

## **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 Sirmour 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**

| <b>Sr. No.</b> | <b>Name &amp; Address of Lease</b>   | <b>Khasra No. of Lease</b> | <b>Area (Bighas/ Kanals/ Hects.)</b> | <b>Mohal/Mauza</b> | <b>Period</b>        |
|----------------|--|----------------------------|--------------------------------------|--------------------|----------------------|
| 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             |

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|     |   |  |         |                  |                            |
|-----|---|--|---------|------------------|----------------------------|
|     | Rampur Ghat, Teh. Paonta Sahib, Distt. Sirmour.   | 487/332/148/1,<br>586/473/184/2 &<br>584/477/188 |         |                  | to<br>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<br>to<br>27.09.10 |
| 4.  | Sh. Inder Singh Vill. Rampur Ghat, P.O. Shivpur, Teh. Paonta Sahib, Distt. Sirmour  | 431/322/1,<br>431/322/2,<br>638/613/590/188/4    | 19.84   | Mohkampur Nawada | 26.09.05<br>to<br>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<br>23.04.20    |
| 6.  | M/S Chandel Associates, 186/10, Devi Nagar, Paonta Sahib, Distt. Sirmour (H.P.)   | 1248/1026/912/2 &<br>911/679/3                   | 9.5     | Manpur Devra     | 21.11.09<br>to<br>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<br>to<br>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<br>to<br>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<br>to<br>23.05.28 |
| 10. | Mahender Singh, Devinagar, Paonta Sahib   | 283/13/1   | 10.1    | Kunja            | 15.10.10<br>to<br>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<br>to<br>12.12.26 |
| 12. | Sh. Gajender Pal Singh S/o Sh. Surain Singh, 519 Vijay Park extension, Dehradun (UK)                                      | 637/613/188 &<br>639/563/480/1                   | 10.4    | Mohkampur Nawada | 02.11.10<br>to<br>01.11.25 |
| 13. | M/S Yamuna Mines and Minerals,  |  | 3.75    | Gojar Addain     | 08.10.15<br>to             |

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|     |  |  |      |                  |                      |
|-----|--|--|------|------------------|----------------------|
|     |  |  |      |                  | 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 |

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|     |                   |                    |     |              |                         |
|-----|-------------------|--------------------|-----|--------------|-------------------------|
| 30. | Kamal Kumar Gupta | 901/674/1, 900/674 | 2.1 | Manpur Devra | 31.03.12 to<br>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<br>( 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<br>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 stream 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 succevely by finer and finer particles. When the stream begins to flow more vigourously, 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 tributaries 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<br>Boulder conglomerate |
|          | Cobble                          |              | Cobble gravel<br>Cobble conglomerate   |
| 64 mm--- | Pebble                          |              | Pebble gravel<br>Pebble conglomerate   |
| 4 mm---  | Granule                         |              | Granule gravel                         |

|              |      |                   |
|--------------|------|-------------------|
| 2 mm--       | Sand | Sand<br>sandstone |
| 1/16 mm--    | Silt | Silt<br>Siltstone |
| 1/256 mm---- | clay | Clay<br>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<sup>2</sup>/sec) and is equal to the channel cross-sectional area (m<sup>2</sup>) times the average stream velocity (m/sec).

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

### 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 velocity<sup>2</sup>, 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.

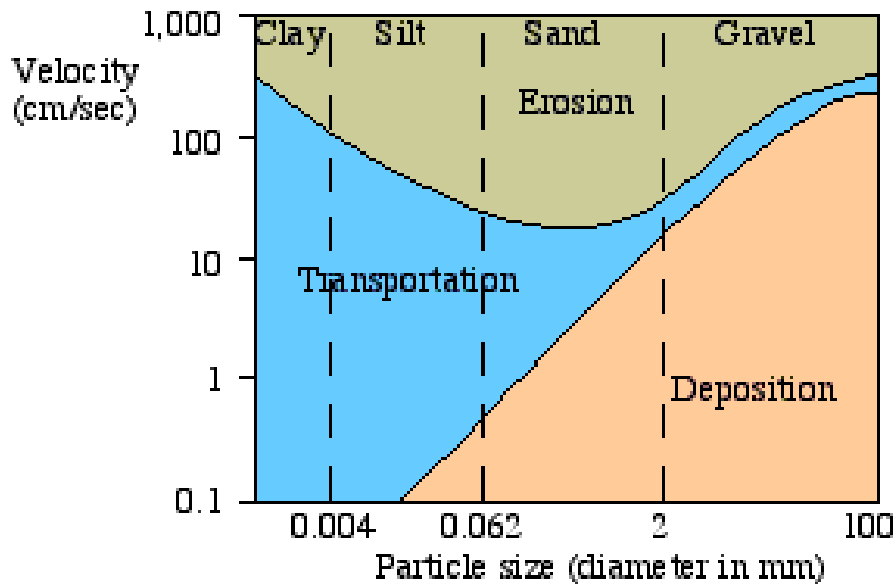


Figure 1. Diagram showing the stream velocity required to erode, transport and deposit particles of various sizes.

## 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<sub>4</sub> and HCO<sub>3</sub>. 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 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<sup>0.1</sup>, 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<sup>0</sup> (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*).

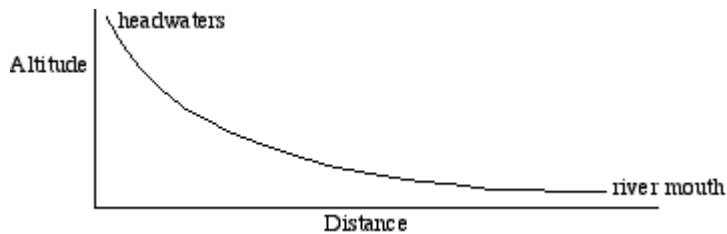


Figure 2. Long profile of a graded stream, showing a regular change in gradient.

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                  |

## **DISTRICT SURVEY REPORT**

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

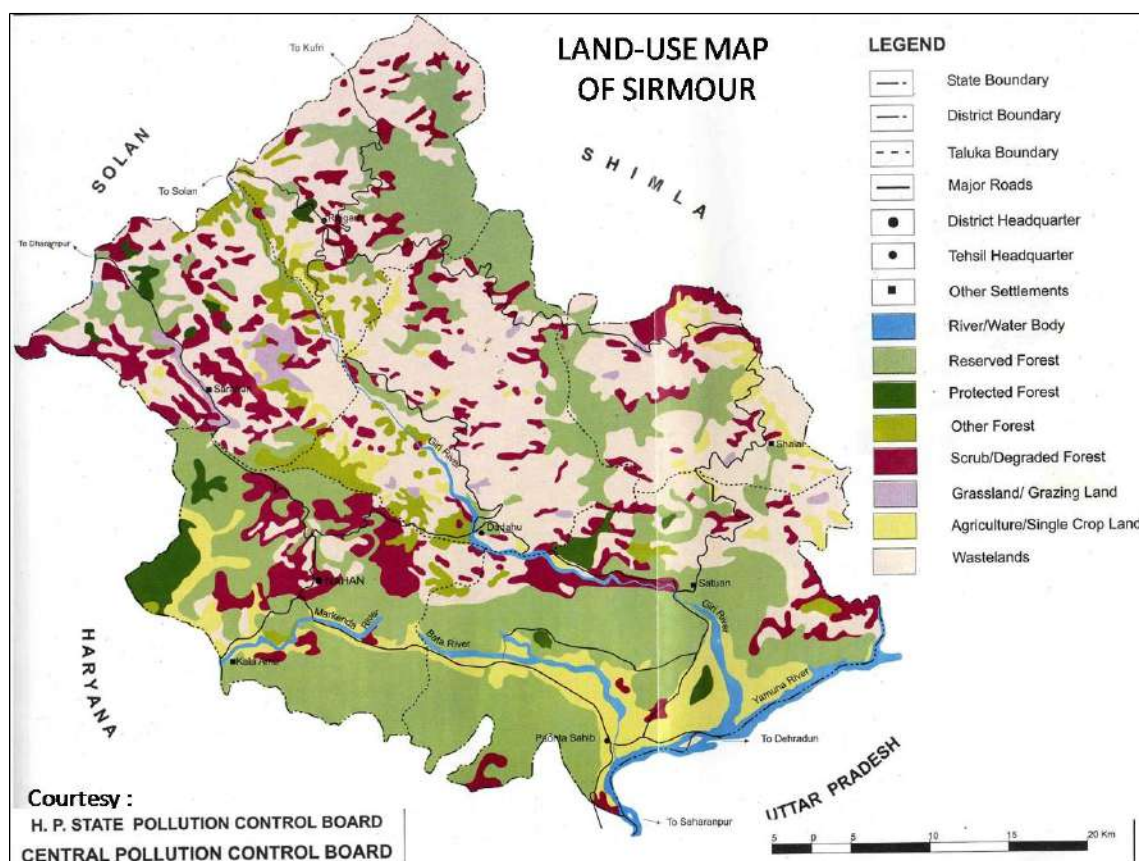
Number of villages - 966  
Total Population - 4,58,593 (2001 census)  
Density per Sq Km - 162



**4.2 Land Utilization Pattern**

The general land utilization pattern of the District is as given below

| Land Utilization Pattern of the District (in hect) |        |
|--|--------|
| 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 conditions 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 metres in 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 fir and alpine forest to the higher elevations. The following are the main forest type in the district:-

- Deodar
- Chir pine
- Oak
- Fir
- 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 Bear
- Ghoral (Himalayan Goat)
- Barking Deer (Kakar)
- Langours
- 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 sandy 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 possesses diverse climatic conditions. 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 kinds i.e. oil seeds and other 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
- Sugarcane
- Ginger
- Vegetables (Peas, Tomato, Capsicum, Cabbage, Cauliflower)
- Spices (Pepper 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 a 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 Husbandry plays a key 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 rivers 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 Uttarakhand. The district lies between 30°22'30" to 31°01'20" north latitude and 77°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.

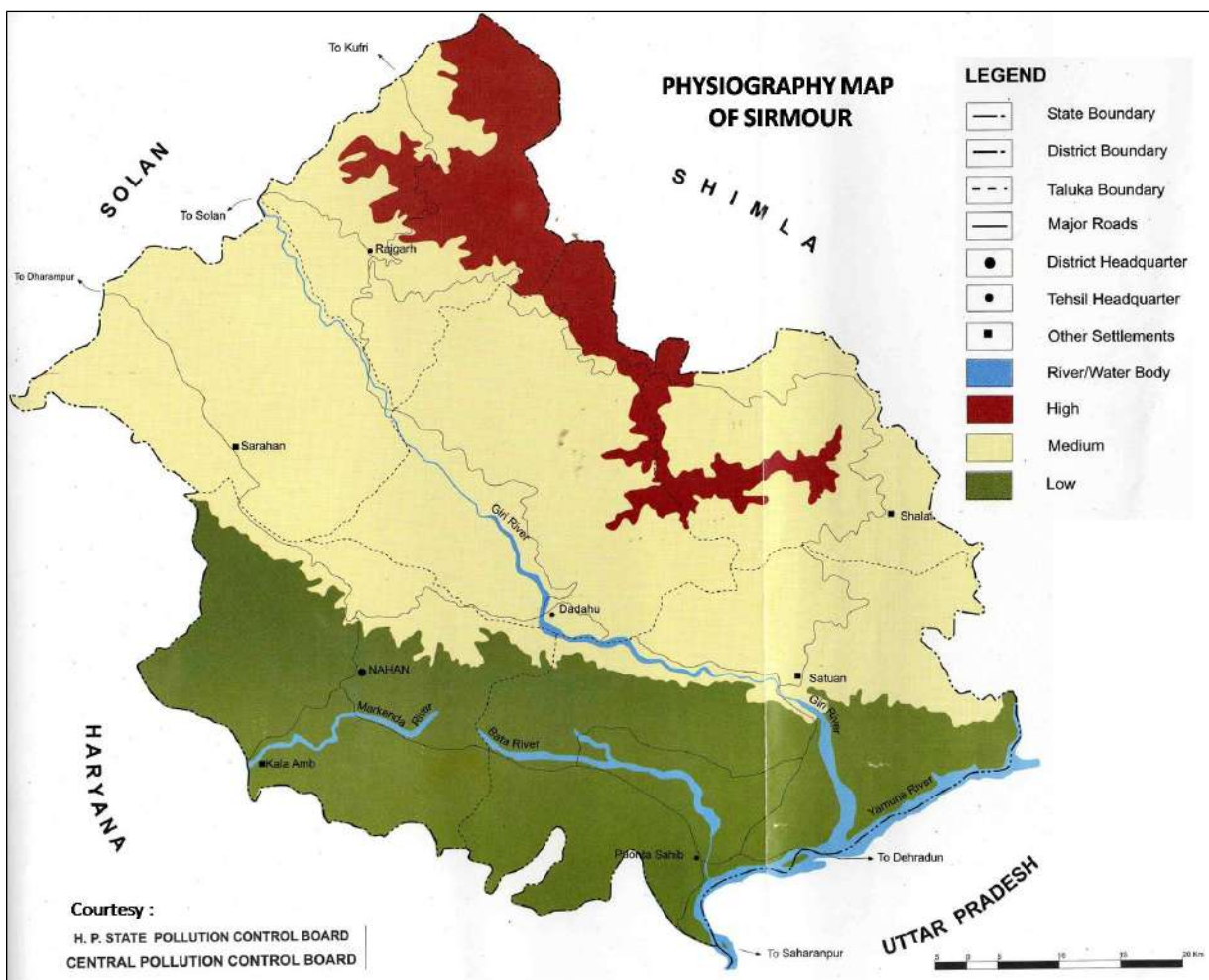
Broadly speaking the district is hexagonal in shape with longest length from west to east being 77 km. and maximum width from north to south being 80 km. Geographically the district can be divided into three parts.

