जल वर्ष 2007 Water Year 2007

स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल

CONSERVE WATER - SAVE LIFE

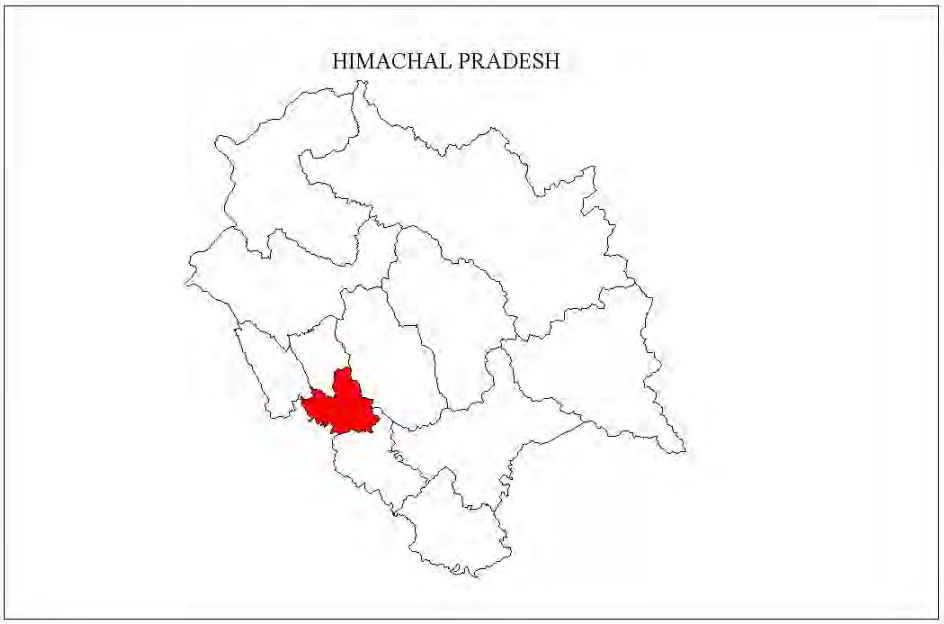
Government of India

Ministry of Water Resources

CENTRAL GROUND WATER BOARD

GROUND WATER INFORMATION BOOKLET

BILASPUR DISTRICT, HIMACHAL PRADESH



NORTHERN HIMALAYAN REGION
DHARMSALA
2008

जल वर्ष 2007 Water Year 2007

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CONSERVE WATER - SAVE LIFE

Contributors

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Assistant Hydrogeologist

Prepared under the guidance of

Arun Kumar

Regional Director Incharge

Our Vision

Water security through sound groundwater management

जल वर्ष 2007 Water Year 2007

स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल

CONSERVE WATER - SAVE LIFE

District Bilaspur, Himachal Pradesh

At a Glance

Sl. No.	Items	Statistics
1	GENERAL INFORMATION	
	i) Geographical area (Sq. Km)	1167
	ii)Administrative Divisions	
	Sub divisions	2
	Number of Tehsils	3
	Number of Sub Tehsils	1
	Development blocks	3
	No. of Panchayats/Villages	151/1080
	iii) Population (As on 2001 census)	340735
	iv) Average annual rainfall (mm)	720 mm
2	GEOMORPHOLOGY	
	Major physiographic units	Structural Hill, Denudation hill, and Valley fill
	General altitude	610 m. amsl
	Major Drainages • Satluj Basin	Satluj, Ali Khad, Gamrola Khad and Seer khad
3	Land Use (Sq. Km)	
	a) Forest area:	127.83
	b) Cultivable area	330.91
	c)Net Sown area	305.11
4.	MAJOR SOIL TYPES	Alluvial soils and Non-calcic Brown soils
5	AREA UNDER PRINCIPAL CROPS (As on.)	Maize, Paddy, Wheat
6.	IRRIGATION BY DIFFERENT SOURCES (Areas and Numbers of Structures)	
	Dugwells shallow TW Surface flow irrigation Schemes Tanks	No/scheme Area (Sq. km) 35 45
	Tube wells / Bore wells	45
	Tanks / Ponds	-
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31.3.2007)	No Monitoring wells

