

# Smt. Asha Rani Dang

Village Baddi, Shitapur, Landewal, Kalyanpur & Kainuwal,  
Tehsil Nalagarh, District Solan, Himachal Pradesh  
Mobile No. 9816300012

Ref.:

Dated: 30.09.16

To,  
The Director IA -III (I),  
Ministry of Environment, Forests & Climate Change  
Indira Paryavaran Bhavan  
JorBagh Road  
New Delhi - 110 003

**Subject: Submission of replies to the queries raised on 8<sup>th</sup> meeting expert appraisal committee for environmental Clearance.**

Dear Sir

The project of Smt. Asha Rani Dang located at Village Baddi, Shitapur, Landewal at Kalyanpur & Kainuwal, Tehsil Nalagarh, District Solan, Himachal Pradesh bearing the file number J-11015/192/2011-IA.II (M) River Bed Mining Project of Sand, Bajri and Stone (Minor Mineral). Has been appraised on 8<sup>th</sup> Meeting on July 21-22, 2016 and queries were raised.

The queries were replied point wise (**Annexure-I**) along with the District Survey Report, Solan HP, Department of Industries, Geological wing, Shimal-1 (**Annexure-II**). Submitted for your kind perusal and grant us the Environment Clearance.

Thanks and Regards.

Yours sincerely

  
(SMT. ASHA RANI DANG)  
For Shri Krishna Stone Crusher

**Point wise replies to the queries raised on 8<sup>th</sup> Meeting on July 21-22, 2016 for the project of Smt. Asha Rani Dang located at Village Baddi, Shitapur, Landewal at Kalyanpur&Kainduwal, Tehsil Nalagarh, District Solan, Himachal Pradesh bearing the file number J-11015/192/2011-IA.  
II (M)**

<b>Sl. no</b>	<b>Quarries</b>	<b>Reply</b>
1.	Project Proponent shall decrease / stop the mining of Sand, Bajri and Boulder, in case the replenishment is lower than the approved rate of production, till the replenishment is completed;	Agreed
2.	Project Proponent shall appoint a Monitoring Committee to monitor the replenishment study, traffic management, levels of production, River Bank erosion and maintenance of Road etc.;	Agreed, Monitoring committee shall be established
3.	Excavation will be carried out up to a maximum depth of 1.5 meter from surface of sand deposit and 1 meter above from the water level of the River channel whichever is reached earlier;	Agreed, mining shall be done as per approved mining plan
4.	Project Proponent shall implement the Disaster Management Plan as the mine lease area is located in Seismic Zone-IV. Project Proponent shall appoint a Committee to have a check over any disaster to warn workers well before for the safety of the workers. Emergency helpline number will be displayed at all levels;	Agreed Disaster Management Plan ( <b>Annexure -I</b> )
5.	Project Proponent shall appoint an Occupational Health Specialist for Regular and Periodical medical	Agreed annual Medical checkup camp shall be organized

	<p>examination of the workers engaged in the Project and records maintained; also, Occupational health check-ups for workers having some ailments like BP, diabetes, habitual smokers, etc. shall be undertaken once in six months and necessary remedial/preventive measures taken accordingly. Recommendations of National Institute for Labour for ensuring good occupational environment for mine workers would also be adopted; All the old age people of the surrounding villages may be provided medical facilities;</p>	
6.	<p>The number of trips of the trucks shall not exceed the estimated quantity of 5 trucks (20 tonnes capacity) with 4 trips per day. Transport of minerals shall be done either by dedicated road or it should be ensured that the trucks/dumpers carrying the mineral should not be allowed to pass through the villages. The Project Proponent shall ensure that the road may not be damaged due to transportation of the mineral; and transport of minerals will be as per IRC Guidelines with respect to complying with traffic congestion and density:</p>	<p>Agreed shall be monitored strictly Truck shall be guided not to be pass through villages</p>
7.	<p>Implementation of Action Plan on the issues raised during the Public Hearing. The Proponent shall complete all the tasks as per the Action Plan submitted with the budgetary provisions during the Public Hearing;</p>	<p>Agreed All tasks shall be completed as per commitment during public hearing</p>
8.	<p>The pollution due to</p>	<p>Only PUCV vehicle shall allowed to</p>

	<p>transportation load on the environment will be effectively controlled &amp; water sprinkling will also be done regularly. Vehicles with PUC only will be allowed to ply. The mineral transportation shall be carried out through covered trucks only and the vehicles carrying the mineral shall not be overloaded. Project should obtain 'PUC' certificate for all the vehicles from authorized pollution testing center;</p>	<p>carry mineral from the quarry</p>
9.	<p>Washing of all transport vehicle should be done inside the mining lease;</p>	<p>Agreed</p>
10.	<p>Permanent pillars has to be constructed to demarcate width of extraction of ROM leaving 25% of River width from the bank with depth of 1.5m below the ground and 1.2 m above the ground to observe its stability.</p>	<p>Agreed to leave 25% of ROM</p>

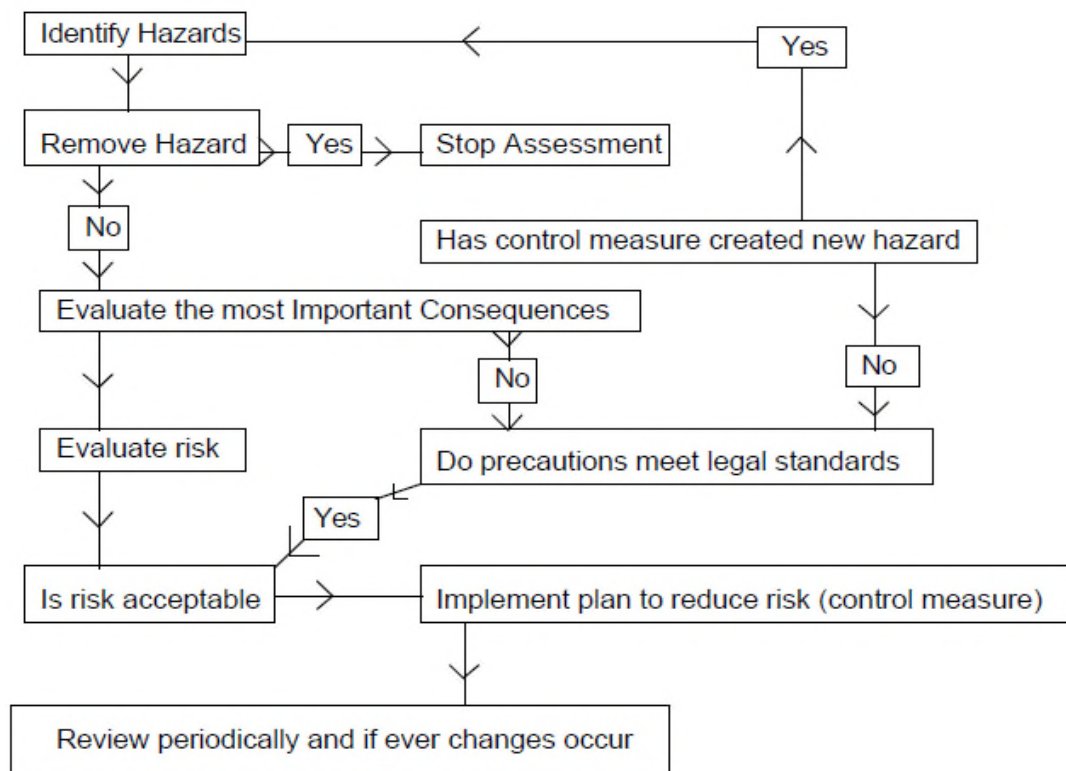
## RISK ASSESSMENT

### 1.1 INTRODUCTION

Mining are associated with several hazards that pose impacts on employees & surrounding area necessitating adequate implementation of Safety and health measures. Hence, River Bed mine safety is one of the most essential aspects for associated people. Smt. Asha Rani Dang has proposed for Sand, Bajri and Stone mining from Sirsa River located at Village-Baddi, Shitalpur, Landewal, Kalyanpur, Kainduwal, PO & Tehsil- Nalagarh, District-Solan, State-Himachal Pradesh is highly vulnerable to multihazards viz. earthquake, landslides, flash-floods, Dam Burst, lightning, road accidents, etc.

Risk assessment is essential for prevention of accidents and there is a need to be aware about the risk of an accident and steps can be taken to prevent the same before its happening.

Therefore, risk assessment and disaster management plan is essential for the proposed project for prevention & mitigation of hazards. A systematic model for risk analysis is shown below in **Figure- 1**:



**Figure 1: Model for Risk Assessment**

The risk assessment for riverbed mining following steps are involved-

- Identify the hazard
- Identify activity involves in risk

- Removal of the hazard
- Evaluation of the risk
- Decide on control measures
- Record of the assessment
- Review

## 1.2 RISK ANALYSIS

Risk Assessment is all about prevention of accidents and to take necessary steps to prevent it from happening. The possible risks in the case of river bed mining project following natural/industrial problems which may be countered during the mining operation are given below:

- Inundation at mine lease area due to excessive rains.
- Possibility of earthquake as mine lease lies in Seismic Zone-IV (As per 1893:2002).
- Accident due to excavated pits.
- Accident due to movement of vehicles.
- Occupational injuries.
- Fires on large surface vehicles through ignition of fuel/hydraulic fluids.

Keeping the above points of high risk accidents like subsidence flood etc. In consideration, all the statutory precautions will be taken for quick evacuation. Hence, safety of the mine and employees will be taken care of by the mining rules & regulations, which are well defined with laid down procedure for safety.

## 1.3 PREVENTIVE/CORRECTIVE MEASURES

### Preventive Measures for Inundation

Mining will be done during the non-monsoon periods; therefore problem of flood is not likely to happen during operational phase i.e. round the year excluding June-August.

### Measures for Earthquake

Proper training will be given to the labours for earthquake and the area will be evacuated as soon as there is any news or signal for earthquake.

Preventive and Corrective Measures for Accidents Due To Excavated Pits

Pits will be created of limited depth of 1m. Excavated pits will be backfilled with the solid waste generated in the form of silt mixed sand during operational phase of mine. Thus, the chance of failure of pit slope does not exist.

Preventive and Corrective Measures for Accidents Due To Trucks & Dumpers

- All transportation within mine lease should be carried out directly under the supervision and control of the management.
- The vehicles will be maintained in good condition and checked thoroughly at least once a month by the competent person authorized for the purpose by the management.
- Road signs will be provided at each and every turning point up to the main road.
- A statutory provision of the fences, constant education, training etc. will go a long way in reducing the incidents of such accidents.

Preventive and Corrective Measures for Occupational Injuries

- Training will be given to the workers on how to use hand equipments.
- First aid will be provided on-site only if any accident occurs.
- In-case of poor condition of any equipment, it will be changed immediately.

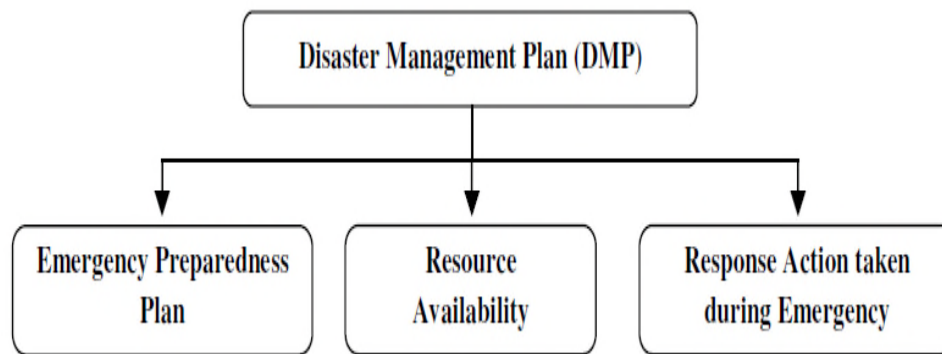
Preventive and Corrective Measures for Fires on large surface vehicles through ignition of fuel/hydraulic fluids

- Availability of fire extinguishers on-site throughout the operational phase of mine
- Maintenance of vehicles on monthly basis.

## DISASTER MANAGEMENT PLAN

### 1.4 INTRODUCTION

The objective of disaster management plan is to localize a disaster and to the maximum extent possible contain it to minimize the impact on life, the environment and property. The disaster management plan may be broadly divided into following steps as given in **Figure-2:**



**Figure 2: Steps for DMP**

### 1.5 TYPES OF EMERGENCIES

The type of emergency primarily considered here is the major emergency which may be defined as one which has the potential to cause serious danger to persons and/or damage to property and which tends to cause disruption inside and/or outside the site and may require the co-operation of outside agencies.

An emergency in the river bed mine site can arise due to certain undesired incidents as floods, landslides, flash floods, earthquake etc.

#### 1.5.1 Definition of On-Site Emergency and Off-site Emergency

An On-site emergency is one where the consequences of an undesired incident remain confined within the mine site. Emergencies at the mine site shall be On-Site Emergencies if the consequences remain confined within the premises of mine site.

An emergency, which is likely to develop or has developed such as to pose a threat to members of public outside the mine site, is termed as an off-site emergency.

#### 1.5.2 Classification of Emergencies

Emergencies have been broadly classified into three levels:

- Level 1 :** The incident at mine site is confined to a small area and does not pose an immediate threat to life or property.
- Level 2 :** An incident at mine site involving a greater hazard or larger area which poses a potential threat to life or property.
- Level 3 :** An incident at mine site involving a severe hazard or a large area which poses an extreme threat to life or property.

### **1.5.3 Priority in Emergency Handling**

The general order of priority for involving measures during the course of emergency would be as follows:

- Safeguard life
- Safeguard environment
- Safeguard property

### **1.6 SPECIFIC OBJECTIVES OF THE DISASTER MANAGEMENT PLAN**

A formal planning for managing disasters is therefore necessary to ensure reduction in times of occurrence of any disaster or on its result. This can only be achieved through:

- Pre-planning a proper sequence of response actions.
- Allocation of responsibilities to the participating agencies.
- Effective management of resources.
- To incorporate the disaster resistant features of national building code and earthquake resistant codes of Bureau of Indian Standards.
- To ascertain the status of existing resources and facilities available with the various agencies involved in disaster management.
- To assess their adequacies and short falls if any in providing a meaningful disaster response.
- Monitoring & evaluation of actions taken during disasters and providing relief.
- Minimize damage to property and the environment.
- Initially contain and ultimately bring the incident under control.
- Identify casualties.
- Provide authoritative and factual information for the news media.

The main objectives of the Disaster Management Plan would be:

- Ensure that loss of life and injuries to persons are minimized.
- Damage to environment is minimized.
- Property loss is minimized.
- Relief and rehabilitation measures are effective and prompt.
- Minimize the outage duration of the facilities.

### **1.7 STRUCTURE OF THE DISASTER MANAGEMENT PLAN**

This Disaster management plan basically comprises of the following elements:

- Outline of Disaster Management Plan
- System of Communication

- Consultative Committee
- Facilities and Accommodation
- First Aid & Medical facilities
- Transport Services
- Functions of Public Relations/ Responsibility of Mine Management

### **1.7.1 Outline of Disaster Management Plan**

The purpose of disaster management plan is to restore the normalcy for early resumption of mining operation due to an unexpected, sudden occurrence resulting to abnormalities in the course of mining activity leading to a serious danger to workers or any machinery or the environment. The following factors will play major role in the management strategy.

### **1.7.2 System of Communication**

Where is an internal communication system for the department head and to their line of command with telephone. The telephone numbers and addresses of adjoining mines, rescue station, police station, fire service station, local hospital, electricity supply agency and standing consultative committee members are also maintained for any emergency requirement.

### **1.7.3 Consultative Committee**

A standing consultative committee will be formed under the head of mines manager. The members consists of safety officer/medical officer/Asst. manager/ public relation officer/ Foreman/ and environmental engineer.

### **1.7.4 Facilities & Accommodation**

Accommodation and facilities for medical centre, rescue room and for various working groups will be provided.

### **1.7.5 First Aid & medical facilities**

The mine management will have first aid/ medical centre for use in emergency situation. All casualties would be registered and will be given first aid. The centre will have facilities for first aid & minor treatment, ambulance and transport. It will have proper telephone/wireless set for quick communication with hospitals where the complicated cases are to be sent.

### **1.7.6 Transport services**

A well defined transport control system will be provided to deal with the situation.

### **1.7.7 Functions of Public Relations/ Responsibility of Mine Management**

- To make a cordial relation with government officials and other social service organization and working groups.

- To liaise with representatives of the mine to ameliorate the situation of panic, tension, sentiments, grievances and misgivings created by any disaster.
- To ameliorate the injured, survivors and family members of affected persons by providing material, moral support and establishing contact with relatives of victims.

### **1.8 OFF-SITE EMERGENCY PLAN**

Off-site emergency plan defining the various steps to tackle any off-site emergencies which may affect surrounding areas of the project has to be prepared after due final discussion with local panchayat and revenue officials. As per this plan, actions have to be promptly initiated to deal with any off-site disastrous situation, with help of collector and other officials.

## OUTLINE OF DISASTER MANAGEMENT PLAN

### 1.9 INTRODUCTION

The district Solan is affected by natural disaster like floods, earthquake, landslides etc. as the state falls in the highest seismic risk zones of the country i.e. Zone IV.

The hazard which however, poses biggest threat to the State is the earthquake hazard. The disasters like floods, earthquake, landslides etc have caused immense loss of property, natural wealth, and human lives.

### 1.10 EARTHQUAKES

An earthquake is a phenomenon that occurs without warning and involves violent shaking of the ground and everything over it. It results from the release of accumulated stress of the moving lithospheric or crustal plates. The earth's crust is divided into seven major plates, that are about 50 miles thick, which move slowly and continuously over the earth's interior and several minor plates. Earthquakes are tectonic in origin; that is the moving plates are responsible for the occurrence of violent shakes. The occurrence of an earthquake in a populated area may cause numerous casualties and injuries as well as extensive damage to property.

The seismic zone map of India and Himachal Pradesh is given in **Figure-3** & **Figure-4** respectively.

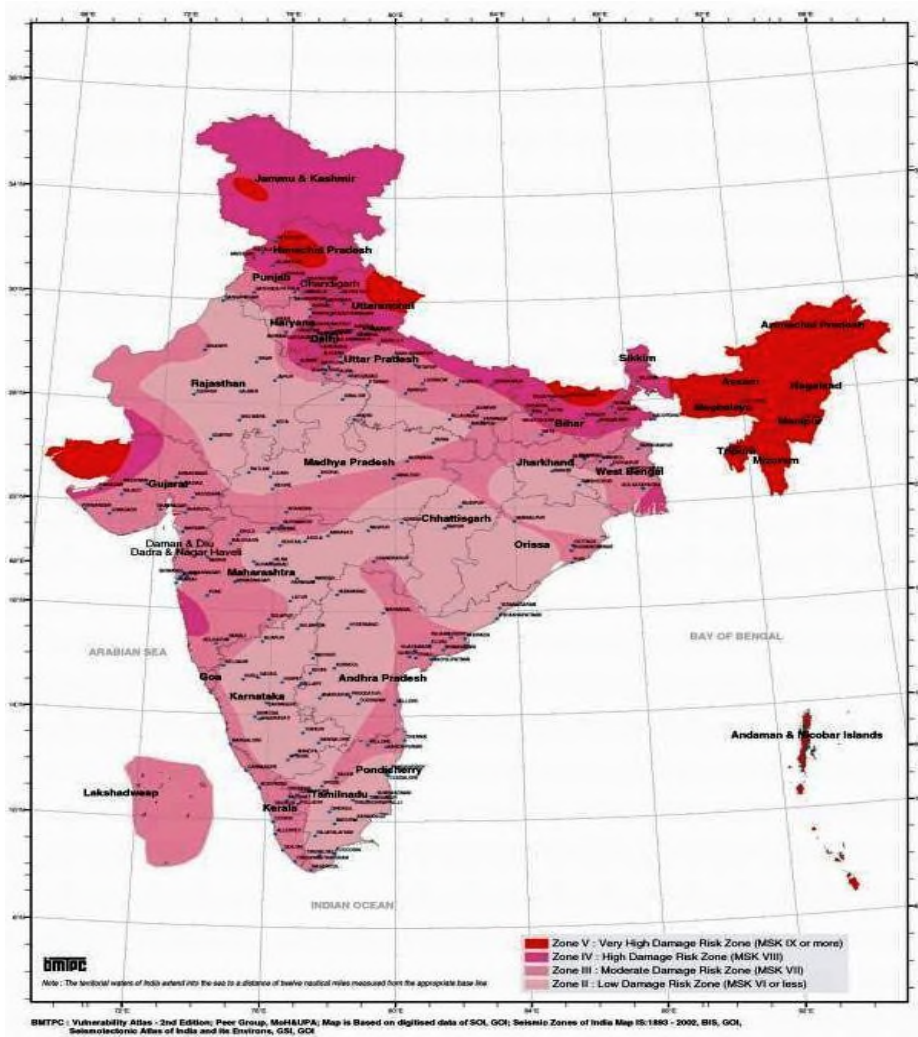


Figure 3: Seismic Zone Map of India (IS : 1893, 2002)

Source: NDMA

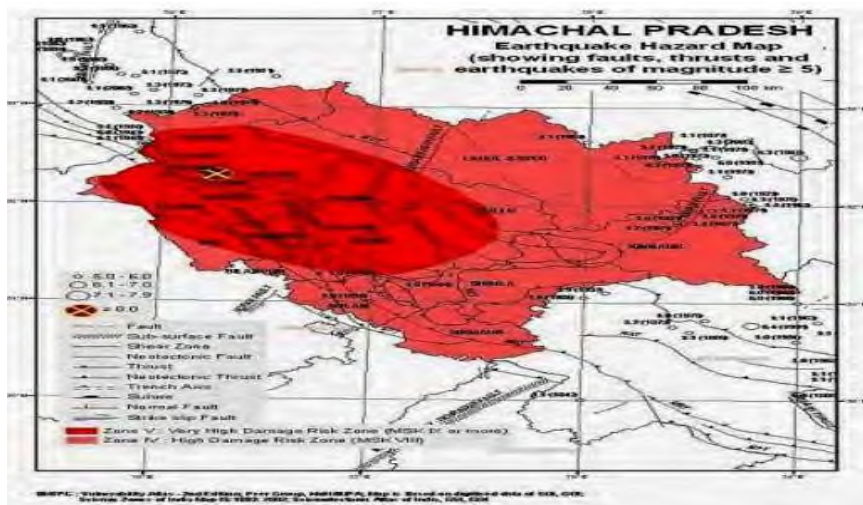


Figure 4: Earthquake Hazard Map of Himachal Pradesh

Source: NDMA

### 1.10.1 What to Do Before an Earthquake

- Repair deep plaster cracks in ceilings and foundations. Get expert advice if there are signs of structural defects.
- Anchor overhead lighting fixtures to the ceiling.
- Follow BIS codes relevant to your area for building standards
- Fasten shelves securely to walls.
- Place large or heavy objects on lower shelves.
- Store breakable items such as bottled foods, glass, and china in low, closed cabinets with latches.
- Hang heavy items such as pictures and mirrors away from beds, settees, and anywhere that people sit.
- Brace overhead light and fan fixtures.
- Repair defective electrical wiring and leaky gas connections. These are potential fire risks.
- Secure water heaters, LPG cylinders etc., by strapping them to the walls or bolting to the floor.
- Store weed killers, pesticides, and flammable products securely in closed cabinets with latches and on bottom shelves.
- Identify safe places indoors and outdoors.
- Under strong dining table, bed
- Against an inside wall
- Away from where glass could shatter around windows, mirrors, pictures, or where heavy bookcases or other heavy furniture could fall over
- In the open, away from buildings, trees, telephone and electrical lines, flyovers and bridges
- Know emergency telephone numbers (such as those of doctors, hospitals, the police, etc)
- Educate yourself and family members
- Awareness Generation Resources for Earthquake Disaster Management
- Disaster(Earthquake) Resistant Construction Practice
- Techno Legal Regime for Safe Construction Practice (Model Amendment in Town & Country Planning Legislations, Regulation for Land Use Zoning and Building Byelaws for Structural Safety)
- Past Programmes/Projects, Resource Materials on Earthquake Risk Management.