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.

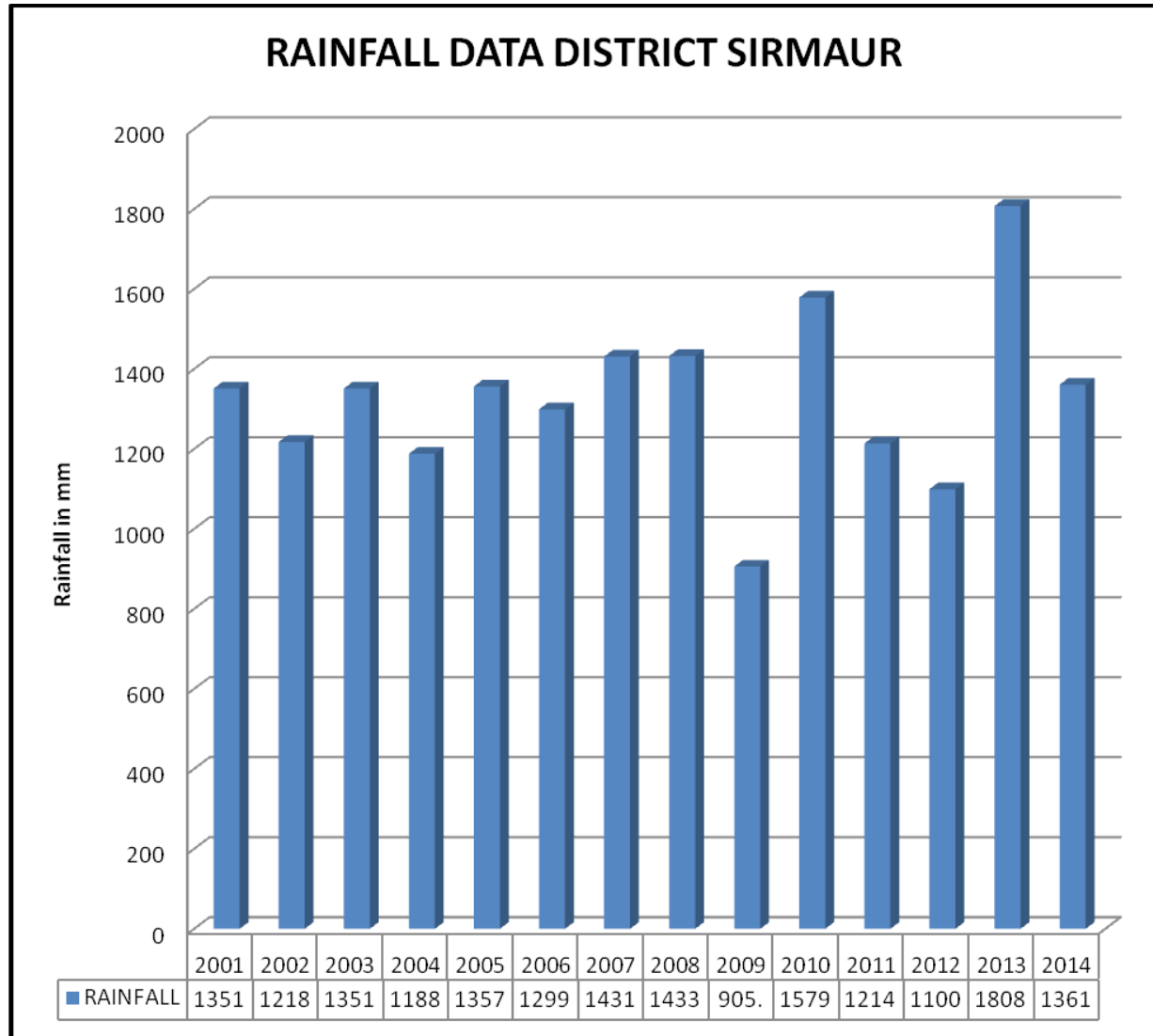
The Cis –Giri (Giri War Region) is intersected by three main ranges which run from north-west to south-east. Of them, first is the Sain Dhar which runs parallel to the river Giri and second is the Dharthi Dhar. Between these to Dhar flows river Jalal. The third is quite a low range, which runs from around 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 storms. 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.

## DISTRICT SURVEY REPORT

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 confined 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 fault of the Himalayas, extending from Indus to Brahmaputra, runs through the south central portion of the district. The major tectonic break here is called Nahan thrust, and along this fault 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.

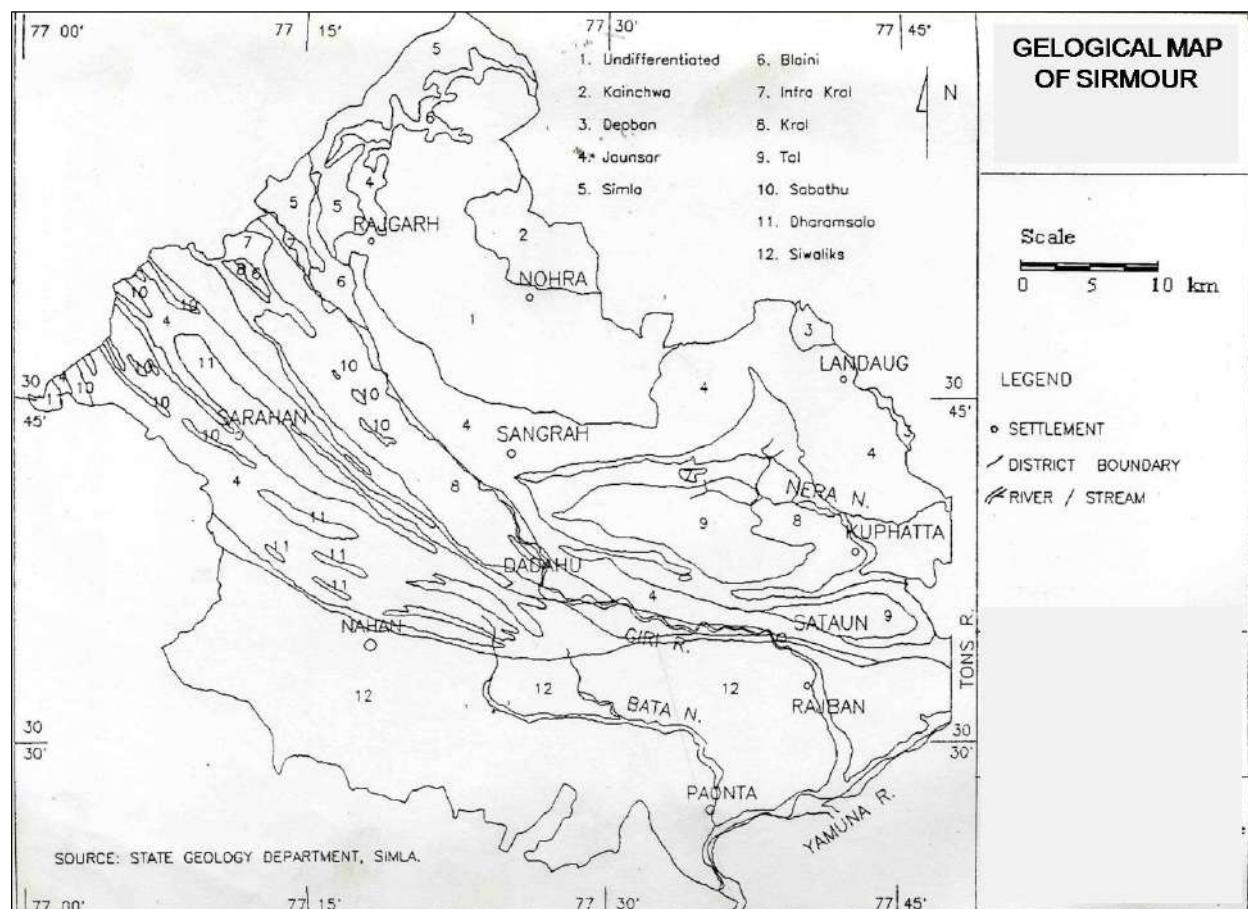
Generalised stratigraphic Successions of the district is given in the following table.

| 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 Eocene to Upper 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  |

## DISTRICT SURVEY REPORT

|                         |                |  |
|-------------------------|----------------|--|
|                         |                | argillaceous sandstone.  |
| Cretaceous and Jurassic | 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 , carbnpaceous 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.

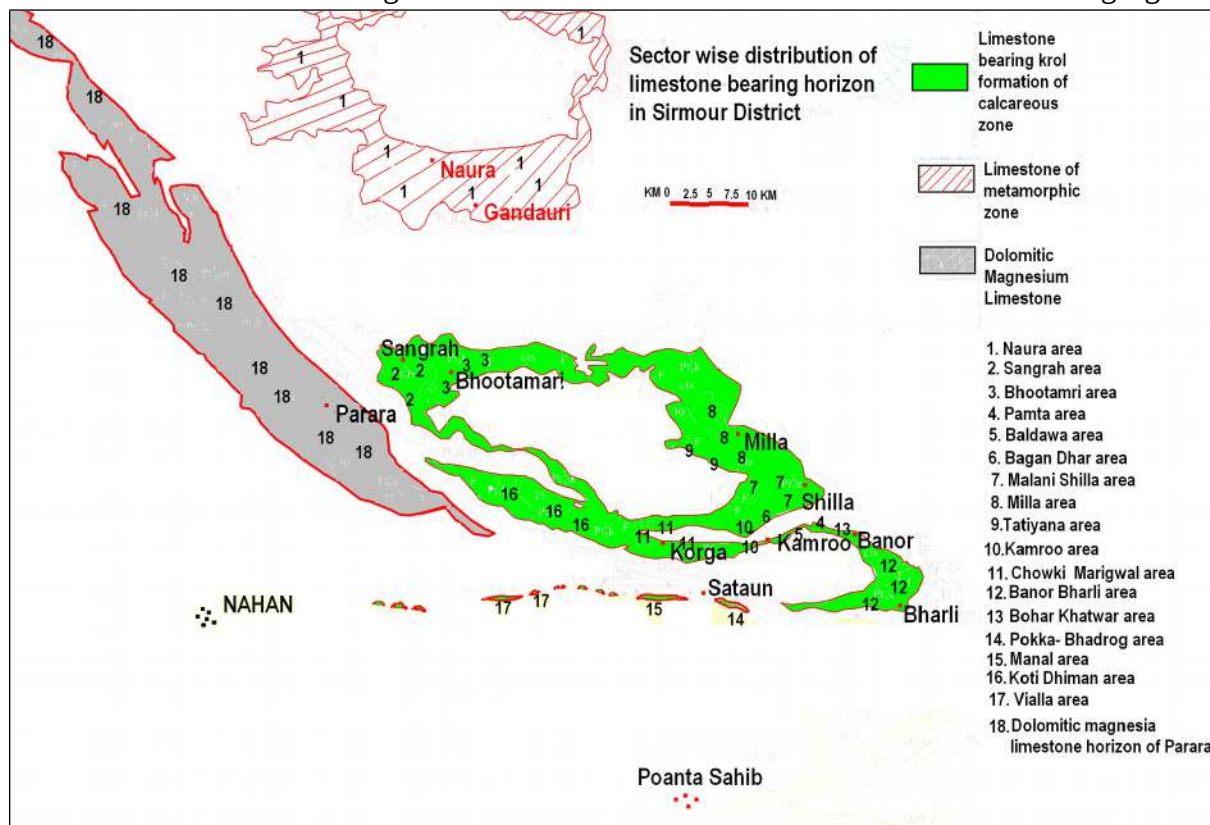
The total limestone reserve of Sirmour district are ( as per Geological Survey of India) is about 1200 million tonnes. The detail of some of the limestone deposit is given below in the following table.

