There are again two old workings along the Fumaria ridge. The main o ld working is about 300 metres SE the Kanhari old workings and is situated on the steep slopes of the ridge. There is a vertical face at a distance of about 25 metres south-east of the old working with magnetite lenses and quartz veins in the hard massive grey and white quartzites. The inbetween portion of old working and the vertical face is covered with debris wihte few boulders of magnetite. There are thin veins and streaks of magnetite in between and on the sides of these lenses. The magnetite lenses are about 2 to 4 metres in thickness and extend upto 60 to 10 metres. Two metres SE of the middle lens there is another lens of magnetite which is about 15 metres in length and is about 1.5 metre thick in the middle. After a covered portion of about 7 metres, there is another lanticular outcrop of magnetite which is 2 metres in length and 0.5 metre width. There are numerous quartz veins and some of them being 30 to 50 cms thick running

parallel as well as oblique to the ore body. Silica in the form of thin streaks of lenses and specks is quite commonly seen. Pyrite also occurs in great abundance in the form of pockets and veins within the magnetite lenses. The second old working along the Fumaria ridge is situated at a distance of about 600 metres SE of the main old workings.

Upper horizon:- The uprer horizon is exposed 640 metres in north eastern direction from the lower horizon and has greater extensions but poor concentrations. Starting from almost top of the ridge south of Kanhari village, it is exposed along the either banks of Mait Khala passes through the Reoli ridge and, with a few exposures in the fields NE of Chandrona village, is again exposed along the Southern slopes of Chandrona ridge and gradually pinch out in SE direction.

Khanhari or right bank block:- The mineralized band, start from almost top of the ridge, south of Kanhari village, is traceable in north eastern direction up to fifty metres short of Mait Ka Khala. The mineralized zone is about 2 to 4 metres tr.ick. In most of the portions there are thin streaks of magnetite running along the bedding planes. In the north-eastern portions of the mineralized band there is a better concentration of magnetite which can be traced for about 350 metres. Thin lenses with streaks of magnetite can be further traced in South West direction for about 250 metres. The maximum of magnetite veins recorded is about 60 to 70 cms only Pyrite is seen at one place exposed along the foot-path east of Kanhari village. It occurs as thin stringers and pockets in the magnetite body. Silica veins are also associated along with the ore body. With no extensions of mineralization on the bank of the ridge and its sudden disappearance in the Kanhari nala indicates limited extensions along the strike direction in this block.

Left bank block:- An almost continuous, conspicuous and projected band of quartzite with magnetite mineralization is exposed along the left bark of Nait Khala starting from the confluence point of Rampur nala with that of Nait Khala, it runs in Southern direction for about a distance of 100 metres with an average thickness of 2 to 3 metres.. Thereafter, it suddenly disappears for a distance of about 120 metres under debris and is again seen continuously along south eastern direction to form part of the Reoli Block.

The nature of mineralization is similar as in the right bank block. Pyrite in the form of thin stringers was seen at one place of the sections. The mineralized zone is about 3 to 4 metres thick. The concentration seems to increase along the dip directicn.

Reoli B1ock - The mineralized band exposed along the Reo1i ridge a little south of Reoli village runs almost in the strike direction for a distance of 300 metres with a few intermittent unexposed portions covered by debris and continues upto the right banks of

Pipli Nala. It dies out at the confluence of Pipli and Chandrona Nala The mineralized zone gradually disappears in the south eastern direction. The maximum concentration is near village Reoli where it is about 2 to 3 metres thick. Silica again form a common association with almost absence of Pyrite.

Chandrona Block: The mineralized band is exposed along the the south western and southern slopes of chandrona ridge. Ii is exposed along the foot path going to village Bhotli for a distance of about 25 metres. Further in south east direction it is exposed for about 200 metres - a little below the foot path . It completely dies out near Tali School. The maximum concentration is

along the outcrop exposed along the foot path and it gradually goes on decreasing in the South East direction.

Pyrite

An occurrence of pyrite in the form of lenses and veins in limestonne and slate was recorded at Sayasu (30° 4': 77° 4'/) and Diyandon (30° 43': 77° 43'). The steeply dipping vein at Sayasu is exposed in the bed of the Tons river, for a distance of 150 metres with a thickness varying between 50 cms and 1.2 metres. On analysis the sample yielded 30% sulphur with arsenic in traces.

Talc/ Steatite

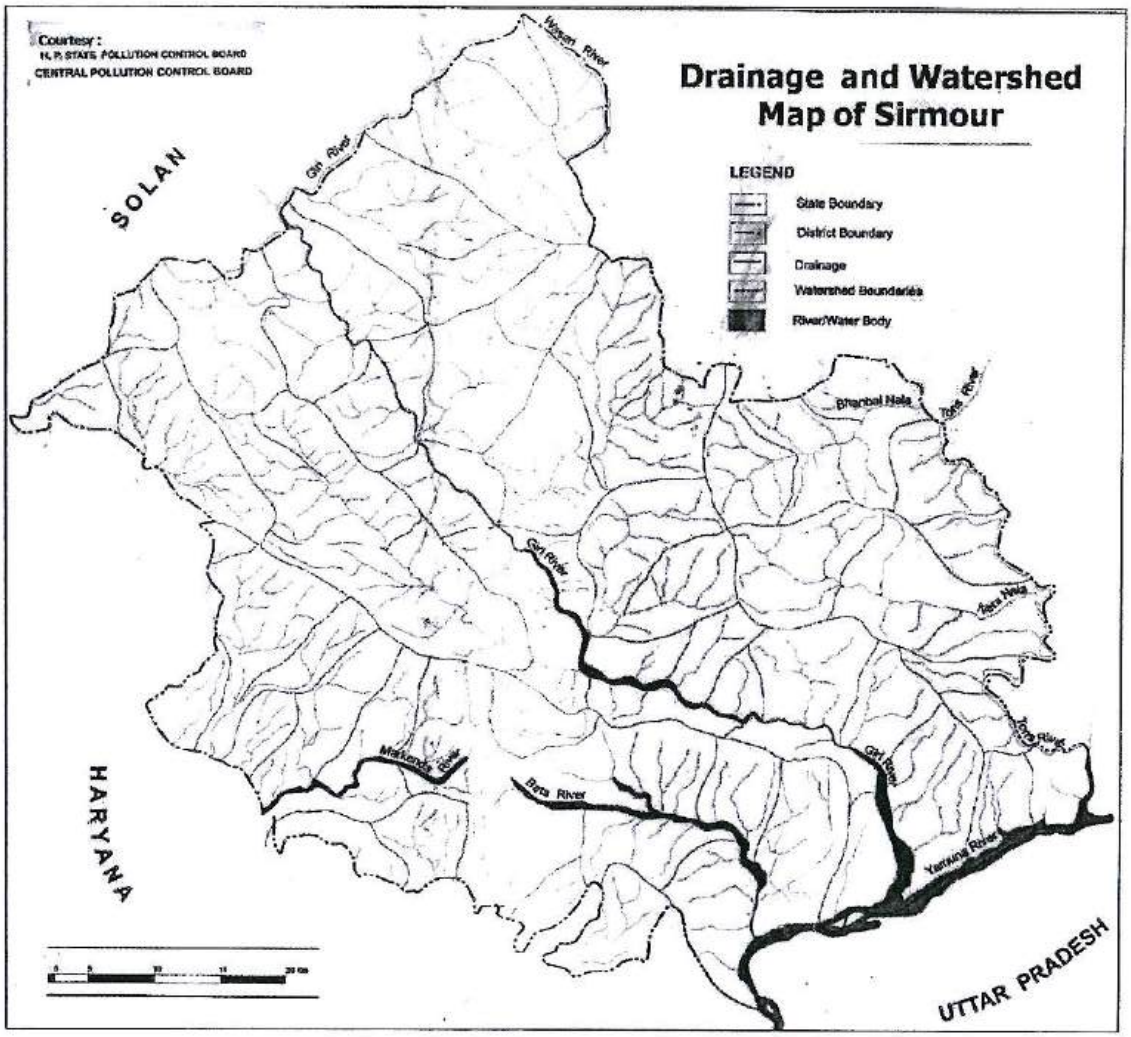
In Sirmour District Steatite of good quality occurs at Nahan ($30^0$33':77^0 17').

Zinc

In Sirmour District Zinc is found associated with galena and pyrite at Anyar (30^0 44' : 77^0 45') and Chamri ($30^0$43' :$77^0$45'). At Anyar, the samples from old working analysed 1.5% Zn and 0.21 %Pb. Another sample gave 10% Zn. At Chamri the zone contains 3.01% Zn and 3.01 % Pb.

8. Drainage System

The general drainage pattern of the Rivers/ streams in the district is dendritic pattern. All rivers/streams flowing in Sirmour district are tributaties of Yamuna River catchment.