### 1.10.2 Have a disaster emergency kit ready

- Battery operated torch with extra batteries
- Battery operated radio
- First aid kit and manual
- Emergency food (dry items) and water (packed and sealed)
- Candles and matches in a waterproof container
- Knife
- Chlorine tablets or powdered water purifiers
- Can opener.
- Essential medicines
- Cash and credit cards
- Thick ropes and cords

- Sturdy shoes

### **1.10.3 Develop an emergency communication plan**

- In case family members are separated from one another during an earthquake (a real possibility during the day when adults are at work and children are at school), develop a plan for reuniting after the disaster.
- Ask an out-of-state relative or friend to serve as the 'family contact' after the disaster; it is often easier to call long distance. Make sure everyone in the family knows the name, address, and phone number of the contact person.

### **1.10.4 Help your community get ready**

- Publish a special section in your local newspaper with emergency information on earthquakes. Localize the information by printing the phone numbers of local emergency services offices and hospitals.
- Conduct week-long series on locating hazards in the home.
- Work with local emergency services and officials to prepare special reports for people with mobility impairment on what to do during an earthquake.
- Provide tips on conducting earthquake drills in the home.
- Interview representatives of the gas, electric, and water companies about shutting off utilities.
- Work together in your community to apply your knowledge to building codes, retrofitting programmes, hazard hunts, and neighborhood and family emergency plans.

### **1.10.5 What to Do During an Earthquake**

Stay as safe as possible during an earthquake. Be aware that some earthquakes are actually foreshocks and a larger earthquake might occur. Minimize your movements to a few steps that reach a nearby safe place and stay indoors until the shaking has stopped and you are sure exiting is safe.

### **1.10.6 If indoors**

- DROP to the ground; take COVER by getting under a sturdy table or other piece of furniture; and HOLD ON until the shaking stops. If there is no a table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.
- Protect yourself by staying under the lintel of an inner door, in the corner of a room, under a table or even under a bed.
- Stay away from glass, windows, outside doors and walls, and anything that could fall, (such as lighting fixtures or furniture).
- Stay in bed if you are there when the earthquake strikes. Hold on and protect your head with a pillow, unless you are under a heavy light fixture that could fall. In that case, move to the nearest safe place.
- Use a doorway for shelter only if it is in close proximity to you and if you know it is a strongly supported, load bearing doorway.
- Stay inside until the shaking stops and it is safe to go outside. Research has shown that most injuries occur when people inside buildings attempt to move to a different location inside the building or try to leave.

- Be aware that the electricity may go out or the sprinkler systems or fire alarms may turn on.

#### **1.10.7 If outdoors**

- Do not move from where you are. However, move away from buildings, trees, streetlights, and utility wires.
- If you are in open space, stay there until the shaking stops. The greatest danger exists directly outside buildings; at exits; and alongside exterior walls. Most earthquake-related casualties result from collapsing walls, flying glass, and falling objects.

#### **1.10.8 If in a moving vehicle**

- Stop as quickly as safety permits and stay in the vehicle. Avoid stopping near or under buildings, trees, overpasses, and utility wires.
- Proceed cautiously once the earthquake has stopped. Avoid roads, bridges, or ramps that might have been damaged by the earthquake.

#### **1.10.9 If trapped under debris**

- Do not light a match.
- Do not move about or kick up dust.
- Cover your mouth with a handkerchief or clothing.
- Tap on a pipe or wall so rescuers can locate you. Use a whistle if one is available. Shout only as a last resort. Shouting can cause you to inhale dangerous amounts of dust.

#### **1.10.10 What to Do After an Earthquake?**

##### **1.10.10.1 DO'S**

- If any damage is suspected, turn the system off from the main valve or, switch.
- Clean up household chemical spills, toxic and flammable materials to avoid any chain of unwanted events.
- Gather information and necessary instructions from battery operated radios.
- Obey Public safety precautions.
- Leave a message stating where you are going if you must evacuate your residence.
- Take your earthquake survival kit with you.
- It should contain all necessary items for your protection and comfort.
- Check your water and electrical lines for defects.

##### **1.10.10.2 DON'T s**

- Do not fill the overhead tank completely.
- Do not carry out haphazard repairs.

- Repairs should be done only under the supervision of a structural engineer.
- Do not put additional supports without the guidance of an experienced/qualified structural engineer.
- Do not use the lift until it has been checked and certified by the lift company.

#### 1.10.11 Action Plan:

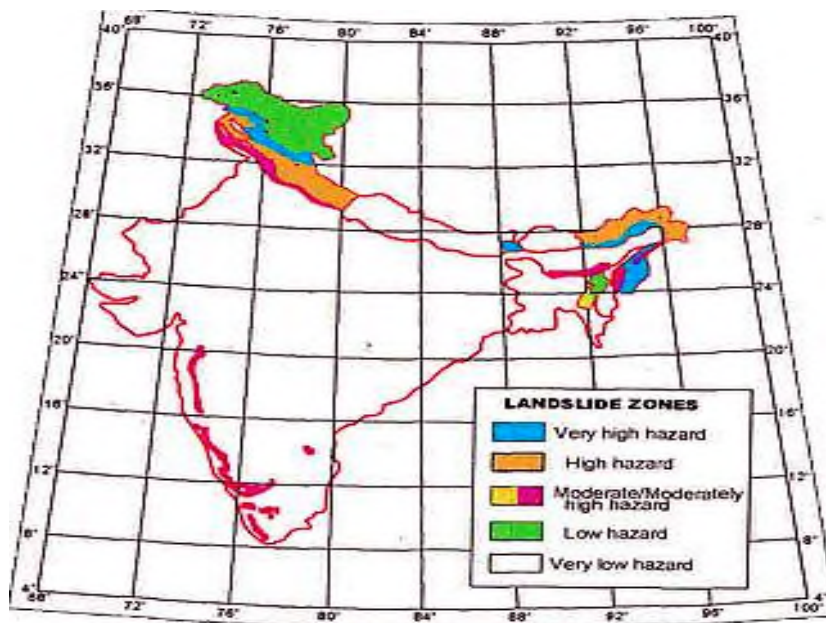
The main features to be included in the plan are:

- i. Training of trainers in professional and technical institutions.
- ii. Launching demonstration projects to disseminate earthquake-resistant techniques.
- iii. Launching public awareness campaigns on seismic safety and risk reduction and sensitising all stakeholders to earthquake mitigation.
- iv. Developing an inventory of the existing built environment.
- v. Preparing community and village level DM plans, with specific reference to management of earthquakes.
- vi. Carrying out the vulnerability assessment of earthquake-prone areas and creating an inventory of resources for effective response.
- vii. Operationalising the local companies of Home Guards and IRBs/Police for disaster response.
- viii. Strengthening the medical preparedness for effective earthquake response, etc.

#### 1.11 LANDSLIDES

The hills and mountains of District Solan are liable to suffer landslides during monsoons and also in high intensity earthquake.

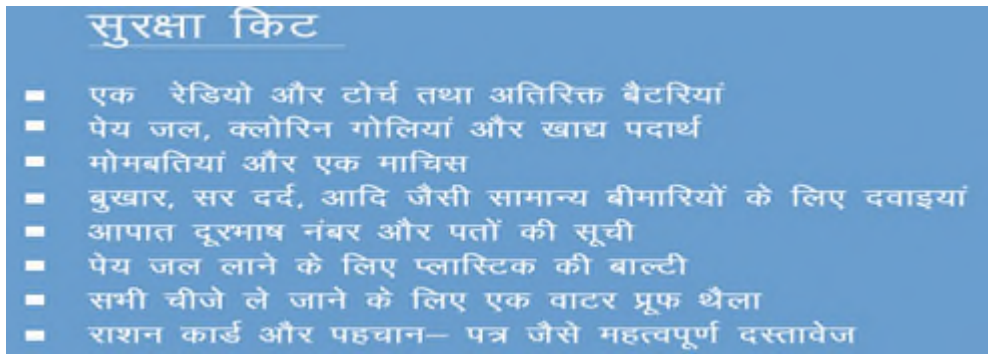
The map showing the landslide zone of India is given in **Figure-5**.



**Figure 5: Map Showing Landslide Zone of India**

**Source:** NDMA

Source: NDMA



**Figure 6: Emergency Kit**

Source: NDMA

### 1.11.1 Do's

- Prepare tour to hilly region according to information given by weather department or news channel.
- Move away from landslide path or downstream valleys quickly without wasting time.
- Keep drains clean,
- Inspect drains for - litter, leaves, plastic bags, rubble etc.
- Keep the weep holes open.
- Grow more trees that can hold the soil through roots,
- Identify areas of rock fall and subsidence of buildings, cracks that indicate landslides and move to safer areas. Even muddy river waters indicate landslides upstream.
- Notice such signals and contact the nearest Tehsil or District Head Quarters.
- Ensure that toe of slope is not cut, remains protected, don't uproot trees unless re-vegetation is planned.
- Listen for unusual sounds such as trees cracking or boulders knocking together.
- Stay alert, awake and active (3A's) during the impact or probability of impact.
- Locate and go to shelters,
- Try to stay with your family and companions.
- Check for injured and trapped persons.
- Mark path of tracking so that you can't be lost in middle of the forest.
- Know how to give signs or how to communicate during emergency time to flying helicopters and rescue team.

### 1.11.2 Don'ts

- Try to avoid construction and staying in vulnerable areas.
- Do not panic and loose energy by crying.
- Do not touch or walk over loose material and electrical wiring or pole.
- Do not built houses near steep slopes and near drainage path.
- Do not drink contaminated water directly from rivers, springs, wells but rain water if collected directly without is fine.

- Do not move an injured person without rendering first aid unless the casualty is in immediate danger.

### **1.11.3 Action Plan:**

The main features to be included in the plan are:

- i.** Wide dissemination of model land use practices in hilly areas.
- ii.** Training of trainers in professional and technical institutions.
- iii.** Training of professionals like engineers and geologists for landslide mapping, investigation techniques, analysis, and observational practices.
- iv.** Establishing appropriate mechanisms for compliance reviews of all land use bye-laws in hilly areas.
- v.** Preparing an inventory of existing landslides, active or inactive, in the area.
- vi.** Developing an inventory of the existing built environment in areas around existing landslides and in high hazard zones as per the LHZ maps.
- vii.** Assessing the status of risk and vulnerability of the existing built environment.
- viii.** Strengthening the EOC and communication network.

## EMERGENCY SYSTEM OF COMMUNICATION

### 1.12 EMERGENCY ORGANIZATION & RESPONSIBILITIES

In case of an emergency at Mine site, the On-site Emergency Plan will come into action.

Effective emergency plan requires that, in the event of an accident, nominated functionaries to be given specific responsibilities, often separate from their day-to-day activities.

Emergency control organization has been designed by identifying the safe transition from normal condition to emergency condition. For this purpose an emergency response organization with appropriate lines of authority with succession planning and actuating the response management has been formed.

#### 1.12.1 Emergency Organization

Overall objectives of the emergency control organization are as follows:

- To promptly control problems as they develop at the scene.
- To prevent or limit the impact on other areas and offsite.
- To provide emergency personnel, selecting them for duties compatible with their normal work functions wherever feasible.

The organizational chart is given with contact detail as follows in **Figure** given below.

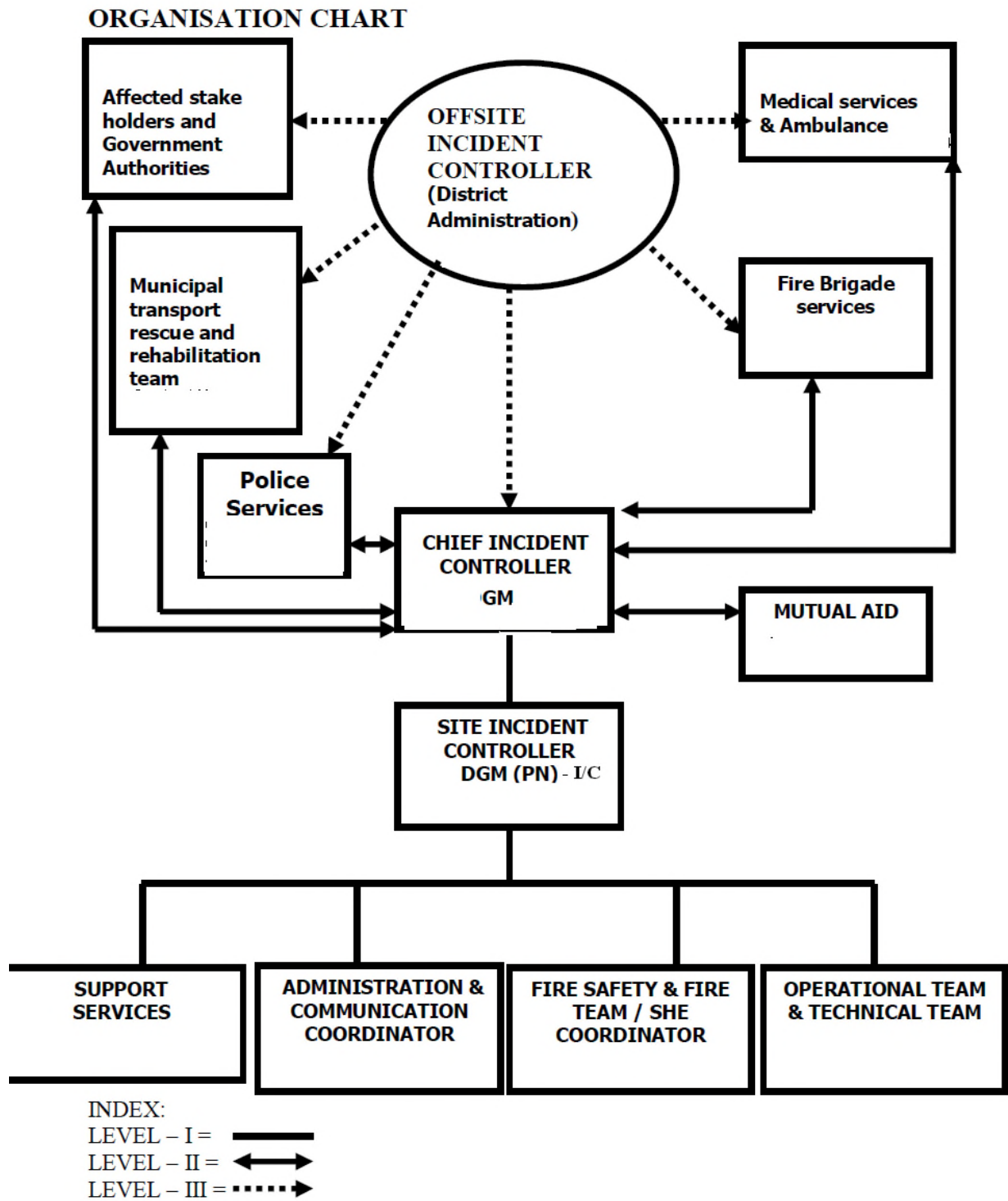


Figure 7: Organization Chart with Contact Details of On-site and Off-site personnel

## **1.13 DISASTER AWARENESS**

### **1.13.1 Public Awareness System**

The safety measures to be taken in the event of an emergency shall be made, known to the general public who are likely to be affected.

For disclosure of information to the public of the mine site they are briefed about our preparedness and measures taken to face any disaster situation. They are also explained about the Disaster Warning Signals and measures to be taken in case of any disaster in the location and any possible emergency.

Or disclosure of the information, particularly during the disaster situation, the Public announcements are being done by Communication Department. To avoid any panic, it is been considered that the necessary announcement will be made for working personnel on-site/off-site of mine lease area and nearby villagers too.

### **1.13.2 The use of Electronic Media**

For bringing the awareness among the external public at large, the use of electronic media like TV, Air & Press coverage is used. The Welfare & Media co-ordinator prepares the Press release to the issued for the local press & other important dailies.

## EMERGENCY RESPONSE PROCEDURES

### 1.14 BACKGROUND

Disaster management committee plays a crucial role during emergency in systematic and proper way. In addition, the implementation of an Emergency Response Plan relies on a number of response functions, which deals with different aspects given as follows-

- Communication and co-ordination
- Medical Services
- Security
- Administration (Logistics and Welfare)
- Co-ordination with external agencies

### 1.15 EMERGENCY CONTROL CENTRE

The Emergency Control Centre (ECC) is established for emergency operations are directed and co-ordinated. The ECC will be activated as soon as emergency is declared. During emergency all emergency staff will gather in ECC.

The ECC staff is as follows-

- Site Main Controller (SMC)
- Assistant to SMC
- Telephone Attendant
- Messengers
- Key Personnel & Team (Monitoring & Warning Committee Manager, Incident controller & Rescue Team Manager, Relief Team) as per the Disaster Management Committee.

#### 1.15.1 Emergency Control Centre's planning during disaster

The ECC will always be ready for operation and provided with the equipment and supplies necessary during the emergency, which is given as-

- Rescue Tubes & Rescue Cans
- Rescue Ring Buoys
- Dive Bricks & Dive Rings
- Swim Safety Buoys & Pool

- Lifelines
- Spin boards & Head
- Immobilizers
- First Aid Kit

Except all these facility, ECC will have its own lightning facility during emergency.

# OF DISTRICT SOLAN

PREPARED BY

INDRASEKHARAN

GEOLOGIST

Geological Wing



Attested to be true copy

*[Signature]*  
Asstt. Geologist  
Deptt. of Industries,  
Geological Wing,  
Shimla-1

*[Signature]*  
Attested to be true copy  
Publicity Officer  
Deptt. of Industries  
(Geological Wing)  
Shimla-1




**SURVEY DOCUMENT IN RESPECT OF MINOR MINERAL QUARRIES /  
DEPOSITS OF DISTRICT SOLAN, HIMACHAL PRADESH.**


**Contents**

1. INTRODUCTION .....	5
2. PHYSICAL FEATURES .....	5
3. RIVER SYSTEM .....	7
4. CLIMATE AND RAINFALL .....	9
4.1. Catchment .....	14
5. LAND USE PATTERN .....	14
7. FOREST .....	15
8. GEOLOGY .....	15
8.1. Siwalik Group: .....	22
8.2. Lower Siwalik: .....	23
8.3. Middle Siwalik: .....	23
8.4. Upper Siwalik: .....	23
8.5. Older Alluvium: .....	23
8.6. Newer Alluvium: .....	24
8.7. Arki Limestone Deposit: .....	26
8.8. Bagha-Bhalag Limestone deposit: .....	26
8.9. Kashlog-Mangu Limestone Deposit .....	27
9. Methodology and Guiding principles .....	28
10. RIVER/STREAM WISE DETAIL .....	31
10.1. LOHAND KHUD: .....	31
10.2. RATTA NADI: .....	33

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10.3.	SARSA NADI: .....	35
10.4.	BALAD NADI:.....	38
10.5.	PALIMAHDEV RIVER .....	40
10.6.	KUNDLU RIVER:.....	42
10.7.	CHIKNI RIVER: .....	44
10.8.	KARSOLI RIVER:.....	46
10.9.	KAUSHALYA RIVER:.....	47
10.10.	Mandhala River: .....	49
10.11.	Surjpur Chao: .....	51
10.12.	Gamber Khad:.....	53
10.13.	ASNI RIVER:.....	55
10.14.	Daseran River:.....	58
11. ✓	Status of Mining: .....	59
11.1.	NALAGARH TEHSIL:.....	62
11.2.	KASAULI TEHSIL: .....	64
11.3.	RAMSHAHAR TEHSIL:.....	65
12. ✓	Recommendations.....	67
13.	CONCLUSION.....	74

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**GRAPHS**

Graph 1 Showing average rainfall in Solan Distt. And Himachal Pradesh./ .....10

Graph 2 Yearwise Average Rainfall .....11

Graph 3 Monthly Rainfall .....11

Graph 4 Year 2010.....12

Graph 5 Year 2009.....12

Graph 6 Year 2008.....12

Graph 7 Year 2007.....13

Graph 8 Year 2006.....13

Graph 9 Lohand Khad .....32

Graph 10 Ratta khad .....35

Graph 11 Annual Production (Sarsa Khad).....37

Graph 12 Annual Production (Balad Khad) .....39

Graph 13 Annual Production (Palimahadev Khad).....40

Graph 14 Annual Production (Kundlu Khad) .....43

Graph 15 Annual Production (Chikni Khad) .....45

Graph 16 Annual Production (Kaushalya Khad) .....48

Graph 17 Annual Production (Mandhala Khad) .....50

Graph 18 Annual Production (Surajpur Chao) .....52

Graph 19 Annual Production (Ghamber Khad) .....55

Graph 20 annual Production (Asni Khad).....57

Graph 21 Year wise revenue .....60

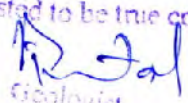
Graph 22 Status of mining leases and auction.....62


Graph 23 Tehsil wise area (Nalagarh) .....64

Graph 24 Tehsil wise area (Kasauli) .....65

Graph 25 Tehsil Wise Area- Ramshahar.....65

Graph 26 Tehsil Wise Area (Arki) .....66

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**FIGURES**

Figure 1 Distric Map ..... 6  
Figure 2 Drainage Map of Solan Distric.....8  
Figure 3 Hydrogeological map.....25

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**SURVEY DOCUMENT IN RESPECT OF MINOR MINERAL QUARRIES /  
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**1. INTRODUCTION**

Pursuance of point 9.2 (Strategy 2) of "River/Stream Bed Mining Policy Guidelines for the State of Himachal Pradesh, 2004" for regulation and control of mining operations in which preparation of survey document of existing River/Stream Bed Mining in each district is to be undertaken. Accordingly, the undersigned was deputed to prepare the survey document for Solan District.

Solan as an independent District came into existence on 1<sup>st</sup> September, 1972, consequent upon reorganization of the districts of Himachal Pradesh. The District derives its name from Solan, the headquarter town. It is said that the name Solan is associated with Shoolni the local deity, located at a distance of 48 Km from Shimla. Solan is considered as the gateway to capital of Himachal Pradesh. The total area of the district is 1936sqkm. The district has 7 towns and 2501 villages of these 2348 villages are inhabited. At the 1991 census the total population of the district was 382268. The people of Solan district are predominantly Hindus followed by Sikhs and Muslims.

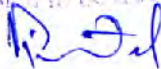
The Distt. was carved out of Solan and Arki Tehsils of the then Mahasu Distt. and Tehsils of Kandaghat and Nalagarh of the then Shimla Distt. The Distt. is bounded by Mandi and Bilaspur Distts in the North, Punjab State in the West, Haryana State and Sirmour Distt. in the South and Shimla Distt. in the East. The terrain of the Distt. is mostly mountainous with an elevation ranging from 300 to 2250Mtrs. above mean sea level. The highest peak in the Distt. is Krol Tibba having the elevation of 2253 Mtrs. above mean sea level.


For administrative convenience, the Distt. has been divided into four sub-divisions with headquarters at Solan, Kandaghat, Nalagarh and Arki. Solan sub-division consists of Solan and Kasauli Tehsils and Krishangarh sub-Tehsil, Nalagarh sub-division consists of Nalagarh Tehsil and Ramshahr sub-Tehsil, whereas Kandaghat and Arki sub-divisions cover respective Tehsil only.

**2. PHYSICAL FEATURES**

The elevation of the Distt ranges from 300 to 2200 Mtrs. above mean sea level. The District has some parts with a very low altitude. The terrain is mostly mountainous except valley of Saproon in solan, Tehsil Doon in Nalagarh Tehsil and Kunihar in Arki Tehsil. The mountains of lower elevations are found in Western and Southern parts of the Distt. comprising of Nalagarh and Arki Tehsils while higher ranges start from central region and extend up to North-Eastern corner of the

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... elongated or fan shaped are situated on a very high mountain ranges and difficult terrain.