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

| Limestone deposit   | Reserve  | Chemical Analysis  |
|---|--|--|
| <b>Naura Sub- Tehsil</b><br>Datwari ( 30° 46' 45" : 77° 28'00") Chunvi ( 30° 46'30" : 77° 24'10")                                   | Potential 101.36 million tonnes, Inferred 21.44 million tonnes | CaO 53.93 %, MgO 0.61 %  |
| <b>Naura Sub- Tehsil</b><br>Hathna( 30° 48' 00" : 77° 25'15") Olana ( 37° 48'00" : 77° 26'00")                                      | Probable 29.87 million tonnes                                  | CaO 53.90 %, MgO 0.66 %, Al <sub>2</sub> O <sub>3</sub> 0.22% and Fe <sub>2</sub> O <sub>3</sub> 0.19% |
| <b>Naura Sub- Tehsil</b><br>Dida-( 30° 46' 45" : 77° 25'20") Bhanra ( 30° 46'15" : 77° 26'00") Shangoli ( 30° 46' 40" : 77° 26'45") | Reserve upto 100 metres = 34.56 million tonnes                 | CaO 53.22 %, MgO 14.1 %,   |
| <b>Naura Sub- Tehsil</b><br>Naura -( 30° 47' 10" : 77° 24'10") Hindga ( 30° 48'40" : 77° 23'30")                                    | Reserve upto 60 metres = 6.26 million tonnes                   | CaO 53.95 %, MgO 0.88 %,   |
| <b>Naura Sub- Tehsil</b><br>Bulain Dhar -( 30° 47' 10" : 77° 24'10")  | Reserve upto 60 metres = 1.94 million tonnes                   | CaO 53.60 %, MgO 0.95 %,   |
| Bhatrog ( 30° 32' 45" : 77°   | 48.84 million tonnes   | CaO 50 %, MgO 1 %,   |

|  |  |           |
|--|--|-----------|
| 38'53") Baila ( 30° 34' 42" :<br>77° 28'19") Section             |  |           |
| Sataun-Kamroo- Banor – Bharli<br>–Pamta- Shilla – Sangrah sector | Reserve upto 30 metres<br>= 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° 37' N – 77°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 from 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 <sub>2</sub>              | 0.08  |
| R <sub>2</sub> O <sub>3</sub> | 0.30  |
| MgO                           | 0.15  |
| CaO                           | trace |
| SO <sub>3</sub>               | 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 <sub>2</sub>              | 0.38  | 0.20  | 0.6   |
| R <sub>2</sub> O <sub>3</sub> | 0.59  | 0.34  | 0.50  |
| MgO                           | 12.45 | 14.44 | 4.16  |
| CaO                           | 18.07 | 20.90 | 6.31  |
| SO <sub>3</sub>               | 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**

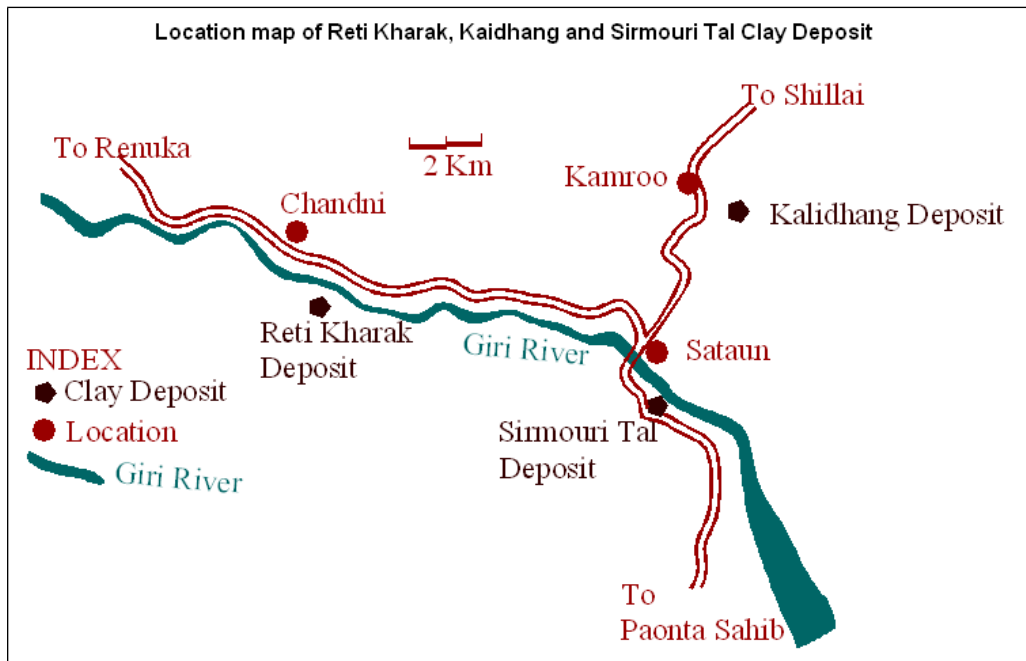
In Bench area (30°47' : 77°37') in Sirmour district, bauxite occurs in isolated patches at the base of Eocene/Palaeocene rocks i.e. Kakra and Subathu Formations. The deposit contains low alumina and high silica. Bauxite at Nahan (30° 33' :77°16'). Its outcrop is buried under a landslide.

### **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 Sirmour 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 clay 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 Kalidhang 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 Sirmour-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 ( $30^{\circ}50'30''$ ;  $77^{\circ}24'15''$ ), Roundi ( $30^{\circ}49'30''$ ;  $77^{\circ}27'00''$ ), Kotiyan ( $30^{\circ}49'08''$ ;  $77^{\circ}27'15''$ ) and Gudag, ( $30^{\circ}46'30''$ ;  $77^{\circ}29'15''$ ). 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 ( $30^{\circ}35'$ ;  $77^{\circ}44'$ ).

### Coal

In Sirmour District at Deothal ( $31^{\circ}51'$ ;  $77^{\circ}10'$ ) 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 ( $30^{\circ}33'$ ;  $77^{\circ}38'$ ), 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 ( $30^{\circ} 44'$ :  $77^{\circ} 44'$ ). 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  $60^{\circ}$  W direction after which it becomes narrow and is caved. This audit is located in yellowish – brown friable phyllite trending N  $70^{\circ}$  W- S $70^{\circ}$ E and dipping  $65^{\circ}$  to NE. The ore body consist of massive load comprising pyrite, minor specks of galena and sphalerite. The load is 0.70 m thick and strikes in N $50^{\circ}$  W –S $50^{\circ}$ E directory and dips  $35^{\circ}$  to  $65^{\circ}$  to the NE. The load appears to be localized along the anticline trending N $70^{\circ}$ W- S $70^{\circ}$ E. 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 limestone. This audit is 3.70 m long and inclined at an angle of  $30^{\circ}$  in a N $50^{\circ}$ E direction.

(ii) Synsedimentary, polymetallic sulphide mineralisation occurs within an interbedded slate-limestone sequence near the Deoban-Shimla Group contact in Dathyari- ( $30^{\circ} 41'$  :  $77^{\circ} 45'$ ) - Chamri ( $30^{\circ} 43'$ :  $77^{\circ} 44'$ )- Auri ( $30^{\circ}42'$  :  $77^{\circ} 44'$  ) 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 N $70^{\circ}$ W-S $70^{\circ}$ E occurs along a shear zone in slates. Another sulphide vein runs sub-parallel to this zone and strikes in N $60^{\circ}$ W-S $60^{\circ}$ E 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 ( $30^{\circ} 38'$  :  $77^{\circ}27'$  ). Large pebbles with rich galena mineralisation are a common sight all along the Amba *Nala*. Small gossanised band measuring 4m x 1m occurs in sandstone and shale of subathu Formation, one kilometre east of Chapla ( $30^{\circ} 58'$  :  $77^{\circ} 27'$ ) in Dabur God. Lead value varies from 0.9 to 0.38%. Old workings of lead ore have been reported at Danheri ( $31^{\circ}00'$ :  $77^{\circ}00'$ ) and Panuh ( $30^{\circ} 50'$  :  $77^{\circ}08'$ ).

## 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 Limestone and as selenite crystals associated with the carbonaceous shales in the Nahan Sandstone. 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° 37' 30" : 77° 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, limestone 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 latter with red shale of Krols.

The mineral occurs in three veins

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 comparatively 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° 33' : 77°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° 36' : 77°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° 33' : 77°42')

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

Ridana ( 30° 34' : 77°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° 34' : 77° 14')

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

Nahan (30° 33' : 77° 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° 47': 77° 22' ) - Kanhari (30°47': 77° 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 19<sup>th</sup> 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 old 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 white 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 lenticular 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 upper 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.

Kanhari 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 thick. 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 bank 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 direction.

Reoli Block - The mineralized band exposed along the Reoli 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. It 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 limestone 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**

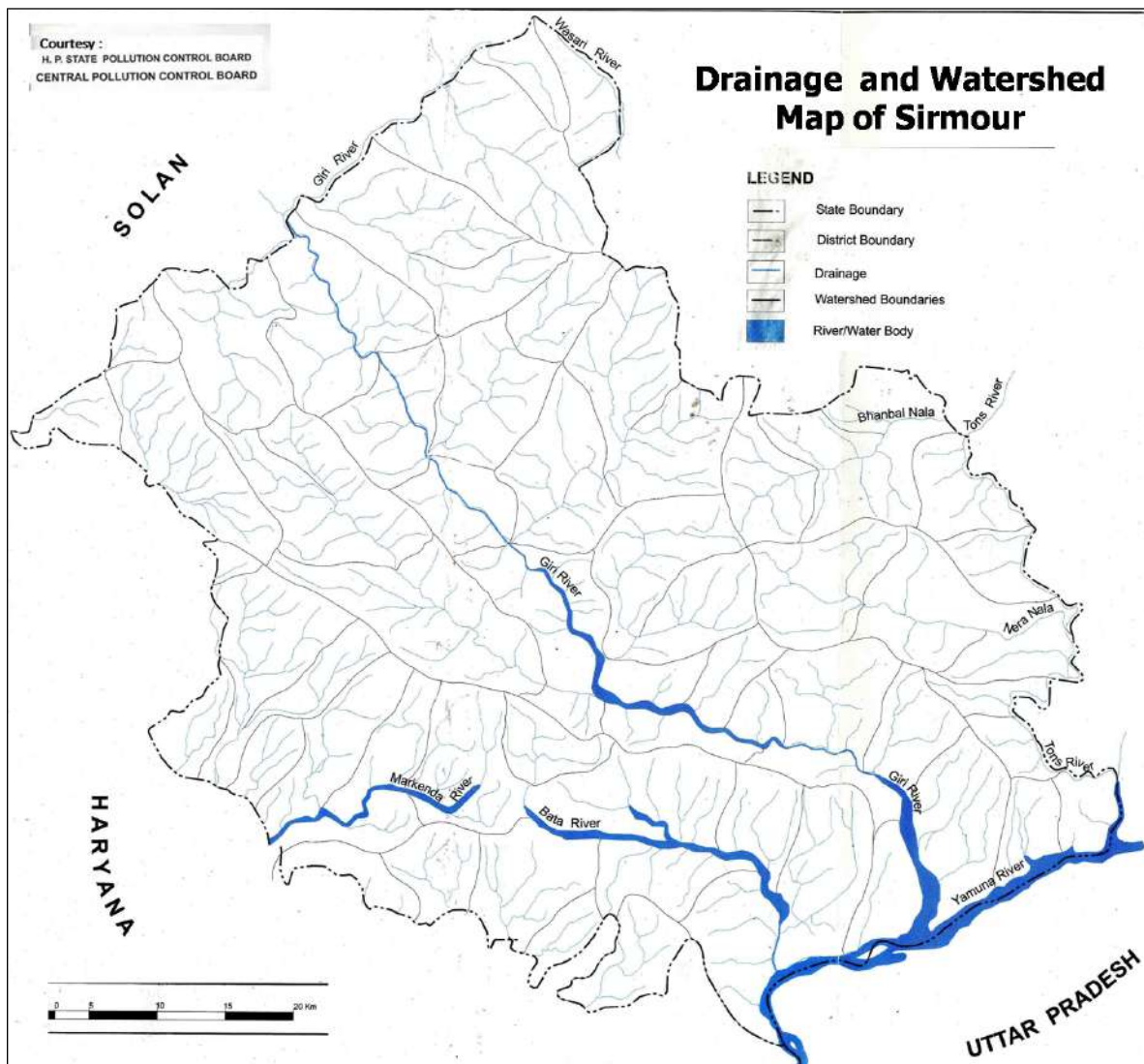
In Sirmour District Steatite of good quality occurs at Nahan (30°33':77° 17').

### **Zinc**

In Sirmour District Zinc is found associated with galena and pyrite at Anyar (30° 44' : 77° 45') and Chamri (30°43' :77°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 tributaries 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. Its 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 (38° 59' N 78° 27' E) at an elevation about 6387 mtrs. in district uttrakashi. The Yamuna catchment drains 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 height 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-eastern 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<br>(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.