	No. of Dug Wells No. of Piezometers	
8.	PREDOMINANT GEOLOGICAL FORMATIONS	Siwaliks, Kasauli, Dagshai, Subathu
9.	HYDROGEOLOGY	
	Major Water bearing formation	
	1. Consolidated sediments/ Hard Rocks (Older Crystalline & Metamorphics)	Covering minor part
	• Yield prospects • GW structures	Low (<5 lps) Handpumps & springs
	1. Unconsolidated / Semi-consolidated/ Consolidated sediments	Covering major part And in Valley areas
	• Yield prospects • GW structures	Low to high (<5 – 15 lps) Dugwells, Hand pums,
10	GROUND WATER EXPLORATION BY CGWB (As on 30.9.2007)	
	No of wells drilled (EW, OW, PZ, SH, Total)	3
	Depth Range (m)	31 m bgl to 115 bgl
	Discharge (litres per second)	7.7 to 20.75
	Storativity (S)	
	Transmissivity (m2/day)	
11	DYNAMIC GROUND WATER RESOURCES(2004)	Not estimated due to localized aqifers
12.	AWARENESS AND TRAINING ACTIVITY	--
	Mass Awareness Programmes organized • Date/Place/No of participants	Nil
	• Water Management Training Programmes organized	Nil
	• Date/Place/No of participants	Nil
14.	EFFORTS OF ARTIFICIAL RECHARGE & RAIN WATER HARVESTING	Nil
15.	GROUND WATER CONTROL AND REGULATION	
	Number of OE Blocks	Nil
	No of Critical Blocks	Nil
	No of blocks notified	Nil
16.	MAJOR GROUND WATER PROBLEMS AND ISSUES	Nil