Doon valley is the most fertile and bigger tract in Nalagarh Tehsil whereas Saproon Valley is its counterpart in Solan Tehsil and Kunihar Valley in Arki Tehsil but these are smaller in size. Solan district is located in the Southern part of the state bordering with Punjab and Haryana states. It lies between  $30^{\circ} 45'$  to  $31^{\circ} 21' 10''$  north latitude and  $70^{\circ} 36' 0''$  to  $77^{\circ} 15' 20''$  east longitude.

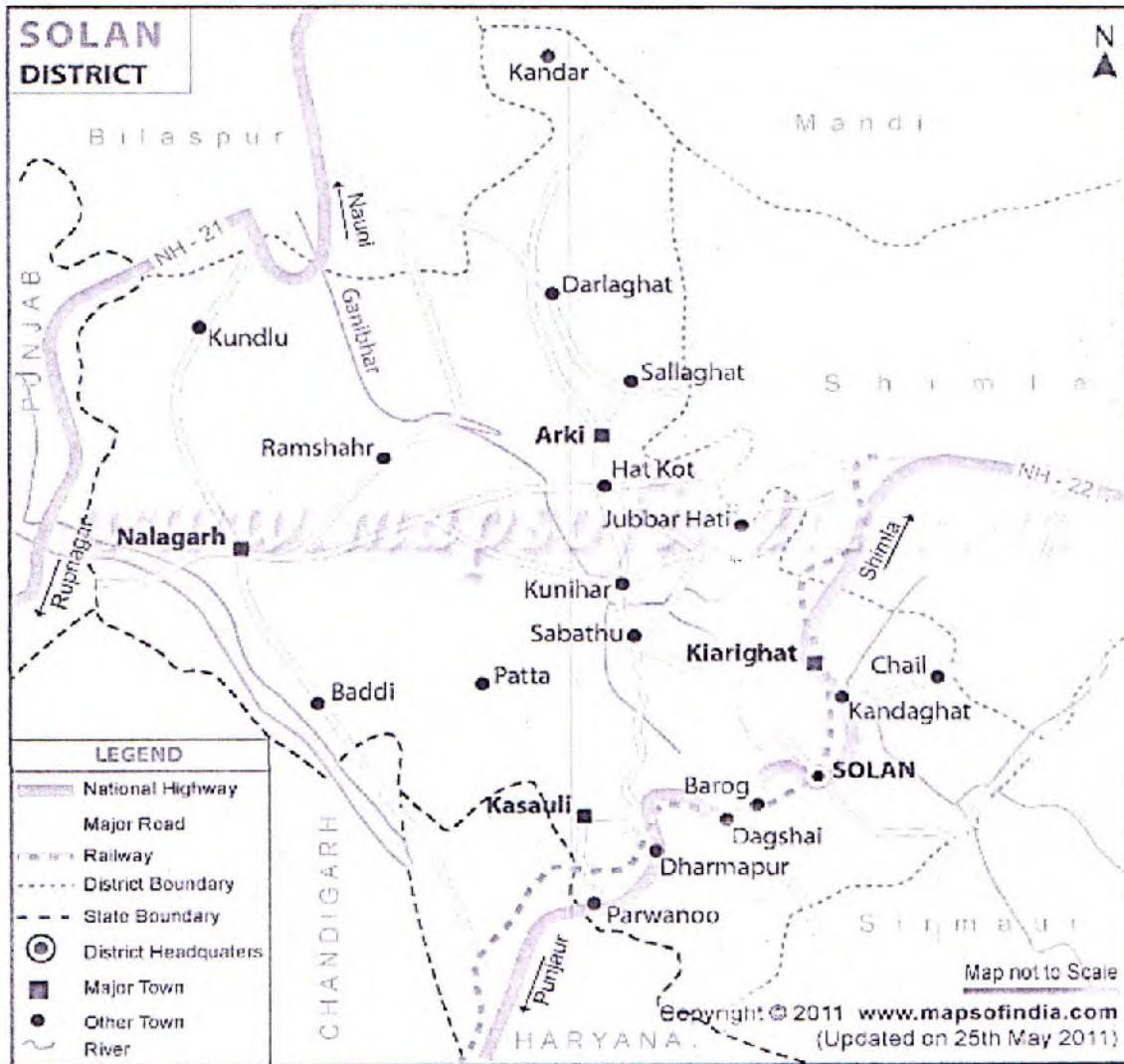


Figure 1 Distric Map

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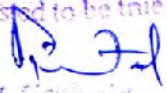
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### 3. RIVER SYSTEM

Solan Distt. is covered by catchments area of three important rivers namely Satluj, Yamuna and Ghaggar. Main tributary of Yamuna is Asni and those of Satluj River are Kiar-Ka-Nala, Gamber Khad, and Kuthar Nadi etc. Kaushalya Nadi is the main tributary of Ghagar. Sirsa is the main stream in Nalagarh Sub-Division. It has its source in the Hill above Kalka and runs North-West along the base of the Shivalik eventually joining the Satluj at Avankot in Ropar Distt. The branching drainage pattern so established is tree like, is termed as dendrite drainage pattern. There are sufficient water sources both for drinking and irrigation purposes. Quite a few of these have been tapped and there is a net work of drinking and irrigation water supply schemes all over the District. The entire tract of Kunihar forest division falls in the Satluj catchment, Gamber, Gamola and Kuni khads are perennial streams. Majority of the small streams and nallahs have discharge only during the rains. Volume of the flow and its duration depends upon the intensity of the rains. Thus drainage system is good though there is acute shortage of drinking water during the summer. River Sirsa and Gamber khads are the two main source of drainage of Nalagarh both these are perennial in nature. Drainage system is very rapid and excessive and is mostly in the form of torrents.

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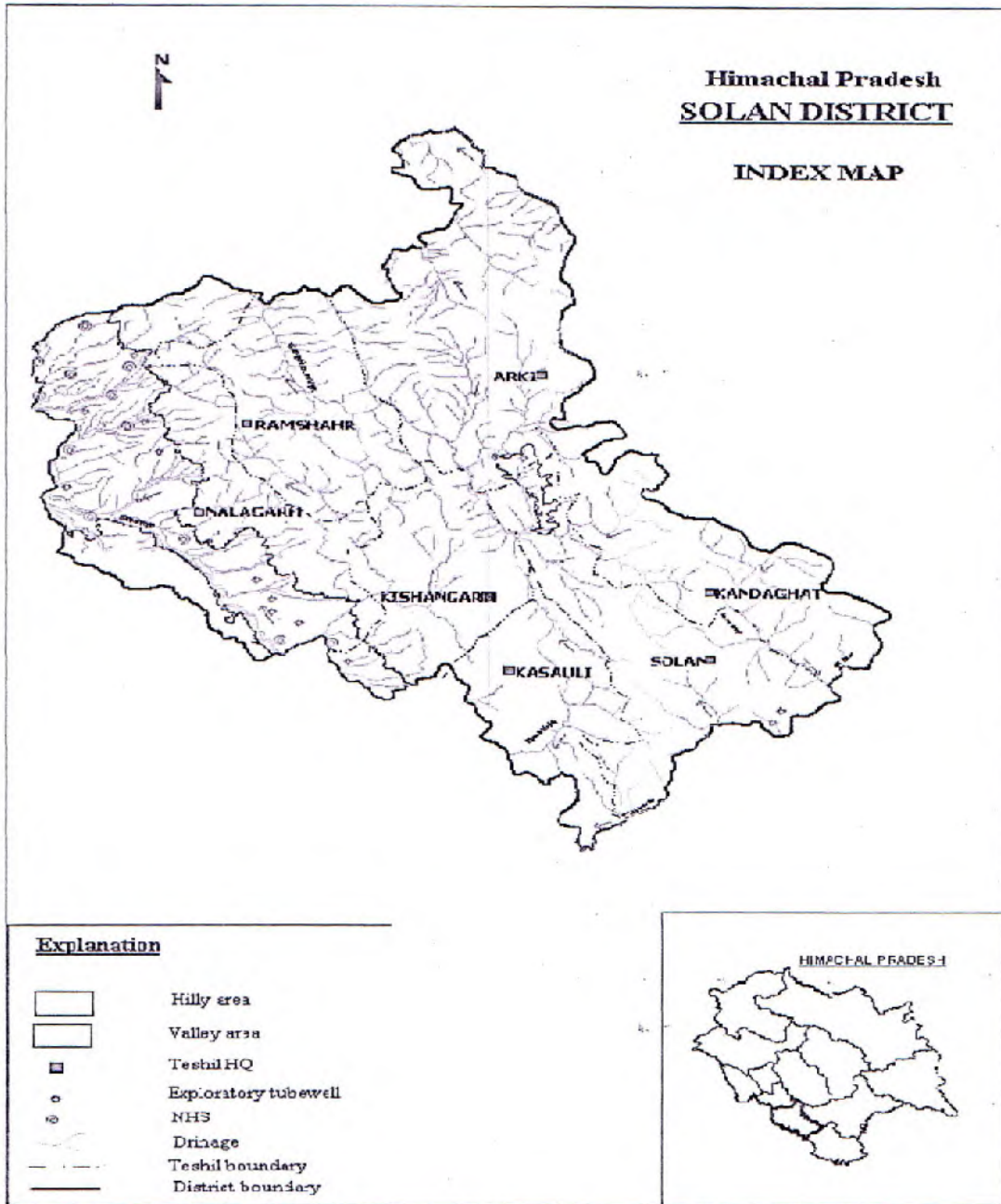


Figure 2 Drainage Map of Solan District

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#### 4. CLIMATE AND RAINFALL

The climate of the District is mostly sub-tropical in the lower reaches and moist temperate in the upper reaches. Winter, summer, rainy and autumn seasons are well marked in the area. Generally the rainy season commences from the first week of July and continues up to the last week of August but sometimes it may advance by a fortnight and extends even up to the end of September. Winter rains generally commence from the last week of December and continue up to end of February. October, November and, May are relatively dry months. Snow is received during January/February mainly around Chail, Kausauli and Krol Tibba, but occasionally does come down to even lower elevation of 800 Meters. Due to significant variations in altitudes in the Distt., the temperature also varies considerably. Minimum temperature goes down below 0° in higher reaches during the winter season and the maximum temperature exceeds even 40° C in lower reaches during the summer season. Rainfall is indispensable for the cultivation in the hilly areas. This is because irrigation facility could not be created here to the extent possible as in plains. Due to unfavorable climatic conditions, only higher elevations with a facility of irrigation provide a good scope for vegetable cultivation in the District.

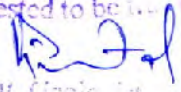
The average annual rainfalls for the last four years i.e. 1999 to 2002 in the Distt. are as under:-

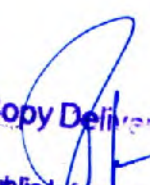
##### Average Annual Rainfalls

<u>Year</u>	<u>Average of Rainfall</u>
1999	1182.9mm.
2000	937.4mm.
2001	865.5mm.
2002	908.5mm.

Whereas overall annual average rainfall of the Himachal Pradesh for the above said years are as under:-

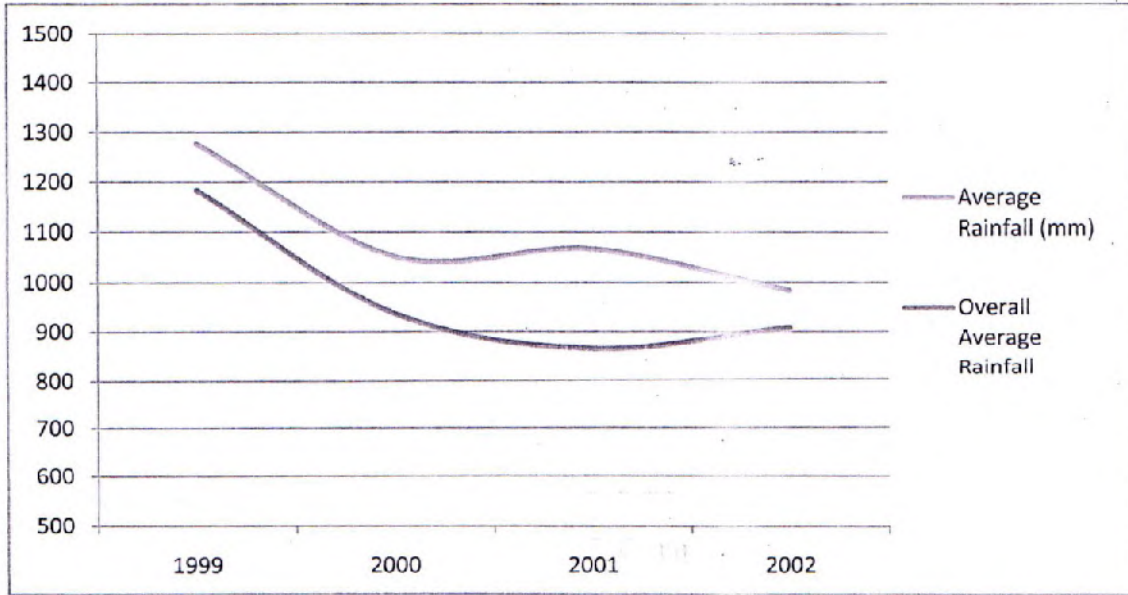
<u>Year</u>	<u>Average of Rainfall</u>
1999	1277.6mm.
2000	1052.4mm.
2001	1067.5mm.

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2002

984.8mm.



Graph 1 Showing average rainfall in Solan Distt. And Himachal Pradesh./

The average annual rainfalls for the next four years i.e. 2004 to 2008 in the District are as under:-

Average Annual Rainfalls

<u>Year</u>	<u>Average of Rainfall</u>
2001	865.5mm.
2002	908.5mm.
2003	-----
2004	718 mm.
2005	922 mm.
2006	830 mm.
2007	1076 mm.

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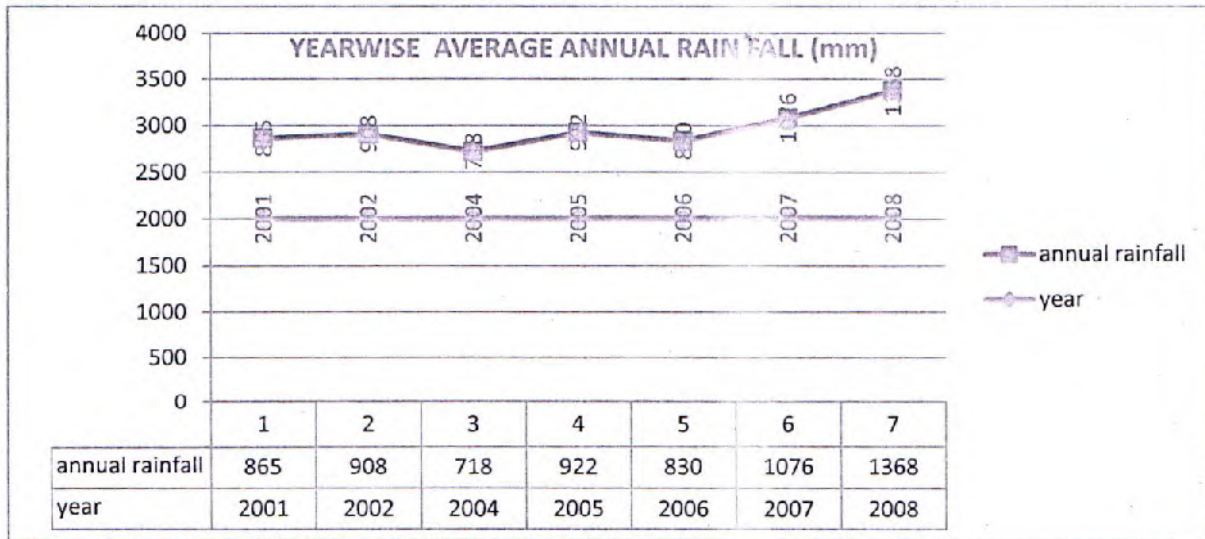
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2008

1368 mm.



Graph 2 Yearwise Average Rainfall

YEAR	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEP		OCT		NOV		DEC	
	RF%	DEP	RF%	DEP	RF%	DEP	RF%	DEP	RF%	DEP	RF%	DEP	RF%	DEP	RF%	DEP	RF%	DEP	RF%	DEP	RF%	DEP	RF%	DEP
2006	49.9	-37	0.9	-99	100	40	13.3	56	77.6	48	103	-26	77	31	244	28	80.6	-53	7.4	85	7.7	47	18	50
2007	0.1	100	171	146	151	111	18	41	21.1	60	124	-11	90	49	354	8	101	-41	19	63	0	100	1.5	90
2008	44.1	-45	33	-53	0	100	11.4	63	95.9	82	308	121	75	30	358	6	343	101	25	51	0	100	1.2	97
2009	10.5	-87	22	-68	34.3	-52	19.4	36	21.1	60	44.9	-68	25	43	122	64	266	115	10	80	6.1	-58	0.1	99
2010	7.5	-91	56	19	0.2	100	0.7	98	39.4	25	169	22	119	7	287	15	284	67	30	41	15.4	5	68	97

Graph 3 Monthly Rainfall

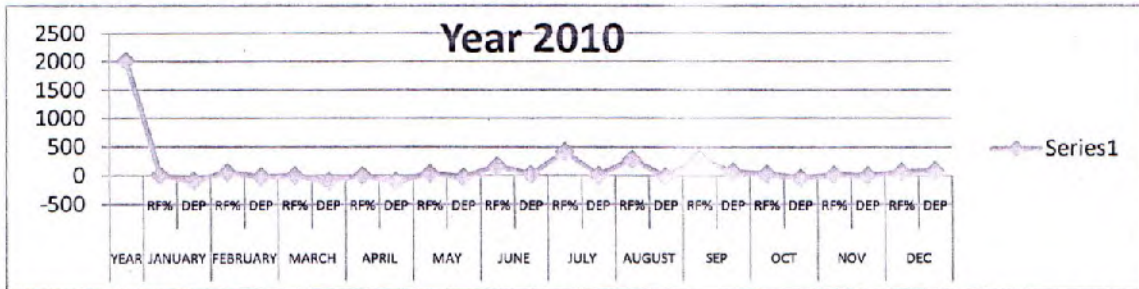
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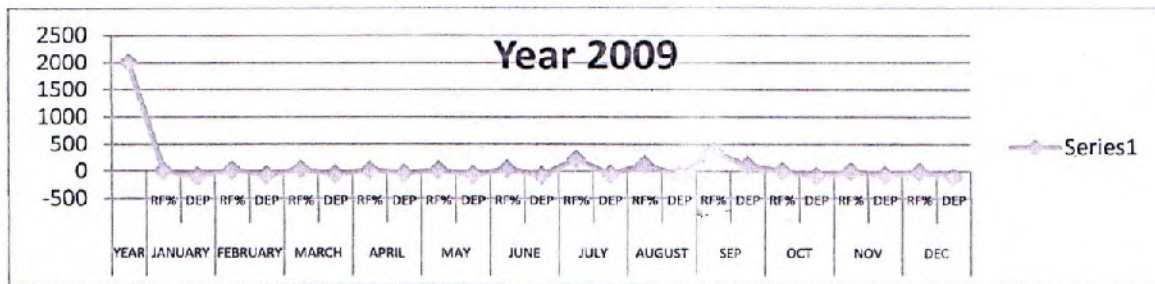


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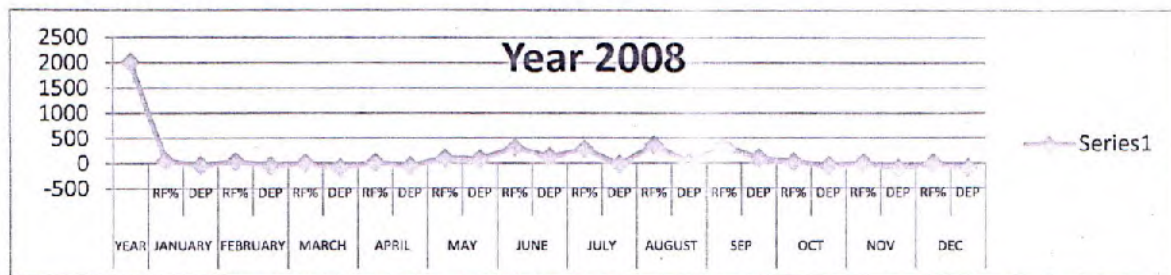
Graph 4 Year 2010

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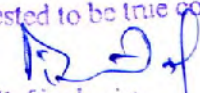
Graph 5 Year 2009

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Graph 6 Year 2008

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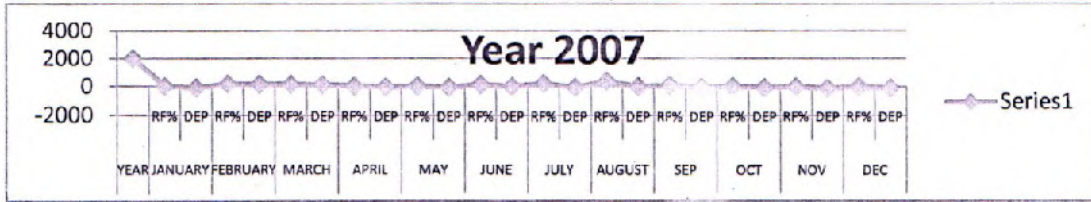
  
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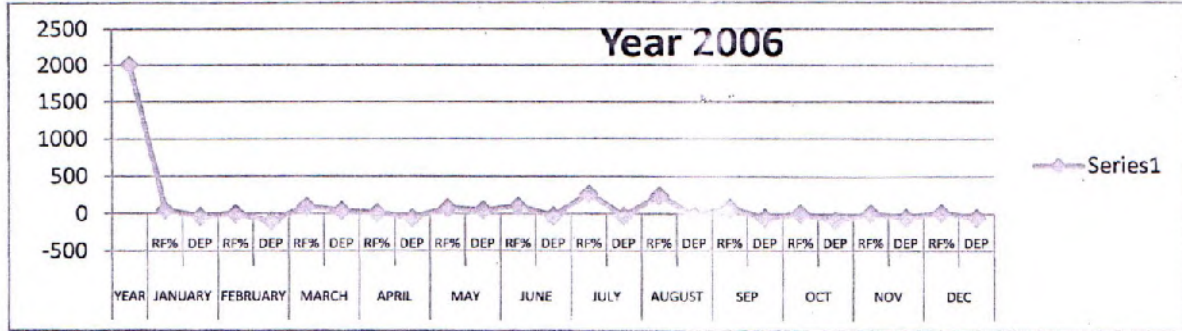
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Graph 7 Year 2007

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Graph 8 Year 2006

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#### 4.1. Catchment

The entire tract of Kunihar area falls in the Satluj catchments. Gamber, Ghambrola and Kuni Khads are perennial streams and nallahs have discharge only during the rains. There is a dendritic drainage system but there is always acute shortage of drinking water during the summer. River Sirsa and Gambhar Khads are the two main sources of drainage of Nalagarh forest division and both of these are perennial in nature. Drainage system is very rapid and excessive and is mostly in the form of torrents (Drainage map annexed as Annexure-II).

The Solan area embraces catchments area of three important rivers namely Satluj, Yamuna and Ghaggar. Main tributaries of Yamuna are Asni and Giri and those of Satluj river are Kian-Ka-Nal, Gamber, Deher Khad and Kuthar Nadi, Balad Nadi and Kaushalya Nadi is the main tributary of Ghaggar. All the streams draining the area are largely rain fed.

#### 5. LAND USE PATTERN


The Distt. is spread over the valleys and higher elevations. The cultivation is possible only in small terraces in the hills or along the stream/khad in most parts of the Distt. However, in the valleys the cultivation is spread over a vast area. Except the valley area most of the land is either under shrub forests or grassy land with chill trees up to the height of 1,500 Mtrs. from the mean sea level and Kail and Deodar on the high altitudes, It is only in the Doon, Saproon and Kunihar valleys that the land is mostly flat and fertile. The settlement operations in the Distt., were carried out at different times as most of the area was forming the princely hill States.

