

**WATER QUALITY ISSUES
IN
HIMACHAL PRADESH**

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H P State Pollution Control**

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UPL Group**



WATER QUALITY ISSUES IN HIMACHAL PRADEASH

Himachal Pradesh is a predominantly hilly state with marked geo-climatic & biotic diversity and variations. It has geographical area of 55673 square kilometers constituting 1.69% of country's area and 10.54% area of Himalayas.



MAJOR RIVER SYSTEMS:

The State is drained by nine major river systems. The part of catchment area of these rivers in the state is as follows:

Sutlej	30.69%	Indus	2.6%
Beas	24.5%	Markanda	0.6%
Chenab	14.5%	Ganga	0.5%
Yamuna	10.6%	Ghaggar	0.5%
Ravi	9.0%		

Four major rivers systems in the State namely Sutlej, Beas, Ravi and Yamuna, whose catchments cover 75% of the State's physical area, and is the home to 80% of its population.



THRUST DEVELOPMENT AREAS

- **Hydro Power;**
- **Horticulture & Agriculture;**
- **Tourism;**
- **Industry;**
- **Mineral exploitation and;**
- **Connectivity & Communications.**



Water Quality Assessment in Himachal Pradesh

Assessment of water quality of natural water bodies is done by the HP State Pollution Control Board in about 189 locations under the national MINARS programme under the auspices of the Central Pollution Control Board including the monitoring by the State Board from its own resources. Government of India has also introduced Uniform Protocol on Water Quality Monitoring w.e.f. 17-06-2005 and the water quality is being monitored according to this protocol.



Water Quality Assessment continued...

According to the water quality monitoring being done by the State Board in HP it is observed that:

Water Quality of Major rivers conforms to Class-A (in respect of physico-chemical parameters) of Primary Water Quality Criteria for Designated Best Use prescribed by the Central Pollution Control Board. But due to presence of Total Coliform in large numbers, criteria of Primary Water Quality Criteria for Designated Best Use, the water quality corresponds to Class-C, which is indicative of pollution due to discharge of untreated sewage from urban areas.



MAJOR WATER QUALITY ISSUES IN HP

- **Municipal Sewage:** There are **58 municipal bodies** in the State out of which sewage treatment facilities are provided in only **12**.
- **Total daily sewage generation** in the State is estimated at **80 Million litres** and at present about **18 percent** is being treated and the remaining is drained in the river systems of the State without any treatment.
- **Silt loads:** Because of developmental activities including harnessing of hydel power potential, mining, road construction etc. and naturally occurring landslides presence of silt (suspended solids) in the rivers quite high.



Water Quality Issues continued...

- Reduced flows: Hydrological regime of major rivers which have been harnessed for power generation and meeting the water needs of other States by construction of multipurpose projects, vast stretches of rivers have been deprived of the bare minimum aquatic base flows, affecting thereby the water quality in these stretches besides other ecological consequences.
- Industrial effluents: Though HP has not been an industrially developed as compared to other States; recent fiscal incentives have resulted in increasing the ingress of several industrial units. At present daily total industrial wastewater discharge in the State is estimated at 95 million litres. With strict enforcement of the pollution control laws, level of compliance in industry is much higher and 1115 large, medium and small water-polluting industries have provided effluent treatment plants.



Water Quality Issues continued...

- **Agriculture & Horticulture:**

Use of chemical fertilisers and pesticides and insecticides is ever increasing in the State with more and more areas being covered under agriculture and horticulture. These applications are bound to have adverse impact on the water quality in the state.

- **Modified hydrological flow regimes:**

Changes introduced largely by human interventions (hydel projects) and by forces of nature in the hydrodynamic behaviour of rivers have resulted in decomposition of biomass & sediments in the reservoirs, which is impairing the water quality.



PRESENT WATER POLLUTION LOAD in H.P.

No of Industries – Water Polluting- 2154

**Quantum of Effluent Generated from Industries
95 MLD
Having 98.20% level of Treatment**

**Quantum of Sewage Generated from Urban Areas = 80 MLD
Having only 18 % level of Treatment**

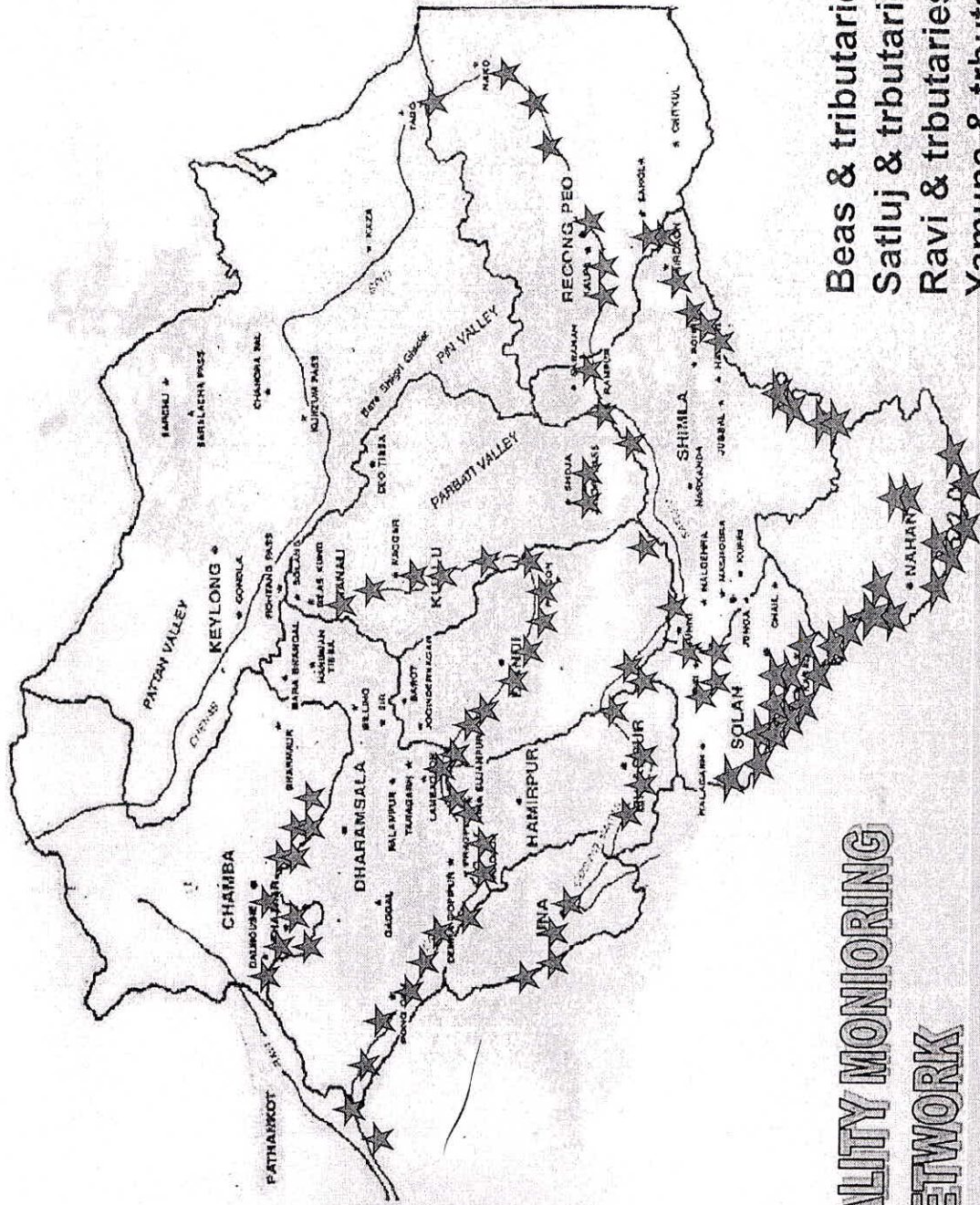
Environmental Issues Related to Hydro Electric & Highway Projects

These are areas of major concern in HP.

The Hydel Projects leads to environmental degradation in many ways;

- Impounding of water.
- Diversion of rivers.
- Long term effects on quality of soil.
- Damage the microorganisms which help in natural purification of water.
- Generation of Muck and its disposal.
- Quarries and Crushers.
- Impact on aquifers and loss of ground water.

No. of Hydro Electric Projects in H.P.	Micro	Major	Total
Quantum of Muck (Solid waste) Generated	13	19	32
Quantum of Muck Likely to be generated From the Projects in Pipe Line	92,58,837 M ³	2,03,13,567 M ³	



**WATER QUALITY MONITORING
NETWORK
IN H.P.**

- Beas & tributaries -48
- Satluj & trbutaries-55
- Ravi & trbutaries-26
- Yamuna & trbutaries-37
- Lakes & Well 3+20

Water Quality Monitoring

All Major Rivers & Tributaries are monitored at 189 locations. Ground water at 20 locations.