Map showing the Watersheds and Drainage system of district Sirmour

8.1 YAMUNA

This river originates from the Jamnotri mountain in the Himalayas at a height of about 7,924 m from the mean sea level. After crossing through Garhwal and irrigating Jaunsar area, it flows on the eastern boundary of the district for a distance of about 31 km. Entering at village Khodar Majri and leaving at Kaunch and continues in the Uttrakhand. It separates Kayarda Dun from the Dehradun and forms the boundary line between this district and the Utter Pradesh. Within the boundary of this district the estimated maximum width of the river is about 91m and the depth is about 6m, but this limit is far exceeded during the rainy season.In the summer, due to melting of snow on the mountains, the volume of water of the river is often subject to variation. The water of this river is generally cold and clear but during the summer, due to melting of snow, it becomes somewhat muddy.It is a sacred river having two temples on its bank, at Rampur and at Paonta where a Gurudwara also exists.Since this river flows at a lower level than of the plateau of the Kayarda Dun, its water cannot be made use of for irrigating the area. It notable tributaries in the district, are the Tons meeting it at Khodari Majri, the Giri Joining it near Rampur Ghat and the Bata mingling its water with it at Bata Mandi.

The river Yamuna is the primary tributary of the river ganga, originates from the Yamounotri Glacier near Banderpoonch peak(38o 59'N78o27'E) at an elevation about 6387 mtrs.in district uttrakashi. The Yamuna catchment drain the Punjab-Kinmaon Himalayas from Shimla in northwest to Musoorie in the south east. After flowing in southeasterly direction for about 120 kms it is joined by its principal tributary the Tons near Dakpathar. The Tons drain a large catchment area hence carries a large volume of water than the main river Yamuna. From the west another important tributary, the Giri joins the main river near the Paonta Sahib. The river pierces the lower Shiwalik range and enters the plains near Tajewala. From Tajewala onward it flows in a southerly direction for a distance of 240 kms upto the Okhla head water near Delhi. The Yamuna after receiving the water through other important tributaries joins the river Ganga and the underground Saraswati at Prayag(Allahbad) after traversing about 950 kms.

The catchment of the Yamuna river system covers part of Uttar Pradesh, Uttrakhand, Himachal Pradesh, Haryana, Rajasthan, Madhya Pradesh, and Delhi states. The state wise catchment area distribution is as below.

Name of the state	Total catchment area in Yamuna(in Sq. Km)	Percentage contribution.
Uttar Pradesh (including Uttrakhand)	74208	21.5
Himachal Pradesh	5799	1.6

Haryana	21265	6.5
Rajasthan	102883	29.8
Madhya Pradesh	14028	40.6
Delhi	1485	0.4

The tributaries contribute 70.9% of the catchment area and balance 29.1 % accounted for the direct drainage into the Yamuna river or to the smaller tributaries. On the basis of area the catchment basin of the Yamuna account to 40.2% of the Ganga basin and 10.7% of the total land mass of the country.

8.2 GIRI

By far the greater portion of the district is drained by the river Giri or its tributaries. The river Giri originates near Kharapathar in Jubbal Tehsil of the district Shimla at hight of about 3270 mtrs. It through the hills of Kot-Khai and Tatesh, parts of Shimla district, and enters in the district on its south-west side. It continues its course for about 40 kms., forming the boundary with the Keonthal area of the Shimla district. At village Mandoplasa, this district and debouches in the Yamuna at Rampur Ghat

None of its tributaries are important, except, on its right bank, the Jalal, which joins it at Dadahu below Sati Bagh at the souther-eastrn extremity of the Sain Dhar. On its left bank the principal streams are the Nait and Palar, which rise on the Kawal, a stream which first flows westward, till it falls into the Giri. Other tributaries are the Bajhethy, the Pervi, the Khal and the Joggar streams.

8.3 Tons

The source of this river lies in the Jamnotri mountains and after coursing through the territories of Jubbal and Jaunsar it enters the district near village Kot separating it from the Jannsar area, once a part of the ers while princely state of Sirmour. After flowing for about 50km and forming the eastern boundary of the district it joins the Yamuna near Khodar Majri, too soon losing its name in that of the Yamuna, which is trebled in size after the junction of the two rivers. When it issues from its bed of snow at an elevation of about 3,897 m. above the level of the sea, it flows in a grand volume, 9m wide and 9m deep maintaining its dignity of character until its confluence with the river, which should, if rivers had their just rights, have been considered its tributary. During its comparatively short career, the Tons receives into its bosom the water of several other beautiful streams. The current of this river is swift and the course full of stones.

8.4 Jalal

This small, shallow and narrow river rises near village Bani below Nehi in tehsil Pachhad and forms a dividing line between the Sain and the Dharthi. At Dadahu in SubTehsil, it falls into the Giri river losing its name. It is generally fordable and rarely up-passable except when it flood which passes away soon.

8.5 Markanda

It rises at Baraban in the hills of Katasan and pass below a temple of Katasan Devi. After flowing from south-east to south-west for a distance of about 24 km. With in the district, irrigating Bajora area, it passes on to the Ambala district at Kala Amb where it is quite wide at village Dewani it is joined by a streamlet named Salani. Areas of Bajora, Kala Amb the lands of Shambhuwala, Rukhri and the garden of Bir Bikrambag and the Khadar Bag are irrigated by its water and few water mills are also run. Its only tributary, of any importance, is the Salani.

8.6 Bata

This river issues from Siori spring in the Dharthi range, located in village Bagna tehsil Nahan and takes easterly direction reverse to the course of the Markanda. Dividing Kayarda Dun into two parts it joins Yamuna at Bata Mandi and loses its separate entity and name. Dun area is irrigated by its water. It is a perennial stream subject to heavy floods in the rainy season, though usually for badable.

8.7 Ghaggar

This river is mentionable not because it is one of the main or principal water bodies of the area but simply for the reasons that it rises near Lawasa in this district. It flows in the westerly direction and whole of southern slope of Dharthi Dhar up to Lawasa drains into this river. It flows for about 12.8 km. in Pachhad tehsil of this district before it enters the Haryana near Prit Nagar. Before it collects water sufficient to make it a river has already crossed the limits of the district. It is only two main tributaries, eg. the Lah which runs throught Ghinni tract and Deh which drains the Ghar portion of the Ponwala Jagir. Near its source and for a number of kilometers further on it has a well defined boulder strewn bed which is never dry but while coursing in the plains the quantity of water diminishers to a mere thread and finally it loses itself in Bikaner territory near Hanumangarh formerly called Bhatnair.

The District Sirmour is drained by the Giri, Tons, Bata, Markanda, Ghaggar and Somb Rivers . The Percentage of area shared by these streams is as below;

Name of the river	Area drained (in Sq. Km)	%age of the area drained
River Giri	1482	52.45
River Tons	430	15.21
River Bata	335	11.88
River Markanda	318	11.25
River Ghaggar	116	4.13
Somb Nallah	144	5.08

Table: Area of district Sirmour being drained by various rivers/nallah.