#### 6. AGRICULTURE


Agriculture is the main stay of the rural economy of the Distt. 54.96 percent of the working population of the Distt. is engaged in agriculture. Maize, Wheat, Rice and Pulses etc. are the main crops of the Distt. Cash crops such as sugarcane in Nalagarh Tehsil and Potato in Kandaghat Tehsil are grown. Besides, vegetable cultivation has also taken a boost. Despite hilly topography of the Distt. additional area has been brought under cultivation.

A large number of cultivators in the Distt. are growing mushroom on commercial scale. As the climatic conditions in the Distt. are most conducive for growing mushrooms, special incentives are being offered to small and marginal farmers. The soil in the district varies from light to sandy heavy and in the valley areas it is sandy loam types of soil. Climate is the main factors responsible

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for the proper development of agriculture in the area. The district has different type of soils, which offer great potentialities for growing various types of cereals, fruits, vegetables and other cash crops. Climate of the Dist. is mostly sub tropical in the lower reaches and moist temperature in upper reaches.

The hilly and agro-climatic condition of the district is very congenial for the development of the horticulture in general and cultivation of temperate and stone fruits in particular. Apart from stone and citrus fruits, apples are also being grown in the higher reaches of the district and its cultivation is mainly in Chail area of Kandaghat Tehsil.

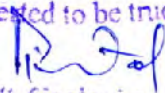
## 7. FOREST

Due to wide variations in the altitude, soil depth and available moisture, the vegetation met within this division shows a great variation. Chil, Khair, Bamboos and other broad leaved species like Chhal, Simbal, Jhingan etc. are the most important species met within this area. Tropical Euphorbia scrub forest to Shiwalik Chil, pine and little Ban oak forests are found in this area. Vegetation changes due to water and slopes. Undergrowth consists of Phullakri, Karaunda, Ghandela and top storey consists of Kashmal, Katni, Kainth, Tirmira, Khair, Bel, Banarasi, Kangu, Malkora, Dub, Dhaula and lobb are the various types of grasses found in this District. The climbers that are generally found are Hedera Lelix, Smilax, Bauhnia vehili, Smilax spp, Gulab, Acacia Pinnata etc.

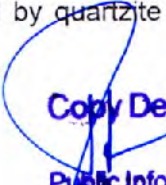
There is a great variety of wild life met within this District. The main wild life animals found are; Leopard, Ghoral, Indian wild Bear, Kakar, Hyena, Wild bear, Porcupine, Hone, Squirrels. Leopard is found throughout the area up to an elevation of about 2,200mtrs. In scrub forests Ghoral is found above an elevation of 1200mtrs. In Mangal area Various types of birds like Chukar, Black Pettridge, Kareshna and Jungle fowl are also found in the District. Besides the already mentioned birds, a number of other birds like Peacock, Parrot, Sparrow, Pigeon and Doves are also found. The entire tract of Kunihar forest falls in Satluj catchment.

## 8. GEOLOGY

Solan District lying within the Lesser Himalaya and the Shiwalik foothill comprises rocks ranging in age from Proterozoic to Quaternary. The oldest rocks of undifferentiated proterozoic age belong to the Jutogh group, comprising carbonaceous phyllite, Schist, Gneiss, Quartzite and marble. The Sundernagar group Rocks of Meso-Preterozoic age represented by quartzite with basic flows.

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The Deoban/Shali Group of Rocks (Meso-Proterozoic) comprising limestone, dolomite, (at Places tromatolytic) Slate & Quartzite occurs along the Main Boundary fault and also in the North-eastern part of the District. The argillo-arenaceous sequence of Shimla/Jaunsur Group rests unconformable over the Deoban Group and assigned meso-Proterozoic age. Both Shimla and Jaunsur Group, comprising diamictite, pink dolomite, carbonaceous shale and slate besides quartzite bands. The Krol Group, which overlies the Balaini Group, is dominantly a carbonaceous sequence with minor shale and sandstone. The Regional Geology and the General Stratigraphy of the Solan District are as given below:-

In the western side of the Solan District Shimla Group of rocks are exposed. It is divisible into four formations on the basis of certain characteristic lithological association and order of super position. Out of four formations, three are exposed in the Solan District.

Formation	Member	Lithology	Remarks
Sanjauli	Upper	Conglomerate, arkosic sandstone, Proto quartzite, Grey and Purple Shale.	Exposed in Shimla
	Lower	Greywacke sandstone, Greywacke Siltstone, Shale and Siltstone alternation, Ortho quartzite.	
Chhoasa		Shale and siltstone alternation with siltstone and orthoquartzite.	
Kunihar		Shale and siltstone alternation with limestone.	
Basantpur	D.	Thick bedded to platy grayish blue limestone with interbedded shale.	Partially exposed in Shimla Distt. And partially exposed in Solan District.
	C.	Massive to bedded limestone-Dolomite.	
	B.	Shale, siltstone with interbeds of lenticular limestone; shale is Sporadically carbonaceous. Impersistent band of Quartzite and dolomite.	
	A.	Greyish white Quartzite and conglomerate	

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The best development of the Basantpur formation is exposed between Tal village near Arki, pass Ghiana and northward up to the Satluj.

Kunihar formation succeeds the Bilaspur formation and is best developed in the vicinity of Kunihar and traceable from Kakarhatti to Bamot. Along the Kalthu Dhar, the limestone interbeds are exposed which contain algal, stromatolites.

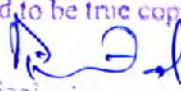
Kunihar marks the contact between the former and the Chhaosa where the Kunihar latterly pinches out to facies, the Chhaosa directly overlies the Basantpur.

The best development of the Chhaosa formation can be seen along the Shimla- Bilaspur highway between Danoghat and Theog.

In the Eastern side of the Solan District, Shimla sequences are succeeded by a younger sequence of formation designated as the Blaini, Infra Krol forming two parallel and apparently independent belts. These are respectively referred to as the outer Krol Belt over the Shimla Group and the inner Krol Belt over the Jauansar Grup. The Krol Hill, Kamli-Dhar synclinal complex belong to the outer Krol Belt. Blaini formation is seen from Halog towards the Giri Valley in the South-East and then extends towards Nago Dhar in the North. The Blaini forms the base of the infra Krol-Krol sequence of outer Krol Belt.

#### Outer- Krol- Belt

Formation	Member	Lithology
	E-	Pale calcareous sandstone, Quartzarenite
		1. Banded grey and pale cream white calcilutite with interbeds of red and black shale.
		Alternation of cherty limestone and shale
	D	Rare conglomerate and sandstone.
		Massive dark blue dolomite
	C-	
	Krol Formation:	B-
A.		1. Red shale with subordinates green shale and thin dolomite and limestone.
		2. Dolomite, oolitic limestone.
		Alternation of calcilutite and shale, argillite.

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<b>Krol Sandstone</b>	Quartzarenite and friable sandstone with fragments of phosphatic shale
<b>Infra Krol</b>	Black shale and slates closely interbedded with thin bands of Infra Krol, slaty Quartzite.

Blaini Group

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Shimla Group

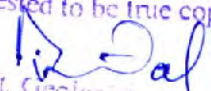
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In the Solan area the black shale of Infra –Krol pass up through a transition unit of shale and slate Quartzite of Krol sandstone. North- West of Solan, development of thin bedded sand stone is noticed. Krol sandstone formation as generally massive and pale grey and coarse to medium grained rock. The friable variety is mainly developed in the Solan- Barog area.

The Tal Group of Early Cambrian age is heterolithic sequence of siltstone, dolomite, shale, ash grey tuff, chert/ phosphorite, carbonaceous shale, grit and quartz arenite and recorded algal structures and trilobite. Subathu Formation is composed of olive green shale, limestone, quartzite and laterite. The Sirmour Group is represented by a thick pile of palaeogene sediments exposed in the foothill, bounded by the Main Boundary Fault and Krol Thrust. It comprises shale, fossiliferous limestone, quartz arenite, siltstone, clay, sandstone and local pebble bed. The Shiwalik Group of Middle Miocene and Early Pleistocene age comprises coarse clastic fluvial deposits of sandstone, clay and conglomerates. The Quaternary sediments (Older Alluvium and Newer Alluvium) along prominent channels consisting of sand, silt, clay, pebbles and cobbles of Middle to Late Pleistocene and Holocene age.

The general trend of the rocks is NW-SE and E-W directions with dip varying from 10 to 40 on either side. Beside Main Boundary Fault, Krol, Giri, Chail and Jutogh Thrust, two major synformal axes running NW-SE also passes through Krol and Tal Group of rocks.

Nalagarh, Barsar and Bilaspur thrust are in general parallel to the Main Boundary Fault. The Pinjaur Dun is developed between the detached anticlinal ridges of Siwalik molasses (mainly Upper Siwalik Formation) in the south and Lower Tertiary (Dagshai, Kasauli and Subathu)/ Tertiary (Lower and Middle Siwalik) rocks in the North. Subathu, Dagshai and Kasauli formations occurrence within foot-hill Palaeogene belt are termed as Sirmour Group of rocks. They extend from the Ravi to the Yamuna in the Himachal Himalaya.

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### Lithostratigraphic Classification of the Sirmour Group

<u>Formation</u>	<u>Member</u>	<u>Lithology</u>
Kasauli		Massive sandstone, subordinate shale
Dagshai	Pabo Chimnum	Alternation of sandstone and clay. Red, Green and Indigo blue coloured Mudstone, Shale, Quartzarenite.
Subathu	B.	Green Shale. Foraminiferal limestone and oyster marls, Quartzarenite, local Carbonaceous shale, calcareous sandstone.

In the main belt, the base of the Subathu formation is exposed at Subathu town, there is considerable tectonisation along the contact. The subathu of the Himachal Foot-hill Palaeogene belt at places contain phosphatic nodules with olive green shales. This sequence contains fossils like Gastropods and divergent terrestrial vertebrates.


The Dagshai formation overlies the Subathu formation along a gradational contact. No break in sedimentation is noticed. The rocks of this formation are characterized by the presence of purple sandstone and clays with pink clay conglomerate and also grey sandstone. This formation is well developed/exposed at Kasauli.

The Kasauli Formation comprises essentially of sandstone with subordinate shale. From Dagshai to the Kasauli, the contact is normal and transitional. This formation is also fossiliferous contains plant fossils.

The close of sedimentation of the Sirmour basin almost coincided with the development of a new fore deep to its South for a new cycle of sedimentation of the Siwalik Group. The period witnessed a southward migration of the Cenozoic basin.

The rocks of the Sarsa Catchments are represented by the Siwalik Group, Older Alluvium and Newer Alluvium. The stratigraphy of the Sarsa catchments with lithology of the area is as given below in the table:

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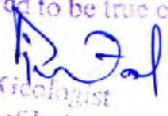
  
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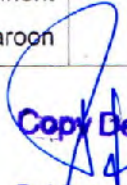
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**Lithostratigraphy of the Kothiwali Khol catchment and its Surrounding**

<u>Group</u>		<u>Lithology</u>	<u>Age</u>
Newer	Channel Alluvium	Grey micaceous, fine to coarse alluvium grained sand, silt and clay.	Quaternary
	Fan Alluvium	Cyclic sequence of grey clay, micaceous sand, silt, clay. Brownish Grey clay, sand and gravel boulders.	
Older	Dun Alluvium Gravel	Multi-cyclic sequence of brown to grey silt, clay with kankar and reddish brownish clay with pebbles. Predominantly massive conglomerate with red and orange clay as matrix and minor sandstone and earthy buff and brown clay stone	
Siwalik Group	Upper Siwalik	Sand stone, clay and conglomerate alterations. Massive sandstone with minor conglomerate and local variegated clay stone.	Neogene
	Middle Siwalik	Predominantly medium to coarse grained sandstone and red clay alterations, soft pebbly with sub ordinate clay stone, locally thick prisms of conglomerate.	
	Lower B	Alteration of fine to medium Siwalik grained sporadically pebble sandstone, calcareous cement and prominent	
	Lower A	chocolate and medium maroon	

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		clay stone in the middle part. Red mauve clay stone with thin intercalations of sandstone.	
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The Dun is boarded by Nalagarh thrust in the north and detached Siwalik hills (mainly comprising of **Upper Siwalik**) in the south. Within the Dun, Quaternary sediments are exposed as Alluvial fan and river terraces. North of Nalagarh thrust, Tertiary (**Siwalik Group**) and lower Tertiary (**Subathu Group**) rocks are exposed. The Sub Himalaya, the Southernmost division of the Himalaya, is separated from the Lesser Himalaya by the Main Boundary Thrust (**MBT**) in the north and southern boundary is demarcated from the Indo-Gangetic Plain by the Himalayan Frontal Fault (**HFF**). The northern part of the Sub-Himalaya is characterized by a series of intrabasinal thrusts.

The Nalagarh Thrust marks the northern boundary of the Dun, which brought the Tertiary/Lower Tertiary rocks over the quaternary Dun sediments. The Satluj river and its tributaries are the major drainage system in the Dun. The Satluj river flows in a longitudinal course from the north west to the southeast, whereas its tributaries originate from the higher reaches of Sub-Himalaya, between Nalagarh Thrust and Main Boundary Thrust and flow in transverse courses in a South- Southwest direction. The catchments areas of these piedmont rivers (tributaries of Satluj) are mainly comprised of Lower Tertiary and Tertiary (Lower and Middle Siwaliks) rocks. Mudstones and sandstones are the predominant rock types in the Lower and Middle Siwaliks, respectively. The important geomorphic features observed within the Dun basin are alluvial fans and river terraces. Alluvial fans are fan- or cone-shaped sedimentary bodies that accumulated at the base of the Sub-Himalayan mountain front, south of Nalagarh thrust, down slope from the point where the piedmont rivers emerge from the uplands. Extensive road cuttings and river cuts provide an excellent opportunity to examine nearly continuous exposures (from fan head to toe and transverse view) of these fan sediments. A series of alluvial fans are observed exposed around present-day rivers, between Kiratpur in the West and Pinjaur in the East. Many alluvial fans are exposed around Luhund Khad, Kundlu-ki-khad, Chikni and Mahadeva river etc. The Kundlu-ki-Khad fan is about 15 Kms. long and 6 Kms. wide, whereas the Luhund Khad fan is about 11 Kms. long and 7 Kms wide.

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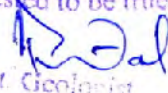
**8.1. Siwalik Group:**

The Siwalik deposits are one of the most comprehensively studied fluvial sequences in the world. They comprise mudstones, sandstones and bedded conglomerates laid down when the region was a vast basin during Middle Miocene, to Upper Pleistocene times. The sediments were deposited by rivers flowing southwards from the Greater Himalayas, resulting in extensive multi-ordered drainage systems. Following this deposition, the sediments were uplifted through intense tectonic regimes (commencing in Upper Miocene times), subsequently resulting in a unique topographical entity i.e. the Siwalik Hills. The Siwaliks are divided stratigraphically into three major Sub-groups-Lower, Middle and Upper. These Sub-groups are further divided into individual formations that are all laterally and vertically exposed today in varying linear and random patterns.

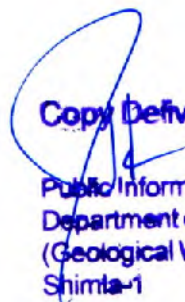
Ongoing erosion and tectonic activity has greatly affected the topography of the Siwaliks. Their present-day morphology is comprised of hogback ridges, consequent, subsequent, obsequent and resquent valleys of various orders, gullies, chos (seasonal streams), earth-pillars, rilled earth buttresses of conglomerate formations, semi-circular chos-divides, talus cones, colluvial cones, water-gaps and chos terraces. Associated badlands features include the lack of vegetation, steep slopes, high drainage density and rapid erosion rates.

In the advent of Neogene, a depression was formed in front of the rising mountains (Proto-Himalaya). This depression becomes a repository of a thick sequence of molassic sediments of the Siwalik. The Siwalik Group comprises of conglomerates, friable micaceous sandstone, siltstone and clay stone.

The conglomerates in general are poorly cemented but at places they are very hard. These consist mainly of pebbles and cobbles of quartzite. The stray pebbles of granite, limestone, sandstone, breccia and lumps of clay stone are also observed at places. Often the size of pebbles is large enough to be called as boulders. The conglomerates not only occur as regular band but also as lenticular bands with alternative with micaceous sandstone and claybeds.

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The sediments were brought down 2 to 25 million years ago by the numerous fast flowing rivers issuing forth from rapidly rising Mountain mass of the Himalaya, in the north.

The Siwalik Group is divisible into three sub-groups respectively the Lower, Middle and Upper on the basis of the lithostratigraphy as given in the table.

**8.2. Lower Siwalik:**

The Lower Siwalik consists essentially of a sandstone-clay alternation. In District Solan, the lower sequence of the lower Siwalik consists of medium grained sub graywacke inter bedded with thick red clay, but higher up in sequence, sandstones are coarser and clasts become more frequent while the clays are less developed. The uppermost horizon consist of conglomerate with well- rounded clast of grey quartzite possibly derived from the Shali. The total thickness is about 1600 Mtrs.

**8.3. Middle Siwalik:**

The Middle Siwalik Sub-group comprises of large thickness of coarse micaceous sandstone along with some interbeds of earthy clay and conglomerate. It normally succeeds the Lower Siwalik along a gradational contact. The sandstone is less sorted than those in Lower Siwalik. Clay bands are dull coloured and silty. The general thickness is 1400 to 2000 mtrs.

**8.4. Upper Siwalik:**

The Upper Siwalik is mainly represented by sandstone interbedded with silt and conglomerate. The lower portion of the Upper Siwalik mainly consists of soft, massive, pebbly sandstone with intercalations of conglomerates. In the upper portion, the conglomerate intercalation is replaced by the clay intercalations. The general thickness in the District is about 2300mtrs.

**8.5. Older Alluvium:**

The Older Alluvium in Dun valley is designated as Dun gravels while in the plains as Varanasi (Ambala). It is a multicyclic sequence of brown to grey silt, clay with Kankar and reddish brown to grey micaceous sand with pebbles.

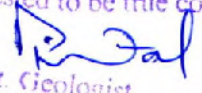
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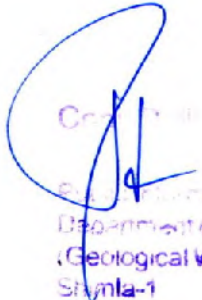
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**8.6. Newer Alluvium:**

Newer Alluvium has been subdivided into Fan Alluvium compassing of brownish grey clay, sand and gravel sequence, lies disconformable over Older Alluvium with in a narrow zone immediately to the south of Siwalik hill and terrace alluvium exposed as depositional terraces of Satluj and Sirsa River and comprising of cyclic sequence of grey, micaceous, fine to coarse grained sand, silt and clays. Channel Alluvium exposed as point bar/channel bars within the active channels is composed of grey, fine to coarse micaceous sand and silts.

A number of minerals are found in the District but most of them except limestone and minor minerals like sand, stone and gravel are in insignificant quantity. These minerals are Barytes, Coal, Copper ore, Gypsum, Lead ore and Phosphate. There are huge deposits of limestone available in the District are as under (Geological Map of Solan District annexed as Annexure-1).

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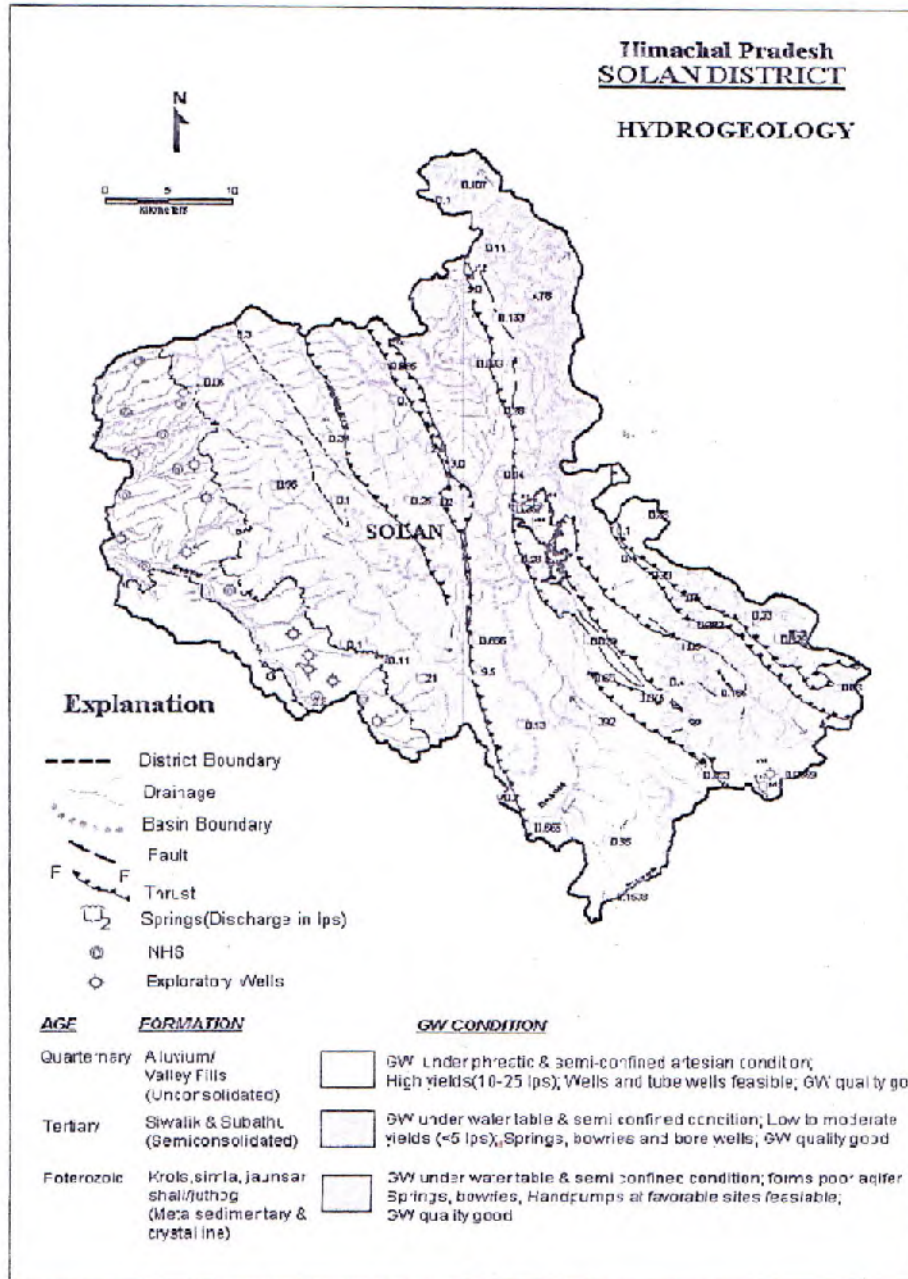


Figure 3 Hydrogeological map

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**8.7. Arki Limestone Deposit:**

**Approach:** The limestone belt of Arki is about 2Kms. NNW of Arki town, which is the Tehsil headquarter of Solan District, Arki is 39Kms. from Shimla via Shalaghat, the State Headquarter & 58Kms. from Solan via Subathu. It lies between longitude  $76^{\circ} 58' 02''$  and  $76^{\circ} 56' 24''$  E and Latitudes  $31^{\circ} 11' 15''$  and  $31^{\circ} 9' 36''$  N.

**Nature of deposit:** Limestone deposit of Arki area belong to Basantpur formations of Shimla group of rocks & predominantly it is composed of limestone, dolomite and shales & siltstone.