- Parameters- 12 (Quarterly) baseline.
40 (yearly) micro pollutant.
- Frequency- Quarterly.
- Bio-monitoring-

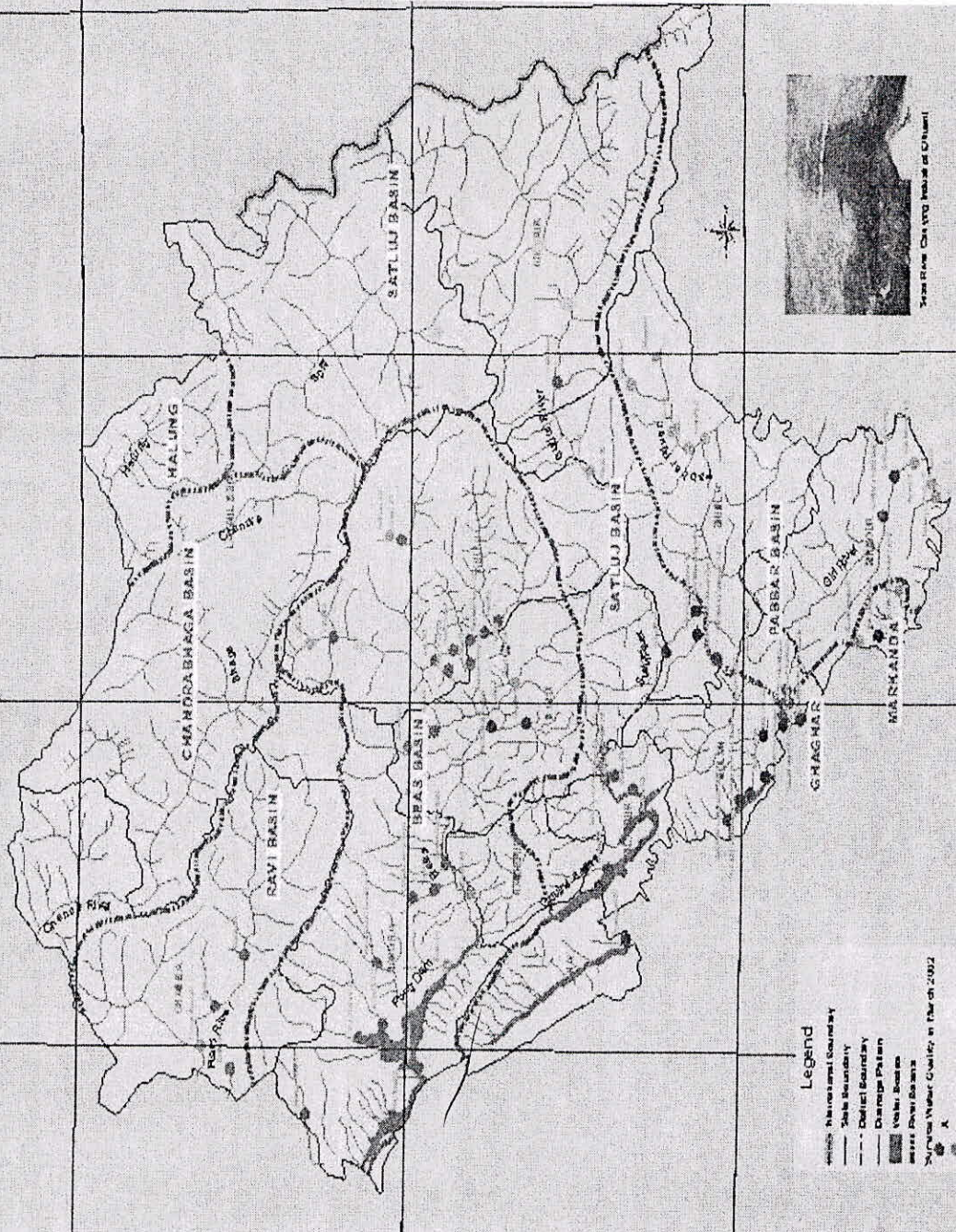
Evaluation of aquatic benthic macro invertebrate for assessment of Benthic Saprobity Index (BSI) Biological Diversity Index (BDI) at 28 locations.

PRIMARY WATER QUALITY CRITERIA

Designated Best Use	Class of Water	Criteria
Drinking water source without conventional treatment but after disinfection.	A	1. Total Coliform organism MPN/100ml. shall be 50 or less. 2. pH between 6.5 and 8.5. 3. Dissolved Oxygen 6 mg/l or more. 4. Biochemical Oxygen Demand 5 days 20°C 2 mg/l or less.
Outdoor bathing (Organized)	B	1. Total Coliform organism MPN/100ml.shall be 500 or less. 2. pH between 6.5 and 8.5. 3. Dissolved Oxygen 5 mg/l or more. 4. Biochemical Oxygen Demand 5 days 20°C 3 mg/l or less.
Drinking Water Sources after conventional treatment	C	1. Total Coliform organism MPN/100ml.shall be 5000 or less. 2. pH between 6 and 9. 3. Dissolved Oxygen 4 mg/l or more. 4. Biochemical Oxygen Demand 5 days 20°C 3 mg/l or less.
Propagation of Wild Life Fisheries.	D	1. pH between 6.5 and 9.5. 2. Dissolved Oxygen 4 mg/l or more. 3. Free Ammonia (as N) 1.2 mg/l or less.
Irrigation, Industrial Cooling Controlled Waste.	E	1. pH between 6.5 and 9.5. 2. Electrical Conductivity at 25-mg/cm max. 2250. 3. Sodium absorption ratio Max. 26. 4. Boron Max 2 mg/l.

Himachal Pradesh

SURFACE WATER QUALITY



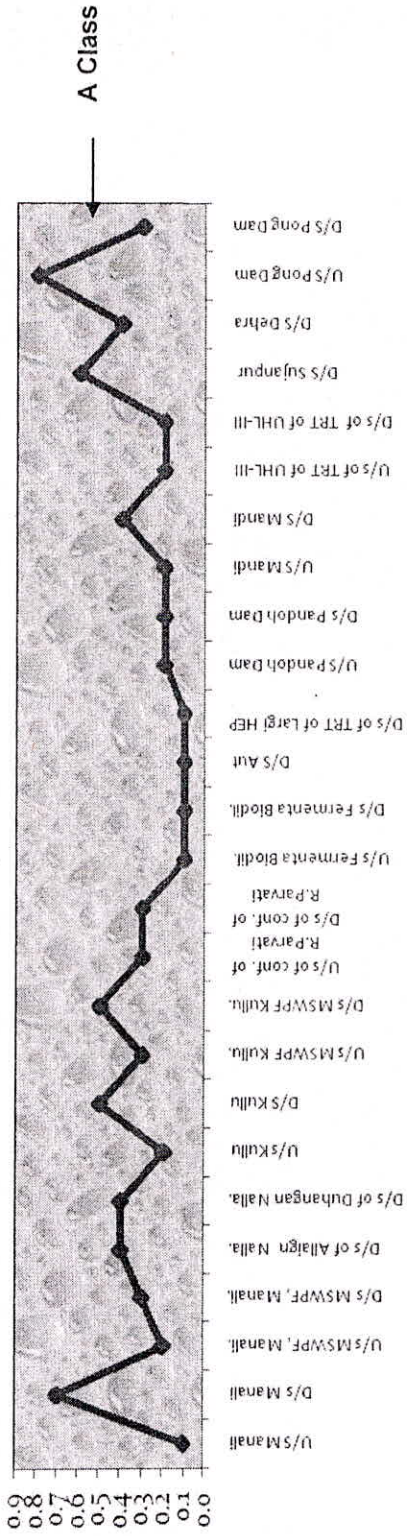
- Legend**
- Natural Boundary
 - State Boundary
 - - - District Boundary
 - Drainage Pattern
 - Water Bodies
 - Water Quality Monitoring Station
- Source: H.P. State Environment Deptt. & Pollution Control Board