DISTRICT GROUND WATER BOOKLET
BILASPUR DISTRICT, HIMACHAL PRADESH

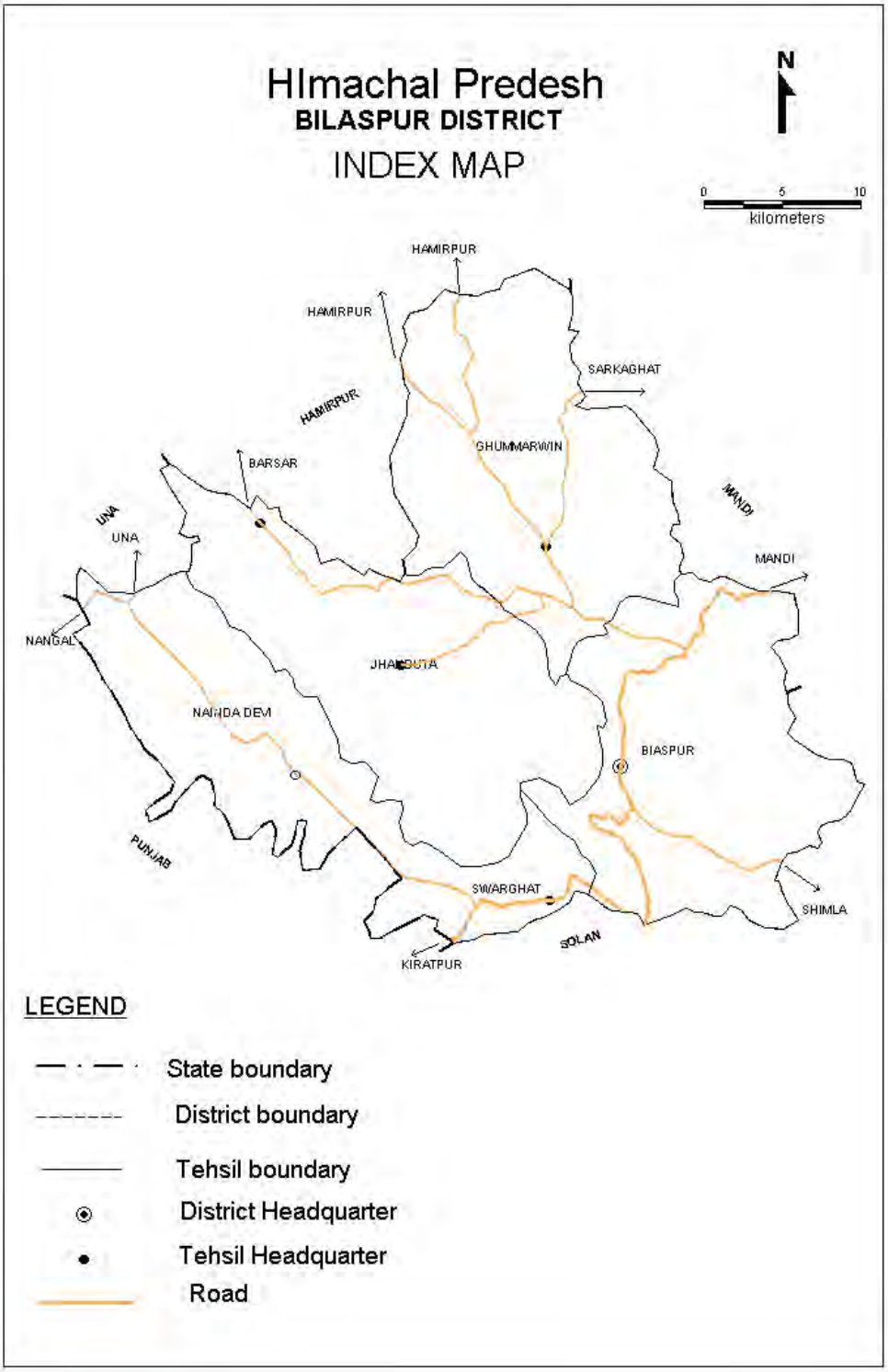
1.0 INTRODUCTION

Bilaspur district was formed in 1954 when the part 'C' State of that name was merged into Himachal Pradesh. The district is in the southwestern part of the State of Himachal Pradesh. The district, with its headquarter at Bilaspur town, has a geographical area of 1167sq km and covers 2.1 % area of the State. It lies between North latitude 31°18'00" & 31°55'00" and East longitude 75°55'00" & 76°28'00" and is covered in survey of India degree sheet No.53A & 44M. Towards north it is bounded Kangra district, towards north- & east by Hamirpur & Bilaspur districts and towards south-west by State of Punjab.

Administratively, the district has been divided into two sub-divisions (Sadar & Ghummarwin) and comprises of 3 tehsils (Sadar, Ghummarwin, Jhandutta) & 1 sub-tehsil (Swarghat). Further, there are 3 CD blocks (Sadar, Ghummarwin & Jhandutta) There are 4 towns (Bilaspur, Ghumarwin, Naina Devi & Talai), 1080 villages, and 151 Gram Panchayats in the district. Bilaspur district is well developed in the industrial sector due to close proximity to Punjab state .The district is well connected by road network. The nearest airport is at Chandigarh.

As per 2001 census, district has a population of 340735 with 292 persons /sq km density of population. The male/female sex ratio is 992. Rural population is about 94% indicating thereby that the district has a agricultural economy.

Agriculture is the major occupation of the people of the district with more than 70% population engaged in the agriculture and allied sector. Major crops like maize, wheat, rice, sugarcane and pulses are grown apart from the vegetables in the district. Total cultivable area is 330.91 sq km and net area sown is 305.11.8 sq km. Net area irrigated in the district is about 86 sq km. Ground water is the major source of water in the district for irrigation


HImachal Predesh
BILASPUR DISTRICT
INDEX MAP
N
0 5 10
kilometers
HAMIRPUR
HAMIRPUR
HAMIRPUR
SARKAGHAT
GHUMMARWIN
BARSAR
UNA
UNA
MANDI
MANDI
NANGAL
JHANDUTA
NAINA DEVI
BIASPUR
PUNJAB
SWARGHAT
SHIMLA
SOLAN
KIRATPUR
LEGEND
State boundary
District boundary
Tehsil boundary
District Headquarter
Tehsil Headquarter
Road

and domestic use. There are large numbers of water supply wells & tube wells, springs, *kulhs* (water channels) and lift irrigation schemes implemented exclusively for irrigation purposes.

Central Ground Water Board (CGWB) has carried out hydro-geological studies and ground water exploration in the district. Exploration commenced recently and under exploratory drilling programme 3 exploratory wells ranging in depth from 31 to 115 m bgl have been drilled.