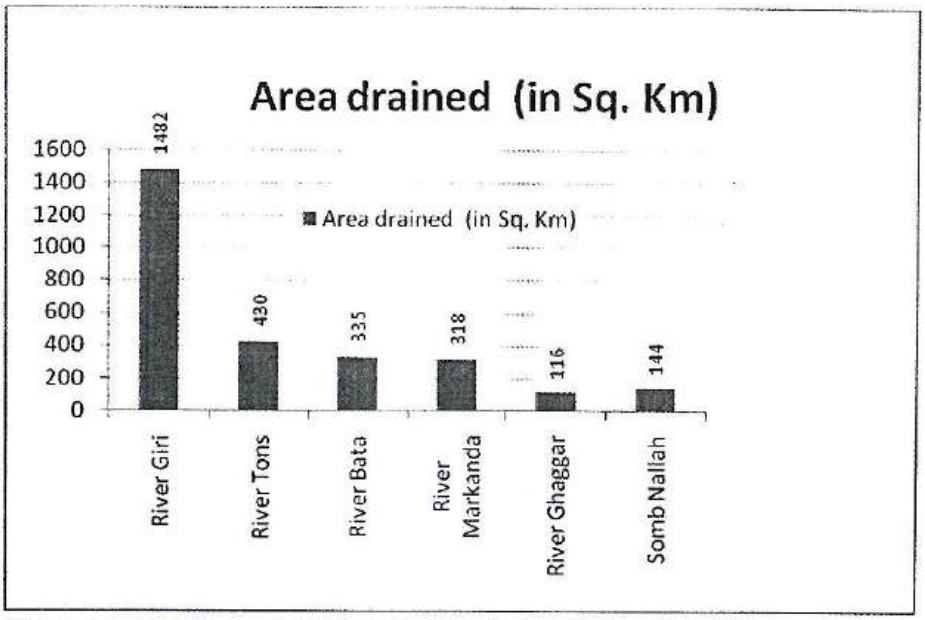


Chart showing Area of district Sirmour being drained by different streams

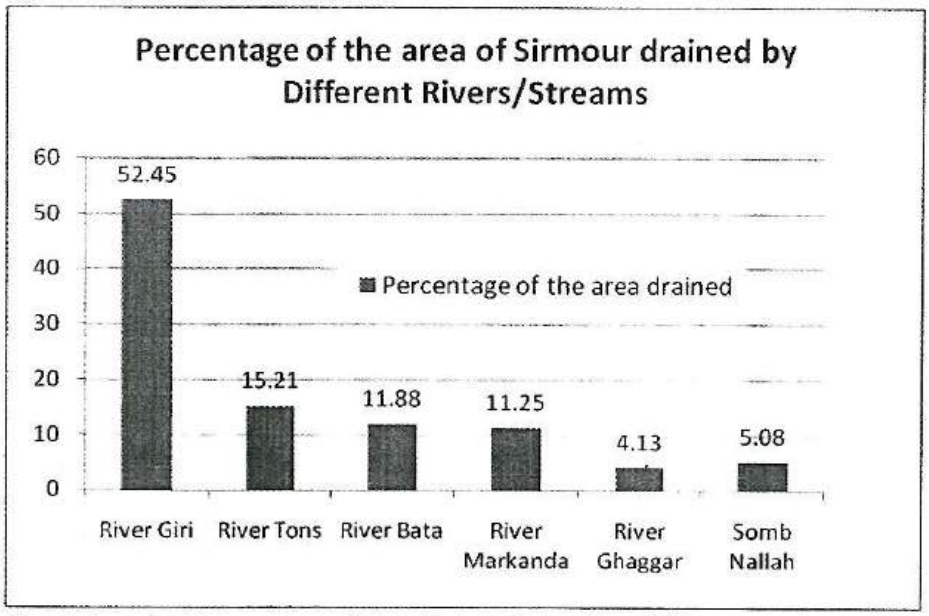


Chart showing Percentage of Area being drained by different streams

8. Salient Features of Important Rivers and Streams

Serial Nos.	Name of the River/Stream	Total Length in Sirmour(in Km)	Place of Origin	Altitude at Origin (in Metre)
1	Yamuna	31	Yamounotri Glacier	6387
2	Giri	109	Kharapathar in Jubbal	3270
3	Jalal	39	Sainki Dhar Near Village Barno	1868
4	Bata	36	Daghera RF	1460
5	Nera	26.8	Juni Dhar	2450
6	Tons	48.6	Yamounotri Glacier	6387
7	Markanda	27.6	Simbhwala Dhar	1390

			Near Vilage Santhal	
8	Trilokpur Nadi	9.8	Kaluwala Ki Dhar	590
9	Salauni Ki Nadi	18.2	Near Village Shilli Sinari	1150
10	Run Nadi	21.4	Dharti Dhar	1290
11	Kandiwala Ki Nadi	12.8	Kangu Ki Dhar	1282
12	Kairi Ka Khala	6.6	Khairwala RF	650
13	Somb Nadi	9.3	Nagiwala RF	636
14	Lohgarh Ka Khol	9.8	LohGarh RF	655
15	Nimbuwala Khala	15.5	Garuk RF	635
16	Matar Ki Khol	7.9	Brahmanwala RF	648
17	Jagat Ka Nala	20.6	Dawai Dhar	2462
18	Katli Ki Nadi	5.2	Simbhwala Dhar Near Vilage Santhal	1390
19	Sudanwala Khala	6.4	Sudanwala RF	655
20	Gumti Nadi	13.4	Gumti Sambhalwa RF	620
21	Dholi Rao Khalla	8.0	Gorasa	650

10. Methodology adopted for calculation of Mineral Potential:

The mineral potentials have been calculated based on field investigations and geology of the catchment area of the river/streams. It is also important to mention here that the there is a provision in the River/Stream Bed Mining Policy Guidelines where collection of material upto a depth of one meter is allowed in a single season where mineral concession have been granted. As per the provision in the River/Stream Bed Mining Policy Guidelines, only 60% of the area of the particualr river/sream bed has been taken into account for calculation of mineral potential. It is noticed that during flood season whole of the pits so excavated is completely filled up and as such the excavated area is replenshed with new harvest of mineral. Mineral constituents like boulder, river borne bajri, sand upto a depth of one metre are considered as resource mineral. Other constituents like clay and silt are exculed as waste while calculating the mineral potential of particualr river/stream. The specific gravity of each mineral constituents is different. While calculating the mineral potential, the avrerage specific gravity is taken as 2.25. The percentage of mineral constituents like boulder, river borne bajri, sand are aslo varies for different river/stream. While calculating the mineral potential the percentage of each mineral constituents is taken as, 35-40% for Boulder, 30-35% for river born Bajri, 25-30% for sand and 5-15% for silt and clay.

The deposition in river beds is more pronounced during rainy season. Although the quantum of deposition is varies from stream to stream depending upon numbers of fectors such as catchment lithology, discharge, river profile and geomorphology of the river course. However there are certain geomorphological features developed in the river beds such as channel bars, point bars etc. where annual deposition is much more even two to three metres. The annual deposition of minor mineral in the different river/stream beds has been calculated on the basis of field investigations and geology of the catchment area of the river/streams. The rate annual deposition of minor mineral in the different river/stream beds of district Sirmour varies from 20-25%.

11. Description of Rivers/Streams

11.1 Yamuna (Toposheet No. 53F/11 and 53F/15)

General

Yamuna river is one of the major tributaries of the Ganga river system. This river originates from the Jamnotri mountain in the Himalayas at a height of about 6387 m from the mean sea level. Drainage pattern of the Yamuna river is of Dendritic type. Total length of Yamuna river in Himachal Pradesh is about 31 Km and the total catchment of this area is approx. 270 Sq. Km.

Mining Officer
Distt. Sirmour
at Nahan

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Confluence with Tons River to Behral near Haryana and Uttar Pradesh Border	31	478	14818000	16803612

Present status of mining.

Presently there are 9 mining leases in operation in Yamuna river. Out of these, 6 mining leases have been granted for running the stone crushers and 3 mining leases for extraction of minor mineral for free sale. The detail is as under:

For free sale

Sr. No	Name of the Party	Area
1.	Sh. Inder Singh, S/O Sh. Sunder Singh, VPO Kamrau, Sub Teh. Kamrau, Distt. Sirmour, H.P	2-66-75 Hect. (32 Bighas)
2.	Shri Brijender Singh, S/o Shri Ujjagar Singh, Village Haripur Tohana, P.O. Shivpur, Tehsil Paonta Sahib, Distt. Sirmour, H.P.	13-0 Bighas
3.	Sh. Lakhvinder Singh, Flat No. 824, HIG, Phase-2, Mohali, Punjab	49-6
	Total Area	**94.6 Bighas**

For stone crusher

Sr. No	Name of the Party	Area
1.	Shri Mahender Singh, S/o Shri Sohan Singh,Devi Nagar, Tehsil Paonta Sahib, Distt. Sirmour, H.P.	122-06 Bighas
2.	Smt. Shubhlata Sharma, W/o Sh. M.M. Sharma, H.No. 214, Ward No. 10, Devi Nagar, Paonta Sahib, Distt. Sirmour, H.P.	18-18 Bighas
3.	M/s Akhilesh Enterprises, Prop: Malini Jung, Village Ganguwala, Tehsil Paonta Sahib, Distt. Sirmour, H.P.	24.0 bighas
4.	Sh. Lakhvinder Singh, Flat No. 824, HIG, Phase-2, Mohali, Punjab	60-00 bighas
5.	M/s Yamuna Mines & Minerals, C/o Shri Sher Singh Negi, House No. 16 Ward No. 6, Devi Nagar, Paonta Sahib, Distt. Sirmour, H.P.	124-17 Bighas
6.	Smt.Meera Chandel, W/o dr. Hakam Chandel Chandel, 186/10, Devi Nagar, Paonta Sahib, Distt. Sirmour, H.P.	4-70-10 Hect.
	Total Area	**406-12 Bighas**

Upstream google earth view of Yamuna River near Guruwala

The production of the minor minerals from these mining leases for last three years is as under:

Year	Production (in MT)
2013-14	141502
2014-15	336892
2015-16	139800

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent like boulder, river borne bajri and sand. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 20%.

Table Showing Minor Mineral Potential and Annual Deposition of Yamuna River

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
5601204	6801462	4400946	16803612
Annual Deposition			
2240482	2720558	1760378	6721445

Recommendation

It is evident from the above table that about 16803612 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Yamuna River in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 6721445 metric tones. At present average annual production is around 80,000 metric tones from the river bed. As such 16803612 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the right bank of the river bed from downstream of confluence with Tons River to village Behral near Haryana and Uttar Pradesh Border.