Scale: 1:15,00,000

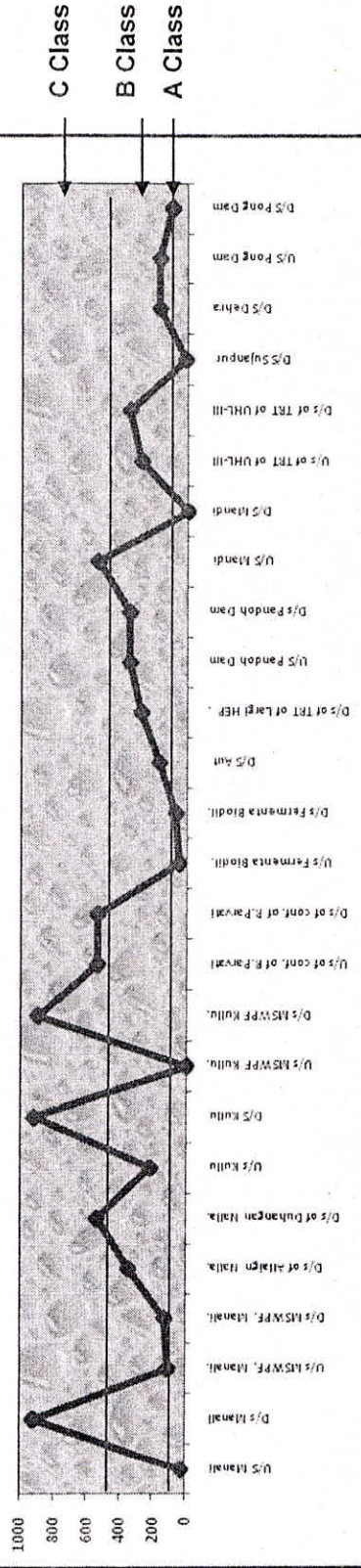
0 10 20 40 60 80 100 120 Kilometres

Status of Beas River Water Quality

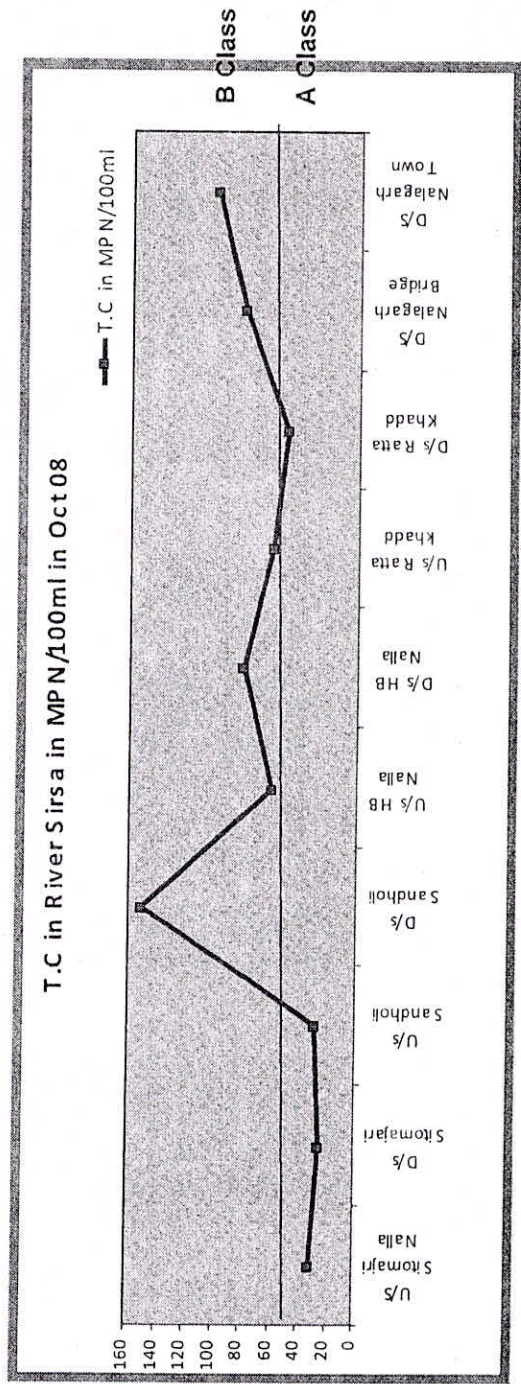
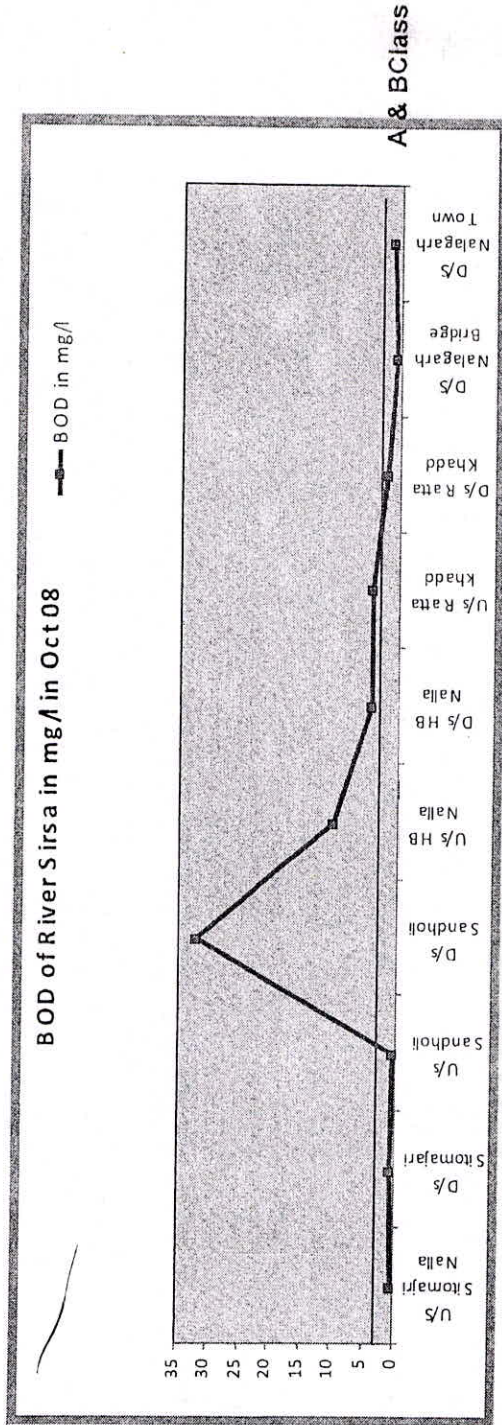
BOD of River Beas in mg/l in Oct 08



T.C in River Beas in MPN/100ml in Oct 08

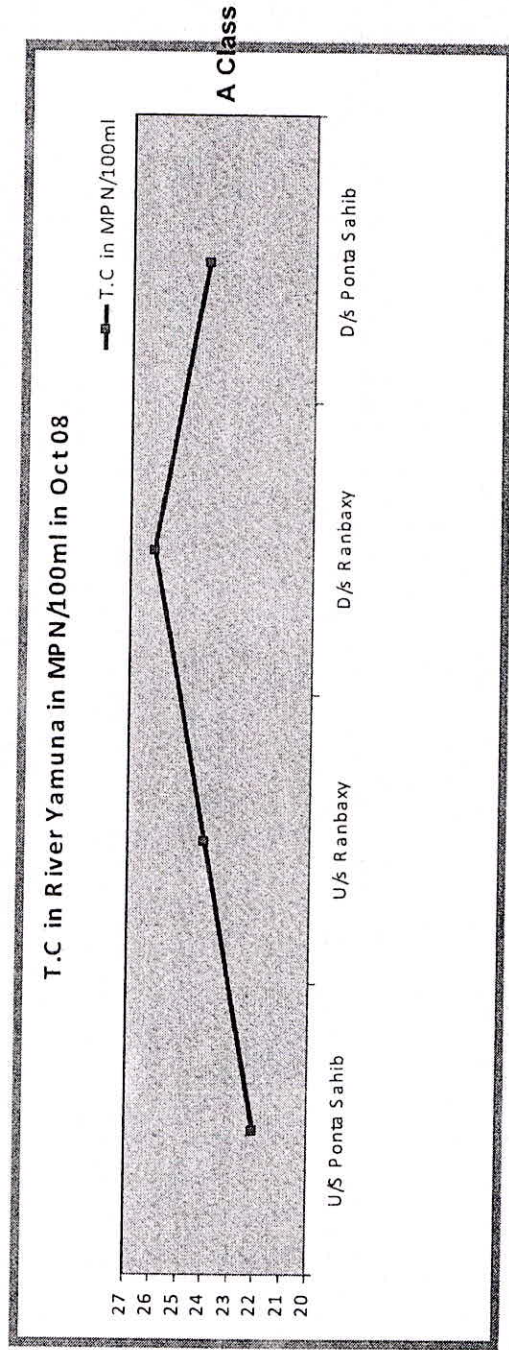
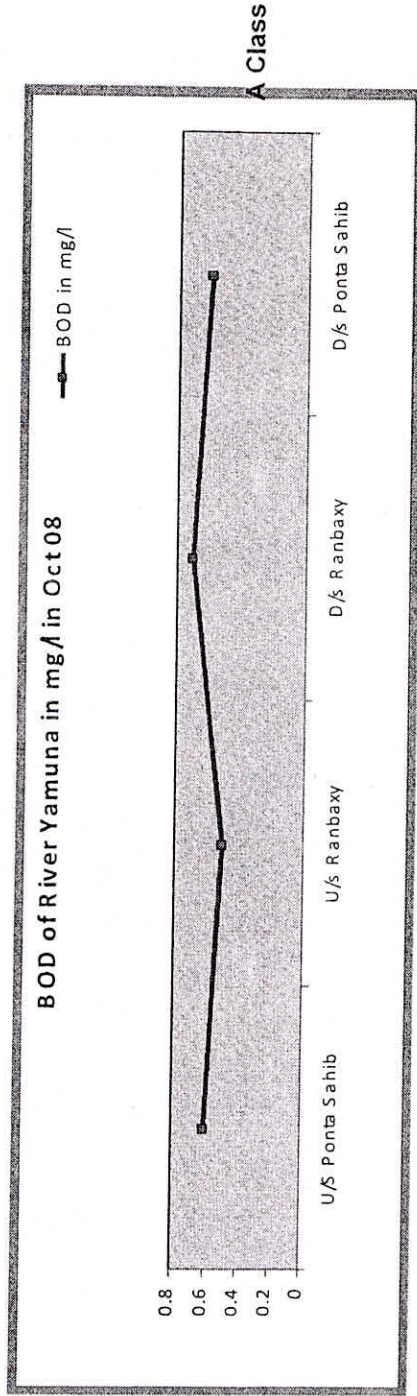


Status of Sirsa River Water Quality



भारतीय जलविज्ञान संस्थान
 National Institute of Hydrology
 R-5527
 21/10/08
 Bhopal
 India

Status of Yamuna River Water Quality



Status of Water Quality in H.P.

There are four major rivers systems in the State, whose catchments cover 75% of the State's physical area, and is the home to 80% of its population.

Rivers are: Satluj, Beas, Ravi and Yamuna

The existing status of water quality at various monitoring stations on our Rivers have shown the water quality to be either of 'A' category or 'B' and at few locations of 'C' category due to the presence of "Total Coliforms"

The River Beas at D/s. of the towns Manali, Kullu, Mandi, Dehra shows the contamination of water due to Total Coliform presence.

Similarly, the River Satluj is also found slightly polluted in the down streams of the towns Rampur, Bilaspur etc.

The reason for this is stated to be:

- Illegal dumping of Municipal Solid Waste,
- Disposal of untreated waste water Sewerage water etc.