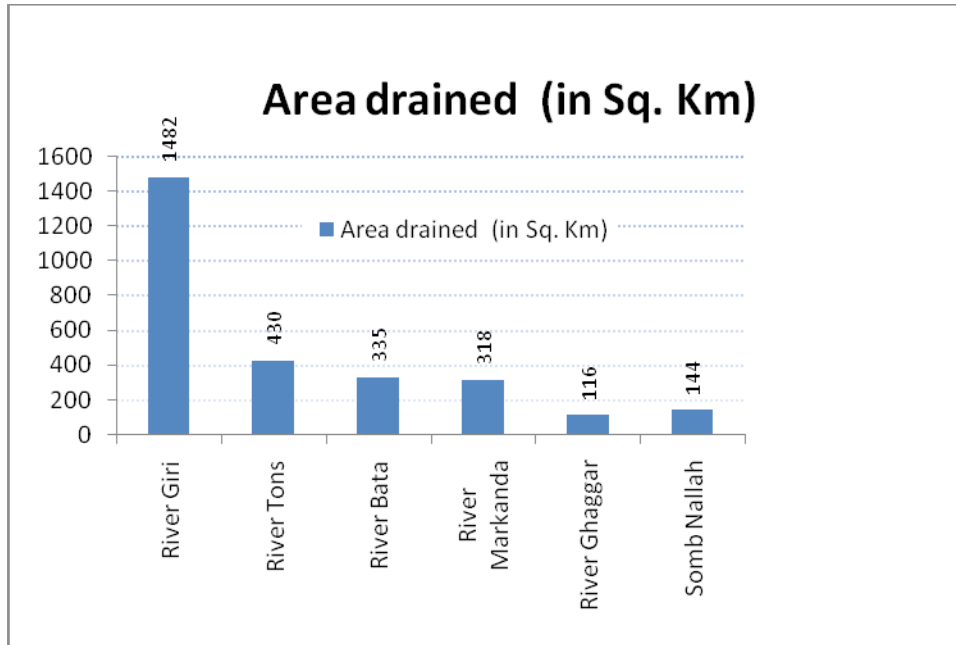


Chart showing Area of district Sirmour being drained by different streams

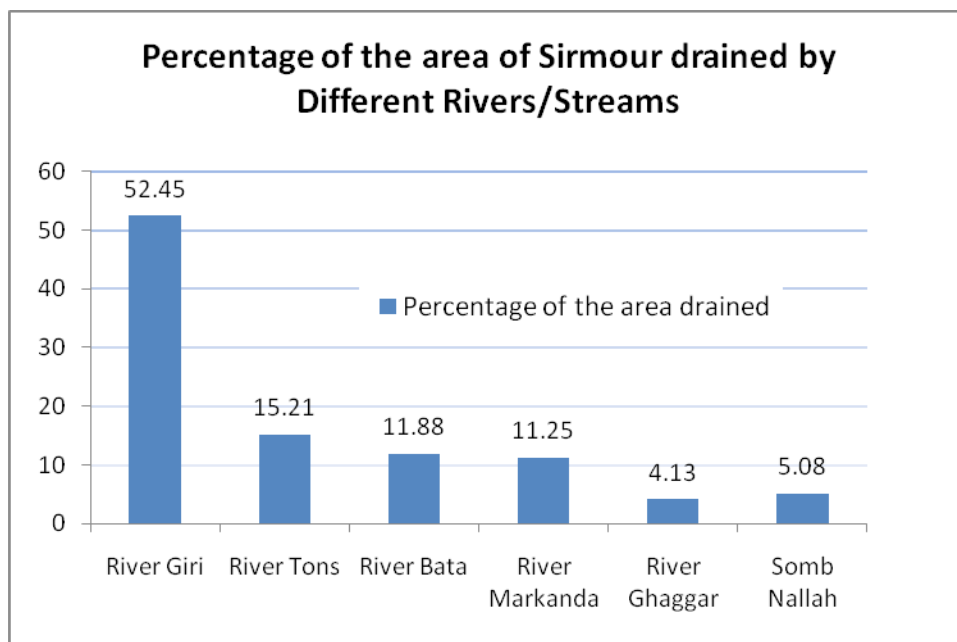


Chart showing Percentage of Area being drained by different streams

**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                          |

## DISTRICT SURVEY REPORT

|    |                      |      |   |      |
|----|----------------------|------|---|------|
|    |                      |      | Near Village<br>Santhal                   |      |
| 8  | Trilokpur Nadi       | 9.8  | Kaluwala Ki Dhar                          | 590  |
| 9  | Salauni Ki Nadi      | 18.2 | Near Village<br>Shilli Sinari             | 1150 |
| 10 | Run Nadi             | 21.4 | Dharti Dhar                               | 1290 |
| 11 | Kandiwala Ki<br>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<br>Khol   | 9.8  | LohGarh RF                                | 655  |
| 15 | Nimbuwala<br>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<br>Near Village<br>Santhal | 1390 |
| 19 | Sudanwala<br>Khala   | 6.4  | Sudanwala RF                              | 655  |
| 20 | Gumti Nadi           | 13.4 | Gumti<br>Sambhalwa RF                     | 620  |
| 21 | Dholi Rao<br>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 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 particular river/stream 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 replenished 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 excluded as waste while calculating the mineral potential of particular river/stream. The specific gravity of each mineral constituents is different. While calculating the mineral potential, the average specific gravity is taken as 2.25. The percentage of mineral constituents like boulder, river borne bajri, sand are also 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 factors 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.

## DISTRICT SURVEY REPORT

| 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:

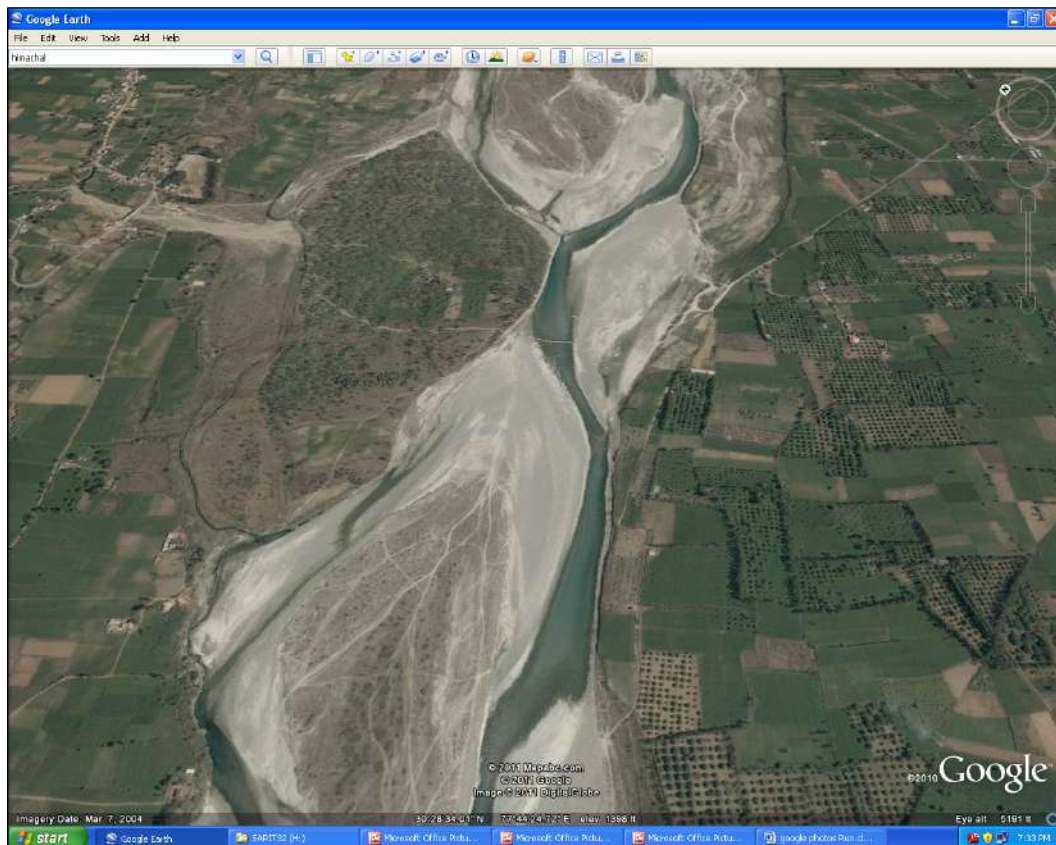
For free sale

| 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                      |
|        | <b>Total Area</b>   | <b>94.6 Bighas</b>        |

## DISTRICT SURVEY REPORT

### 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.        |
|        | <b>Total Area</b>  | <b>406-12 Bighas</b> |



Upstream google earth view of Yamuna River near Guruwala

## DISTRICT SURVEY REPORT

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**

| <b>Mineral Potential</b>   |                                     |                         |   |
|----------------------------|-------------------------------------|-------------------------|---|
| <b>Boulder<br/>(in MT)</b> | <b>River Born<br/>Bajri (in MT)</b> | <b>Sand<br/>(in MT)</b> | <b>Total Mineable<br/>Mineral Potential<br/>(in MT)</b> |
| 5601204                    | 6801462                             | 4400946                 | 16803612  |
| <b>Annual Deposition</b>   |                                     |                         |   |
| 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.

**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 height 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**

| <b>Sr. No</b> | <b>Name of the Party</b>  | <b>Area</b>   |
|---------------|---|---------------|
| 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 (Uttarakhand)                         | 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  |

## DISTRICT SURVEY REPORT

|                   |  |                           |
|-------------------|--|---------------------------|
| 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) |
| <b>Total Area</b> |  | <b>1061-2 Bighas</b>      |

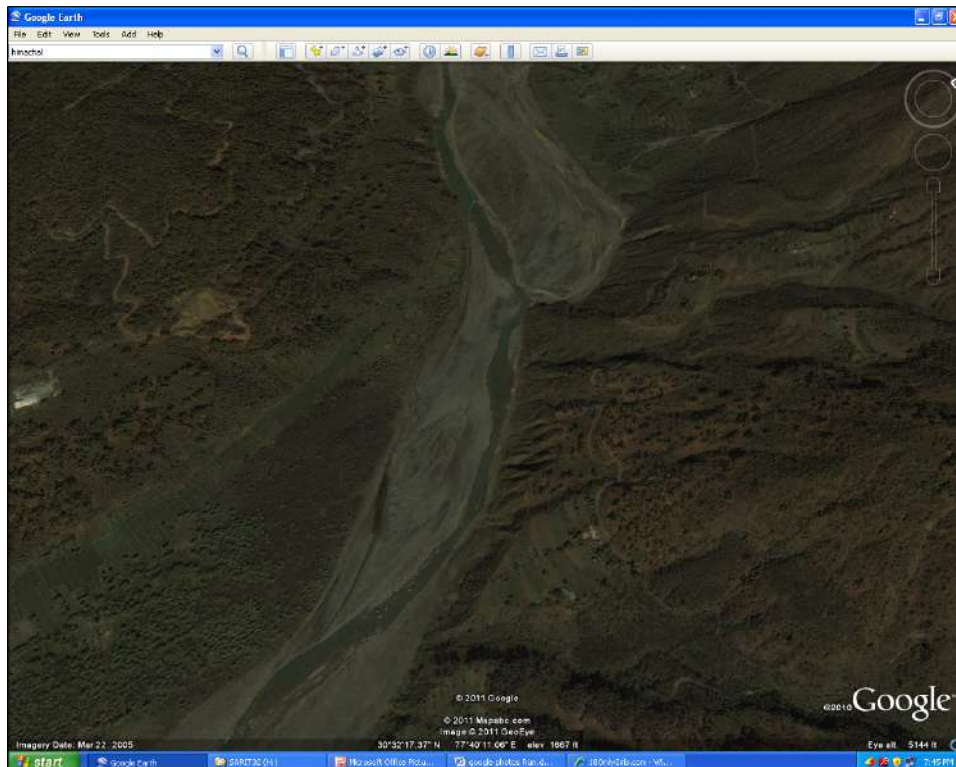
### For free sale

| <b>Sr. No</b> | <b>Name of the Party</b>   | <b>Area</b>  |
|---------------|--|--------------|
| 1.            | Shri Vishal Aggarwal, S/o Shri Nehar Singh, 12/10, Ashirwad Enclave, Ballupur, Dehradun (Uttarakhand).                         | 58-02 bighas |
| 2.            | Shri Sanjay Kishore, S/o Shri Gopi Chand, Main Market, Vikas Nagar, Dehradun (Uttarakhand)                                     | 58-01 bighas |
| 3..           | Shri Ramesh Chand Arora, S/o Shri Sagar Chand Arora, 41/6, Alkapuri, Dehradun (Uttarakhand)                                    | 57-10 Bighas |
| 4.            | Shri Inder Singh, S/o Shri Mangal Singh 194/3/3, Rajpur Road, Dehradun (Uttarakhand).  | 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          |

|                   |  |                     |
|-------------------|--|---------------------|
|                   |  |                     |
| <b>Total Area</b> |  | <b>336-5 Bighas</b> |