Mining Officer
Distt. Sirmour
at Nahan

11.2 Giri: (Toposheet No. 53F/1, 53F/5, 53F/6, 53F/10 and 53F/11)

General

Giri river is one of the major tributaries of the Yamuna river system. The river Giri originates near Kharapathar in Jubbal Tehsil of the district Shimla at hight of about 3270 mtrs. Drainage pattern of the Giri river is of Dendritic type. Its catchment is stretched between 30°04'30" to 31°15'40" N latitude and 77°00'00" to 77°43'45" E longitude covering an area catchment area of 2600 Sq.Km. which is further divided into 36 Sub-catchments. Its water has been diverted by putting a barrage at Dadahu to generate power at Girinagar and provide irrigation in and around Paonta valley. Keeping in river physics point of view and availability of the minerals, the Giri river can be divided into two portions i.e. upstream of the Dadahu Barrage (Giri-I) and downstream of the Dadahu Barrage(Giri-II).

Present status of Mining

Presently there is 16 mining leases are in operation in Giri river. Out of these, 7 Nos. leases have been granted for running the stone crusher and 9 Nos. for extraction of minor mineral for free sale. The detail is as under:

For stone crusher

Sr. No	Name of the Party	Area
1.	Shri Ashish Kumar, S/o Shri Anand Kumar, Devi Nagar, Paonta Sahib, Distt. Sirmour, H.P.	216.05 bighas
2.	Shri Anil Kumar, S/o Shri Natha Ram Sharma, 167/10 Devi Nagar, Paonta Sahib, Distt. Sirmour, H.P.	23-0 bighas
3.	M/s Al Stone Mine & Minerals, VPO Rampur Ghat, Tehsil Paonta Sahib, Distt. Sirmour, H.P.	238.10 bighas
4.	Shri Gajender Pal Singh, S/o Shri Surain Singh, 519 Vijay Park Extension Dehradun (Uttrakhand)	125-01 Bighas
5.	M/s Chandel Association, 186/10, Devi Nagar, Paonta Sahib, Distt. Sirmour, H	114-16 Bighas
6.	M/s Dev Raj Stone Crusher, 186/10, Devi Nagar, Paonta Sahib, Distt. Sirmour, H.P.	114-14 Bighas
7.	Smt Shubh Lata Sharma, S/o Shri M.M. Sharma, House No. 214, Ward No. 10, Devi Nagar, Paonta Sahib, Distt. Sirmour, H.P.	18-18 bighas

8.	Smt Shubh Lata Sharma, S/o Shri M.M. Sharma, House No. 214, Ward No. 10, Devi Nagar, Paonta Sahib, Distt. Sirmour, H.P.	25-18 bighas
9..	S/Shri Ashok Goyal & Naveen Goyal, Prop: M/s Goyal Crushing Company,Village Manpur Devra, Tehsil Paonta Sahib, Distt. Sirmour, H.P.	125-00 Bighas
10.	Sh. Madan Sharma, House No. 214, Ward No. 10, Devi Nagar, Paonta Sahib, Distt. Sirmour, H.P.	4.9 Hect. (59-00 Bighass)
Total Area		**1061-2 Bighas**

For free sale

Sr. No	Name of the Party	Area
1.	Shri Vishal Aggarwal, S/o Shri Nehar Singh,12/10, Ashirwad Enclave, Ballupur, Dehradun (Uttrakhand).	58-02 bighas
2.	Shri Sanjay Kishore, S/o Shri Gopi Chand, Main Market, Vikas Nagar, Dehradun (Uttrakhand)	58-01 bighas
3..	Shri Ramesh Chand Arora, S/o Shri Sagar Chand Arora, 41/6,Alkapuri, Dehradun (Uttrakhand)	57-10 Bighas
4.	Shri Inder Singh, S/o Shri Mangal Singh 194/3/3, Rajpur Road, Dehradun (Uttrakhand).	58-10 Bighas
5.	Smt. Shakuntla Chandel, W/o Late Shri Roop Singh Chandel, House No. 166, Devi Nagar, Paonta Sahib, Distt. Sirmour, H.P.	26-03 bighas
6.	Shri Ranbir Singh, Surat Palace, Nahan, Distt. Simrour, H.P.	23-06 bighas
7.	Smt Shubh Lata Sharma, Kunja, S/o Shri M.M. Sharma, House No. 214, Ward No. 10, Devi Nagar, Paonta Sahib, Distt. Sirmour, H.P.	2.2 Hect.
8.	Shri Prem Pal, S/o Shri Gopal Singh, Village Mehat, P.O. Kando Kansar, Tehsil Paonta Sahib, Distt. Sirmour, H.P.	24-12 bighas
9.	Sh. Kamal Kumar Gupta, Manpur Devra	2.1

Total Area		**336-5 Bighas**

The production of the minor minerals from these mining leases for last three years is as under:

Year	Production (in MT)
2013-14	1,35,128
2014-15	1,37,586
2015-16	2,46,277

Upstream google earth view of Giri River near Rajban

11.2.1 Giri-1

Minor Mineral Potential in the River Bed

As the stream cut its course through the Himalayan Hills of district Shimla and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent like boulder, river borne bajri, sand upto a depth of one metre leaving the

clay and silt as waste. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 5 Cms.

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Confluence Khori Ka Nala to Confluence with River Jalal near Dadahu	64	120	7680000	8709120

Table Showing Minor Mineral Potential and Annual Deposition of Giri-I River

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
2903040	3525120	2280960	8709120
Annual Deposition			
145152	176256	114048	435456

Recommendation

It is evident from the above table that about 8709120 metric tones of different sizes of minor minerals are available upto depth of one metre in the this portion of river bed in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 435456 metric tones. . As such 8709120 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed From Downstream of Confluence Khori Ka Nala to Confluence with River Jalal near Dadahu. No concession may be granted in small tributaries for proper replenishment of River bed.

11.2.2 **Giri-II**

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 5 Cms.

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Jataun Barrage to Confluence with River Yamuna	34	498	16932000	19200888

Present status of Mining

Presently there is 19 mining leases are in operation in Giri river. Out of these, 10 Nos. leases have been granted for running the stone crusher and 9 Nos. for extraction of minor mineral for free sale. The average annual production of these granted leases is about 173000 metric tons.

Table Showing Minor Mineral Potential and Annual Deposition of Giri-II River

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
6400296	7771788	5028804	19200888
Annual Deposition			
320015	388589	251440	960044

Recommendation

It is evident from the above table that about 19200888 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Baker khad in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 960044 metric tones. At present average annual production is around 1,73000 metric tones from the river bed. As such 19027891 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral

concession can be granted in the river bed The mineral concession may be granted in the river bed From Downstream of Jataun Barrage to Confluence with River Yamuna. No mineral concession may be granted in small tributaries for proper replenishment of river.

11.3 Jalal (Toposheet No. 53F2 and 53F3)

River Jalal is the right bank tributary of the river Giri and merge into Giri near Dadahu. Its Total length in Sirmour is about 39 km. It originates from the Sainki Dhar at an elevation of 1868 metre.

Upstream google earth view of River Jalal near village Baneri

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Village	27	45	1215000	1377810

Odar to Confluence with River Giri				

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 5 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Jalal River

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
459270	557685	360855	1377810
Annual Deposition			
22964	27884	18043	68891

Recommendation

It is evident from the above table that about 1377810 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Jalal river in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is apprixmately to the tune of 68891 metric tones. As such 1377810 metric tones of minor mineral can safely be lifted from the river bed.. It is therefore recommended that mineral concession can be granted in the river bed of Jalal river from downstream of Village Odar to Confluence with River Giri near Dadahu. No mineral concession may be granted in small tributaries of the river.

11.4 Bata(Toposheet No. 53F2 and 53F3)

River Bata is the right bank tributary of the river Yamuna and merge into Yamuna near Paonta Sahib. Its Total length in Sirmour is about 36 km. It originates from the Daghera Reserve Forests at an elevation of 1460 metre.

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Village Uttamwala to Confluence with River Yamuna	26	290	7540000	8550360

Upstream google earth view of Bata River near Kolar

Present status of mining

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent like boulder, river borne bajri, sand upto a depth of one metre leaving the clay and silt as waste. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 5 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Bata River

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
2850120	3460860	2239380	8550360
Annual Deposition			
142506	173043	111969	427518

Recommendation

It is evident from the above table that about 8550360 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Bata River in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 427518 metric tones. As such 8550360 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed of Bata from From Downstream of Village Uttamwala to Confluence with River Yamuna and no mineral concession may be granted in small tributaries for proper replenishment of River.

11.5 Nera(Toposheet No. 53F2 and 53F3)

River Nera is the right bank tributary of the river Tons and merge into Tons near Pojal. Its Total length in Sirmour is about 26.8 km. It originates from the Juni Dhar at an elevation of 2450 metre.