**Reserves:** Total mine able reserves of steel grade limestone have been proved to the tune of 119.06 million tones. The said deposit has been leased out to NMDC for exploitation of the said reserves for further supply to Steel authority

**Quality:** Average grade of limestone up to the depth of 146Mtrs. is as below:

CaO,	MGO,	SiO <sub>2</sub> ,	Fe <sub>2</sub> O <sub>3</sub> ,	Al <sub>2</sub> O <sub>3</sub> ,	L.O.I
53.46%	1.48%	0.50%	0.35%	0.27%	53.46%


**8.8. Bagha-Bhalag Limestone deposit:**

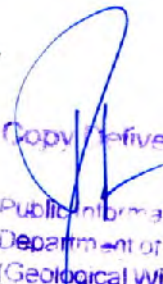
**Approach:** The area under reference lies on the border of District Bilaspur and Solan. The Majority of limestone is exposed around village Bagha, tehsil Arki, Distt. Solan, H.P. and is located at a distance of 6 Kms. from Kharsi falling on Darla Mor-Beri Road. Kharsi is 16Kms. away from Darla Mor towards Beri which onwards falls on National Highway No. 88 i.e. Shimla-Hamirpur-Mataur.

**Nature of Deposit:** The limestone belongs to Sorgharwari Member of Shali formation comprises of pink and grey with thin shale partings. The rock units exposed in Bagha area forms a plunging syncline in which pink and grey limestone is refolded into minor syncline and anticline thereby increases the thickness of the deposits. The limestone overlies the dolomites of Khatpul member and is well bedded and laminated with Shale partings.

**Average Chemical Analysis of the Limestone is as under:-**

Pink Limestone

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CaO,	MgO,	SiO <sub>2</sub> ,	Fe <sub>2</sub> O <sub>3</sub> ,	Al <sub>2</sub> O <sub>3</sub> ,	L.O.I
46.81%	2.44%	9.00%	0.55%	1.17%	38.02%
Grey Limestone					
CaO,	MgO,	SiO <sub>2</sub> ,	Fe <sub>2</sub> O <sub>3</sub> ,	Al <sub>2</sub> O <sub>3</sub> ,	L.O.I
40.00%	1.75%	20.00%	1.20%	2.80%	33.00%

**Reserves:** The grey and pink limestone in the area rises from 1020 mtrs. to 1640mtrs. R.L. from the M.S.L. The total reserves inferred in the area are to the tune of 295 million tones out of which 95 million tones have been proved by drilling up to 1300 mtrs. R.L. from the M.S.L.

On the said deposite mining leases has been granted in favour of M/S Jay Pee Cements and company has established factory of 2.45 Million Tonn per annum at Bagha

#### 8.9. Kashlog-Mangu Limestone Deposit


**Location:** It is located at a distance of 10 Kms. from Kararaghat falling on Shimla- Bilaspur road at a distance of nearly 40Kms. from Shimla.


**Nature of Depots:** Limestone exposed in the area belongs to Basantpur formation of Shimla group of rocks. It is light grey, dark grey & blackish in colour. Hard compact & crises-crossed by calcite veins. General trend of rocks in the area is NW-SE dipping NE form 22° to 54° in amount.

**Total Reserves:** Total reserves proved by drilling upto a depth of 100 mtrs. are to the tune of 130million tonnes whereas estimated reserves are to the tune of 200 million tonnes.

Quality: Average chemical analysis of limestone is as under:

CaO%	MgO <sup>2</sup> %	SiO <sup>2</sup> %,	R <sup>2</sup> O <sup>3</sup> %,	Total carbonate
				Various from 76% to97%
48.70	0.93	10.47	1.54	

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## 9. Methodology and Guiding principles

The trace of each and every river/stream was covered and studied on the following principles of Geology/River bed mining:

- The general geology of the area;
- The presence of any major geological structure;
- Origin of river;
- Pattern of primary/ secondary/tertiary streams;
- Total catchments;
- General profile of river/streams;
- Meandering Pattern;
- Bank stability;
- Total potential of river bed in reference to minor mineral;
- General slope of the river/stream;
- Morphogenetic regions.

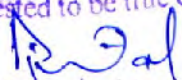
**In Addition to Above presence of following object were also studied**

- The presence of any WSS Schemes
- Bridges
- Agriculture fields
- Bank protection works
- Plantations etc.

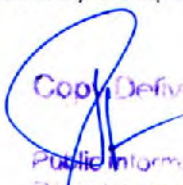
**Following are the important guiding principles considered while recommending the river/stream bed or part of river/stream bed for collection for minor minerals.**

- The production of aggregate in a particular area is a function of the availability of natural resources, the size of population, the economy of the area and various developmental and infrastructural works being undertaken in the area like road construction, hydro-electric projects etc. Further, being a low-value, high-volume mineral commodity, the prices are dramatically affected by transportation distances. If

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the distances increase, the transportation cost may increase much more than the cost of the aggregates.

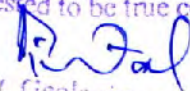
- A stable river is able to consistently transport the flow of sediments produced by watershed such that its dimension (width and depth) pattern and vertical profile are maintained without aggrading (building up) or degrading (scouring down)
- The amount of boulders, cobbles, pebbles and sand deposited in riverbed equals to the amount delivered to the river from watershed and from bank erosion minus amount transported downstream each year.
- It is compulsive nature for river to meander in their belts and therefore they will have to be provided with adequate corridor for meandering without let or hindrance. Any attempt to diminish the width of this corridor (floodway) and curb their freedom to meander would prove counterproductive.
- Erosion and deposition is law of nature. The river/stream has to complete its geomorphological cycle from youth, mature to old age.
- River capturing is unavoidable
- Erosion in upstream and deposition in downstream
- Tendency of the river/stream toward grade
- Fundamentally, the lowest point of any stream is fixed by Sea Level
- The ratio between the width of meander belt and width of the stream decreases as the width of the stream increases.

**Formation, Bank erosion and Replenishment of any specific riverbed depends**


**Primarily upon:**

- The Geology of the area;
- River Profile;
- Nature of source;
- Rainfall in catchments;
- Morphogenetic region;
- Catchments geomorphology;
- Efficiency of River/Stream (i.e. erosive power);

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- The competency of the river/Stream (i.e. transport heaviest stone);
- The capacity of the River/Stream (i.e. volume of transportation);
- Hydraulic radius of the River/Stream (ratio between cross sectional area and length of wetted perimeter).

**Secondarily upon:**

- Geological structures;
- Porosity of formation;
- Run off in the catchments;
- Forest cover;

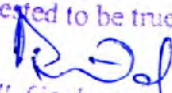
**In addition to above following man made factors are also involved.**


- Type of agriculture;
- Encroachment on flood plain leaving least space for meandering;
- Any barrier on river/stream bed i.e. bands, dams and bridge foundations etc;
- Throwing of debris into the river/stream course;
- Drying up of river courses due to construction of dams, thereby reducing the efficiency and capacity of the river/stream.

The total potential of the river/stream bed is calculated up to the depth of one meter and in the workable span. Total potential or annual replenishment is not necessarily mineable. Mine ability depends upon the availability of approach roads, distance from the general conditions of policy viz distances from WSS Schemes, bridges etc and overall on the market demand etc. Thus keeping these factors into consideration 60% of the total potential has been taken for the purpose of exploitation of minor minerals.

**Method For Calculation of Reserves:-**

For the calculation of total reserves of minor minerals available in the river bed, length, average width and depth of the river bed for which the exploitation is to be carried out/allowed under rule/prevaling instructions of the Govt. was taken into consideration. The volume thus obtained is multiplied with the

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bulk density which has been assumed as 2.2 for all types of minor minerals. Thus reserves up to particular datum line i.e. one meter below the surface have been calculated.

Total reserves of minor minerals (M.T.) =

Length x Width x Height i.e. Depth x Density

For the annual replenishment of minor mineral reserves, the average annual mean depth upto which the replenishment of minor mineral takes place annually, has been taken into consideration which depends upon the annual rainfall factor and geology of the catchments area.

#### 10. RIVER/STREAM WISE DETAIL

##### 10.1. LOHAND KHUD:

A tributary of Satluj River.

Altitude at the origin	- 500 mtrs. above mean sea level (Near Village Kothi)
Total length	- 11.5 Kms.
General Width	- 80-100 mtrs.
Climate of Catchments	- Humid.
Seismicity	- Seismic Zone-iv
General slope: -	8° to 10° up to first 5Kms. 5° to 7° from 5Kms. onward up to entrance point in Punjab.
Total catchments are	- 38 Sq. Kms.
General direction of flow	- NNW-SSE.

##### **Geological condition:-**

The tributary flows through the moderately low hills and intervening valley of the Siwaliks and flood plains. The area is represented by admixture of boulders, cobbles, pebbles and sand of flood plain. The banks are controlled by stable lands. Therefore, Geo-technically, the area is represented by Himalayan fore deep zone and structural ridges and valleys. The rocks belong to quaternary age.

Both the banks are stable and banks of flood plains are represented by lowslopes. The competency of the river is much up to 500 mtrs. contours. All catchments area are represented by Middle Siwalik of

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Siwalik Formation. The carrying capacity is very less right from its origin to the entrance point in Punjab area, leading to 2 to 4cm annual deposition of minerals.

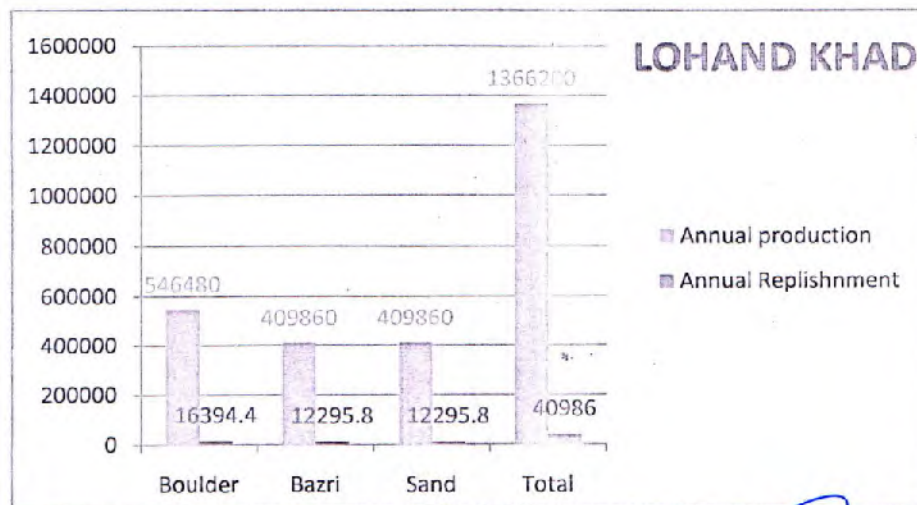
The total calculation of boulders, river born bajri and sand is done by taking average %age of each mineral, but it may differ at specific site, depending upon the type of land form, competency/capacity at that particular place.

**Total potential (M.T.) of minor mineral in the bed (up to 1 Mtrs. depth):-**

- Total Minor Mineral available in the bed = 1366200 M.T.
- Total boulder available in the bed 40% (approx.) = 546480 M.T.
- Total sand available in the bed 30% (approx.) = 409860 M.T.
- Total sand available in the bed 30% (approx.) = 409860 M.T.

<b>Annual replenishment</b>	<b>Boulder 40%</b>	<b>Sand 30%</b>	<b>Bajri 30%</b>
<b>Total 40986 M.T.</b>	<b>16394.4 M.T.</b>	<b>12295.8 M.T.</b>	<b>12295.8 M.T.</b>

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Graph 9 Lohand Khad

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Hence, keeping into consideration the item No. 9.5. d. & 9.5.e of River/Stream Bed Mining Policy Guidelines-2004, 40986 M.T. of mineral can safely be allowed to be lifted from the river bed. It is recommended that lifting of boulder/cobbles/sand can be allowed from this river subject to general conditions of River/Stream Bed Mining Policy. However, no lifting/mining shall be allowed where protection work has been executed by any agency. The above said reserves are total reserves and mineable reserves shall depend upon the area where mineral concession is granted.

## 10.2. RATTA NADI:

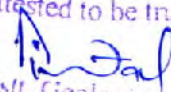
### General:

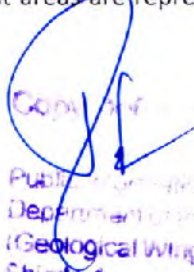
A tributary of Satluj River.

Altitude at the origin	- 500 Mtrs. above mean sea level (Near Village Chhoti.Batauli).
Total length	- 8.5 Kms.
General width	- 60-80Mtrs.
Altitude at confluence	- 360mtrs. above mean sea level (Near at Malka Majra).
Climate of catchments	- Humid.
Seismicity	- Seismic zone IV.
General slope	- 8 <sup>o</sup> -10 <sup>o</sup> upto 2.5 Kms -2 <sup>o</sup> -4 <sup>o</sup> up to from 2.5Kms. onward up to confluence
Total catchment area	- 36.05 Sq.Kms.
General direction of flow	-NE-SW.

The tributary flows through the moderately low hills. Geologically, the area is represented by flood plains. The rocks of both banks are represented by flood plains and are embarked by the stable land. These flood plains belonging to quaternary age. The area is represented by Himalayan fore deep zone and structural ridges and valleys.

Both banks are stable banks of stable land of flood plains. The river banks are very low and hardly demarcated with the course of river bed, hence river bed mining can damage the banks. Thus extra care shall have to be taken at time of mining operations. All the catchment areas are represented by upper

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and Middle Siwalik formation and flood plains having Boulder/Cobbles/Pebbles and sand etc. Hence during rainy season when competency increases, it brings plenty of sand including Boulders, Cobbles/Pebbles and sand etc. The river bed is having wide width as it runs almost along the flood plains. Hence deposition of the mineral on river bed will increase the lateral erosion due to flat course of the river bed.

The carrying capacity suddenly reduces after 400 Mt above MSL leading to only 2cm. to 4cm. annual deposition of mineral.

**Total potential (M.T.) of minor minerals : 785400 M.T.**

(up to 1 mtrs. depth)

Boulders available in the river bed 40%(approx.) : 314160 M.T.

Bajri available in the river bed 30%(approx.) : 235620 M.T.

Sand available in the river bed 30%(approx. ) : 235620 M.T.

**Total annual replenishment**

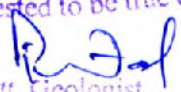
Boulder replenishment in the river bed 40%(approx.) : 9424.8 M.T.

Sand replenishment in the river bed 30%(approx.) : 7068.6 M.T.


Bajri Sand replenishment in the river bed 30%(approx.) : 7068.6 M.T.

**Total : 23562 M.T**

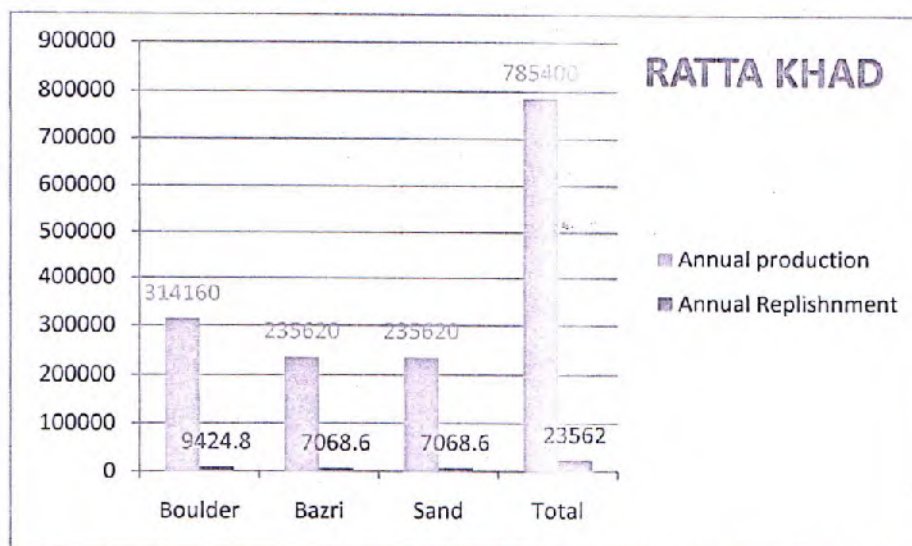
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Graph 10 Ratta khad

Hence, keeping into consideration the item No. 9.5.d and 9.5.e. of the River/Stream Bed Mining Policy Guidelines-2004, the 23562 M.T. Mineral can safely be lifted from the said river bed, otherwise deposition in the central portion would increase, which may ultimately lead to bank erosion. The above said reserves are geological reserves and the mineable reserves depend upon the area where mineral concession is granted. However, it is pertinent to mention here that the said river bed has already been squeezed by the upcoming industries, thus the exploitation of mineral has become very limited.

Hence it is recommended that lifting/mining of boulders/cobbles/pebbles/sand can be allowed from the river subject to general conditions of River/Stream Bed Mining Policy Guidelines-2004.

**10.3. SARSA NADI:**

**GENERAL:**

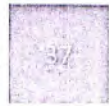
A tributary of Satluj River.

Altitude at the origin - 400 mtrs. above mean sea level enters  
In H.P. (near Daso-Majra Village).

Total length - 35 Kms.

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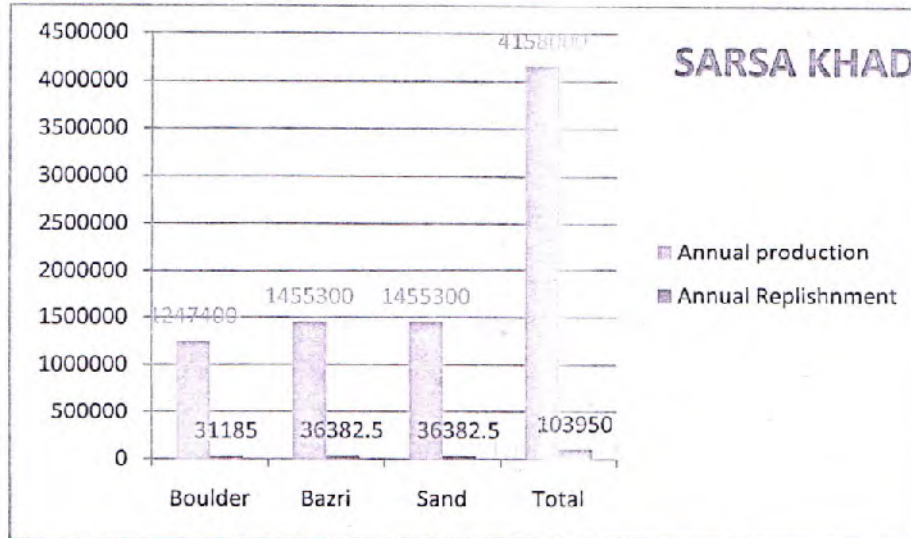
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Bajri available in the river bed 35%(approx.) : 36382.5 M.T.

Sand available in the river bed 35%(approx.) : 36382.5 M.T.

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Graph 11 Annual Production (Sarsa Khad)

Most of the part of the said Nadi is leased out to different individuals. Hence keeping into consideration, the item No. 9.5.d. and 9.5.e. of the River/Stream Bed Mining Policy Guidelines-2004, the 103950 M.T. Mineral can safely allowed to be lifted/collected from the river bed, otherwise, if height of the central portion increases, the banks will be eroded and width of the river bed will increase. However, it is pertinent to point out that already excessive mining/lifting has been carried out in the past. Thus the above said quantity of material may not be available from the river bed as study was made by way of random checking. These are total reserves and mine able reserves depend upon the area where mineral concessions are granted.

Hence, it is recommended that lifting of boulders/cobbles/pebbles/sand can be allowed from this river subject to the general conditions of the Rover/Stream Bed Mining Policy-2004. No further concession except private land engulfed by the river be granted in the said river. The concessions in private land are given only for free sale not for installation of stone crusher.

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**10.4. BALAD NADI:**


A tributary of Satluj River.

Altitude at the origin	- 800 mtrs. above mean sea level (Near Chewag springs).
Total length	-17.5 Kms.
General Width	- 50-70 mtrs.
Climate of Catchments	- Humid.
Seismicity	-Seismic Zone-iv
General slope :-	-20 <sup>0</sup> to 30 <sup>0</sup> up to first 2Kms. -12 <sup>0</sup> to 15 <sup>0</sup> from 2Kms.to 6.5Km. - 18 <sup>0</sup> -20 <sup>0</sup> from 6.5Km to 9.5 Km. - 8 <sup>0</sup> - 10 <sup>0</sup> from 9.5Km to 17.5Km.
General direction of flow	-North to South
Total catchments area	-87.50 Sq.Kms.

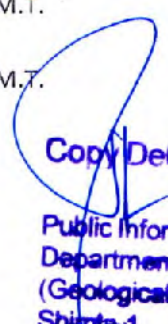
The tributary flows through moderately steep to low flood plains. The area is represented by Himalayan fore deep zone. The rocks on both banks are represented by Middle Siwaliks sandstone and clay bands of Siwalik Formation and in the lower part i.e. from Brotiwala to Baddi, the banks are embanked by flood plains. These formations are belonging to Middle Miocene to early Pleistocene age and Neocene age.

The river shows how the grading is effected by geological structures. The point of least competency and carrying capacity coincide with sudden change in lithology. The riverbed where it enters from sand stone formation to flood plains, suddenly increases in the width. With the increase of width of bed, the competency and carrying capacity reduces considerably. The carrying capacity of annual mineral deposition is only 3 to 4 cms per annum.

<b>Total potential (M.T.) of minor minerals in the bed :</b>	<b>1386000 M.T.</b>
Boulders available in the river bed 40% (approx.) :	554400 M.T.
Bajri available in the river bed 30% (approx.) :	415800 M.T.

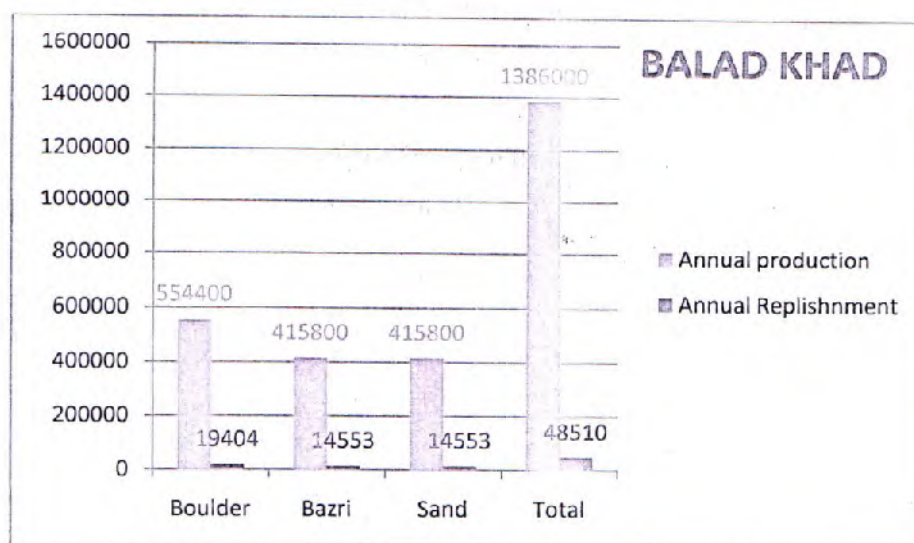
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Sand available in the river bed 35% (approx.) :	415800 M.T
<b>Total annual replenishment of minor minerals in the bed :</b>	<b>48510 M.T.</b>
Boulders available in the river bed 40% (approx.) :	19404 M.T.
Bajri available in the river bed 30% (approx.) :	14553 M.T.
Sand available in the river bed 30% (approx.) :	14553 M.T.

MT



Graph 12 Annual Production (Balad Khad)

Hence, keeping in consideration the item No. 9.5.d. and 9.5.e of the River/stream Bed Mining Policy Guidelines-2004, the 48510 M.T. mineral can safely allowed to be lifted from the river bed, otherwise with increase of height of central portion, bank erosion and lateral erosion increase the dimensions of river. However, it is pertinent to point out here that excessive mining/lifting had already been carried out in past. Thus, above said reserves are the total reserves and mineable reserves depend upon the area where mineral concession is granted.