MONITORING OF WATER QUALITY OF HAND PUMPS

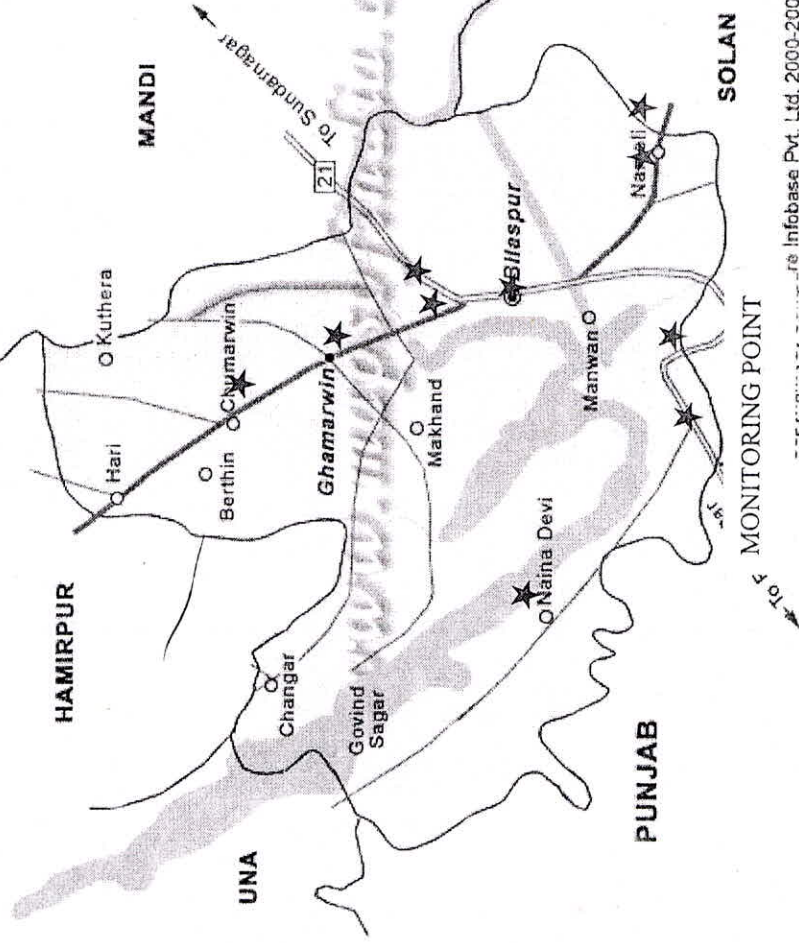
- The H.P. State Pollution Control Board undertook the task of collecting the water samples from 250 hand pumps located in various districts of the State.
- The Samples were analysed in the Central Laboratory at Parwanoo and three Regional Laboratories located at Poanta Sahib, Jasure and Sundernagar
- The quality of water was assessed in terms of microbiological , physical and chemical water quality. The results were compared with the WHO Guidelines for the Drinking Water for assessing the suitability of water for Drinking purpose.

WATER QUALITY STANDARDS AND CRITERIA

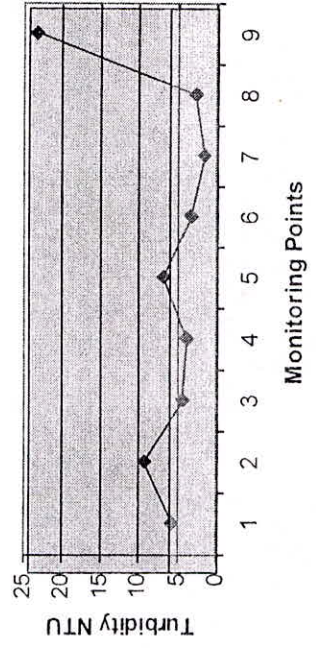
Constituent	Indian Standard (BIS)	WHO(1993) guideline	CPCB CRITERIA FOR DESIGNATED BEST USE (Drinking Water without treatment)
Conductivity	-	-	
Dissolved solids	-	1000 mg/ℓ	
Dissolved Oxygen	-	-	> 6
pH (pH units)	6.5-8.5	-	6.5-8.5
	6.5-9.2 excessive limit		
Turbidity	10 NTU, 25 excessive	5 NTU	
Ammonia	-	1.5 mg/ℓ	
Calcium	75 mg/l	-	
Chloride	250 mg/l	250 mg/ℓ	
Fluoride	0.6 to 1.2 mg/l	1.5 mg/ℓ	
Magnesium	30 mg/l	-	
Nitrate mg/ℓ	45 mg/l	50 as NO ₃ (11 as N)	
Potassium	-	-	
Sodium	-	200 mg/ℓ	
Sulphate	150 mg/l	250 mg/ℓ	

Constituent	Indian Standard (BIS)	WHO(1993) guideline	CPCB CRITERIA FOR DESIGNATED BEST USE (Drinking Water without treatment)
Zinc	5 mg/l	3 mg/l	
Aluminium	-	0.2 mg/l	
Arsenic	0.05 mg/l	0.01 mg/l	
Cadmium	0.05 mg/l	0.003 mg/l	
Chromium	-	0.05 mg/l	
Copper	0.05 mg/l	2.0 mg/l	
Cyanide(free)	0.05 mg/l	0.07 mg/l	
Iron	0.3 mg/l	0.3 mg/l	
Lead	0.1 mg/l	0.01 mg/l	
Manganese	0.1 mg/l	0.5 mg/l	
Mercury	0.01 mg/l	0.001 mg/l	
Nickel	-	0.02 mg/l	
Selenium	0.01 mg/l	0.01 mg/l	
Coliform Organism	1/100ml	-	<50
Total Hardness	300 mg/l		

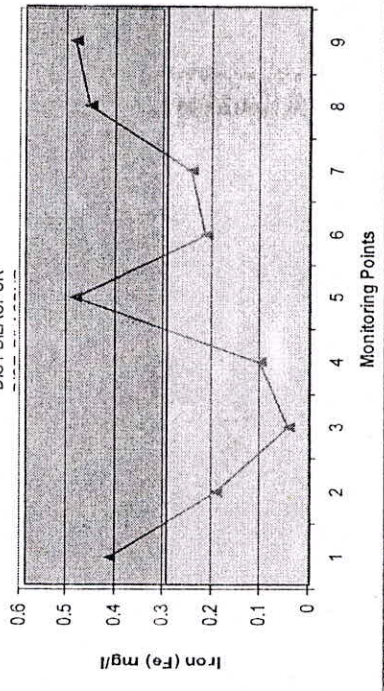
BILASPUR (Himachal Pradesh)



WATER QUALITY OF HANDPUMP
DIST. BILASPUR



WATER QUALITY OF HANDPUMP
DIST. BILASPUR



MAP NOT TO SCALE

- District Boundary
- River
- National Highway
- Major Road
- Road
- Trekking Routes
- District Headquarter
- Taluk Headquarter
- Town

1	Bus Stand Bilaspur
2	Bus Stand on N H Ghaggu
3	Near Sr. Sec., Panj Ghai
4	Near Sr. Sec. School, Jukhala
5	Namhol, Shimla Mandi Road
6	Khallar, Naina Devi
7	On NH Road Swarghat
8	Bus Stand, Ghumarvi
9	Makoh, Lador

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BILASPUR

- **Microbiological Water Quality**
The Fecal coliform was found present at four locations
- **Physical Water Quality**
 - The water was turbid and beyond the prescribed limit at four locations. High turbidity was found at Makoh, Lador.
 - The electrical conductance ranged from 423 to 658 $\mu\text{mho/cm}$.
- **Chemical Water Quality**
 - All others parameters except Iron (Fe) were within the prescribed limit. Iron was slightly higher than 0.3 mg/l (limit) at all sampling locations.
 - The total hardness of the water ranges between 248 to 844 mg/l.

CHAMBA (Himachal Pradesh) JAMMU AND KASHMIR

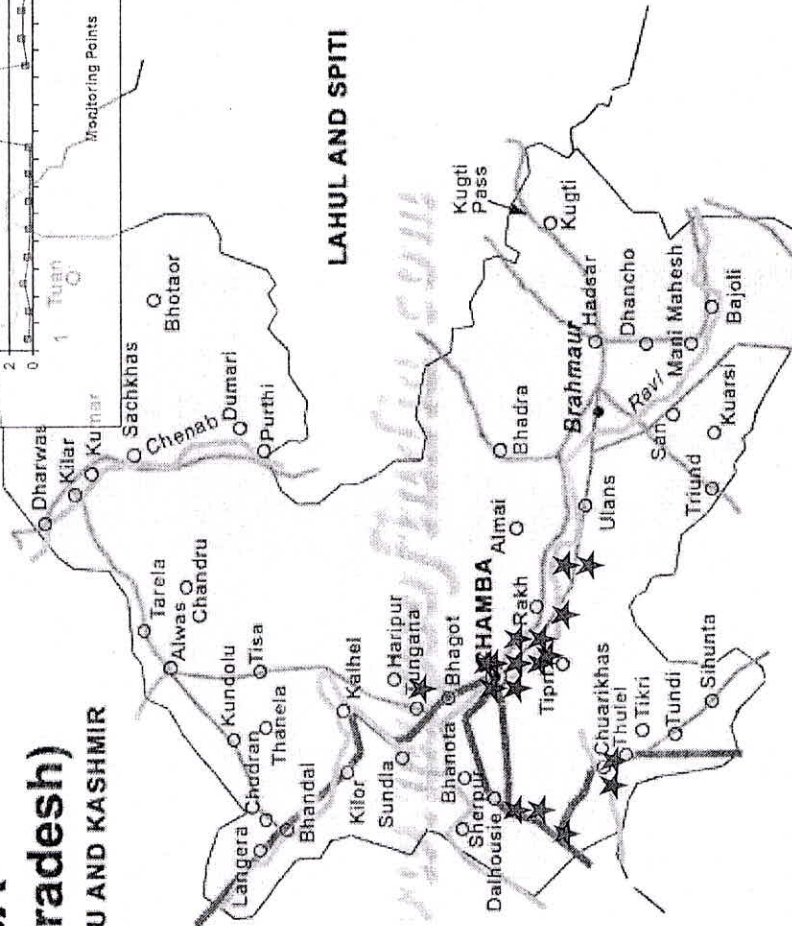


★ MONITORING POINT

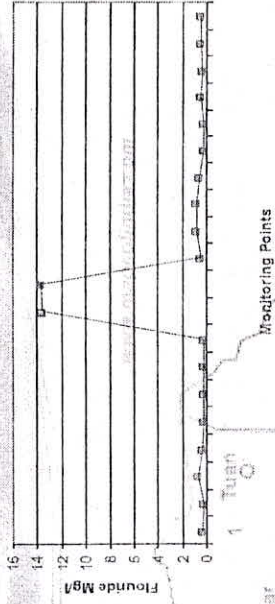
Map not to Scale

- District Boundary
- Road
- District Headquarter
- Taluk Headquarter
- Town
- River
- Trekking routes
- Major Roads