Portion of the River/Stream Recommended for Mineral Concessio	Length of Area Recommended for Mineral Concessio n (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concessio n (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral

n				Potential)
From Downstream of Village Bheta to Village Koti	8.4	62	520800	590587

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Upper Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent like boulder, river borne bajri, sand upto a depth of one metre leaving the clay and silt as waste. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 6 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Nera River

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
196862	239048	154677	590587
Annual Deposition			
11812	14343	9281	35435

Recommendation

It is evident from the above table that about 590587 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Nera River in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 35435 metric tones. As such 590587 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed of Nera River From Downstream of Village Bheta to Village Koti and no mineral concession may be granted in small tributaries for proper replenishment of River.

11.6 Tons(Toposheet No. 53F/14)

River Tons is the right bank tributary of the river Yamuna and merge into Yamuna near Dakpathar. Its Total length in Sirmour is about 48.6 km. It originates from the Yamounotori glacier at an elevation of 6387 metre.

Upstream google earth view of Tons Near Village Kolawar

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of village Dhamog to Confluence with Yamuna River	12.3	38	467400	530031

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 7 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Tons River

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
176678	214536	138817	530031

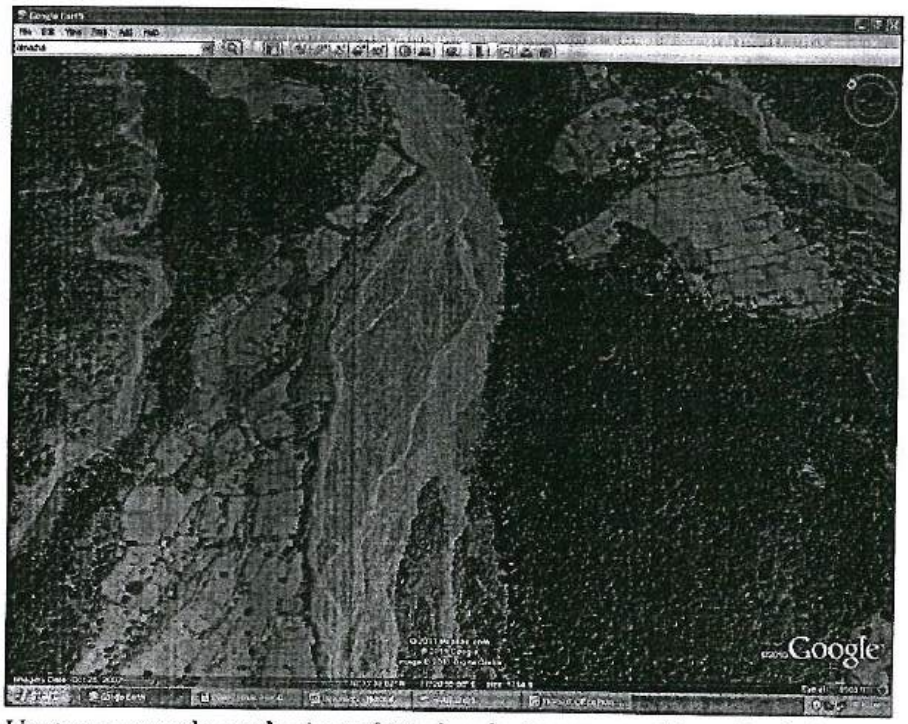
Annual Deposition			
12367	15017	9717	37102

Recommendation

It is evident from the above table that about 530031 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Tons River in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 37102 metric tones. As such 530031 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed of Tons River From Downstream of village Dhamog to Confluence with Yamuna River. No mineral concession may be granted in small tributaries such for proper replenishment of River.

11.7 Markanda River (Toposheet No. 53F2 and 53F3)

Markanda River is the right bank tributary of the river Ghaggar and enters in State of Haryana near Kala Amb. Its Total length in Sirmour is about 27.6 km. It originates from the Simbhwala Dhar near village Santhal at an elevation of 1390 metre.



Upstream google earth view of Markanda river near village Bankalan

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Village Gara to Haryana Border	21	140	2940000	3333960

Present status of mining.

Presently only one Mining lease have been granted in the bed of this stream in favour of Shri Ram Pal Malik, Village & P.O. Shambuwala, Tehsil Nahan, Distt. Sirmour, H.P for running stone crusher. The average annual productionis about 12000 metric ton.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 6 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Markanda River

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
1111320	1349460	873180	3333960
Annual Deposition			
66679	80968	52391	200038

Recommendation

It is evident from the above table that about 3333960 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Markanda River in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 200038 metric tones. At present average annual production is around 12000 metric tones from the river bed. As such 3321960 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed of Markanda River from Downstream of Village Gara to Haryana Border. No concesion may be granted in small tributaries for proper replenishment of Khad.

11.8 Trilokpur Ki Nadi (Toposheet No. 53F2 and 53F3)

Trilokpur ki Nadi is the right bank tributary of the Run Nadi and and enters in State of Haryana near Khairi. Its Total length in Sirmour is about 9.8 km. It originates from the Kaluwala Ki Dhar at an elevation of 590 metre.

Upstream google earth view of Trlokpur ki Nadi near Village Khairi

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of the Motorable Bridge Near Village Bhudra to Haryana Border	3.4	68	231200	255938

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 6 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Trilokpur ki Nadi

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
68666	87394	99878	255938
Annual Deposition			
4120	5244	5993	15356

Recommendation

It is evident from the above table that about 255938 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Trilokpur ki Nadi in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 15356 metric tones. As such 255938 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed of Trilokpur ki Nadi From Downstream of the Motorable Bridge Near Village Bhudra to Haryana Border. No mineral concession may be granted in small tributaries for proper replenishment of Khad

11.9 Salani Ki Nadi (Toposheet No. 53F2 and 53F6)

Salauni ki Nadi is the right bank tributary of the Markanda River and merge into Markanda near village Dida. Its Total length in Sirmour is about 18.2 km. It originates from near village Shilli Shinari in Jhira Reserve Forests at an elevation of 1150 metre.

Upstream google earth view of Salauni Ki Nadi near village Danta

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Village Maholiya Bas to Confluence with River Markanda	7.6	64	486400	538444

Present status of mining.

Presently only one Mining lease have been granted in the bed of this stream in favour of M/S Maa Vaishno Stone Crusher, Village Salani Katola, P.O. Sain Wala, Tehsil Nahan, Distt. Sirmour, H.P. for running stone crusher. The average annual productionis about 16128 metric ton.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituen upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 6 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Salauni Ki Nadi

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
144460	183850	210124	538444
Annual Deposition			
8668	11031	12607	32306

Recommendation

It is evident from the above table that about 538444 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Salauni Ki Nadi which can be safely be removed. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 32306 metric tones. As such 538444 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed From Downstream of Village Maholiya Bas to Confluence with River Markanda. No concession may be granted in small tributaries for proper replenishment of Khad.

11.10 Run Nadi (Toposheet No. 53F2 and 53F6)

Run Nadi is the right bank tributary of the Markanda River and enters in State of Haryana near Mirpur village. Its Total length in Sirmour is about 21.4 km. It originates from Dharti Dhar at an elevation of 1290 metre.

Upstream google earth view of Run Nadi near village Kotla

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of confluence of Tarapur Ki Nadi to Haryana Border	9.5	90	855000	946485

Present status of mining.

Presently two Mining leases have been aaplied in the bed of this stream by Sh. Balbir Singh, Partner M/S Bala Sundri Stone Crusher, Village Bajari, P.O. Barma, Tehsil Nahan, Distt. Sirmour & Sh. Naib Singh, Prop. M/S Shiv Shakti Stone Crusher, Village Mirzapur, Tehsil Naraingarh Haryana for establishment of stone crusher which are pending due to compeletion of farmalities.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 5 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Run Nadi

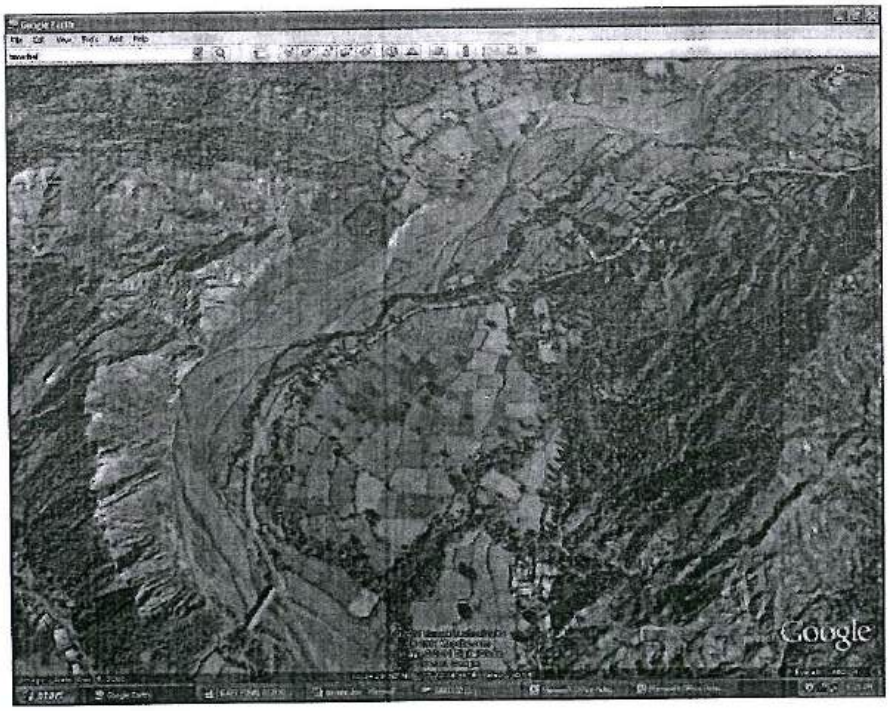
Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
253935	323190	369360	946485
Annual Deposition			
12697	16160	18468	47325

Recommendation

It is evident from the above table that about 946485 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Run Nadi in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 47325 metric tones. As such 946485 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed of Run Nadi From Downstream of confluence of Tarapur Ki Nadi to Haryana Border. No mineral concession may be granted in small tributaries for proper replenishment of Khad.