Hence it is recommended that lifting of Boulders/Cobbles/Pebbles/Sand can be allowed from this river subject to general conditions of River/Stream Bed Mining Policy Guidelines-2004 viz

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distances from bridges etc. Mining shall be encouraged only in central portion so as to channelize the river.

**10.5. PALIMAHADEV RIVER**

A tributary of Satluj River.

Altitude at the origin - 700 mtrs. above mean sea level  
(Near Village Bara & Belh).

Total length - 22 Kms.

General Width - 50-60 mtrs.

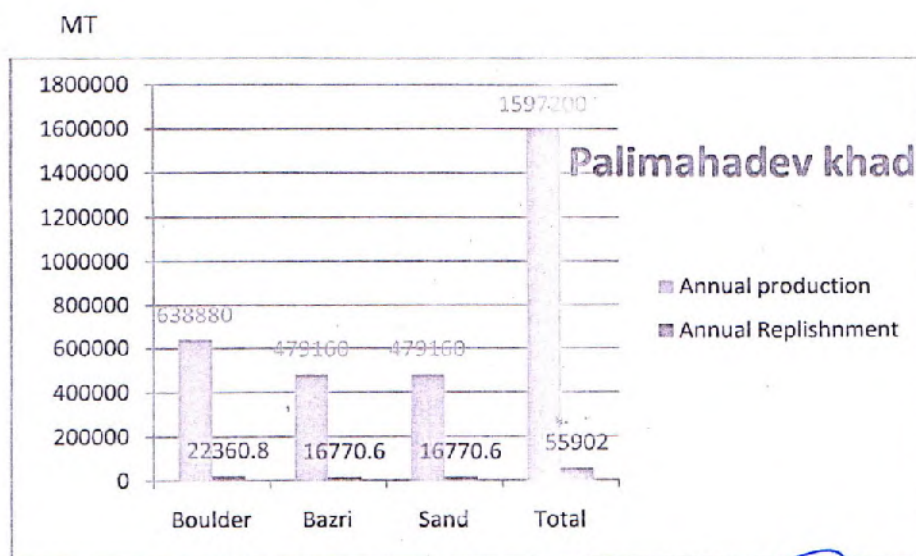
Climate of Catchments - Humid.

Seismicity - Seismic Zone-iv

General slope:-  
- 25° to 30° up to first ½ Kms (From upstream).  
- 20° to 25° from ½ Kms. to 1Km.  
- 18°-20° from 1Km to 3.5 Kms.  
- 12°- 10° from 3.5Km to 10Kms.

General direction of flow - North to South

Total catchments area - 45.75 Sq.Kms.



Graph 13 Annual Production (Palimahadev Khad)

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The tributary flows through moderately steep to low hills. Geotechnically, the area is represented by Himalayan fore deep zone of structural ridges and valleys. The rocks on both banks are represented by sandstone and clay bands of Siwalik Group belonging to Middle Miocene and in the lower part of the river bed, banks are represented by stable land of flood plains belonging to Neocene age.

The both banks are having stable banks of flood plains and sandstone rocks through all along its course. All catchment area is represented by sandstone and flood plains having boulders of different size cemented with matrix of sand and Pebble/Cobbles etc. The point of least competency and carrying capacity coincide with sudden change in lithology. The river when it enters from sandstone formation to flood plains, there is sudden increase in width of the valley. The annual deposition of mineral is only 3cm to 4cms as catchment area is mostly represented by sandstone and flood plains.

**Total potential (M.T.) of minor minerals in the bed : 1597200 M.T.**

**(up to Depth 1 Mtrs.)**

Boulders available in the river bed 40% (approx.) : 638880 M.T.

Bajri available in the river bed 30% (approx.) : 479160 M.T.

Sand available in the river bed 30% (approx.) : 479160 M.T.

**Total annual replenishment of minor minerals in the bed : 55902 M.T.**

Boulders available in the river bed 40% (approx.) : 22360.8 M.T.

Bajri available in the river bed 30% (approx.) : 16770.6 M.T.

Sand available in the river bed 30% (approx.) : 16770.6 M.T.

Hence, keeping in consideration the item No. 9.5.d. and 9.5.e of the River/stream Bed Mining Policy Guidelines-2004, the 55902 M.T. mineral can safely be allowed to lift from the river bed, otherwise meandering will increase the bank erosion with lateral increase in the dimensions of river. Hence, it is recommended that lifting of boulders/cobbles/pebbles/sand can be allowed from the river bed subject

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to general conditions of River/Stream Bed Mining Policy Guidelines -2004 viz distances from bridges etc. However, it is pertinent to point out here that excessive mining/lifting had already been carried out in past. Thus, above said potentials may not be available in the riverbed. The above said reserves are geological reserves and mine able reserves depend upon the area where mineral concession is granted.

#### 10.6. KUNDLU RIVER:

A tributary of Satluj River.

Altitude at the origin - 500 mtrs. above mean sea level  
(Near Village Jharni).

Total length - 13 Kms.

General Width - 40-50 mtrs.

Climate of Catchments - Humid.

Seismicity -Seismic Zone-IV

General slope :-

-20<sup>0</sup> to 22<sup>0</sup> from 2.75 Kms.

-10<sup>0</sup> to 15<sup>0</sup> 2.75Km to 10.25 Kms.

General direction of flow -NNW- SSE

Total direction of flow -53.5 Sq.Kms.

Geomorphologically, the tributary flows through the moderate to low slope angle. All along its course the banks are represented by stable land of flood plains. Therefore river bed mining can be carried out without damage to the banks. All the catchment was represented by flood plains except near the origin, where it is represented by sandstone and alternate bands of clay. The flood plains consist of boulders of different sizes cemented with matrix of sand and pebbles/cobbles. The annual deposition of mineral is about 3cm to 4cm as mostly the said river flows with very negligible grade.

**Total potential M.T. minor mineral in the bed : 772200 M.T.**

Boulders availability in the river bed 40% (approx.) : 308880 M.T.

Sand availability in the river bed 30% (approx.) : 231660 M.T.

Bajri availability in the river bed 30% (approx.) : 231660 M.T.

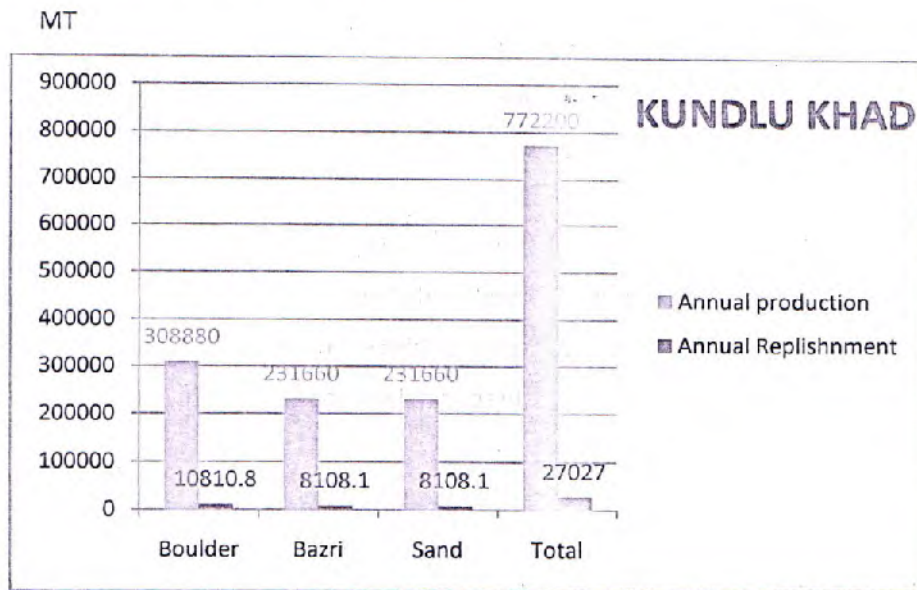
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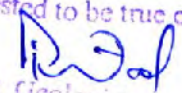
Annual replenishment of minor mineral are **27027 M.T.**


Boulders availability in the river bed	40% (approx.)	:	10810.8 M.T.
Sand availability in the river bed	30% (approx.)	:	8108.1 M.T.
Bajri availability in the river bed	30% (approx.)	:	8108.1 M.T.



Graph 14 Annual Production (Kundlu Khad)

Thus keeping in view the annual replenishment of the minor mineral and taking into consideration the item No. 9.5.d. and 9.5.e of the River/stream Bed Mining Policy Guidelines-2004, the 27027 M.T. mineral can safely be lifted from the river bed, otherwise meandering would increase the bank erosion with lateral increase in the size of the river. Hence, it is recommended that lifting of boulders /cobbles/ pebbles /sand can be allowed from the river bed subject to general conditions of River/Stream Bed Mining Policy Guidelines -2004. However, it is pertinent to point out here that excessive mining/lifting had already been carried out in past. Thus above said potential may not be available in the river bed. The above said reserves are geological reserves and mine able reserves depend upon the area where mineral concession is granted.

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**10.7. CHIKNI RIVER:****GENERAL**

A tributary of Satluj River.

Altitude at the origin	- 360 mtrs. above mean sea level (Near Village Ghansot).
Total length	- 8.5 Kms.
General Width	- 50 to 60 mtrs.
Climate of Catchments	- Humid.
Seismicity	-Seismic Zone-IV
General slope :-	-10 <sup>0</sup> to 15 <sup>0</sup> in 8.5 Kms.
Total catchment area	-56.50 Sq.Kms.
General direction	-NNE to SSW

Geomorphologically, the tributary flows through the moderately to low hills of the Himalayan foothills. The area is represented by the flood plains and the rocks on both banks are represented by stable land of flood plains. Therefore, geotechnically the area is represented by Himalayan fore deep zone and structural ridges and valleys. The rocks belong to quarternary age.

The both banks are stable banks of flood plains and are represented by boulders of different size cemented with matrix of sand and pebbles/cobbles etc. Hence during rainy season when competency increase, it carries boulders/ pebble/cobbles and sand.

The carrying capacity is very less thus annual deposition of mineral leading to only 3cm to 4cms.

<b>Total potential of minor mineral in the bed :</b>	<b>617100 M.T.</b>
Boulders availability in the river bed 40%(approx.) :	246840 M.T.
Sand availability in the river bed 30%(approx.) :	185130 M.T.
Bajri availability in the river bed 30%(approx.) :	185130 M.T.

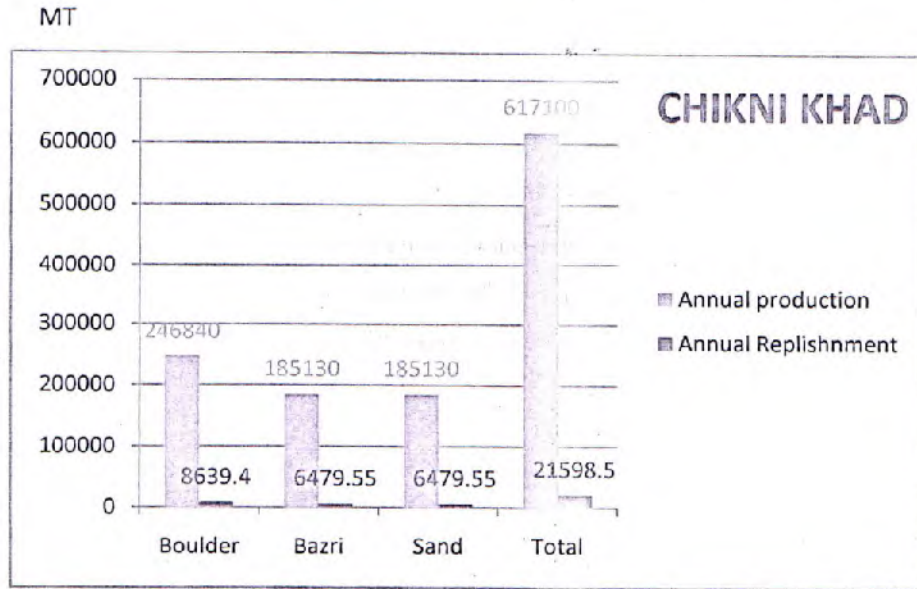
**Annual replenishment of minor mineral in the river bed: 21598.5 M.T.**

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Boulders availability in the river bed	40%(approx.)	:	8639.4 M.T.
Sand availability in the river bed	30%(approx.)	:	6479.55 M.T.
Bajri availability in the river bed	30%(approx.)	:	6479.55 M.T.



Graph 15 Annual Production (Chikni Khad)

Hence keeping into consideration the item No. 9.5.d. and 9.5.e of the River/stream Bed Mining Policy Guidelines-2004, the 21598.5 M.T. mineral can safely be allowed to be lifted from the river bed, otherwise meandering will increase the bank erosion with lateral increase in size of river. It is recommended that lifting of boulders/cobbles/pebbles/sand can be allowed from the river bed subject to general conditions of River/Stream Bed Mining Policy Guidelines -2004 viz distances from bridges etc. However, it is pertinent to point out here that excessive mining/lifting had already been carried out in past. Thus above said potentials may not be available in the riverbed. The said reserves are geological reserves whereas mine able reserves depend upon the area where mineral concession is granted.

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**10.8. KARSOLI RIVER:****GENERAL:**

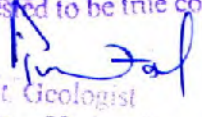
A tributary of Satluj River.

Altitude at the origin	- 350 mtrs. above mean sea level (Near Village Banchha).
Total length	- 45 Kms.
General Width	- 20 to 30 mtrs.
Climate of Catchments	- Humid.
Seismicity	-Seismic Zone-IV
General slope :-	-10 <sup>0</sup> to 15 <sup>0</sup>
Total catchment area	-26.50 Sq.Kms.
General direction	-North to South


Geomorphologically, the tributary flows through the moderate to low slope area along the flood plains. Geotechnically, the area is represented by Himalayan fore deep zone of structural ridges and valleys. The both banks are represented by stable land of flood plains belonging to quarternary age.

The both banks are stable banks of flood plains. All catchment area represented by the flood plains having boulders of different size cemented with sand and Pebbles/Cobbles etc. However in smaller stretch of the river bed, there is very less competency of the river and it is unable to bring with it sufficient quantity of boulders/ pebble/cobbles and sand as such the carrying capacity is very less. Therefore, it is recommended that no further lifting of boulders/ pebble/cobbles and sand can be allowed as it has already been over exploited. However, mineral concession for free sale can be granted from any private land falling in the river course.

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**10.9. KAUSHALYA RIVER:**

A tributary of Satluj River.

Altitude at the origin - 900 mtrs. above mean sea level  
(Near Village Koti).

Total length - 3.5 Kms.

General Width - 20 to 25 mtrs.

Climate of Catchments - Humid.

Seismicity - Seismic Zone-IV

Total catchment area - 35 Sq.Kms.

General direction of flow - North to South

Geomorphologically, the tributary flows through the moderately steep to steep low hills and intervening valley of Siwaliks/ Dharmshal formation. Geotechnically the area is represented by Himalayan fore deep zone and structural ridges and valleys. of the Himalayan foothills. The rocks on both banks are represented by moderately hard sandstone and alternate clay bands belonging to Middle Miocene to early Pleistocene age.

Both the banks are stable banks of moderately hard sandstone formation. The whole catchment area is represented by hard sandstone having boulders of different size and pebbles/cobbles etc. Since the gradient of the riverbed is higher, thereby carrying capacity increases leading to 5cm to 6cm annual deposition of mineral

<b>Total potential (M.T)of minor mineral in the bed :</b>		<b>101640 M.T.</b>
Boulders availability in the river bed	60%(approx.) :	60984 M.T.
Sand availability in the river bed	20%(approx.) :	20328 M.T.
Bajri availability in the river bed	20%(approx.) :	20328 M.T.

**Annual replenishment of minor mineral in the river bed: 5590 M.T.**

Boulders availability in the river bed 60%(approx.) : 3354 M.T.

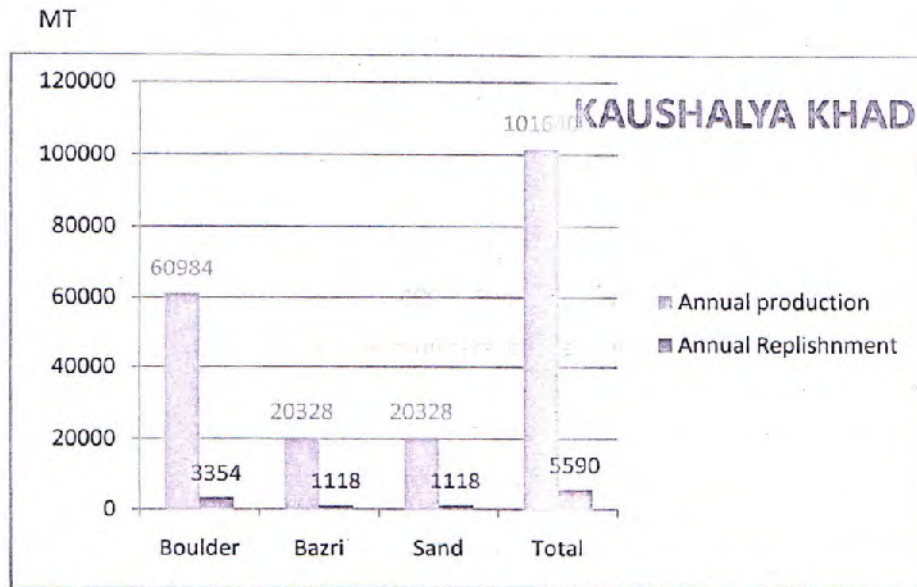
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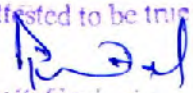
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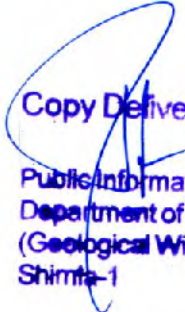
Sand availability in the river bed 20%(approx.) : 1118 M.T.  
 Bajri availability in the river bed 20%(approx.) : 1118 M.T.



Graph 16 Annual Production (Kaushalya Khad)

Hence keeping into consideration the item No. 9.5.d. and 9.5.e of the River/stream Bed Mining Policy Guidelines-2004, the 5590 M.T. mineral can safely be allowed to be lifted from the said river bed, otherwise meandering will increase the bank erosion with lateral increase in the dimensions of river. The above said reserves are total reserves whereas mine able reserves depend upon the area where mineral concession is granted. Therefore it is recommended that lifting of boulders/cobbles/pebbles/sand can be allowed from the river bed subject to general conditions of River/Stream Bed Mining Policy Guidelines -2004. The said reserves are geological reserves whereas mineable reserves depend upon the area where mineral concession is granted.

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**10.10. Mandhala River:**

A tributary of Satluj River.

Altitude at the origin	- 600 mtrs. above mean sea level (Near Village Koti).
Total length	- 6 Kms.
General Width	- 60-70 mtrs.
Climate of Catchments	- Humid.
Seismicity	-Seismic Zone-IV
General slope :-	-10 <sup>0</sup> to 15 <sup>0</sup> from 2 Kms. -5 <sup>0</sup> to 10 <sup>0</sup> from 2Km onward.
General direction of flow	-NNW- SSE
Total direction of flow	-15 Sq.Kms.

The tributary flows through the moderately low hills and intervening valley of the Siwaliks and flood plains. The area is represented by admixture of boulders, cobbles, pebbles and sand of flood plain. The banks are controlled by stable lands. Therefore Geo-technically, the area is represented by Himalayan fore deep zone and structural ridges and valleys. The rocks belong to quaternary age.

Both the banks are stable and banks of flood plains are represented by lowslopes. The competency of the river is much up to 600 mtrs. contours. All catchments area is represented by Middle Siwalik of Siwalik Formation. The carrying capacity is very less right from its origin to the entrance point in Punjab area leading to a 2 to 4cm annual deposition of minerals.

The total calculation of boulders, river born bajri and sand is done by taking average of each mineral, but it may differ at specific site, depending upon the type of land form, competency/capacity at that particular point.

**Total potential (M.T.) of minor mineral in the bed (up to 1 Mtrs. depth):-**

Total Minor Mineral available in the bed = 514800 M.T.

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Total Boulders available in the riverbed 30%(approx.)= 154440 M.T.

Total Sand available in the riverbed 40%(approx.)= 205920 M.T.

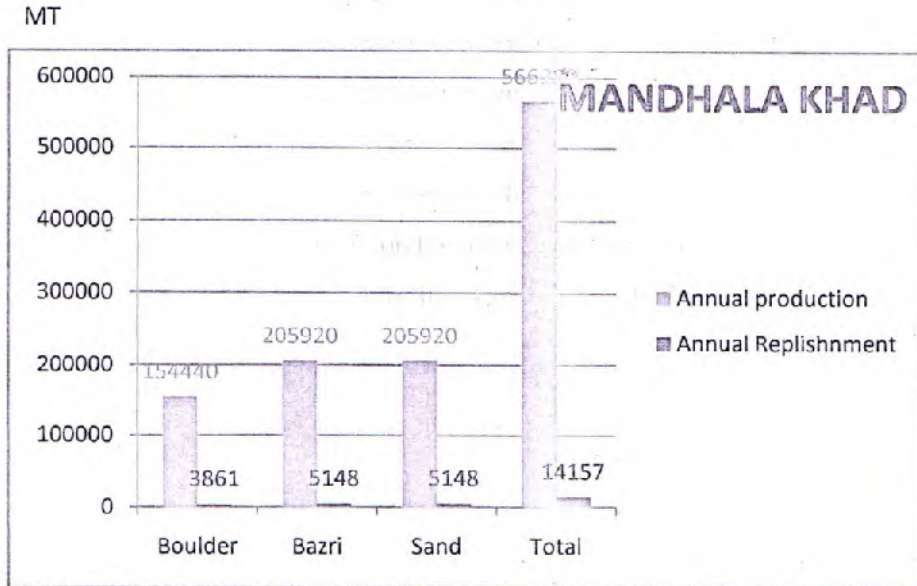
Total Bajri available in the riverbed 40%(approx.)= 205920 M.T.

**Total annual replenishment : 12870 M.T.**

Total Boulders availability in the river bed 30%(approx.): 3861 M.T.

Total Sand availability in the river bed 35%(approx.) : 5148 M.T.

Total Bajri availability in the river bed 35%(approx.): 5148 M.T.



Graph 17 Annual Production (Mandhala Khad)

Hence keeping into consideration the item No. 9.5. d.& 9.5.e of River/Stream Bed Mining Policy Guidelines-2004, 12870 M.T. of mineral can safely be allowed to be lifted from the river bed. It is recommended that lifting of boulder/cobbles/sand can be allowed from this river subject to general conditions of River/Stream Bed Mining Policy. However, no lifting/mining shall be allowed where protection work has been executed by any agency. The above said reserves are geological reserves, whereas mine able reserves shall depend upon the area where mineral concession are granted. It is also pertinent to mention here that half portion of the river bed falls in the Haryana state and half portion

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fall within Himachal Pradesh thereby there are very negligible reserves left, thus their commercial exploitation is not viable.

#### 10.11. Surjpur Chao:

A tributary of Satluj River.

Altitude at the origin - 520 mtrs. above mean sea level  
(Near Village Satinala).

Total length - 8.5 Kms.

General Width - 40-50 mtrs.

Climate of Catchments - Humid.

Seismicity -Seismic Zone-IV

Total Catchment area -11.25Sq.Kms.

General slope :- -2° to 5° upto 5 Kms.  
-5° to 10° from 5Km to 8 Kms.

General direction of flow -NNW- SSE

Geomorphologically, the tributary flows through the moderately low hills intervening valley of the Siwaliks and flood plains. The area presented by admixture of boulders, cobbles, pebbles and sand of flood plains. The banks are controlled by the stable land. All the catchment represented by flood plains except near the origin, where it is represented by sandstone and alternate bands of clay. The annual deposition of mineral is about 2cm to 4cm. as most of the said river flows with very negligible grade.

**Total potential M.T. minor mineral in the bed : 504900 M.T.**

Boulders availability in the river bed 30%(approx.) : 151470 M.T.