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

## DISTRICT SURVEY REPORT

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**

| <b>Mineral Potential</b> |                                 |                     |   |
|--------------------------|---------------------------------|---------------------|---|
| <b>Boulder (in MT)</b>   | <b>River Born Bajri (in MT)</b> | <b>Sand (in MT)</b> | <b>Total Mineable Mineral Potential (in MT)</b> |
| 2903040                  | 3525120                         | 2280960             | 8709120   |
| <b>Annual Deposition</b> |                                 |                     |   |
| 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**

| <b>Mineral Potential</b> |                                 |                     |   |
|--------------------------|---------------------------------|---------------------|---|
| <b>Boulder (in MT)</b>   | <b>River Born Bajri (in MT)</b> | <b>Sand (in MT)</b> | <b>Total Mineable Mineral Potential (in MT)</b> |
| 6400296                  | 7771788                         | 5028804             | 19200888  |
| <b>Annual Deposition</b> |                                 |                     |   |
| 320015                   | 388589                          | 251440              | 960044  |

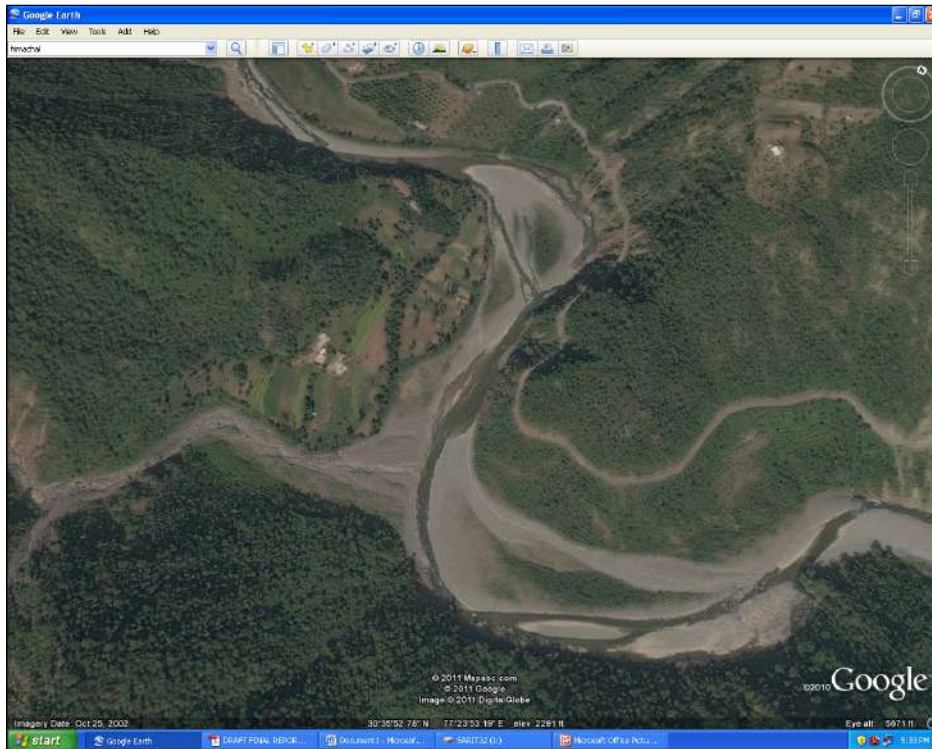
**Recommendation**

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<br>Confluence<br>with River<br>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**

| <b>Mineral Potential</b>   |                                     |                         |   |
|----------------------------|-------------------------------------|-------------------------|---|
| <b>Boulder<br/>(in MT)</b> | <b>River Born<br/>Bajri (in MT)</b> | <b>Sand<br/>(in MT)</b> | <b>Total Mineable<br/>Mineral Potential<br/>(in MT)</b> |
| 459270                     | 557685                              | 360855                  | 1377810   |
| <b>Annual Deposition</b>   |                                     |                         |   |
| 22964                      | 27884                               | 18043                   | 68891   |

**Recommendation**

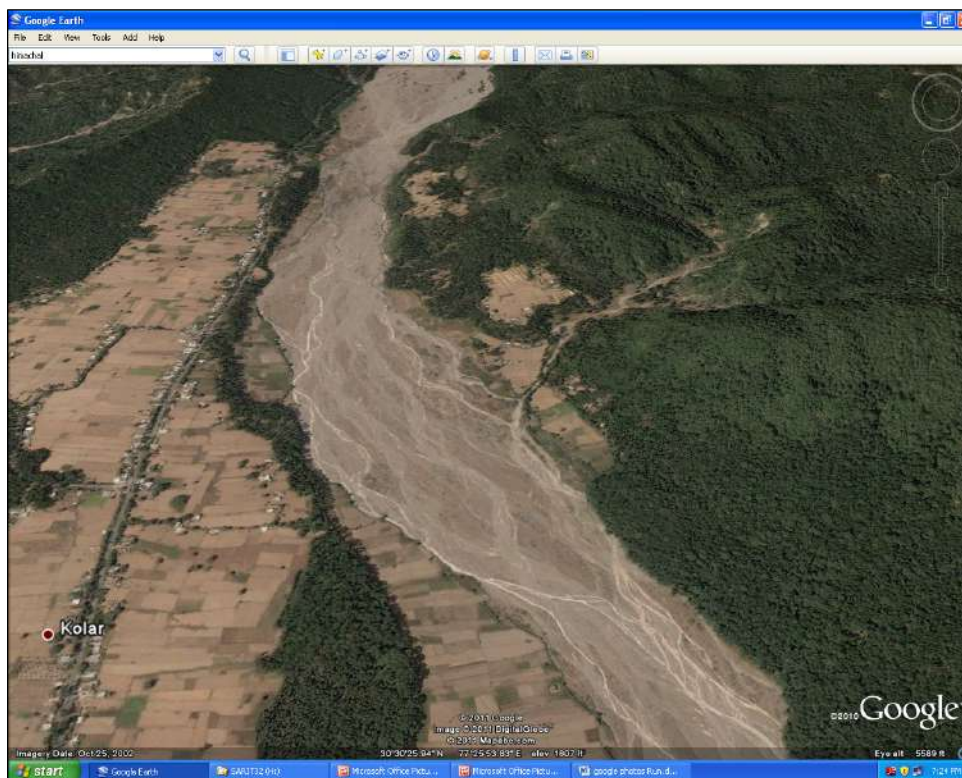
It is evident from the above table that about 1377810 metric tones of different sizes of minor minerals are available upto depth of one metre in the river bed of Jalal river in the Sirmour District. Similarly the annual deposition of minor mineral in the river bed is apprximately to the tune of 68891 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.

## DISTRICT SURVEY REPORT

| 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**

| <b>Mineral Potential</b>   |                                     |                         |   |
|----------------------------|-------------------------------------|-------------------------|---|
| <b>Boulder<br/>(in MT)</b> | <b>River Born<br/>Bajri (in MT)</b> | <b>Sand<br/>(in MT)</b> | <b>Total Mineable<br/>Mineral Potential<br/>(in MT)</b> |
| 2850120                    | 3460860                             | 2239380                 | 8550360   |
| <b>Annual Deposition</b>   |                                     |                         |   |
| 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 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 |
|--|---|---|--|--|
|  |   |   |  |  |

## DISTRICT SURVEY REPORT

|  |     |    |        |            |
|--|-----|----|--------|------------|
| n  |     |    |        | Potential) |
| From<br>Downstream<br>of<br>Village<br>Bheta to<br>Village<br>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**

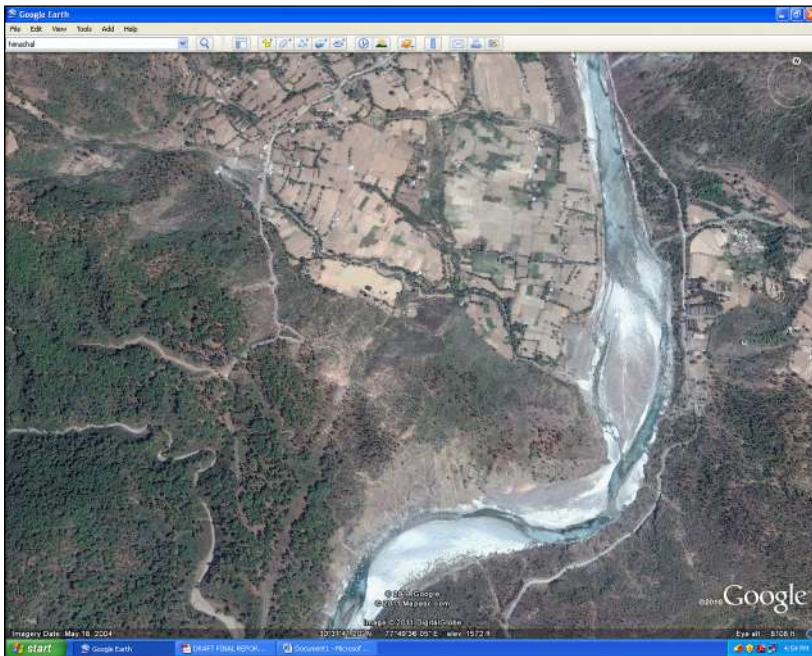
| <b>Mineral Potential</b>   |                                     |                         |   |
|----------------------------|-------------------------------------|-------------------------|---|
| <b>Boulder<br/>(in MT)</b> | <b>River Born<br/>Bajri (in MT)</b> | <b>Sand<br/>(in MT)</b> | <b>Total Mineable<br/>Mineral Potential<br/>(in MT)</b> |
| 196862                     | 239048                              | 154677                  | 590587  |
| <b>Annual Deposition</b>   |                                     |                         |   |
| 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

## DISTRICT SURVEY REPORT

| 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**

| <b>Mineral Potential</b> |                                 |                     |   |
|--------------------------|---------------------------------|---------------------|---|
| <b>Boulder (in MT)</b>   | <b>River Born Bajri (in MT)</b> | <b>Sand (in MT)</b> | <b>Total Mineable Mineral Potential (in MT)</b> |
| 176678                   | 214536                          | 138817              | 530031  |

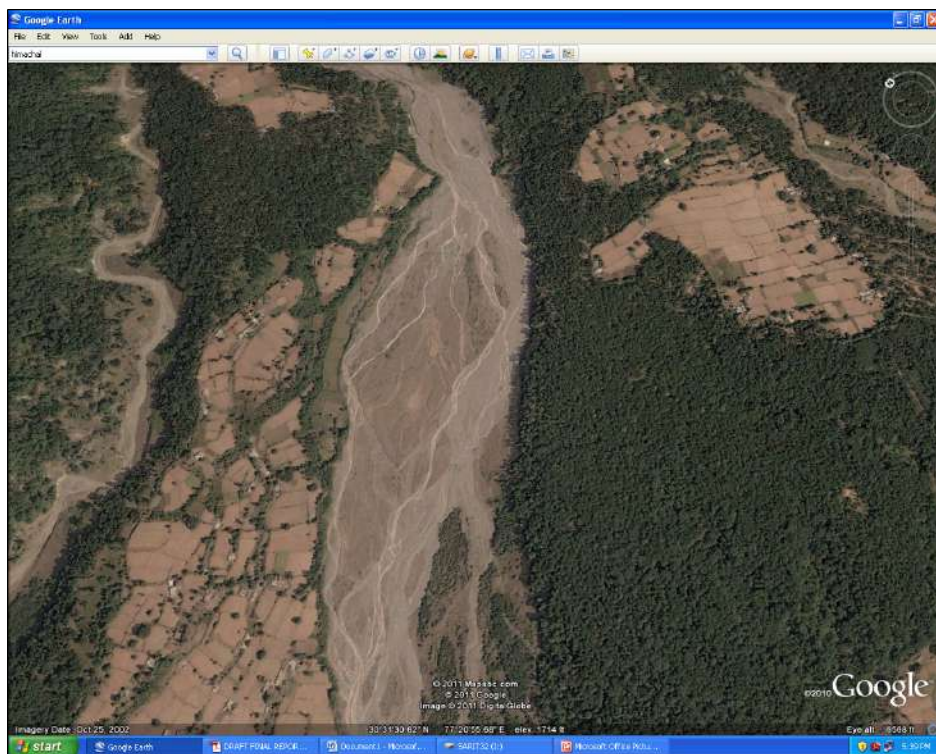
| Annual Deposition |       |      |       |
|-------------------|-------|------|-------|
| 12367             | 15017 | 9717 | 37102 |

## **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 production is 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**