11.11 Kandiwala Ki Nadi (Toposheet No. 53F2 and 53F6)

Kandiwala ki Nadi is the Left bank tributary of the Run Nadi and merge into Run near village Telpura. Its Total length in Sirmour is about 12.8 km. It originates from Kangu Ki Dhar at an elevation of 1282 metre.



Upstream google earth view of Kandiwala ki Nadi near Barma

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Village Kandiwala to Confluence with Run Nadi	5.1	68	346800	383907

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 4 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Kandiwala ki Nadi

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
102000	131090	149817	383907
Annual Deposition			
6180	7865	8989	23035

Recommendation

It is evident from the above table that about 383907 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Kandiwala ki Nadi in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 23035 metric tones. As such 383907 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed From Downstream of Village Kandiwala to Confluence with Run Nadi. No concession may be granted in small tributaries for proper replenishment of Khad.

11.12 Khairi Ka Khala(Toposheet No. 53F/6)

Khairi ka Khala is the Left bank tributary of the Markanda River and merge into Markanda near village Kanthra. Its Total length in Sirmour is about 6.6 km. It originates from Khairwala Reserve Forest at an elevation of 650 metre.

Upstream google earth view of Kairi Ka Khala near Village Simbalwala

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Village Simbalwal	3.2	72	230400	255052

a to Confluence with River Markanda				

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 6 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Khairi ka Khala

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
68428	87092	99532	255052
Annual Deposition			
4106	5225	5972	15303

Recommendation

It is evident from the above table that about 255052 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of **Khairi ka Khala** in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 15303 metric tones. As such 255052 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed From Downstream of Village Simbalwala to Confluence with River Markanda. No mineral concession may be granted in small tributaries for proper replenishment of Khad.

11.13 Somb Nadi (Toposheet No. 53F/6 and 53F/7)

Somb is the Right bank tributary of the Yamuna River and enters in State of Haryana near Devwala village. Its Total length in Sirmour is about 9.3 km. It originates from Nagiwala Reserve Forest at an elevation of 636 metre.

Upstream google earth view of Somb Nadi near village Haripur

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)

From Downstream of Village Dhakranwala to Haryana Border Near Devwala Village	5.4	96	518400	573868

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 5 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Somb Nadi

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
153965	195955	223948	573868
Annual Deposition			
7698	9798	11197	28693

Recommendation

It is evident from the above table that about 573868 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Somb Nadi in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 28693 metric tones. As such 573868 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can

be granted in the river bed From Downstream of Village Dhakranwala to Haryana Border Near Devwala Village. No mineral concession may be granted in small tributaries for proper replenishment of Stream.

11.14 Lohgarh Ka Khol (Toposheet No. 53F/7)

Lohgarh ka Khol is the Left bank tributary of the Somb Nadi and and enters in State of Haryana near Bhagwanpur village of Haryana. Its Total length in Sirmour is about 9.8 km. It originates from Lohgarh Reserve Forest at an elevation of 655 metre.

Upstream google earth view of Lohgarh Ka Khol near village Lohgarh

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Village Lohgarh to Haryana Border	6.6	48	316800	350697

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent like boulder, river borne bajri, sand upto a depth of one metre leaving the clay and silt as waste. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 6 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Lohgarh Ka Khol

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
94090	119750	136857	350697
Annual Deposition			

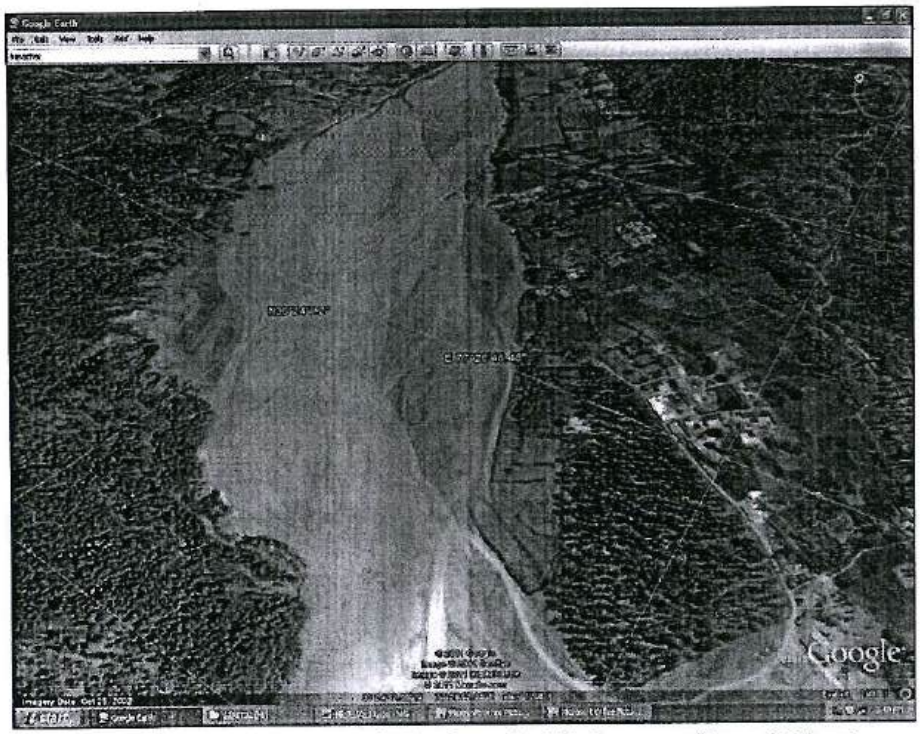
5645	7185	8212	21042

Recommendation

It is evident from the above table that about 350697 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Lohgarh ka Khol in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 21042 metric tones. As such 350697 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed From Downstream of Village Lohgarh to Haryana Border. No mineral concession may be granted in small tributaries for proper replenishment of Khad.

11.15 Nimbuwala Khala(Toposheet No. 53F/7)

Nimbuwala Khala Right bank tributary of the Yamuna River and enters in State of Haryana near Palhori village. Its Total length in Sirmour is about 15.5 km. It originates from Garuk Reserve Forest at an elevation of 635 metre.



Upstream google earth view of Nimbuwala Khala near village Palhori

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Village Pir Marusidh to Haryana Border Near Village Palhori	8.6	96	825600	913939

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent like boulder, river borne bajri, sand upto a depth of one metre leaving the clay and silt as waste. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 5 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Nimbuwala Khala

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
245204	312076	356659	913939
Annual Deposition			

12260	15604	17833	45697

Recommendation

It is evident from the above table that about 913939 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Nimbuwala Khala in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 45697 metric tones. As such 913939 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed From Downstream of Village Pir Marusidh to Haryana Border Near Village Palhori. No mineral concession may be granted in small tributaries for proper replenishment of Khad.

11.16 Matar Ki Khol (Toposheet No. 53F/6 and 53F/7)

Matar ki Khol is Right bank tributary of the Somb Nadi and enters in State of Haryana near Katgarh village. Its Total length in Sirmour is about 7.9 km. It originates from Brahmanwala Reserve Forest at an elevation of 648 metre.