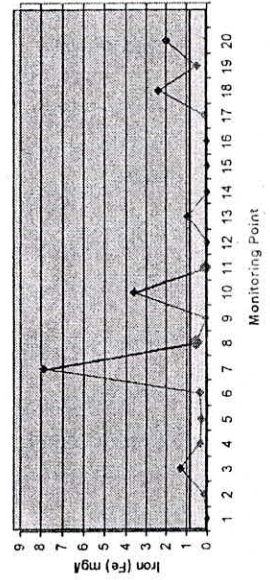
LAHUL AND SPITI



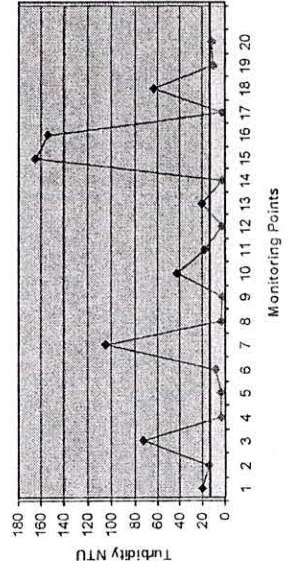
WATER QUALITY OF HAND PUMPS
AT CHAMBA



WATER QUALITY OF HAND PUMP
AT CHAMBA- 2000



WATER QUALITY OF HANDPUMP
AT CHAMBA- 2000





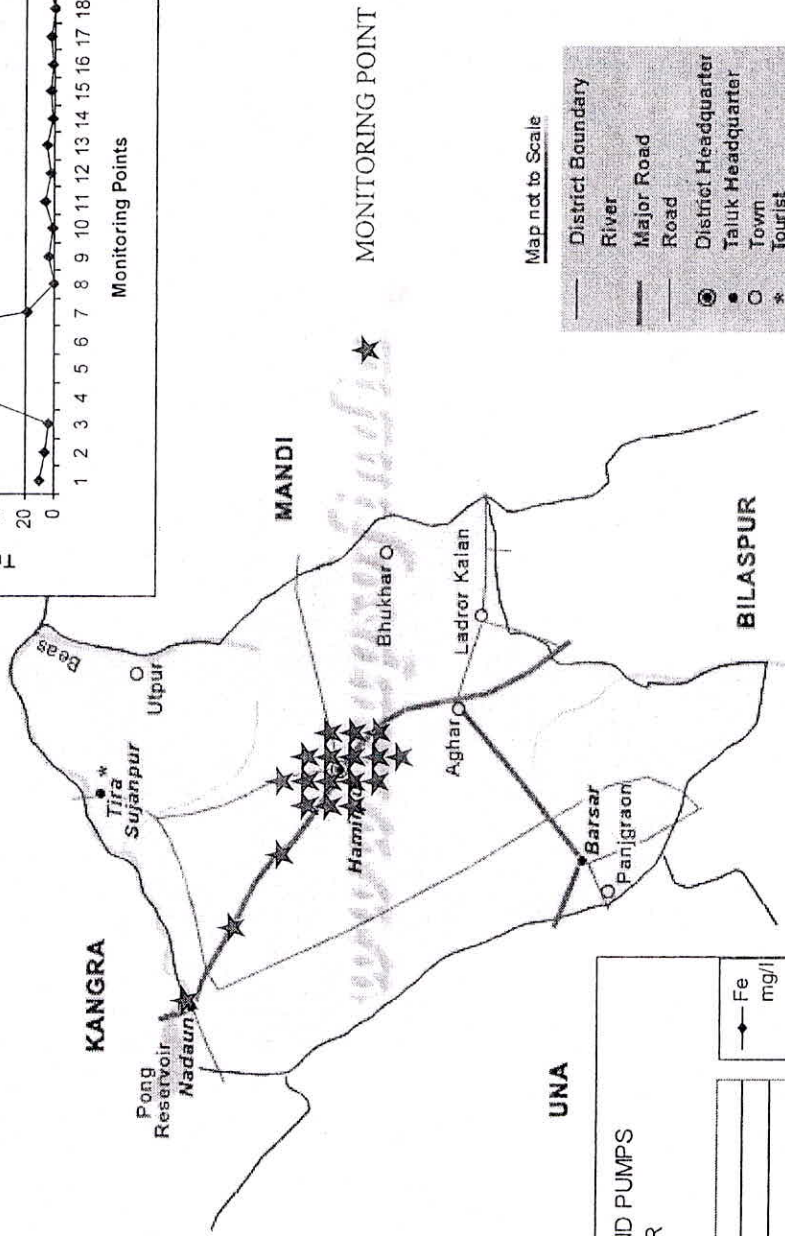
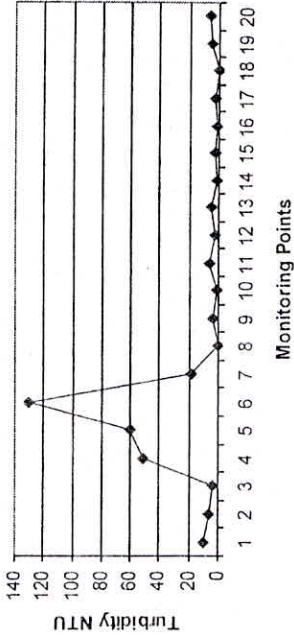
CHAMBA

- **Microbiological Water Quality**
- The coliform organism at all location has been reported within limits.
- **Physical Water Quality**
- At two locations i.e. handpump at Banikhet near Road crossing and at Chowari near hospital, the pH is in the acidic range slightly below the permissible limit of 6.5.
- Out of 20 locations where handpump water quality was monitored, at 13 locations, the water was found turbid beyond the prescribed limit of 5 NTU. At two locations the turbidity was more than 50 NTU and at three locations more than 100 NTU.
- The conductivity ranged between 96 to 3320 $\mu\text{mho/cm}$.
- **Chemical Water Quality**
- **Iron** was present in higher concentration than the prescribed limit at 11 locations.
- At two locations the concentration of **Fluoride** is also very high along with the higher amounts of dissolved solids and electrical conductance. The use of water at these two locations i.e. IPH handpump near HRTC workshop Chamba and at Sitla Bridge Chamba, should not be allowed for drinking purpose.

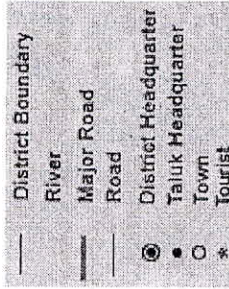
HAMIRPUR (Himachal Pradesh)

पुस्तकालय
राष्ट्रीय जलविज्ञान संस्थान, रुड़की

WATER QUALITY OF HAND PUMPS DIST. HAMIRPUR

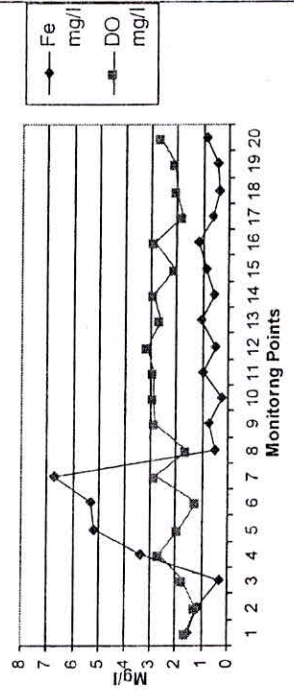


Map not to Scale



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WATER QUALITY OF HAND PUMPS DIST. HAMIRPUR



UNA



HAMIRPUR

● **Biological Water Quality**

- The total and fecal coliform at all locations was found absent indicating hygienic quality of water.

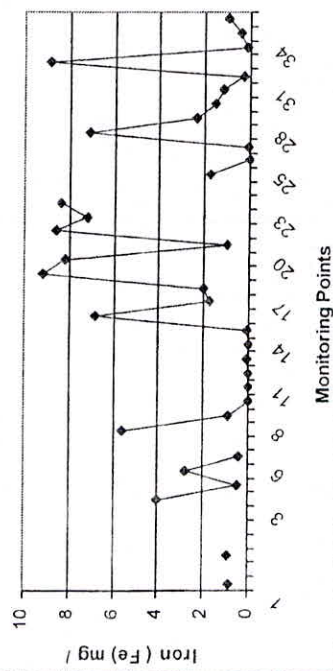
● **Physical Water Quality**

- The water was turbid at 8 locations.

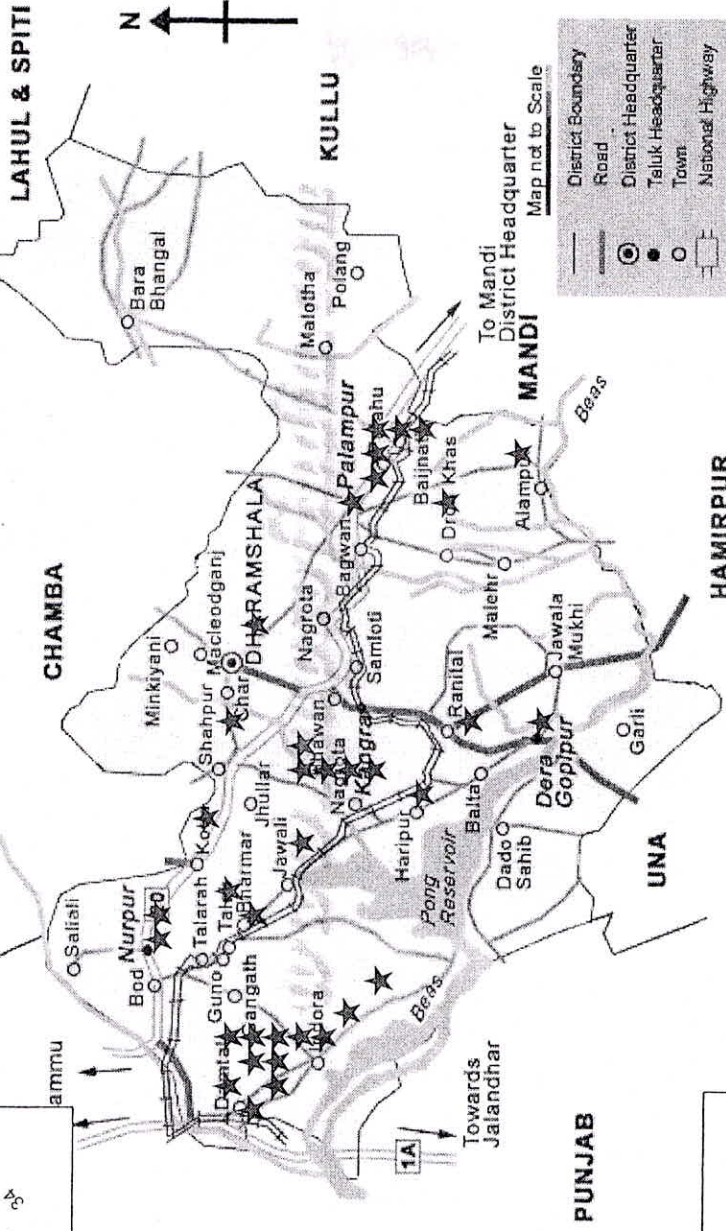
● **Chemical Water Quality**

- Concentration of Iron at most of the location was found above the permissible limit