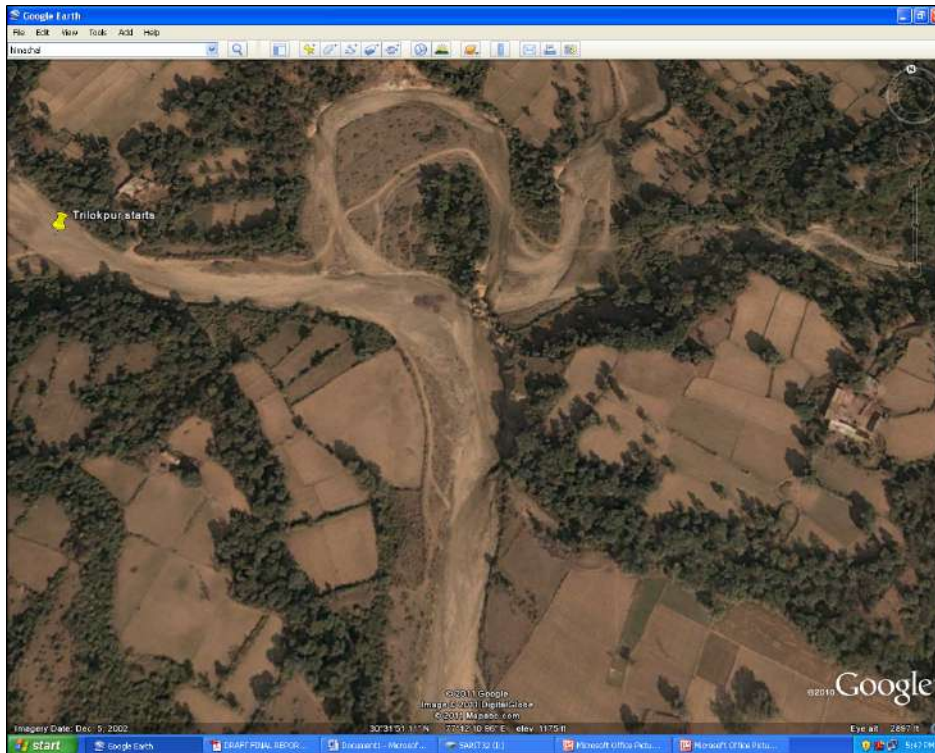
| <b>Mineral Potential</b> |                                 |                     |   |
|--------------------------|---------------------------------|---------------------|---|
| <b>Boulder (in MT)</b>   | <b>River Born Bajri (in MT)</b> | <b>Sand (in MT)</b> | <b>Total Mineable Mineral Potential (in MT)</b> |
| 1111320                  | 1349460                         | 873180              | 3333960   |
| <b>Annual Deposition</b> |                                 |                     |   |
| 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 concession 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 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 Trilokpur ki Nadi near Village Khairi

## DISTRICT SURVEY REPORT

| 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**

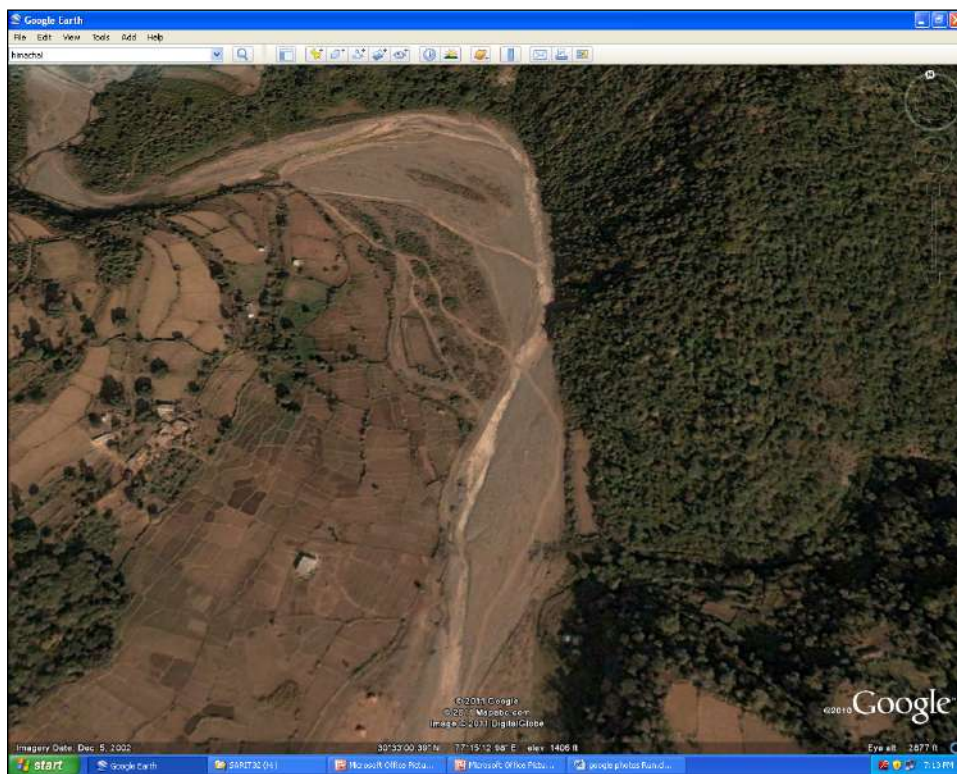
| <b>Mineral Potential</b> |                                 |                     |   |
|--------------------------|---------------------------------|---------------------|---|
| <b>Boulder (in MT)</b>   | <b>River Born Bajri (in MT)</b> | <b>Sand (in MT)</b> | <b>Total Mineable Mineral Potential (in MT)</b> |
| 68666                    | 87394                           | 99878               | 255938  |
| <b>Annual Deposition</b> |                                 |                     |   |
| 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

## DISTRICT SURVEY REPORT

| 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 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 6 Cms.

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

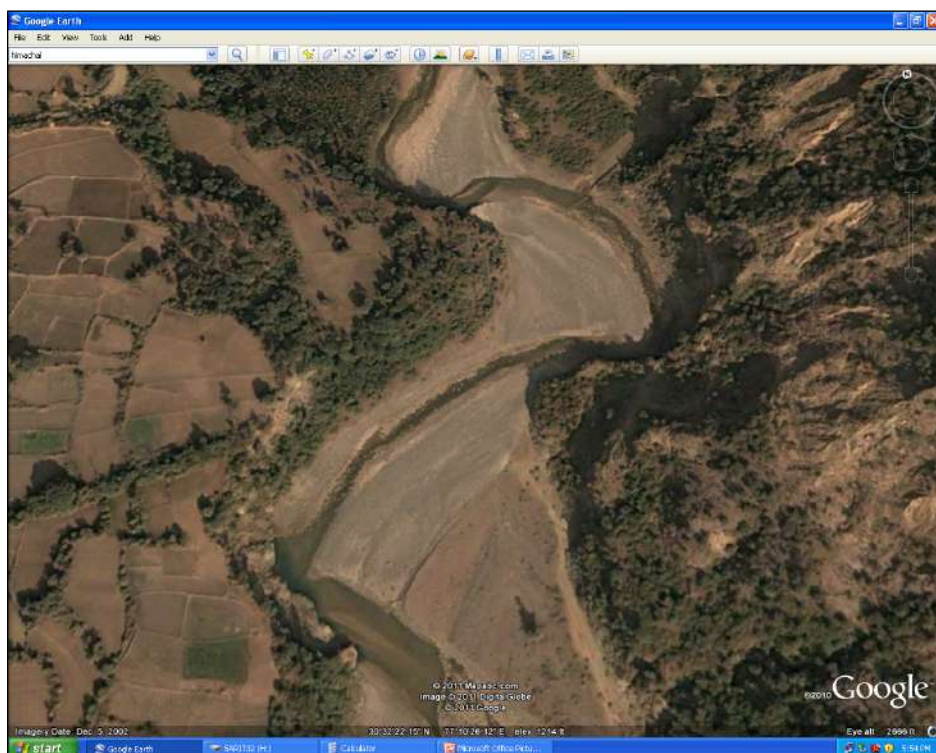
| <b>Mineral Potential</b> |                                 |                     |   |
|--------------------------|---------------------------------|---------------------|---|
| <b>Boulder (in MT)</b>   | <b>River Born Bajri (in MT)</b> | <b>Sand (in MT)</b> | <b>Total Mineable Mineral Potential (in MT)</b> |
| 144460                   | 183850                          | 210124              | 538444  |
| <b>Annual Deposition</b> |                                 |                     |   |
| 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

## DISTRICT SURVEY REPORT

| 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 applied 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 completion of formalities.

### **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**

| <b>Mineral Potential</b>   |                                     |                         |   |
|----------------------------|-------------------------------------|-------------------------|---|
| <b>Boulder<br/>(in MT)</b> | <b>River Born<br/>Bajri (in MT)</b> | <b>Sand<br/>(in MT)</b> | <b>Total Mineable<br/>Mineral Potential<br/>(in MT)</b> |
| 253935                     | 323190                              | 369360                  | 946485  |
| <b>Annual Deposition</b>   |                                     |                         |   |
| 12697                      | 16160                               | 18468                   | 47325   |

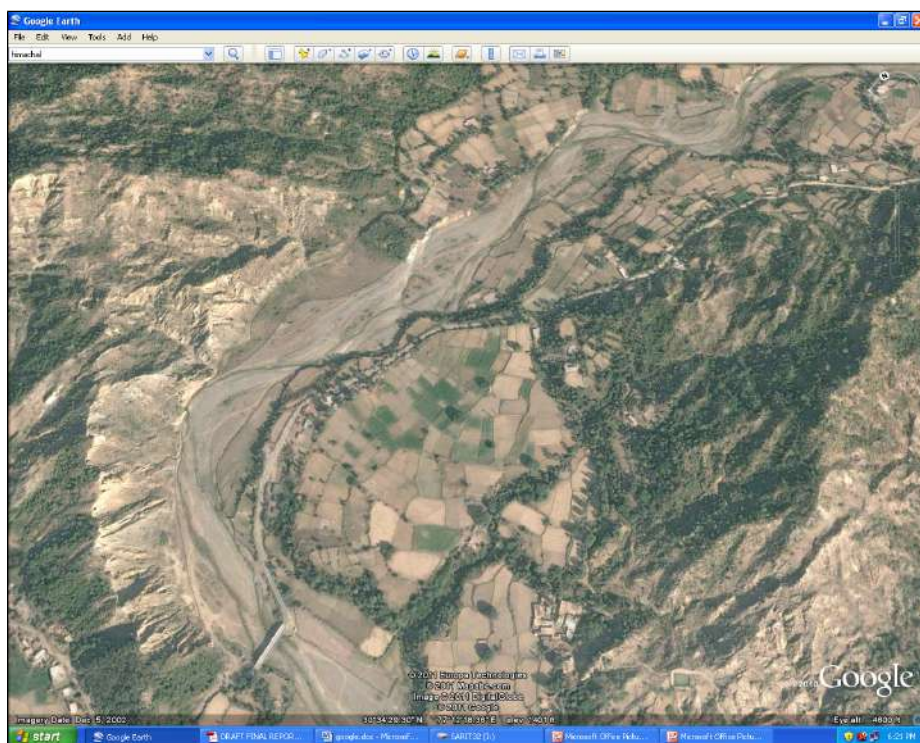
**Recommendation**

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.

## DISTRICT SURVEY REPORT



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**

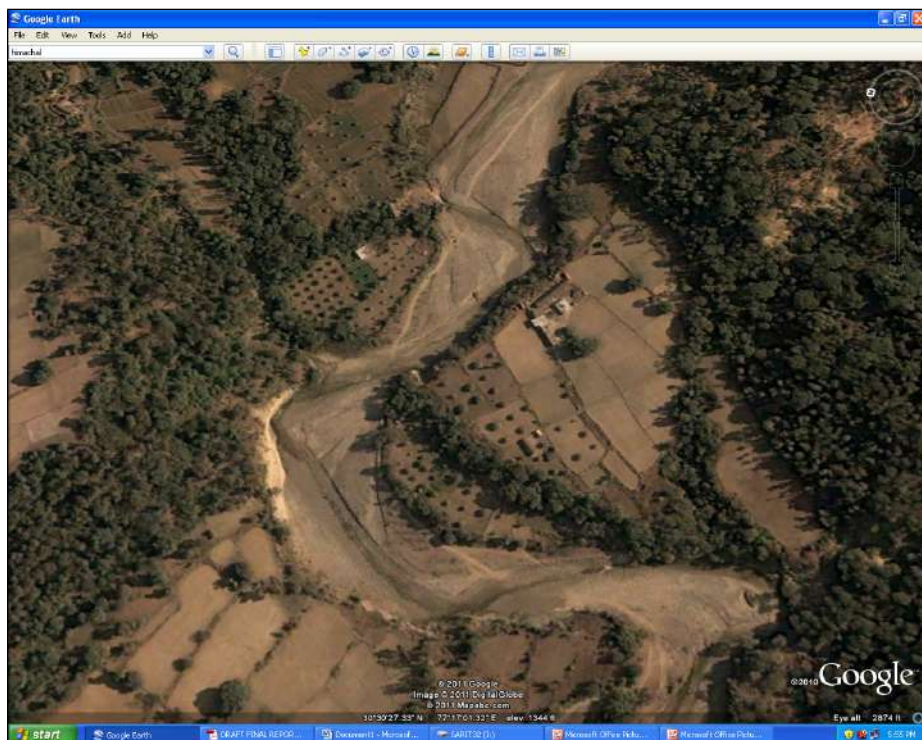
| <b>Mineral Potential</b>   |                                     |                         |   |
|----------------------------|-------------------------------------|-------------------------|---|
| <b>Boulder<br/>(in MT)</b> | <b>River Born<br/>Bajri (in MT)</b> | <b>Sand<br/>(in MT)</b> | <b>Total Mineable<br/>Mineral Potential<br/>(in MT)</b> |
| 102000                     | 131090                              | 149817                  | 383907  |
| <b>Annual Deposition</b>   |                                     |                         |   |
| 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<br>Confluence<br>with<br>River<br>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**