Upstream google earth view of Matar ka Khol near village Matar

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Confuence of Kalhuwala and Brahamanwala streams to Village Matar	4.6	46	211600	234241

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 8 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Matar Ki Khol

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential**

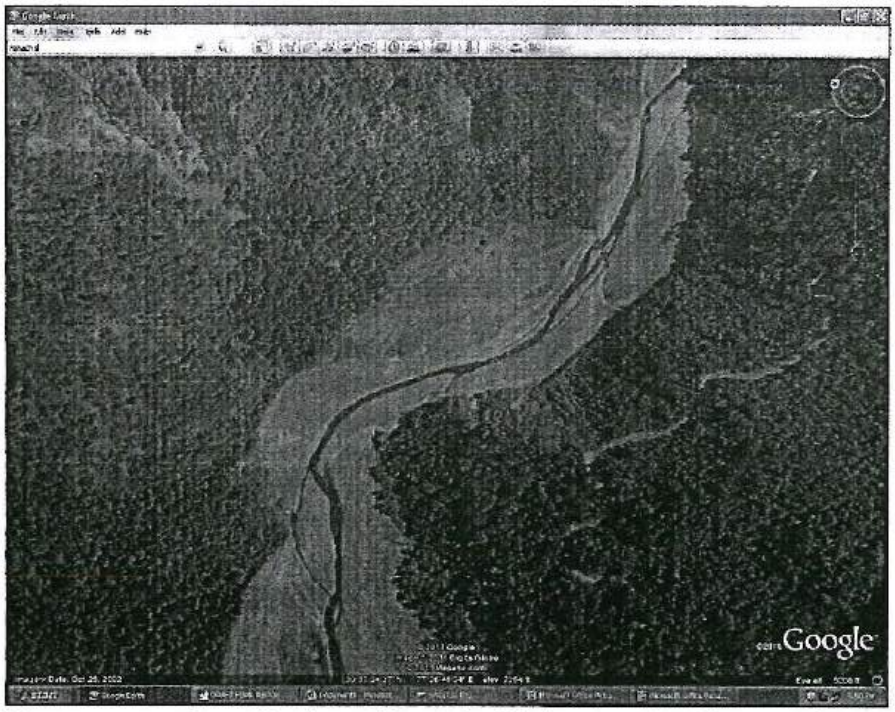
			(in MT)
62845	79984	91412	234241
Annual Deposition			
5028	6399	7313	18739

Recommendation

It is evident from the above table that about 234241 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Matar Ki Khol in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 18739 metric tones. As such 234241 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed From Downstream of Confuence of Kalhuwala and Brahamanwala streams to Village Matar. No concesion may be granted in small tributaries for proper replenishment of Khad.

11.17 Jagat Ka Nala (Toposheet No. 53F/6 and 53F/10)

Jagat ka Nala is Right bank tributary of the Giri river and merge into Giri. Its Total length in Sirmour is about 20.6 km. It originates from Dawai Dhar at an elevation of 2462 metre.



Upstream google earth view of Jagat ka Khala near Conflence with Giri

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of village satna to Confuence with River Giri	2.3	90	207000	229149

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent like boulder, river borne bajri, sand upto a depth of one metre leaving the clay and silt as waste. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 7 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Jagat Ka Nala

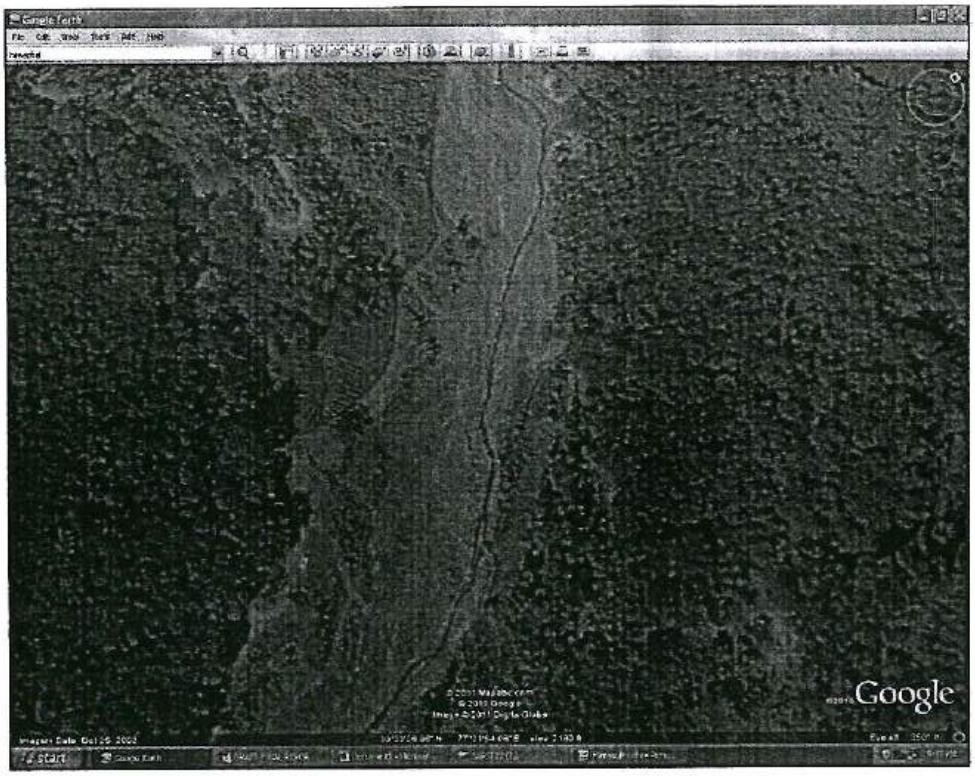
Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
61479	78246	89424	229149
Annual Deposition			
4304	5477	6260	16041

Recommendation

It is evident from the above table that about 229149 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Jagat Ka Nala in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 16041 metric tones. As such 229149 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed From Downstream of village satna to Confluence with River Giri. No mineral concession may be granted in small tributaries for proper replenishment of Stream.

11.18 Katli Ki Nadi (Toposheet No. 53F/6)

Katli Ki Nadi is the right bank tributary of River Markanda. It merge into Markanda near village Dhagat. Its Total length in Sirmour is about 5.2 km. It originates from the Simbhwala Dhar near village Santhal at an elevation of 1390 metre.



Upstream google earth view of Katli ki nadi near village Katli

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of village Karlia to Confuence with Dhagat Ka Khala	2.2	74	162800	180219

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 8 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Katli Ki Nadi

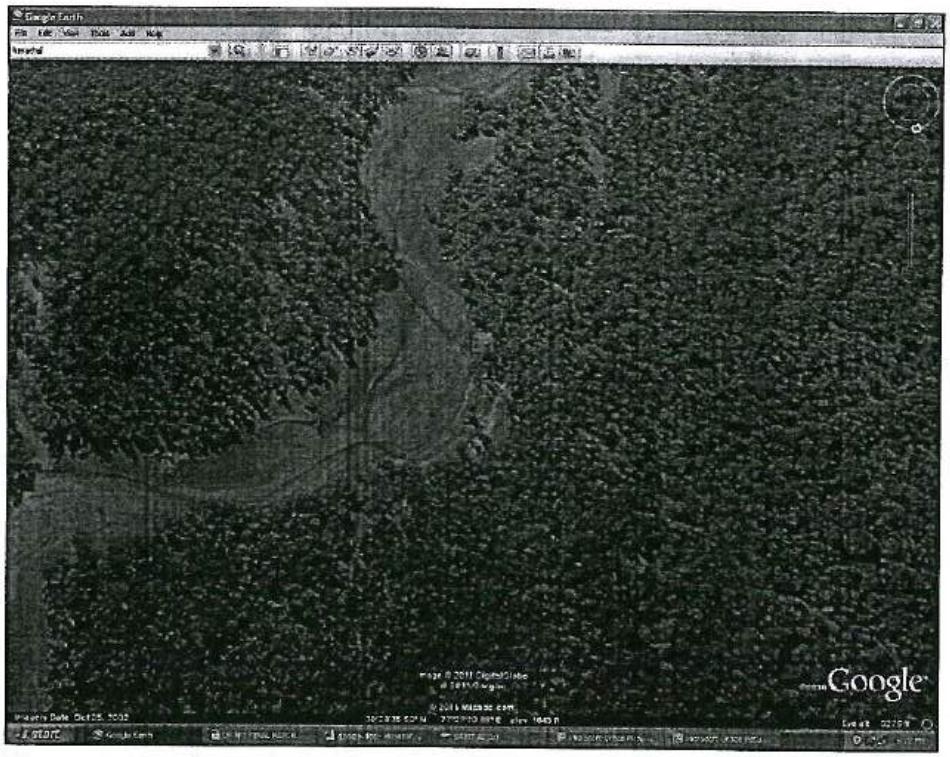
Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
48351	61538	70329	180219
Annual Deposition			
3868	4923	5626	14417

Recommendation

It is evident from the above table that about 180219 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Katli ki Nadi in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 14417 metric tones. As such 180219 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed From Downstream of village Karlia to Confluence with Dhagat Ka Khala. No concession may be granted from Wah Devi to Matlahna. The mineral concession may be granted in small tributaries for proper replenishment of Khad

11.19 Sudanwala Khala (Toposheet No. 53F/6 and 53F/7)

Sudanwala Khala is the right bank tributary of River Bata. It merge into Bata near Dhaula Kuan. Its Total length in Sirmour is about 6.4 km. It originates from the Sudanwala Reserve Forest at an elevation of 655 metre.