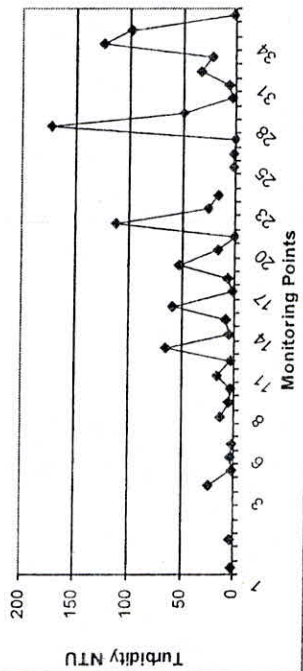
**WATER QUALITY OF HANDPUMPS
DIST. KANGRA**



**KANGRA
(Himachal Pradesh)**



**WATER QUALITY OF HANDPUMPS
DIST. KANGRA**



★ MONITORING POINTS

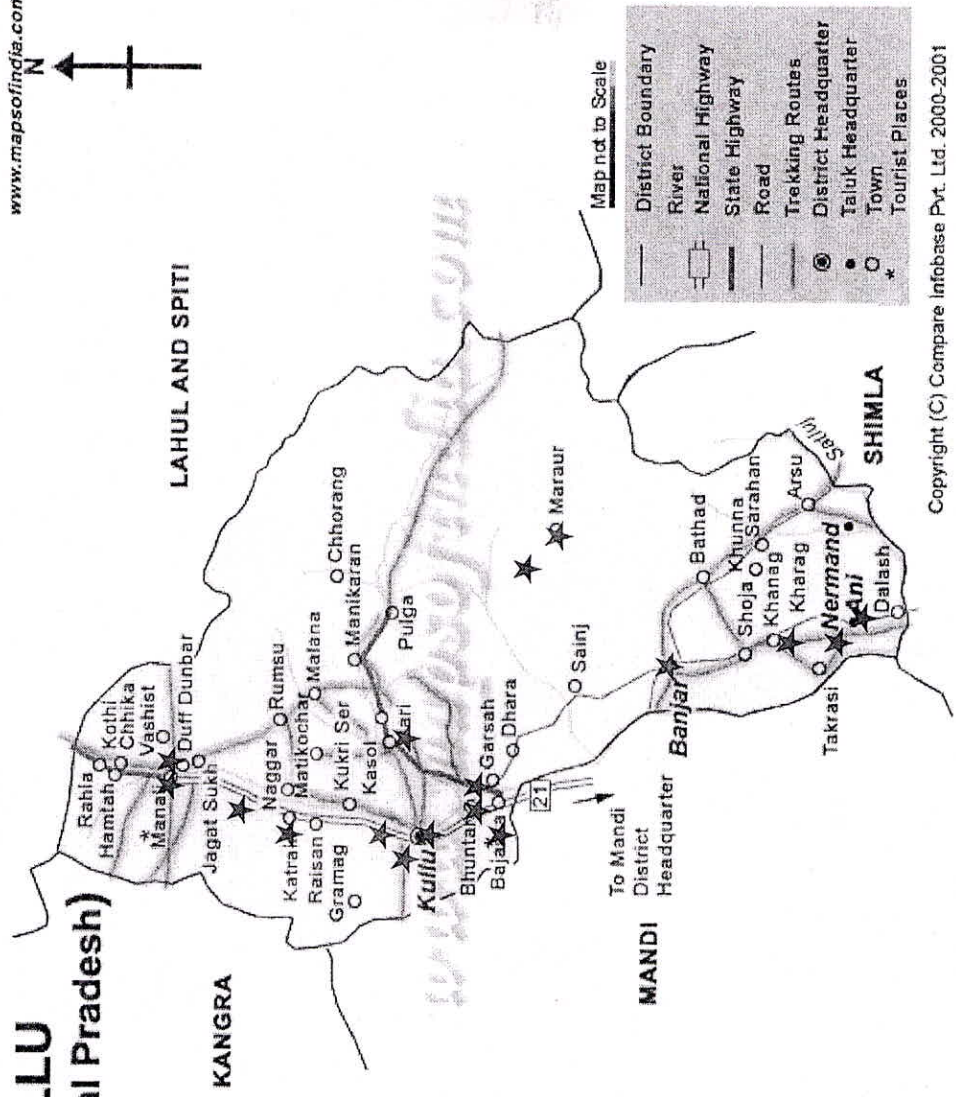


KANGRA

- **Physical Water Quality**
- pH ranged between 6.62 to 7.87 at two locations i.e Ghugger , Palmpur;
- At Alampur and Shahpur the turbidity was found more than 100 NTU. At 14 other locations, the water was turbid beyond the prescribed standard.
- **Chemical Water Quality**
- Out of 35 locations where water quality of Hand pump monitored, at 18 locations concentration of Iron was found beyond the prescribed limit.
- At two locations i.e. at Jaunta and Nurpur. The concentration of Sodium was also higher. The use water should be restricted for drinking purpose.

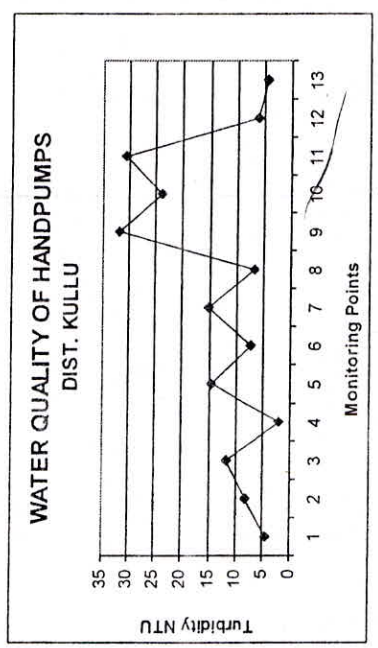
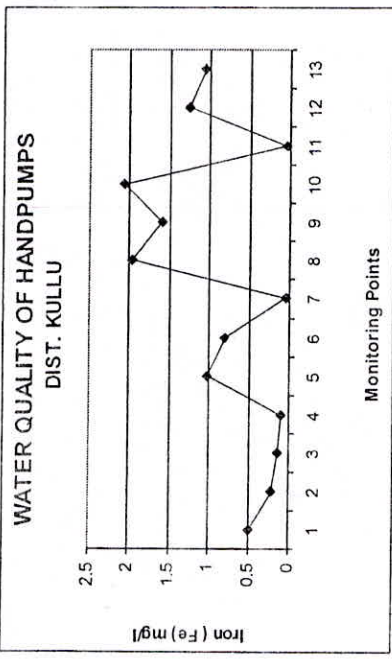
KULLU (Himachal Pradesh)