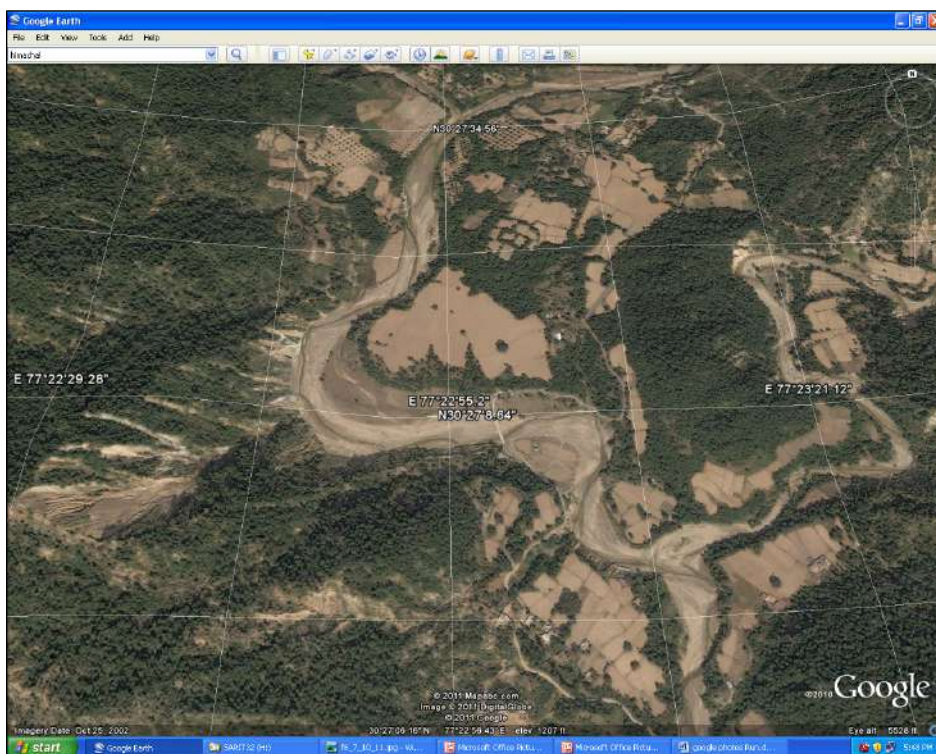
| <b>Mineral Potential</b>   |                                     |                         |   |
|----------------------------|-------------------------------------|-------------------------|---|
| <b>Boulder<br/>(in MT)</b> | <b>River Born<br/>Bajri (in MT)</b> | <b>Sand<br/>(in MT)</b> | <b>Total Mineable<br/>Mineral Potential<br/>(in MT)</b> |
| 68428                      | 87092                               | 99532                   | 255052  |
| <b>Annual Deposition</b>   |                                     |                         |   |
| 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<br>Downstream<br>of Village<br>Dhakranwala<br>to<br>Haryana<br>Border Near<br>Devwala<br>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**

| <b>Mineral Potential</b>   |                                     |                         |   |
|----------------------------|-------------------------------------|-------------------------|---|
| <b>Boulder<br/>(in MT)</b> | <b>River Born<br/>Bajri (in MT)</b> | <b>Sand<br/>(in MT)</b> | <b>Total Mineable<br/>Mineral Potential<br/>(in MT)</b> |
| 153965                     | 195955                              | 223948                  | 573868  |
| <b>Annual Deposition</b>   |                                     |                         |   |
| 7698                       | 9798                                | 11197                   | 28693   |

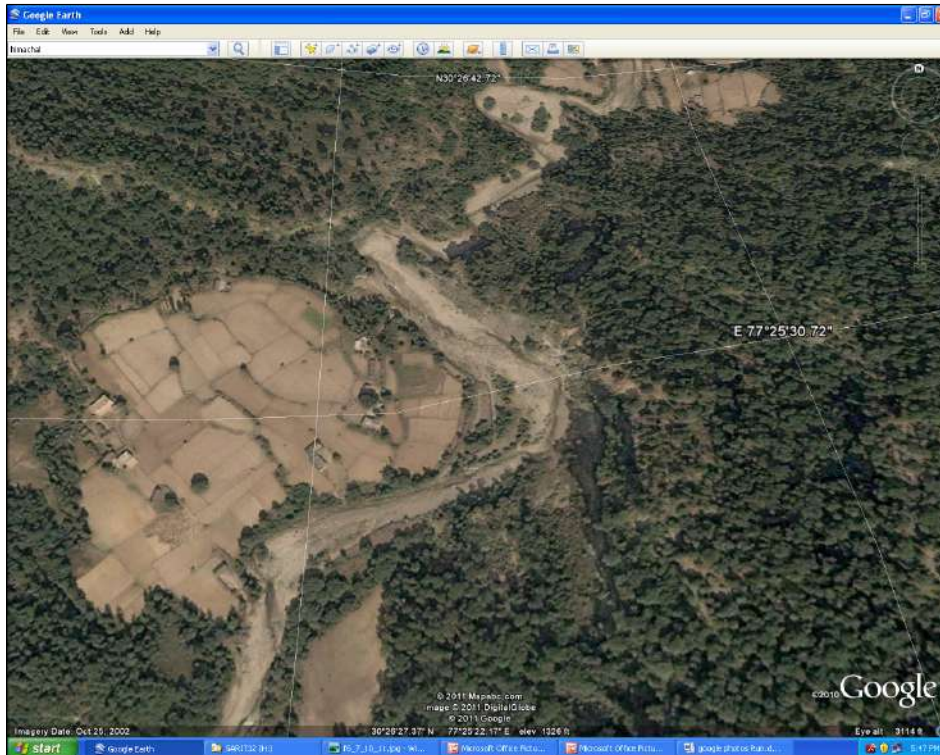
**Recommendation**

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 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

## DISTRICT SURVEY REPORT

| 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**

| <b>Mineral Potential</b> |                                 |                     |   |
|--------------------------|---------------------------------|---------------------|---|
| <b>Boulder (in MT)</b>   | <b>River Born Bajri (in MT)</b> | <b>Sand (in MT)</b> | <b>Total Mineable Mineral Potential (in MT)</b> |
| 94090                    | 119750                          | 136857              | 350697  |
| <b>Annual Deposition</b> |                                 |                     |   |

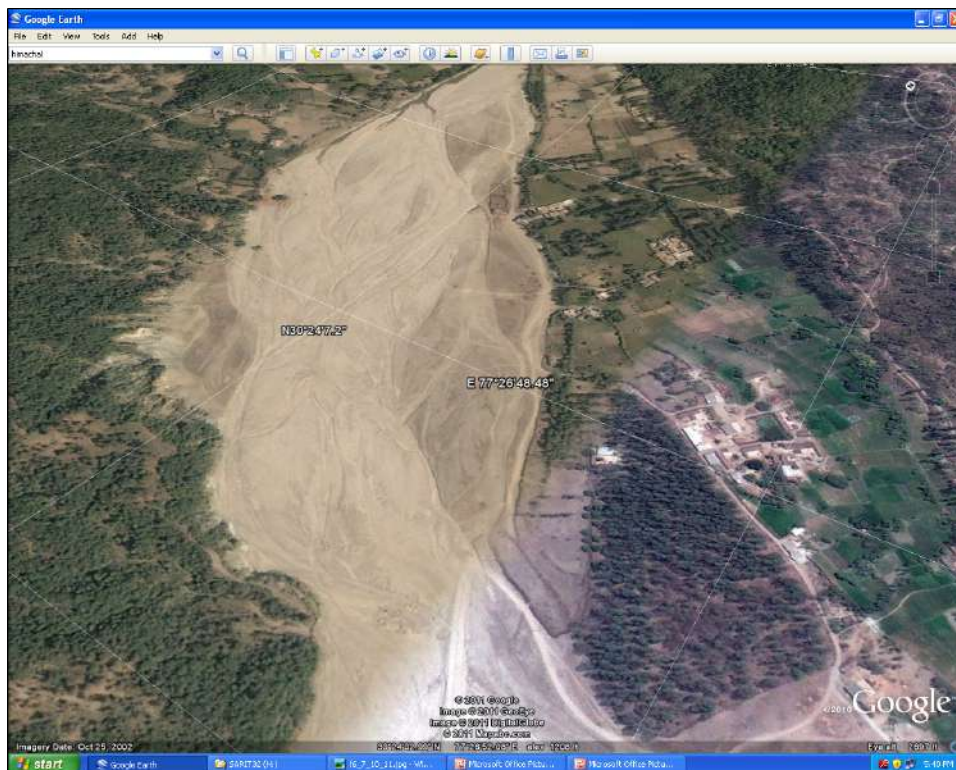
|      |      |      |       |
|------|------|------|-------|
| 5645 | 7185 | 8212 | 21042 |
|------|------|------|-------|

**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

## DISTRICT SURVEY REPORT

| 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**

| <b>Mineral Potential</b> |                                 |                     |   |
|--------------------------|---------------------------------|---------------------|---|
| <b>Boulder (in MT)</b>   | <b>River Born Bajri (in MT)</b> | <b>Sand (in MT)</b> | <b>Total Mineable Mineral Potential (in MT)</b> |
| 245204                   | 312076                          | 356659              | 913939  |
| <b>Annual Deposition</b> |                                 |                     |   |

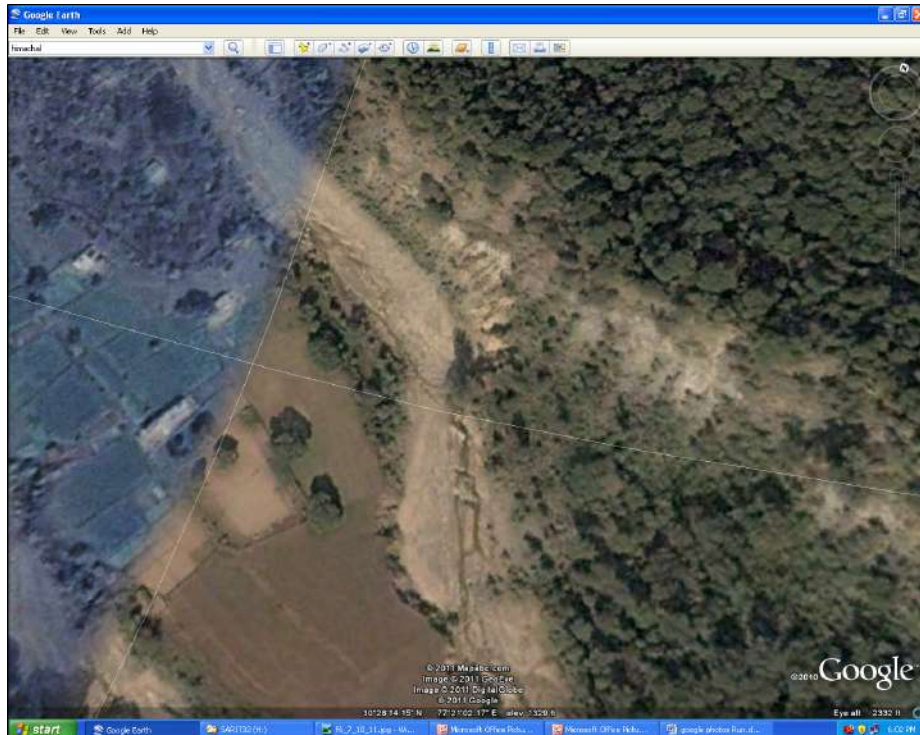
|       |       |       |       |
|-------|-------|-------|-------|
| 12260 | 15604 | 17833 | 45697 |
|-------|-------|-------|-------|

## 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

## DISTRICT SURVEY REPORT

| 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 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**

| <b>Mineral Potential</b> |                                 |                     |   |
|--------------------------|---------------------------------|---------------------|---|
| <b>Boulder (in MT)</b>   | <b>River Born Bajri (in MT)</b> | <b>Sand (in MT)</b> | <b>Total Mineable Mineral Potential</b> |
|                          |                                 |                     |   |