Upstream google earth view of Sudanwala Khala near confluence with Gariwali Khol

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)

From Downstream of Confuence of Gariwali Khol to Confluence with river Giri	3.2	78	249600	249350

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 7 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Sudanwala Khala

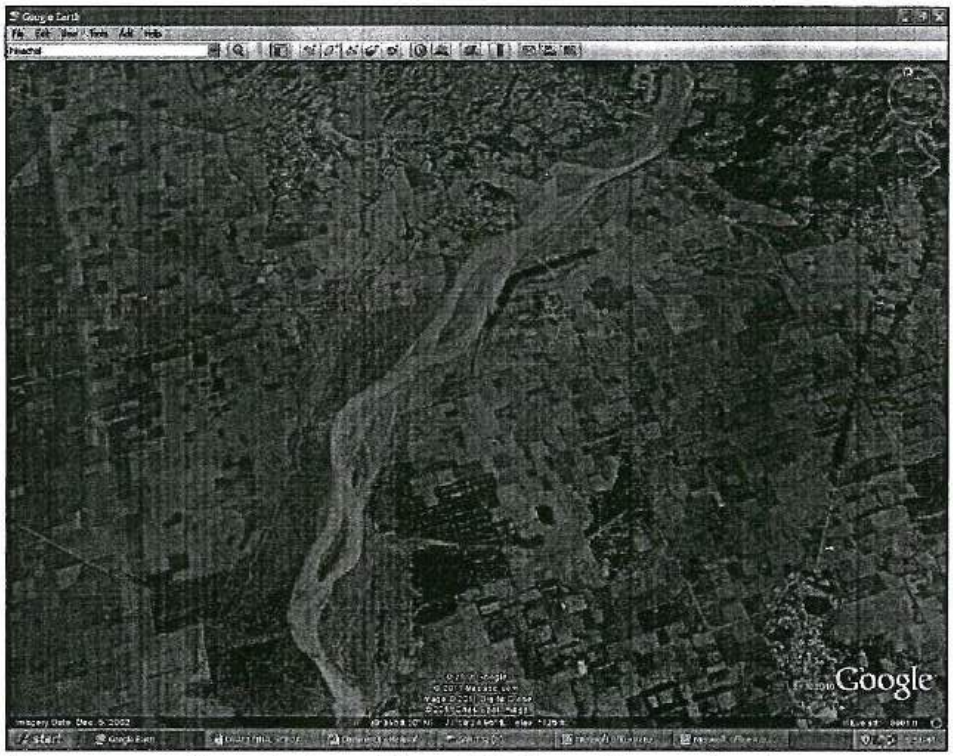
Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
60652	67392	121306	249350
Annual Deposition			
4246	4717	8491	17454

Recommendation

It is evident from the above table that about 249350 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Sudanwala Khala in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 17454 metric tones. As such 249350 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed From Downstream of Confluence of Gariwali Khol to Confluence with river Giri. No concession may be granted in small tributaries for proper replenishment of Khad

11.20 Gumti Nadi (Toposheet No. 53F/2)

Gumti Nadi is the left bank tributary of River Ghaggar and enters in State of Haryana near Katgarh village Churan. Its Total length in Sirmour is about 13.4 km. It originates from the Gumti sambhalwa Reserve Forest at an elevation of 620 metre



Upstream google earth view of Gumti Nadi near Haryana Border

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Near Village Gumti to Haryana Border	9.8	38	372400	372027

Present status of mining.

Presently no mineral concession have been granted in the beds of this stream.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 7 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Gumti Nadi

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
90493	100548	180986	372027
Annual Deposition			
6335	7038	12669	26042

Recommendation

It is evident from the above table that about 372027 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Gumti Nadi in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 26042 metric tones. As such 372027 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed From Downstream of Near Village Gumti to Haryana Border. No mineral concession may be granted in small tributaries for proper replenishment of stream.

11.21 Dholirao Khalla (Toposheet No. 53F/2)

Dholirao Khalla is the left bank tributary of River Yamuna. Its Total length in Sirmour is about 8 km. It originates from the Village Navi near Rajpura at an elevation of 620 metre.

Upstream google earth view of Gumti Nadi near Haryana Border

Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Average Width of Area Recommended for Mineral Concession (in Metre)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (in Metric Tonn) (60%of total mineral Potential)
From Downstream of Near Village Gumti to Haryana Border	9.8	38	372400	372027

Present status of mining.

Presently only one Mining lease have been granted in the bed of this stream in favour of Smt. Savita Bhandari, W/o Sh. Depender Bhandari, Village Salwala, PO Gorkhuwala, Teshil Paonta Sahib, Distt. Sirmour, H.P. for running stone crusher. The average annual production is about **16128** metric ton.

Minor Mineral Potential in the River Bed

As the stream cut its course through the boulder beds of Siwalik rocks and this formation is the prominent source of annual deposition in the river beds. During flood season, the water carries heavy sediment load comprising gravels and sand which are deposited in the bed of stream. The following mineral potentials have been calculated based on the %age of each mineral constituent upto a depth of one metre. The annual deposition of minor mineral in the river bed has been calculated by taking into consideration the annual deposition of about 7 Cms.

Table Showing Minor Mineral Potential and Annual Deposition of Gumti Nadi

Mineral Potential			
Boulder (in MT)	**River Born Bajri (in MT)**	**Sand (in MT)**	**Total Mineable Mineral Potential (in MT)**
90493	100548	180986	372027
Annual Deposition			
6335	7038	12669	26042

Recommendation

It is evident from the above table that about 372027 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Dholirao Khalla in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is approximately to the tune of 26042 metric tones. As such 372027 metric tones of minor mineral can safely be lifted from the river bed. It is therefore recommended that mineral concession can be granted in the river bed From Downstream of Village Navi near Rajpura.One Mining lease is granted in small tributaries for proper replenishment of stream.

12. Summary of Recommendations

Seial Nos.	Name of the River/Stream	Portion of the River/Stream Recommended for Mineral Concession	Length of Area Recommended for Mineral Concession (in Km)	Area Recommended for Mineral Concession (in Sq. metre)	Mineable Minor Mineral Potential (60% of total mineral Potential) (in Metric Tonn)
1	Yamuna	From Downstream of Confluence with Tons River to Behral near Haryana and Uttar Pradesh Border	31	14818000	**16803612**
2	Giri-I	From Downstream of Confluence Khori Ka Nala to Confluence with River Jalal near Dadahu	64	7680000	**8709120**
3	Giri-II	From Downstream of Jataun Barrage to Confluence with River Yamuna	34	16932000	**19200888**
4	Jalal	From Downstream of Village Odar to Confluence with River Giri	27	1215000	**1377810**
5	Bata	From Downstream of Village Uttamwala to Confluence with River Yamuna	26	7540000	**8550360**
6	Nera	From Downstream of Village Bheta to Village Koti	8.4	520800	**590587**
7	Tons	From Downstream of village Dhamog to Confluence with Yamuna River	12.3	467400	**530031**
8	Markanda	From Downstream of Village Gara to Haryana Border	21	2940000	**3333960**

9	Trilokpur Nadi	From Downstream of the Motorable Bridge Near Village Bhudra to Haryana Border	3.4	231200	**255938**
10	Salauni Ki Nadi	From Downstream of Village Maholiya Bas to Confluence with River Markanda	7.6	486400	**538444**
11	Run Nadi	From Downstream of confluence of Tarapur Ki Nadi to Haryana Border	9.5	855000	**946485**
12	Kandiwala Ki Nadi	From Downstream of Village Kandiwala to Confluence with Run	5.1	346800	**383907**
13	Kairi Ka Khala	From Downstream of Village Simbalwala to Confluence with River Markanda	3.2	230400	**255052**
14	Somb Nadi	From Downstream of Village Dhakranwala to Haryana Border Near Devwala Village	5.4	518400	**573868**
15	Lohgarh Ka Khol	From Downstream of Village Lohgarh to Haryana Border	6.6	316800	**350697**
16	Nimbuwala Khala	From Downstream of Village Pir Marusidh to Haryana Border Near Village Palhori	8.6	825600	**913939**
17	Matar Ki Khol	From Downstream of Confuence of Kalhuwala and Brahamanwala streams to Village Matar	4.6	211600	**234241**
18	Jagat Ka Nala	From Downstream of village satna to Confuence with Giri	2.3	207000	**229149**
19	Katli Ki Nadi	From Downstream of village Karlia to Confuence with Dhagat Ka Khala	2.2	162800	**180219**

20	Sudanwala Khala	From Downstream of Confuence of Gariwali Khol to Confluence with river Giri	3.2	249600	**249350**
21	Gumti Nadi	From Downstream of Near Village Gumti to Haryana Border	9.8	372400	**372027**
22	Dholirao Khalla	From Downstream of Village Navi to confluence with river Yamuna	4.5	211500	**126900**