Sand availability in the river bed 35%(approx.) : 176715 M.T.

Bajri availability in the river bed 35%(approx.) : 176715 M.T.

**Annual replenishment of minor mineral are: 15147 M.T.**

Boulders availability in the river bed 30%(approx.) : 4544.1 M.T.

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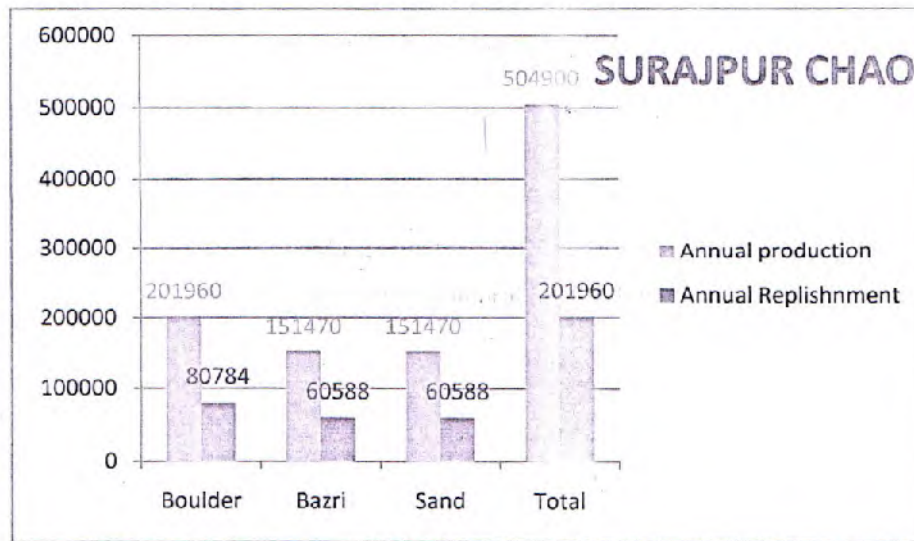
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Sand availability in the river bed 35%(approx.) : 5301.45 M.T.  
 Bajri availability in the river bed 35%(approx.) : 5301.45 M.T.

MT



Graph 18 Annual Production (Surajpur Chao)

Hence, keeping into consideration the item No. 9.5.d. and 9.5.e of the River/stream Bed Mining Policy Guidelines-2004, the 15147 M.T. mineral can safely be lifted from the river bed, otherwise meandering would increase the bank erosion with lateral increase in the size of the river. It is recommended that lifting of boulders/cobbles/pebbles/sand can be allowed from the river bed subject to general conditions of River/Stream Bed Mining Policy Guidelines -2004. It is pertinent to point out here that excessive mining/lifting has already been carried out in the past. Thus the above said potential may not be extracted from the river bed. The said reserves are total reserves available in the river bed, whereas mineable reserves depend upon the area where mineral concession is granted.

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**10.12. Gamber Khad:**

A tributary of Satluj River.

Altitude at the origin	- 1120mtrs. above mean sea level (Near Village Koti).
Total length	- 107 Kms.
General Width	- 30-50 mtrs.
Climate of Catchments	- Humid.
Seismicity	-Seismic Zone-IV
General slope :-	-10 <sup>0</sup> to 15 <sup>0</sup> upto 20 Kms. -20 <sup>0</sup> to 25 <sup>0</sup> from 20Kms to 30.5Kms -10 <sup>0</sup> to 12 <sup>0</sup> from 30.5Kms to 36.5Kms -12 <sup>0</sup> to 15 <sup>0</sup> from 36.5Kms to 59Kms -8 <sup>0</sup> to 10 <sup>0</sup> from 59Kms to 90Kms -20 <sup>0</sup> to 25 <sup>0</sup> from 90Kms to 107Kms
General direction of flow	-SE-NW
Total catchment area	-15 Sq.Kms.

Geomorphologically, the river flows through the moderately low hills and intervening valley of the Siwaliks and its equivalent formations and flood plains. The area represented by admixture of boulders, cobbles, pebbles and sand of Flood plain. The banks are controlled by sandstone and stable land of flood plains.

The competency of the river is much up to 700 mtrs. Contours. All catchments area is represented by Middle Siwaliks of Siwalik Formation. Since the river stretch is more, and the carrying capacity is very high due to high gradient from the origin to the entrance point in Gobind Sagar, which may leads to 5-6cms annual deposition of minerals in the river bed.

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The total calculation of boulders, river born bajri and sand is done by taking average percentage of each mineral, but it may differ at specific site, depending upon the type of land form, competency/capacity at that particular point.

**Total potential (M.T.) of minor mineral in the bed (up to 1 Mtrs. depth):-**

Total Minor Mineral available in the bed = 5649600 M.T.

Total Boulder available in the riverbed 60%(approx.)= 3389760 M.T.

Total Sand available in the riverbed 20%(approx.) = 1129920 M.T.

Total Bajri available in the riverbed 20%(approx.) = 1129920 M.T.

**Annual replenishment of minor mineral in river bed:**

Total availability of minor minerals in the river bed: 2259840 M.T.

Total Boulders availability in the river bed 60%(approx.) : 1355904 M.T.

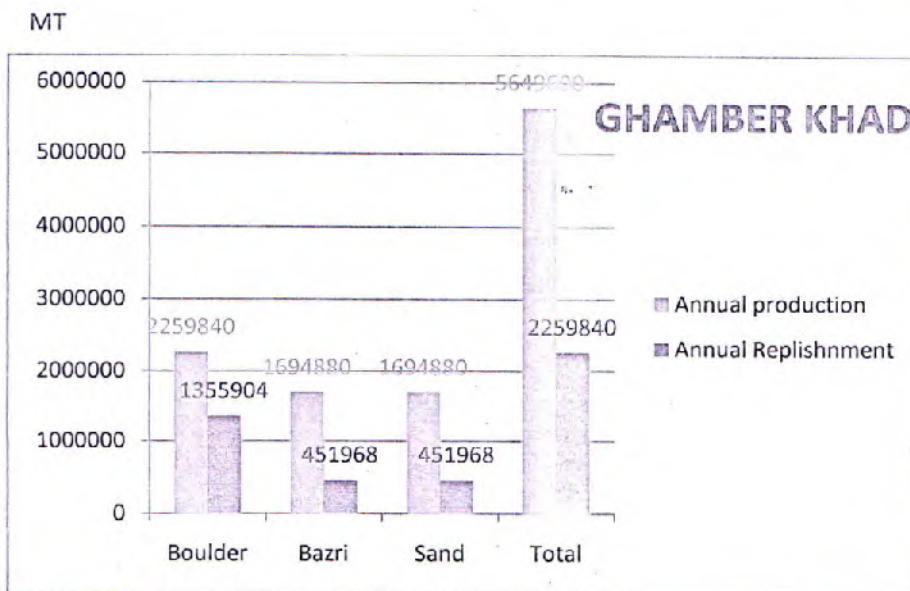
Total Sand availability in the river bed 20%(approx.): 451968 M.T.

Total Bajri availability in the river bed 20%(approx.) : 451968 M.T.

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Graph 19 Annual Production (Ghamber Khad)

Hence keeping into consideration the item No. 9.5. d.& 9.5.e of River/Stream Bed Mining Policy Guidelines-2004, 310728 M.T. of mineral can safely be allowed to be lifted from the river bed. Otherwise meandering will increase the bank erosion with lateral increase in size of river. The above said reserves are geological reserves, whereas mine able reserves shall depend upon the area where mineral concessions are granted. It is, therefore, recommended that lifting of boulder/cobbles/sand can be allowed from this river subject to general conditions of River/Stream Bed Mining Policy Guidelines-2004 and also workable parts of the river bed shall also be proposed to put on auction as the river bed is full of material as on today.

#### 10.13. ASNI RIVER:

##### General:

A tributary of Satluj River.

Altitude at the origin - 1100 mtrs. above mean sea level  
(Near Village Paroth).

Total length - 12 Kms.

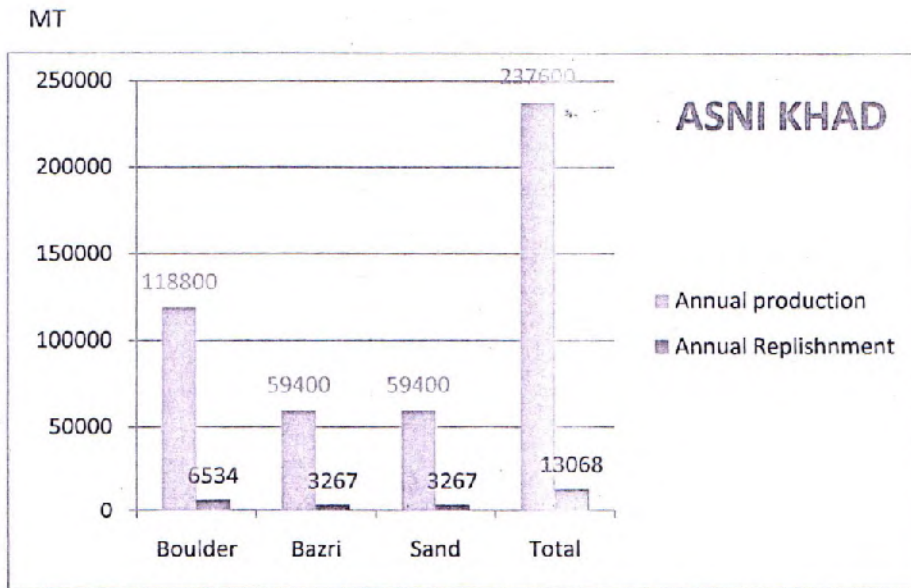
General Width - 10-20 mtrs.

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Graph 20 annual Production (Asni Khad)

Hence keeping into consideration the item No. 9.5. d.& 9.5.e of River/Stream Bed Mining Policy Guidelines-2004, the 13068 M.T. of mineral can safety be allowed to be lifted from the Asni Khad, otherwise meandering would increase the bank erosion with lateral increase in the dimension of river. Therefore it is recommended that lifting of Boulder/Cobbles/Sand can be allowed from this river subject to general conditions of River/Stream Bed Mining Policy Guidelines-2004.

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Location map of mining leases in the area of Solan district

1st attached in Annex C

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78 30

32  
15

30 01  
76 30

77 15  
30 15

Legend

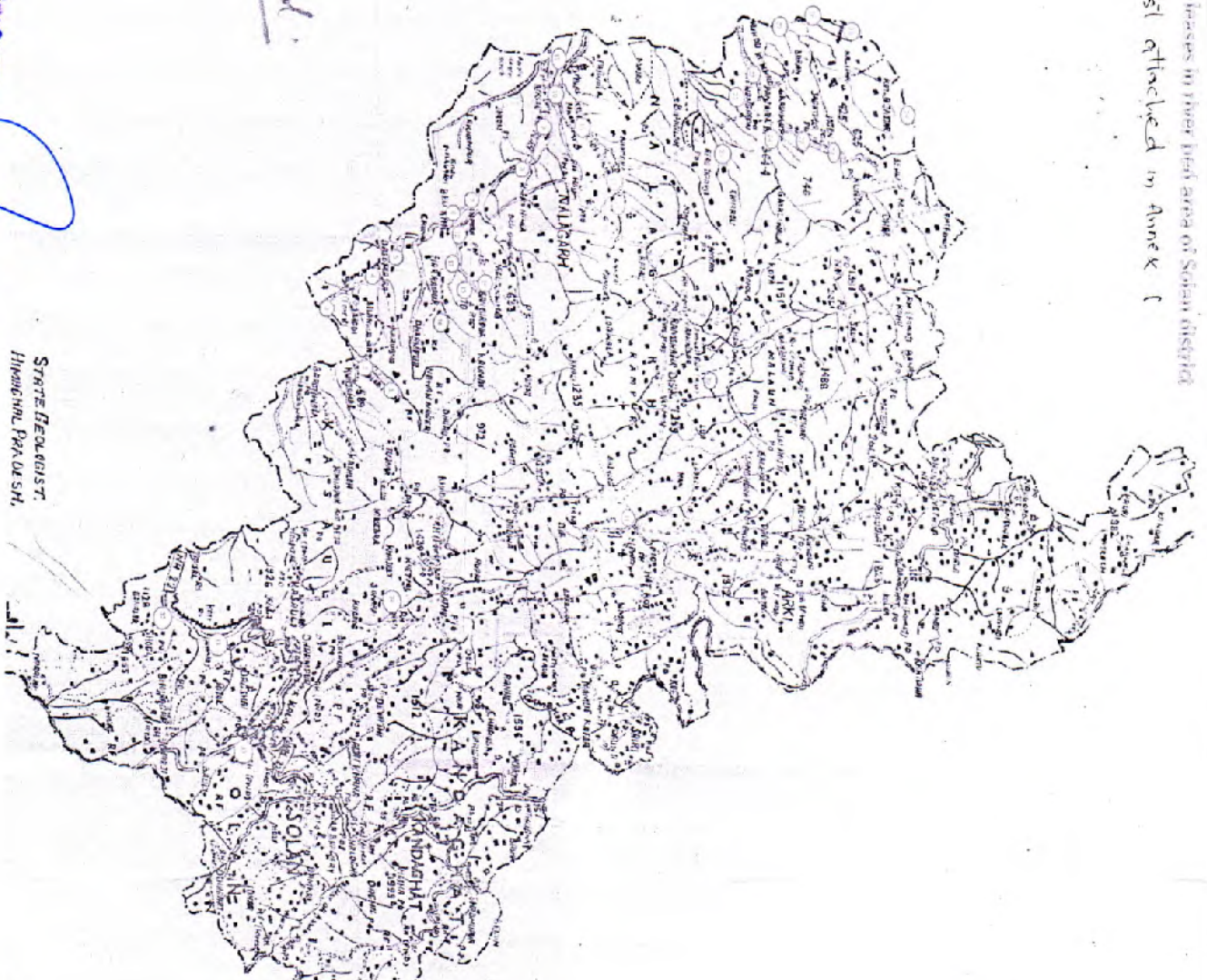
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**10.14. Daseran River:****General:**

A tributary of Satluj River.

Altitude at the origin - 1100 mtrs. above mean sea level  
(Near Village Palani Ghati).

Total length - 4 Kms.

General Width - 10-20 mtrs.

Climate of Catchments - Humid.

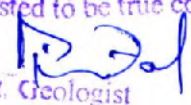
Seismicity - Seismic Zone-IV

General slope :- -8° to 10° in the whole stretch.

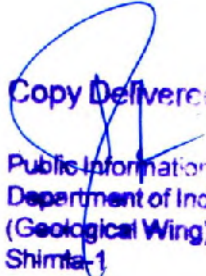
General direction of flow - South to North

Geomorphologically, the tributary flows through moderately steep hills and intervening valleys of the Dharamshala formation. Geo-technically, the area is represented by Himalayan fore deep zone and structural ridges and valleys. The rocks on both banks are represented by sandstone of Dharamshala formations. Both banks are stable banks of sandstone and alluvium. The competency of the river is much less as length of the river bed is very less and whole catchment area is represented by sandstone formation. Thus due to very less competency, the said river may not be put on auction or any type of concessions to anybody may not be granted.

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**11. Status of Mining:**

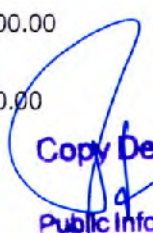
The Solan District is divided into 4(Four) Sub-Divisions. Out of these 4 Sub-Divisions, active mining operations for exploitation of minor mineral are being carried out in three Sub-Divisions. However, in the river/stream beds, the mining operations are strictly carried out as per the River/Stream Mining Policy Guidelines. There are two major rivers i.e. Sirsa and Gamber which are flowing through three Sub-Divisions i.e. Solan, Arki and Nalagarh. There are also other few Khads/Nalah flowing in the said Sub-Divisions, from where the minor minerals are being exploited.

Minor Minerals such as building stones, Gravel, ordinary sand etc. are the main constituents required for the modern development activities. As such the consumption of minor minerals in the District has increased many folds with the pace of developmental activities and increased demand of minor minerals from the neighboring States. The type and quantity of construction material used, depends upon the structural design and type and nature of work. The quantity of minor mineral consumption in a particular area is a thermometer to assess the development of the area. Thus with the pace of development activities, the consumption of minor minerals also increased.

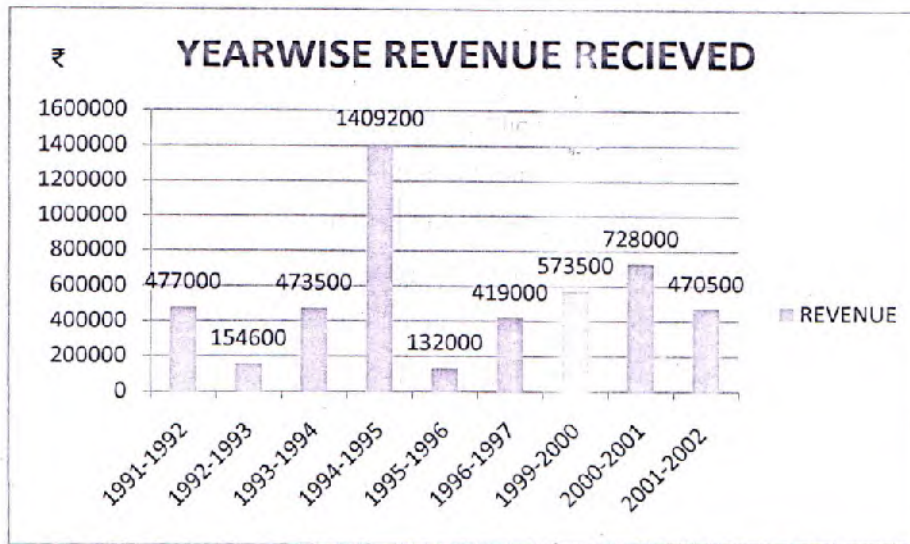
In recent past, the Department used to auction the minor minerals of the river beds falling in the jurisdiction of Solan District and different rivers/streams were put to auction till March, 2002. Thereafter no auction process was carried out due to non-issuance of no objection certificate by Forest Department in Tehsil of Solan, Arki, Kalauli and Nalagarh. In Nalagarh Tehsil the revenue had increase to many folds by way of auction of minor minerals in this District as is reflected from the table given below:-

Sr.No.	Year-wise	Revenue received
1.	1991-1992	□ 4,77,000.00
2.	1992-1993	□ 1,54,600.00
3.	1993-1994	□ 4,73,500.00
4.	1994-1995	☑ 14,09,200.00
5.	1995-1996	☑ 1,32,000.00

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6.	1996-1997	₹ 4,19,000.00
7.	1999-2000	₹ 5,73,500.00
8.	2000-2001	₹ 7,28,000.00
9.	2001-2002	₹ 4,70,500.00



Graph 21 Year wise revenue

The fluctuation in revenue receipts as observed in the table were due to deletion of some of the portions of the rivers/stream beds, granted on leases/contracts and also fluctuations in the demand of minor mineral etc.

There are numerous Khads, Nallas, Choes/flowing in the Solan District whereas only about 15 Khads, Nallas, Choes are flowing in the Nalagarh area, Their general trend of flow is mostly in NE-SW direction and some of these are flowing in NW to SSE direction. These all ultimately pass through the adjoining states i.e. Haryana and Punjab. 34 mining leases under the provisions of H.P. Minor Minerals(Concession) Revised Rules-1971 are granted in favor of different individuals to install mineral based industries in the whole District. Out of these, 23 mining leases are granted only in Nalagarh area to

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meet out the demand of mineral based industries i.e. Stone Crusher. Out of these 23 mining lease, 17 are in operation and 6 mining lease are under renewal. Rest of the mining leases falls in Solan, Kandaghat and Arki Sub-Divisions. Out of 11 mining leases, stone crushers are established on five leases located in Gamber Khad, Ashwani Khad and Dashern Khad. Rest of the stone crushers are established on the basis of hill slope mining.

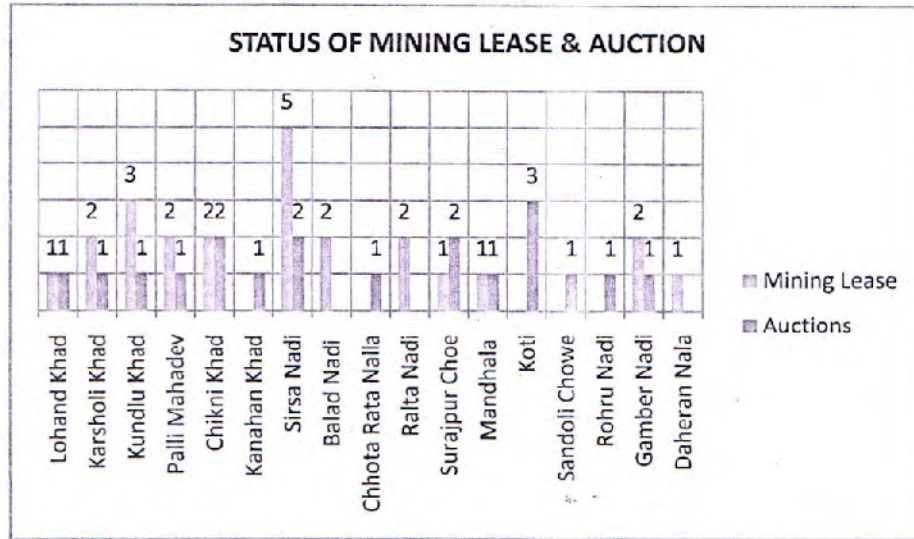
Details of mining leases granted and auctioned areas in different rivers are shown as under:-

Sr.No.	River/Khad/Nala	Mining Lease	Auctions
1.	Lohand Khad	1	1
2.	Karsholi Khad	2	1
3	Kundlu Khad	3	1
4	Palli Mahadev	2	1
5	Chikni Khad	2	2
6	Kanahan Khad	--	1
7	Sirsa Nadi	5	2
8	Balad Nadi	2	--
9	Chhota Rata Nalla	2	1
10	Ralta Nadi	2	--
11	Surajpur Choe	1	2
12	Mandhala	1	1
13	Koti	--	3
14	Sandoli Chowe	--	1
15	Rohru Nadi	--	1

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16	Gamber Nadi	2	1
17	Daheran Nala	1	-



Graph 22 Status of mining leases and auction

However, total 28 points of different rivers/streams were put on auction till 2002. The revenue generated by way of auction of these 28 points of rivers/streams were to the tune of Rs. 4,70,500/- per annum.