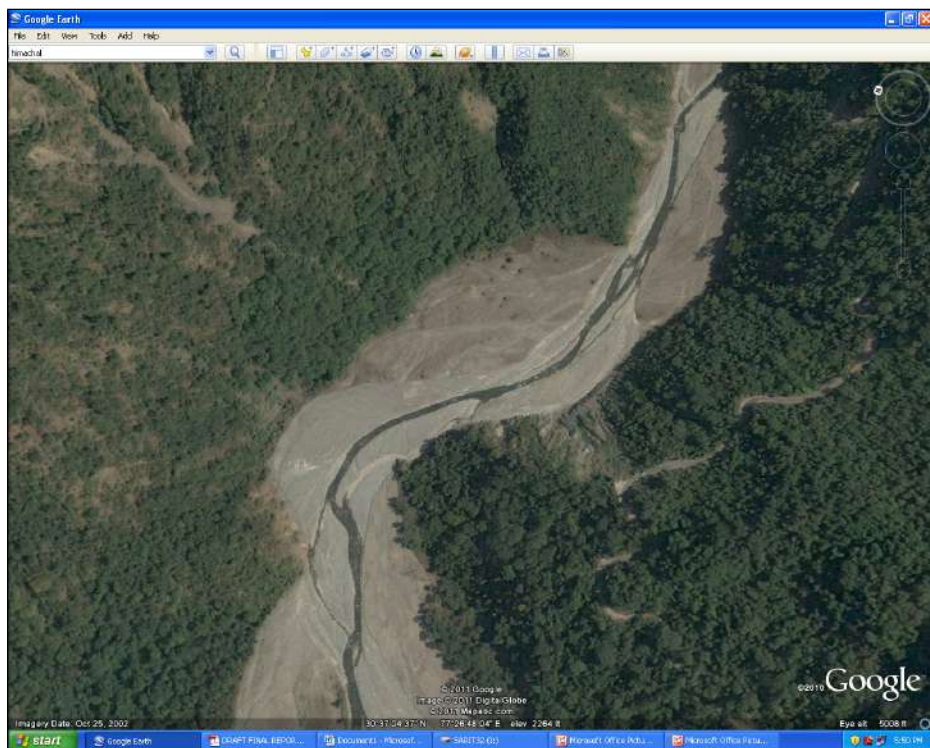
|                          |       |       |                |
|--------------------------|-------|-------|----------------|
|                          |       |       | <b>(in MT)</b> |
| 62845                    | 79984 | 91412 | 234241         |
| <b>Annual Deposition</b> |       |       |                |
| 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 Confluence of Kalhuwala and Brahamanwala streams to Village Matar. No concession 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 Confluence 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 Confluence 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**

| <b>Mineral Potential</b>   |                                     |                         |   |
|----------------------------|-------------------------------------|-------------------------|---|
| <b>Boulder<br/>(in MT)</b> | <b>River Born<br/>Bajri (in MT)</b> | <b>Sand<br/>(in MT)</b> | <b>Total Mineable<br/>Mineral Potential<br/>(in MT)</b> |
| 61479                      | 78246                               | 89424                   | 229149  |
| <b>Annual Deposition</b>   |                                     |                         |   |
| 4304                       | 5477                                | 6260                    | 16041   |

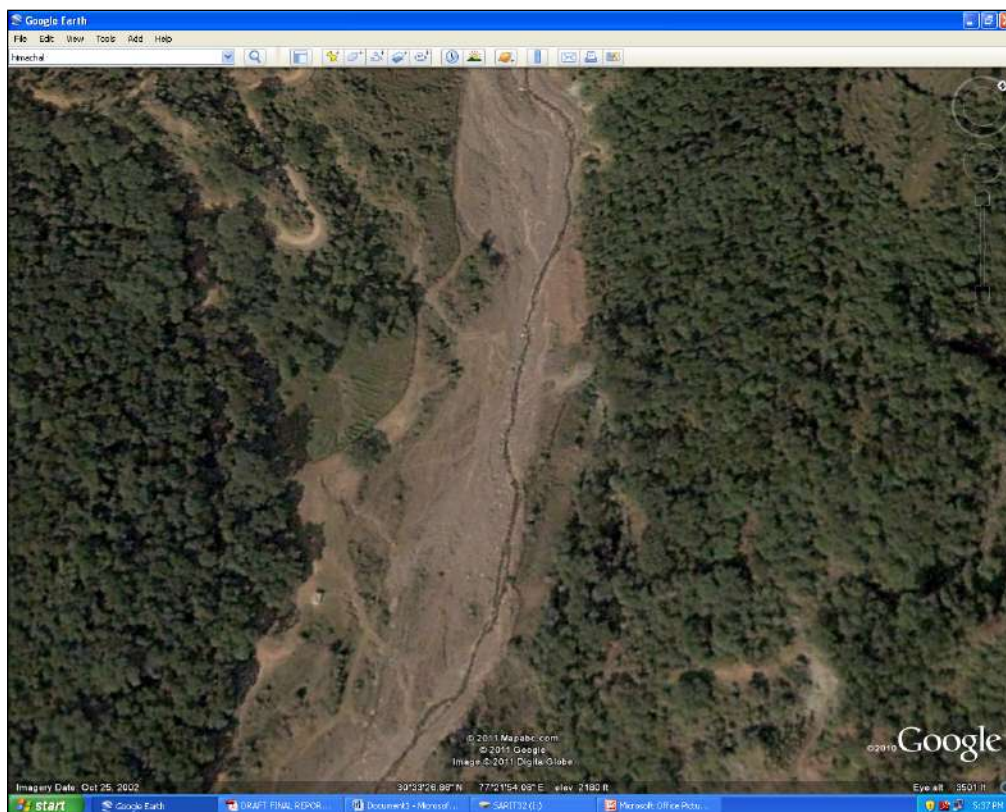
**Recommendation**

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)**

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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 Confluence 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**

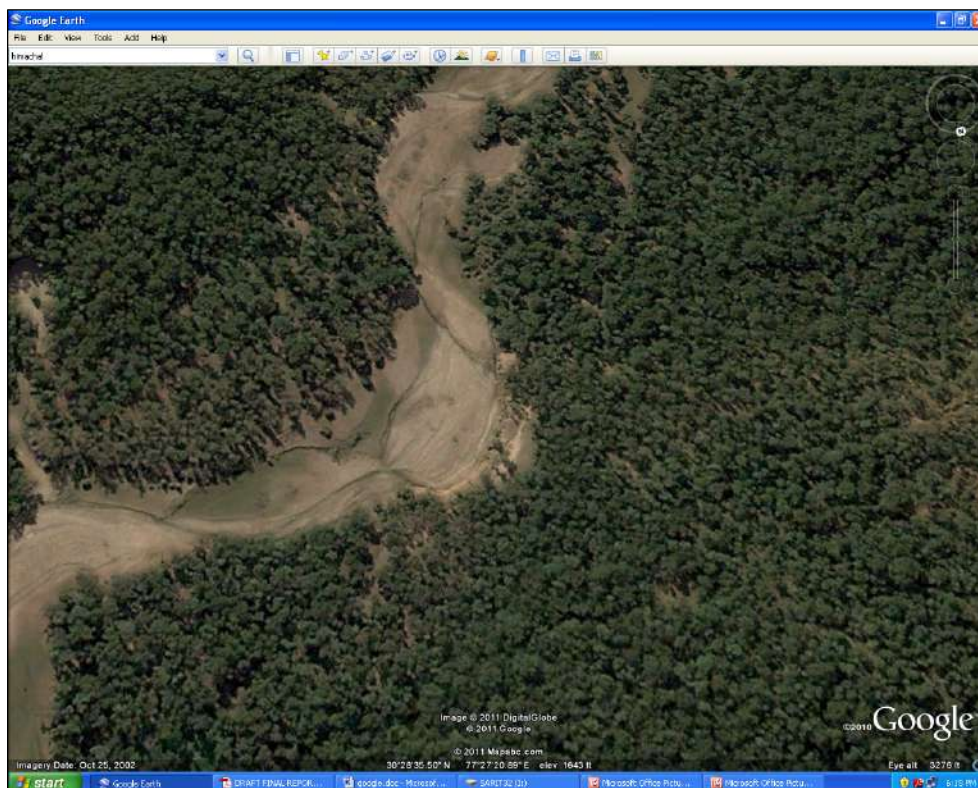
| <b>Mineral Potential</b>   |                                     |                         |   |
|----------------------------|-------------------------------------|-------------------------|---|
| <b>Boulder<br/>(in MT)</b> | <b>River Born<br/>Bajri (in MT)</b> | <b>Sand<br/>(in MT)</b> | <b>Total Mineable<br/>Mineral Potential<br/>(in MT)</b> |
| 48351                      | 61538                               | 70329                   | 180219  |
| <b>Annual Deposition</b>   |                                     |                         |   |
| 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 Confluence 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**

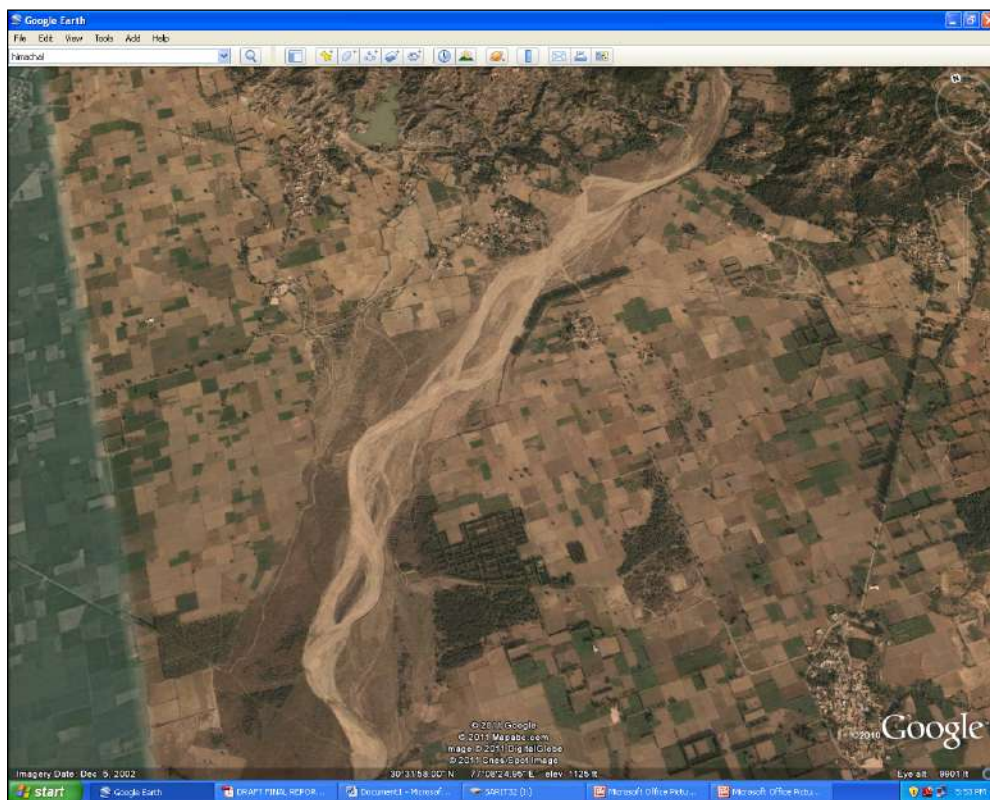
| <b>Mineral Potential</b> |                                 |                     |   |
|--------------------------|---------------------------------|---------------------|---|
| <b>Boulder (in MT)</b>   | <b>River Born Bajri (in MT)</b> | <b>Sand (in MT)</b> | <b>Total Mineable Mineral Potential (in MT)</b> |
| 60652                    | 67392                           | 121306              | 249350  |
| <b>Annual Deposition</b> |                                 |                     |   |
| 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

## DISTRICT SURVEY REPORT

| 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**

| <b>Mineral Potential</b>   |                                     |                         |   |
|----------------------------|-------------------------------------|-------------------------|---|
| <b>Boulder<br/>(in MT)</b> | <b>River Born<br/>Bajri (in MT)</b> | <b>Sand<br/>(in MT)</b> | <b>Total Mineable<br/>Mineral Potential<br/>(in MT)</b> |
| 90493                      | 100548                              | 180986                  | 372027  |
| <b>Annual Deposition</b>   |                                     |                         |   |
| 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.

**11.21Dholirao 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.

## DISTRICT SURVEY REPORT



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**

| <b>Mineral Potential</b>   |                                     |                         |   |
|----------------------------|-------------------------------------|-------------------------|---|
| <b>Boulder<br/>(in MT)</b> | <b>River Born<br/>Bajri (in MT)</b> | <b>Sand<br/>(in MT)</b> | <b>Total Mineable<br/>Mineral Potential<br/>(in MT)</b> |
| 90493                      | 100548                              | 180986                  | 372027  |
| <b>Annual Deposition</b>   |                                     |                         |   |
| 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**

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

## DISTRICT SURVEY REPORT

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

## **DISTRICT SURVEY REPORT**

|    |                        |   |     |        |               |
|----|------------------------|---|-----|--------|---------------|
| 20 | Sudanw<br>ala<br>Khala | From Downstream of<br>Confluence of Gariwali<br>Khol to Confluence<br>with river Giri | 3.2 | 249600 | <b>249350</b> |
| 21 | Gumti<br>Nadi          | From Downstream of<br>Near Village Gumti to<br>Haryana Border                         | 9.8 | 372400 | <b>372027</b> |
| 22 | Dholirao<br>Khalla     | From Downstream of<br>Village Navi to<br>confluence with river<br>Yamuna              | 4.5 | 211500 | <b>126900</b> |