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MONITORING POINT

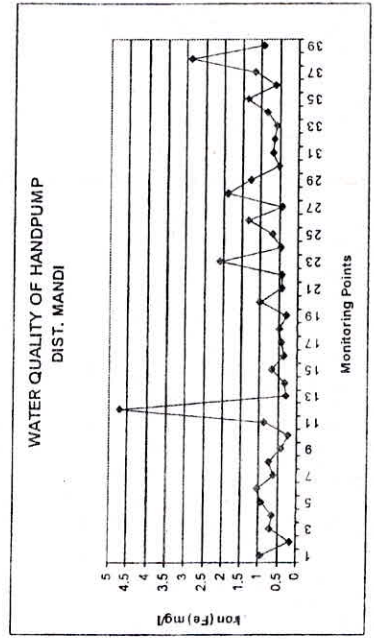
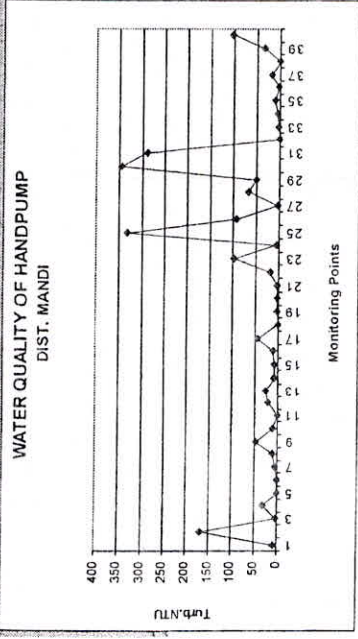
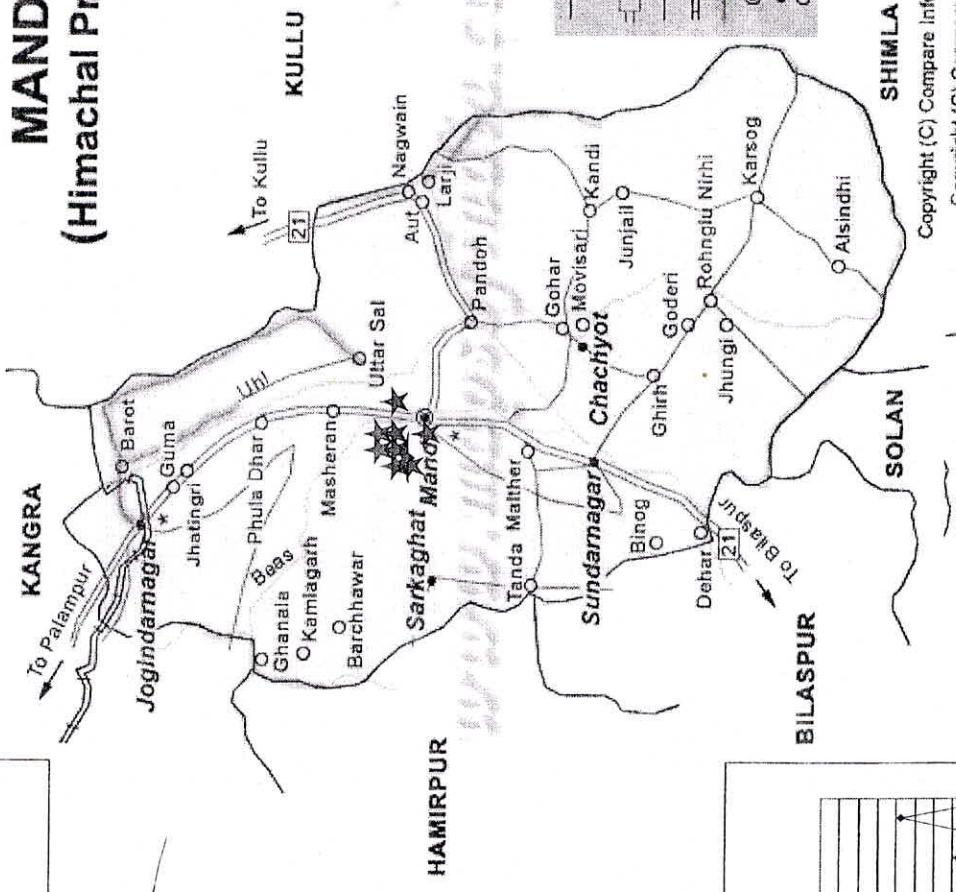




KULLU

- **Biological Water Quality**
- Both Fecal and Total Coliform have shown their absence at most of the locations.
- **Physical Water Quality**
- Out of 13 locations monitored for hand-pump water quality at 10 locations the water has been found turbid beyond the prescribed limit.
- The value of pH ranged between 6.6 to 7.98 and electrical conductivity ranged between 202 to 608 $\mu\text{mho/cm}$.
- **Chemical Water Quality**
- The concentration of Iron (Fe) was found higher than prescribed limit at 9 locations.

MANDI (Himachal Pradesh)



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MANDI

- **Biological Water Quality**

At Takoli Bus Stop , Behar near I&PH Store Sarkaghat and near Degree College Sarkaghat, the water is not fit for drinking without disinfection.

- **Physical Water Quality**

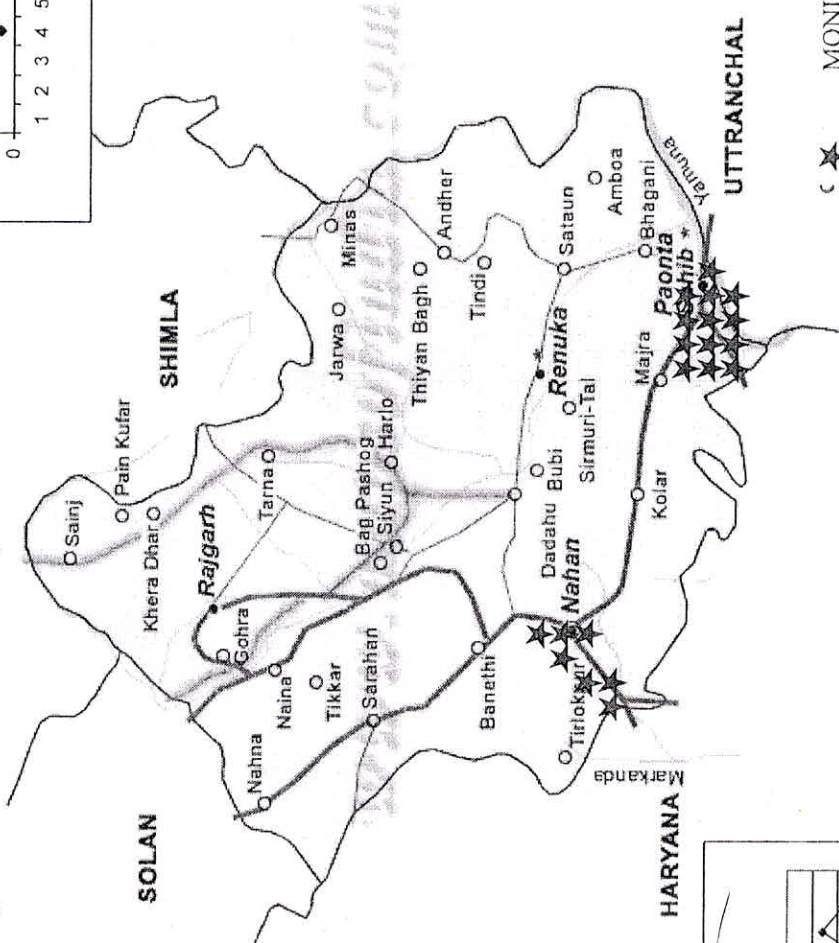
- The value of pH ranged from 6.6 to 8.26 and Electrical conductivity ranged from 45 to 8950 $\mu\text{mhos/cm}$.

- Out of 40 locations monitored, water was found turbid at 24 locations beyond the prescribed limit. The turbidity ranged from 0.94 to 332 NTU.

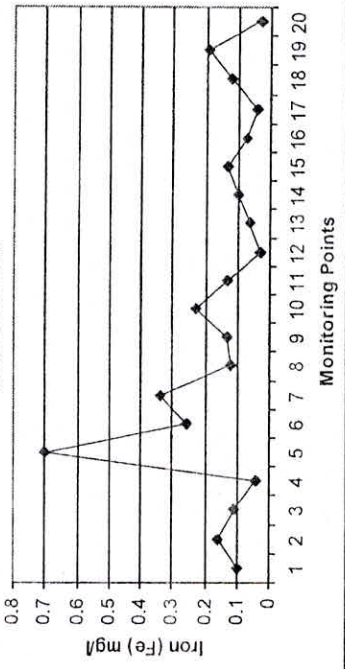
- **Chemical Water Quality**

- The concentration of Iron at almost all locations exceeds the value of prescribed limit. The water quality at Chandpur near samshan ghat, near DFO's residence at Sundernagar and at Kothi Talab Bus stop, was found not fit for drinking purpose as the concentration of Sodium and Chloride ions were very high.

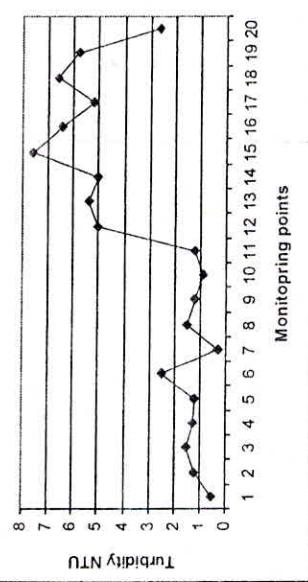
SIRMAUR (Himachal Pradesh)