The following points of River/Stream beds as shown below were usually put on auction till March, 2002, in different parts of the District for extraction of minor minerals i.e. Sand, Stone and Bajri etc :-

**11.1. NALAGARH TEHSIL:**

		Areas (in Bighas)
1.	Manpura	329.00
2.	Sirsa Nadi(Part-II)	1031.15
3.	Palli Mahadev Nadi(Part-III)	124.01
4.	Chhaganpura Nadi	217.12

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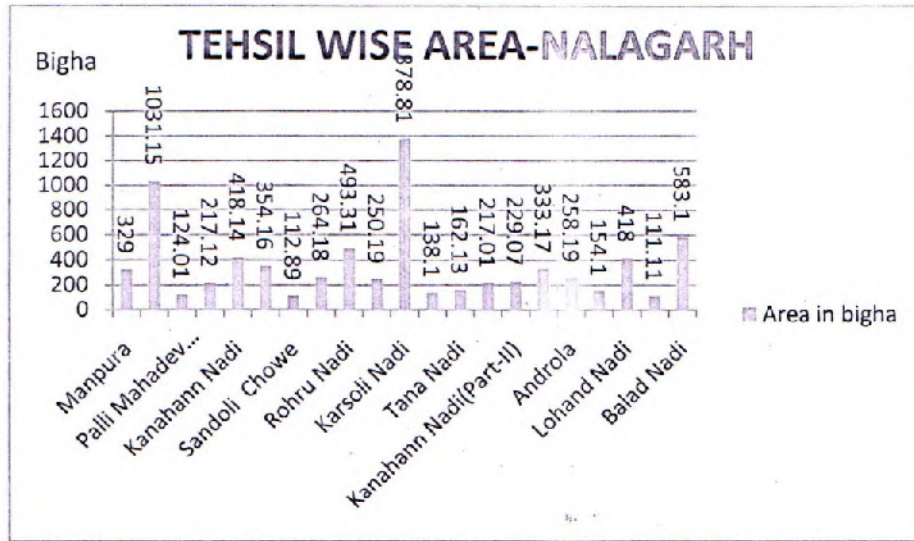
5	Kanahann Nadi	418.14
6	Chikni Nadi	354.16
7	Sandoli Chowe	112.89
8	Kundu Nadi	264.18
9	Rohru Nadi	493.31
10	Androla Ueherala	250.19
11	Karsoli Nadi	1378.81
12	Katam Boa	138.10
13	Tana Nadi	162.13
14	Khokhar Nadi	217.01
15	Kanahann Nadi(Part-II)	229.07
16	Palli Mahadev	333.17
17	Androla	258.19
18	Umarli Nadi	154.10
19	Lohand Nadi	418.00
20	Kundlu Nadi	111.11
21	Balad Nadi	583.1

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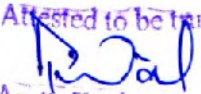
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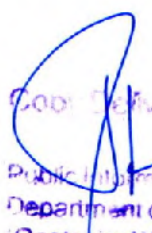


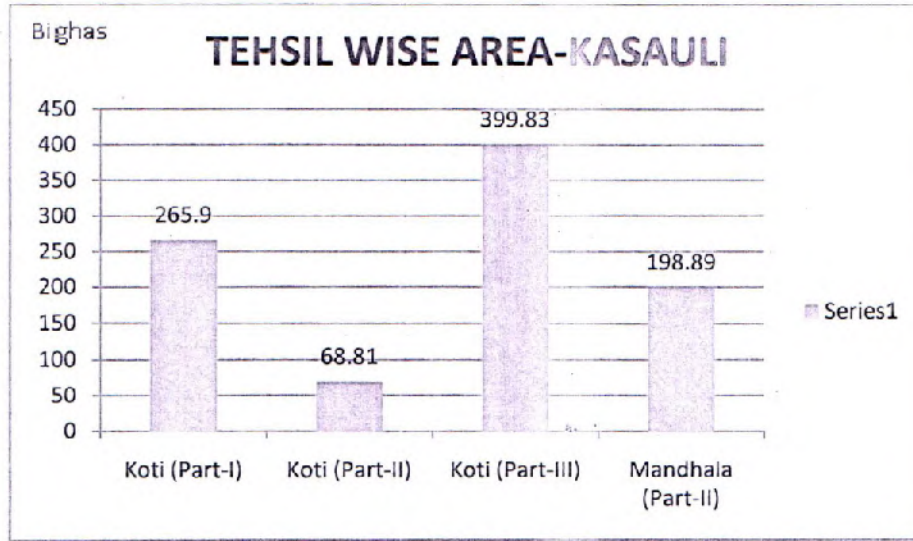
Graph 23 Tehsil wise area (Nalagarh)

11.2. KASAULI TEHSIL:

22.	Koti (Part-I)	265.9
23	Koti (Part-II)	68.81
24	Koti (Part-III)	399.83
25	Mandhala (Part-II)	198.89

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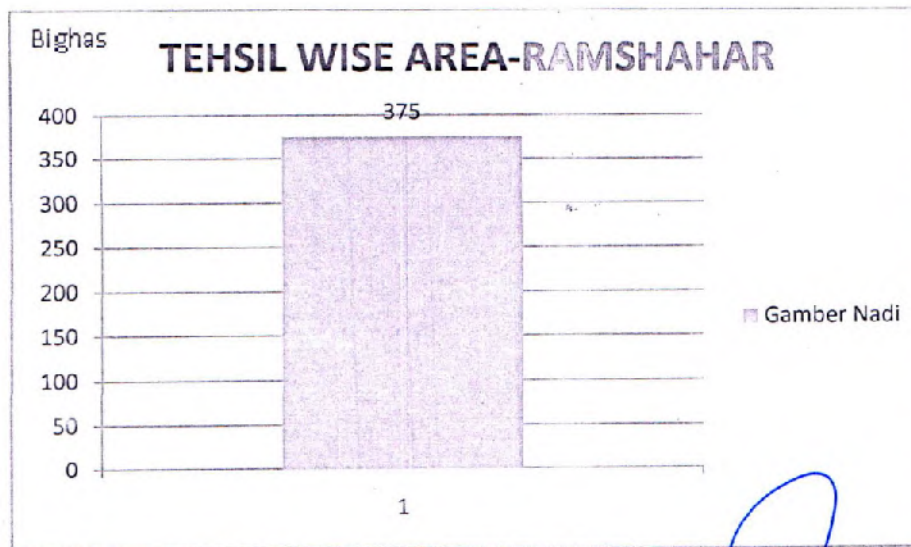
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Graph 24 Tehsil wise area (Kasauli)

11.3. RAMSHAHAR TEHSIL:

26. Gamber Nadi 375.00



Graph 25 Tehsil Wise Area- Ramshahar

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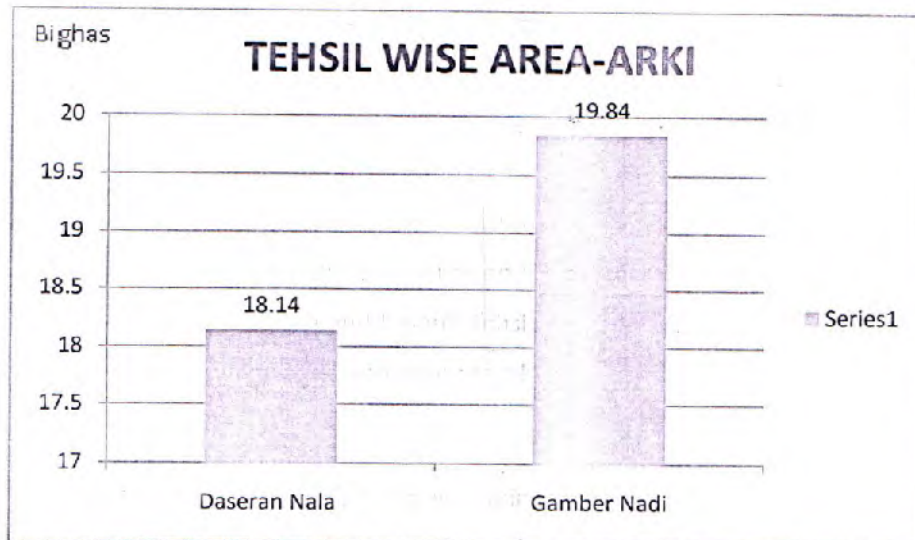
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## 11.4. ARKI TEHSIL

27.	Daseran Nala	18-14
28.	Gamber Nadi	19.84



Graph 26 Tehsil Wise Area (Arki)

Before issuance of River/Stream Bed Mining Policy Guidelines for the State of Himachal Pradesh-2004, 28 Numbers of Rivers/Stream points were put on auction and these rivers/streams were recklessly exploited by way of mechanical mining. Now under this policy as per 9.3 strategy 3 i.e. "Extraction of minor minerals to be done in selected rivers/streams or the river/stream section." In which under section 9.3c, the grant of lease shall be preferred over the auction. In the first instance, in the interest of systematic/scientific mining and to reduce pressure on river/stream beds, no auction shall be done in border areas like Nalagarh Subdivision and Kasauli Tehsil of District Solan, where there are chances of over exploitation of River/Stream beds and chances of illegal transportation of mineral outside the State.

Now under this policy, no auction of minor minerals is being proposed. However, during the field study it has been observed that these portions of river/stream beds which were earlier put on

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auction for extraction of minor minerals are now vacant and are highly susceptible to illegal mining. Thus keeping in view the above fact, vacant areas of the River/Stream beds may be given on leases to local people for free sale of minor minerals with the condition that they will not sale the minor mineral outside the State. In this way maximum number of local people shall be accommodated and it will become source of employment to the local people.

During the field visit, it has also been observed in some places that due to over exploitation of the river/stream beds, bed rocks have been exposed and even clay surface of river/stream beds is visible. Thus, it is further suggested that especially in Nalagarh-Sub-Division and Kasauli Tehsil, no mechanical mining should be allowed and only collection of stone, can be allowed through manual collection.

In other parts of the District, Ghamber river was also visited and observed that earlier auctioned points are now full of boulders, sand and river borne bazri due to fresh replenishment and as such it could be put to auction regularly.

Other point i.e. Dasheran Khad was also visited and it was found that whole auctioned stretch is barren and boulders are sparsely seen in the bed. Therefore, it is recommended that the said bed may not be auctioned.

## 12. Recommendations

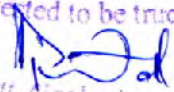
After detail study of all the Rivers/Streams of District Solan, the area recommended for concession is given below.

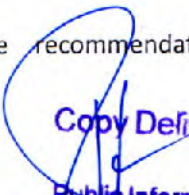
The River/Stream recommended for concession is subject to general condition as per strategy 5 of the River/Stream Bed Mining Policy Guidelines for the State of Himachal Pradesh Notified on 28.2.2004.

### 9.5 Strategy

Mining in River/Stream beds shall be subject to following general conditions in addition to Site specific conditions as specified by the Committee.

9.5..a. No River/ Stream bed mining shall be allowed without the recommendations of the Sub-Divisional Level Committee.

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9.5.b. No River/Sream bed mining shall be allowed without getting clearance under Forest Conservation Act, 1980 if the area attracts the provisions of FCA, 1980.

9.5.c. No River/Sream bed mining shall be allowed within 75 meters from the periphery of soil conservation works, nursery plantation, and check dams or within the distance as recommended by the Sub-Divisional Committee, whichever is more.

9.5.d. No River/Sream bed mining shall be allowed within  $1/5^{\text{th}}$  of its span or 5 meters from the bank or as specified by the Sub-Divisional Committee whichever is more.

9.5.e. No River/Sream bed mining shall be allowed within 200 meters U/S and D/S of Water Supply Scheme or the distance as specified by the Sub-Divisional Committee which ever is more.

9.5.f. No River/Sream bed mining shall be allowed with in 200 meters U/S and 200 to 500 mts D/S of bridges depending upon the site-specific conditions.

9.5.g. No approach road from PWD road shall be allowed for River/Stream Beds Mining, unless lessee/contractor obtains written permission from XEN PWD for making road leading to all intake places from the PWD Roads.

9.5.h. No mechanical mining i.e. through mechanical excavator etc. shall be allowed in River/Stream Beds, for which amendment in the Rules shall be made. Mechanical mining shall not be allowed even for projects of national importance, power projects etc. In the power project areas, no mining activities by power project Companies/promoters shall be allowed in the river beds. Each project shall identify captive mining area duly approved by the competent authority. In the exceptionally inevitable situations where such projects require extraction of sand from river beds, prior approval of Council of Ministers shall be obtained. Royalty for use of various kind of minerals by power projects shall be realized fully by evolving a transparent and scientific procedure and mechanism.

9.5.i. No boulder/cobbles/hand broken road ballast shall be allowed to be transported outside the state from River/Stream Beds, so as to reduce pressure on the River/Stream Beds.

9.5.j. No digging of more than 3 feet shall be allowed in River/Stream Beds.

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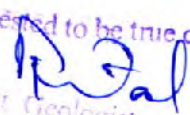
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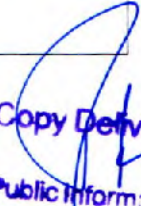
9.5.k. Every leaseholder shall supply in advance, the Registration Nos of vehicle engaged in transportation of mineral from mining area to his industrial unit. This would ensure checking of vehicles carrying illegal extracted minerals.

9.5.l. No blasting shall be allowed in river/stream beds.

Thus taking into consideration the above said general conditions for mining in river/stream bed mining policy guidelines, the recommendations to grant or not to grant concession in the following river/stream beds of the district:

	River	Recommendation
<b>Nalagarh Tehsil</b>		
	Manpura	No concession
	Raipur Khad	-do-
	Sirsa Nadi	No further concession be granted
	Palli Mahadev Nadi-3	-do-
	Maganpura Nadi	No concession
	Khanahan Nadi	--do-
	Chikni Nadi	No concession
	Sandoe Nadi	-do-
	Balad Nadi	-do-
	Balad Nadi	-do-
	Lohand Nadi	-do-
	Kundlu Nadi	-do-

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	Kundlu Nadi	-do-
	Rehru Nadi	No concession
	Karsoli Nadi	-do-
	Tana Nadi	-do-
	Khokhara Nadi	-do-
	Palli Mahadev	No further concession
<b>Kasauli Tehsil</b>		
	Koti Part-I	No concession
	Koti Part-II	-do-
	Koti Part-III	-do-
	Madhala Nadi-I	-do-
	Madhala Nadi-II	-do-
	Barotiwala Nala	-do-
	Androlla Upralla	-do-
	Kotla Choa	No

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	Rao Khad	-do-
	Kahaj Nala	-do-
	Patta Nala	-do-
	Khadiad Nala	-do-
	Katal-Ki-Nadi	-do-
	Gambher Nadi	Proposed for auction
	Gambher Nadi	-do-
	Gambher Nadi	-do-
<b>Arki Tehsil</b>		
4	Dasern Khad	No concession
4	Baliana Nala	-do-
4	Gamber river	-do-
4	Arki-Ki-Khad	-do-
4	Kuni Khad	-do-

## Detail of Mining Leases in Nalagarh:-

	Name of lease holder	Location of lease in part of River/Khad	Total area (Bighas)
1	Sh. Avtar Singh, (Saini Stone crusher)	Sirsa	315-06
2	Smt. Madhuri Saini, (Manjauli Stone crusher-unit 1&2)	Sirsa	1465.8

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3	Sh. Ram Kumar (Kandlu stone crusher)	Sirsa & Ratta (Nadi)	606-16, 138-18
4	Smt. Shashi Adlakha & Sh. Pritam Singh, (Jay Mata naina Devi Stone Crusher)	Sirsa	1643-02
5	Smt. Asha Rani Dang	Sirsa & Balad	1170-70
6	M/s Maharaja Stone Crusher, Bhalla	Balad	679.01
7	Jetindera Stone Crusher	Balad	583-17
8	M/s Amarjeet Kaur (Amarjeet Stone Crusher Pvt.Ltd.)	Mandhal Nadi	312-12
9	Himachal Grit Udyog	Sansiwala (Near Barotiwala)	154-16 & 102-13
10	Sardara Singh(Himalayan Stone Crusher	Ratta Nadi	940-00
11	Parminder Bansal (Gupta Stone Crusher)	Ratta Nadi	902-03
12	Ram Kumar	Ratta Nadi	138-11
13	Raghubir Singh(Barson Stone Crusher)	Chikni	789-09
14	Sardara Singh (Himalaya Stone Crusher)	Chikni	462-08
15	Sunil Garg (Aggarwal Stone Crusher)	Palli Mahadev-I	763-10
16	Sunil Garg (Shiv Bhawani Stone Crusher)	Palli Mahadev-II	899-18
17	Dault Singh (Nalagarh Stone Crusher)	Kundlu	763-10
18	M/s Jai Mata Stone Crusher	Kundlu	178-14
19	Amar Chand (Rohani Stone Crusher)	Karsholi	641-02

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20	Amar Chand (Triptii Stone Crusher)	Karsholi	249-09
21	Amerjeet Singh	Lohand	1209-09
22	Sh. Harbhajan Singh (Prop; Laxami Stone Crusher)	Sirsa	112-09
23	Smt. Savitri Devi w/o Sh. Chet Ram	Manpura Nadi	233-03
24	M/s Ram Sons VPO Manpura, Tehsil Nalagarh	Manpura Khad	251-02
25	Sh. Lachhmi Chand, Vill. Raipur, Tehsil Nalagarh	Lohand Khad	224-00
26	Sh. Harbhajan Singh S/o Sh. Lajja Ram, Nalagarh	Kishanpura Khad	500-0 Khad
27	Sh. Gurcharan Singh, VPO, Haripur Sandoli, Nalagarh.	Kishanpura Khad	317-08
28	Sh. Ajay Kumar S/o Sh. Hukam Chand, VPO Haripur, Sandoli, Nalagarh	Banpur Khad	138-08
29	Sh. Rajesh Verma S/o Sh. Khushi Ram, Nalagarh.	Doduwal Khad	249-08
30	-do-	Manpura Khad & Raipur Khad	129-14
31	Sh. Gurmit Singh S/o Sh. Darshan Singh, Vill. Sauri Bhumia, Nalagarh.	Rehru Khad-	104-01
32	Sh. Hakam Ram (M/s Thakur Rohani Stone Crusher), Nalagarh	Chikni	190-01
33	Sh. Baljeet Kumar S/o Sh. Mattu Ram,	Kishanpura Khad	65-03

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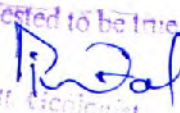
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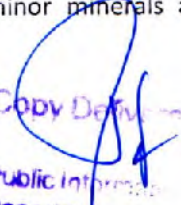
**Mining Leases other than Nalagarh area are as under:-**

- Sh. Yash Paul Thakur, Vill Kotla, Tehsil, Solan, H.P.
- Sh. Harish Sharma, Vill. Korron, Tehsil, Solan, H.P.
- Sh. Sanjay Singh, Prop; M/s Sanjay Stone Crusher, Vill. Kharsi, Tehsil Kasauli, Distt. Solan.
- Sh. Sanjay Singh, Prop; M/s Shiva Stone Crusher, Vill. Kailar, Tehsil Kasauli, Distt. Solan.
- Sh. Paramanand, Vill. Chammo, Tehsil Kasauli.
- Sh. Vinod Agnihotri, Prop; Ganpati Stone Crusher, Vill. Kamli, Tehsil Kasauli.
- Sh. Surinder Kumar, Prop; M/s Thakur Stone Crusher, Vill, Khanalag, Tehsil Arki.
- Smt. Suman Chandel, Prop; M/s Laxmi Stone Crusher, Vill. Lachhog, Tehsil Kandaghat.
- Sh. Ramesh Chand, Vill. Barol, Tehsil Solan.
- Sh. Rameshwar Dass, Prop; M/s Geeta Industries, Vill. Deonda, Tehsil Kandaghat.
- S/Sh. O.P. Chauhan, Aman Gupta, Vill. Khanalag, Tehsil Arki.
- Smt. Chanderawati W/o Sh. Shankar Lal, Vill. Toon, Tehsil Arki.
- Sh. Vinod Kumar Thakur, Vill. Chambaghat, Tehsil Solan.
- Sh. Manmohan Singh, Vill. Basal, Tehsil Solan
- Sh. Ajeet Singh, Vill. Kanthari, Tehsil Solan
- Sh. Rajinder singh, Vill. Shilly, Tehsil Solan.
- M/s Laxmi & Co., Prop; Sh. Saxmi Dutt, Vill, Shilly, Tehsil Solan
- Sh. Roop Dutt Sharma, Vill. Nagali, Tehsil Solan
- Sh. Mohan Lal Thakur, Vill. Bhojnagar, Tehsil Solan
- Sh. Mohan Singh Thakur, Vill. Kanda, Tehsil Solan

**13. CONCLUSION**

The whole District specially Nalagarh Sub-Division and Kasauli Tehsil of Solan Sub-Division were inspected thoroughly and found that replenishment of the minor minerals are less than that of

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lifting/exploitation of minor minerals. It is also observed that whole river beds falling in the periphery of the State in Solan Distt. are over exploited or being exploited. Thus to keep regular pace of work to laborers as well as running of Stone Crusher, it is recommended that Excavator Machines, i.e. Mechanical mining may not be allowed in the above said areas, so that over exploitation of minor mineral could be checked. It is also recommended that mining leases for free sale up to 5 hectares may be given in private lands only. Priority may be given to societies, so that maximum number of local people could be accommodated and employment may be generated accordingly. No lease holder shall be allowed to transport the raw material outside the state. It is further recommended that alternate sites for rehabilitation of existing stone crushers of Nalagarh, Sub-Division and Barotiwala of Kasauli Tehsil also be identified, so that these stone crushers could be shifted from the present place, as with the pace of time and increasing demand of the raw material i.e. Stone, River bone Bajri & Sand, day by day, the existing deposits in the river/stream beds shall not be able to meet the demand for a longer period. Thus further concession in the river beds may be granted as per the recommendations made for each river beds. However, it is further recommended the private agriculture lands which were engulfed by the above mentioned river / streams during the high floods shall be granted for further concessions as per site specific just to compensate to earn their livelihood as their agriculture lands had been damaged due to high floods and soil erosion. These areas shall be granted only for open / free sale and shall not be attached with the crushing unit at any stage.

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## Annexure -I

	Name of lease holder	Location of lease in part of River/Khad
1	M/S Jatinder Singh, Prop: Singh Stone crusher	Balad Nadi
2	M/S Narinder Bhalla, Prop: Shiva Stone crusher	Balad Nadi
3	M/S Asha Rani, Prop: Krishna Stone crusher	Sirsa Nadi
4	M/S Gurucharan, Prop: Shiv Bhola Stone crusher	Kishanpura
5	M/S Ramkumar, Prop: Rama & Kundlas Stone crusher	Sirsa Nadi
6	M/S Baljit Singh, Prop: Manpura Stone crusher	Sirsa Nadi
7	M/S Harbhajan, Prop: Shiv Om Stone crusher	Sirsa Nadi
8	M/S Sasi Adlakha, Prop: Jai Naina Devi & Satokh Stone crusher	Sirsa Nadi
9	M/S Madhuri Saini, Prop: Manjholi Stone crusher	Sirsa Nadi
10	M/S Vivek Agarwal, Prop: (Free Sale)	Sirsa Nadi
11	M/S Avtar Singh, Prop: Saini Stone crusher	Sirsa Nadi
12	M/S Naveen Goel, Prop: Ramson Stone crusher	Manpura Khad
13	M/S Rajesh Verma, Prop:	Manpura Khad
14	M/S Harbhajan Singh, Prop: Laxmi Stone crusher	Sandholi cho
15	M/S Sardara Singh, Prop: Himalaya Stone crusher	Ratta nadi
16	M/S Ajay kumar, Prop: Doon Stone crusher	Banbirpur Khad
17	M/S Rajesh Verma, Prop:	
18	M/S Thakur Rohani Stone crusher, Prop: Roshni Devi	Chikni Nadi
19	M/S Sardara Singh, Prop: Saini Grit Udyog	Chikni Khad
20	M/S Sardara Singh/ Raghuvir Singh, Prop: Berson Stone crusher	Chikni khad
21	M/S Gurmeet Singh, Prop: Gurmeet Stone crusher	Rehru khad
22	M/S Jai mata Stone crusher, Prop: Mohan Singh	Kundlu Khad
23	M/S RP stone crusher Prop Sunil Garg,	Kundlu Khad
24	M/S Rohani Stone crusher, Prop: Roshani Devi	Kundlu Khad
25	M/S Sunil Garg, Prop: Shiv Bhawani Stone crusher	Pali Mahadev
26	M/S Sunil Garg, Prop: Aggarwal Stone crusher	Pali Mahadev
27	M/S Tripti stone crusher, Prop: Kripal Singh	Karsoli/Deoli khad
28	M/S C&C, Prop: Not installed	Karsoli
29	M/S Amarjit, Prop: Amarjit Stone crusher	Lohand
30	M/S Laxmi, Prop: Naina Stone crusher	Lohand
31	M/S Savitri, Prop: Babaji Stone crusher	Gamber khad
32	M/S Surinder Singh, Prop: Shiva Stone crusher	
33	M/S Ganpati SC Prop Vinod Aginontri, Prop:	Kaushalaya khad
34	M/S Vishwakarma SC, Prop: Mohan Lal Mehta	
35	M/S Thakur SC, Kanda, Prop: Mohasn Lal Thakur	
36	M/S Yashpal Thakur, Prop:	

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