WATER QUALITY OF HAND PUMP
DIST. SIRMAUR



WATER QUALITY OF HAND PUMP
DIST. SIRMAUR



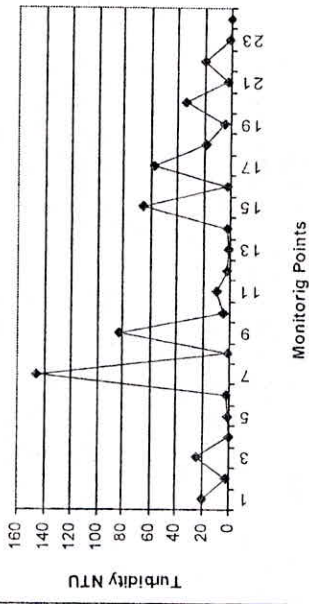
MONITORING POINT



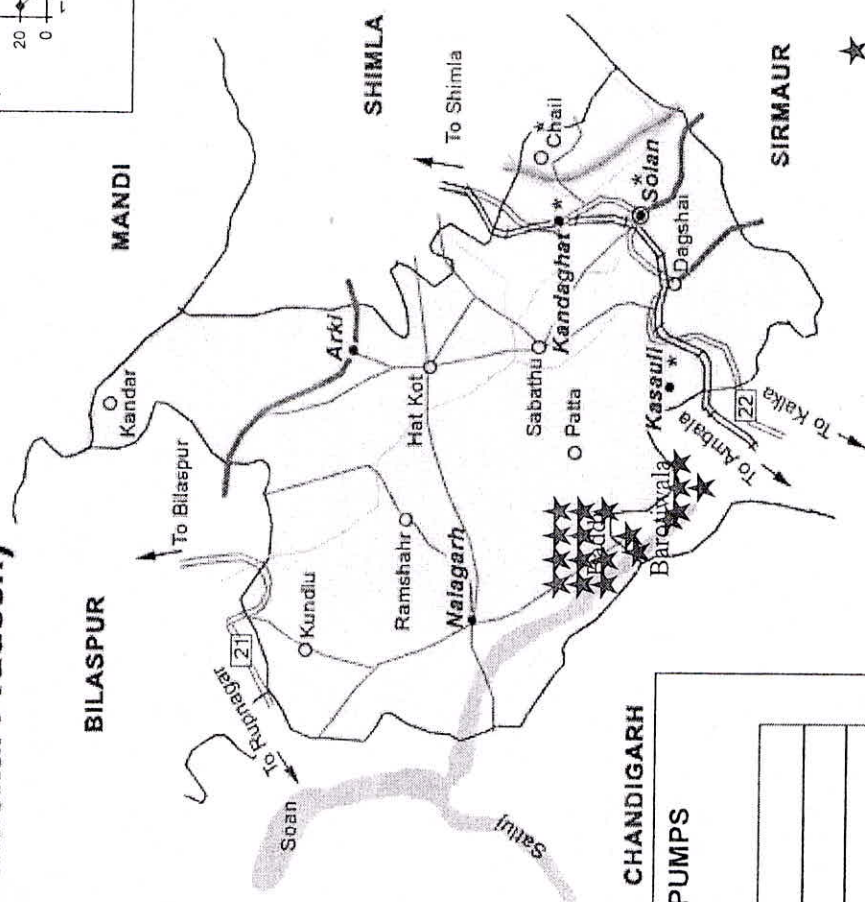
SIRMOUR

- **Biological Water Quality**
- The presence of total coliform and the fecal coliform at all locations is totally absent.
- **Physical Water Quality**
- The pH ranged from 7 to 8.16 and Electrical conductivity ranged from 572 to 1470 $\mu\text{mho}/\text{cm}$. The water was found turbid at 8 locations out of 20 locations monitored.
- **Chemical Water Quality**
- The Chemical quality of water at all locations except at Gondpur near Lada Office, Central jail Nahan and at Ramkundi, Nahan was found within permissible limit.
- At above three locations the total dissolved solids and concentration of Iron in two locations were reported higher than limits.

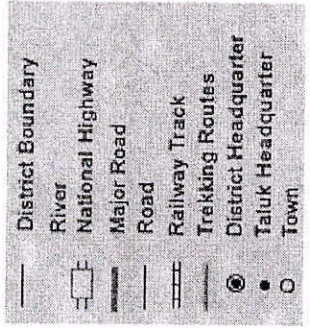
**WATER QUALITY OF HANDPUMPS
DIST. SOLAN-A**



**SOLAN
(Himachal Pradesh)**

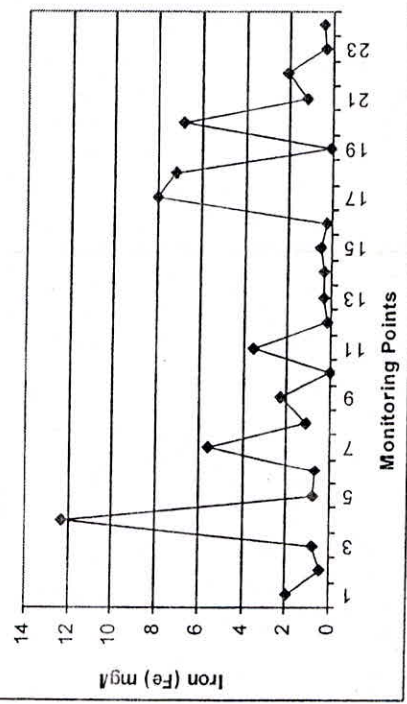


Map not to Scale



★ MONITORING POINT

**WATER QUALITY OF HANDPUMPS
DIST. SOLAN-A**

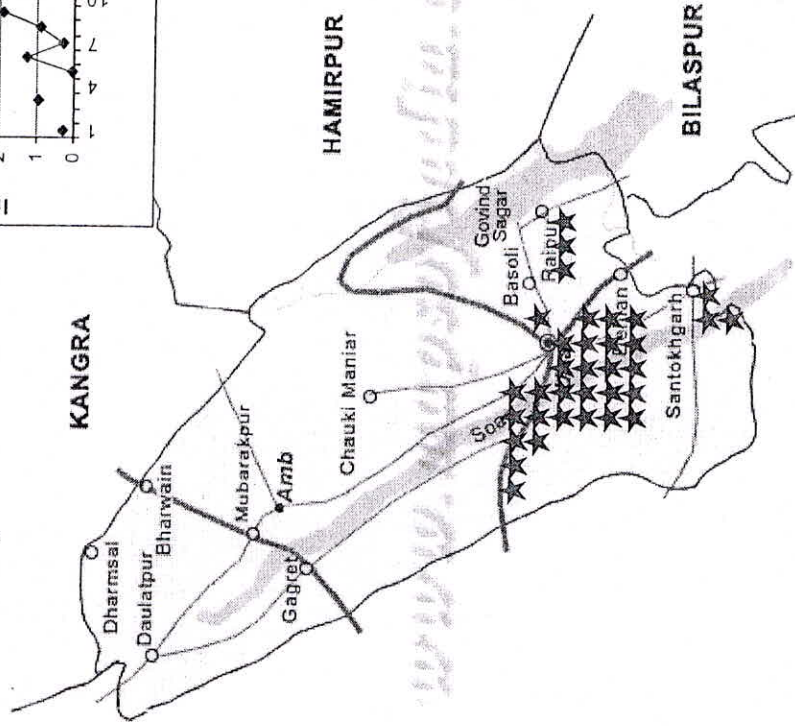




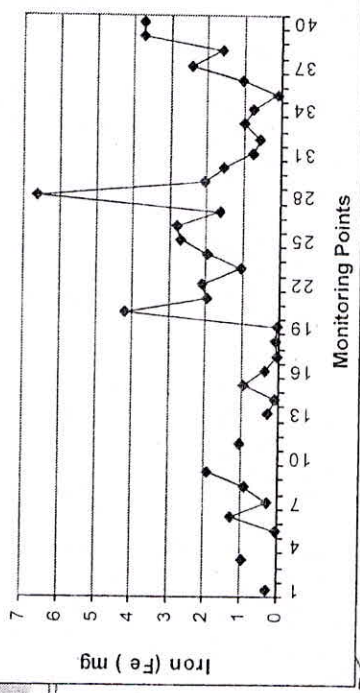
SOLAN

- **Biological Water Quality**
- Total and fecal coliform was found absent at almost all locations.
- **Physical Water Quality**
- pH ranged from 3.62 to 9.3. Low pH value was found in Barog near Rain shelter.
- Electrical conductivity also had very wide range between 285 to 2070 $\mu\text{mhos/cm}$.
- Turbidity has also been reported high at 17 locations.
- **Chemical Water Quality:**
- The concentration of Iron at almost all locations was found higher than prescribed limit.
- The concentration also of dissolved solids at Barotiwala and at Koti Nalagarh D/s of Himalyan veg. Solan Bus Stand, was found very higher. At two location in Baddi Industrial area, the water contains heavy metals i.e. Nickel(Ni) and Lead (Pb) in the concentration higher than the prescribed limit. The water is not fit for drinking and calls for immediate attention for prevention of pollution from industrials.

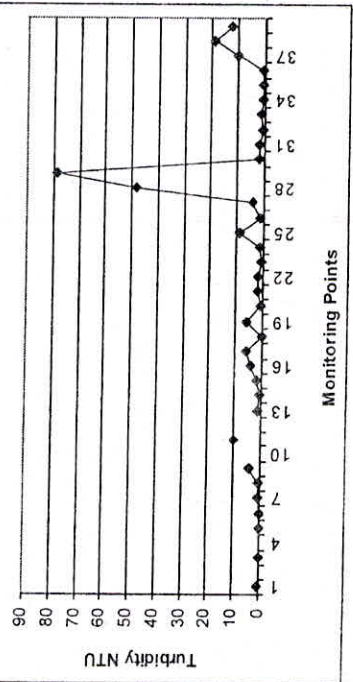
UNA (Himachal Pradesh)



WATER QUALITY OF HANDPUMPS
DIST. UNA



WATER QUALITY OF HANDPUMPS
DIST. UNA





UNA

- **Biological Water Quality**
- Except for the nine locations the total and fecal coliform has been found absent at all other locations.
- **Physical Water Quality**
- The water at almost all locations in district Una except Thaliwal is having low turbidity.
- pH ranged between 7.25 to 8.34.
- The conductivity ranged from 337 to 1140 $\mu\text{mhos/cm}$.
- **Chemical Water Quality:**
- The concentration of iron at 25 location out of 35 monitored was found higher than the prescribed limit.

Water quality of Shimla

Shimla faces acute drinking water crisis Against a daily requirement of 45 MLD of water, the city is getting only 32 MLD from all the sources under the IPH department.

Even this 32 MLD water does not reaches the residents as around 3 MLD of water is wasted due to **leakage**. As per sources around 2 MLD of water is wasted in Dhalli alone where the IPH department has not been able to plug the leakage in the supply line for the past 3 years. (*Himachal Live News on May 27th, 2010*)

264 cases of Jaundice reported in Shimla (4th March 2010)

Shimla: In order to tackle jaundice epidimic in Shimla city water surveillance is being undertaken by Health department, Shimla municipal corporation and IPH department. Out of the eight samples sent to National Centre for Disease Control New Delhi, seven tested positive for Hepatitis-E. This was disclosed by a spokesman from the Health department today in Shimla. Feb 28th, 2010

Hepatitis E

The hepatitis E virus (HEV) is a common cause of hepatitis that is transmitted via the intestinal tract, and is not caused by the [hepatitis A](#) virus. Spread most often by contaminated drinking water, HEV infection occurs mainly in developing countries.

Hepatitis E is also known as epidemic non-A, non-B hepatitis. Like hepatitis A, it is an acute and short-lived illness that can sometimes cause liver failure. HEV, discovered in 1987, is spread by the fecal-oral route. It is constantly present (endemic) in countries where human waste is allowed to get into drinking water without first being purified.

There is currently no FDA-approved vaccine for Hepatitis E.

Hepatitis E Virus