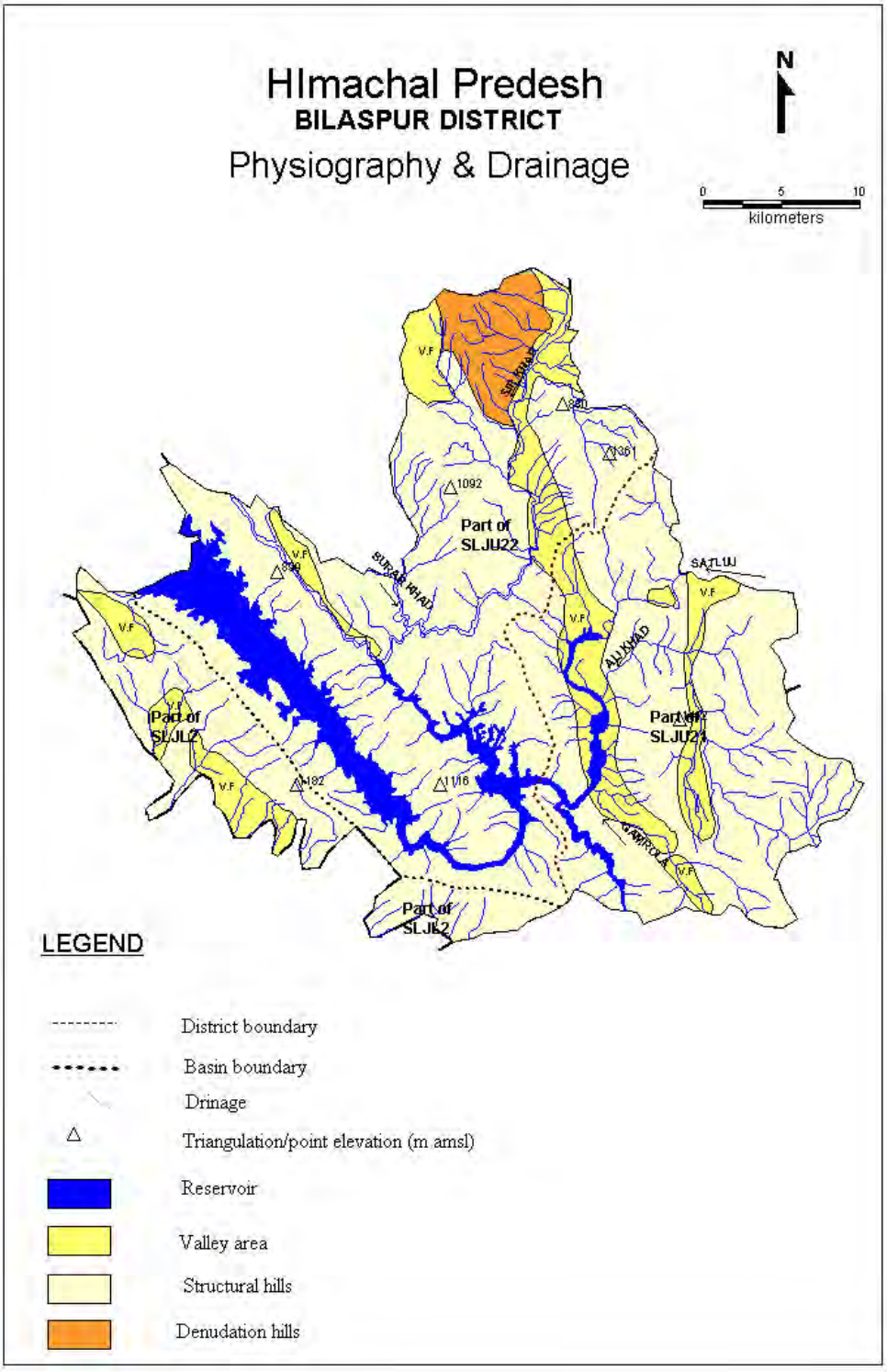
2.0 CLIMATE & RAINFALL

Climate of the district is temperate to Sub- tropical . The summer sare invariably hot, temperature rising to 42^{o} C at some places. And it falls down to 30 ^{o}C soon after th emonsoons. Temperature varies from minimum of 5°C in winter to the maximum of 42°C in summer For three months in winter a thick mist surrounds the Satluj. The places situdated at higher elevations such as Swarghat, Nambhol hav a bracing climate. The hill valleys and valleys along the khads are quite dry and hot in summer. In Rainy Season Humidity Increases and the weather becomes hot and sultry.

The area receives rainfall during monsoon period extending from June to September and also non-monsoon period (winter). The annual average rainfall in the area is about 720 mm with about 55 average rainy days. The winter season starts from the November and continues till the middle of March. Thereafter the mercury continues rising till the set of Monsoon which starts from the last weak of June and continues till the middle of September.

3.0 GEOMORPHOLOGY & SOILS

Bilaspur district nestles between Siwalik ranges and forms part of the lesser Himalaya. It has a diverse landscape made of the hills, valleys with piedmont zone There are seven main hill ranges i.e. *Naina Devi, Kot, jhanjiar, Tiun, Bandla, Bahaurpur and Ratanpur* constituting the hill system of District Bilaspur. The district is mostly hilly and has no mountains of higher altitude from the mean sea level. The elevation of the lowest point is about 290 m and the highest peak is *Bhadurpur hill* with an elevation of 1980 m amsl.


HImachal Predesh
BILASPUR DISTRICT
Physiography & Drainage
N
0
5
10
kilometers
V.F
1092
Part of SLJU22
SUTLUJ
SATLUJ
ALUKHAD
Part of SLJU21
Part of SLJL2
1182
1116
Part of SLJL2
LEGEND
District boundary
Basin boundary
Drinage
Triangulation/point elevation (m amsl)
Reservoir
Valley area
Structural hills
Denudation hills

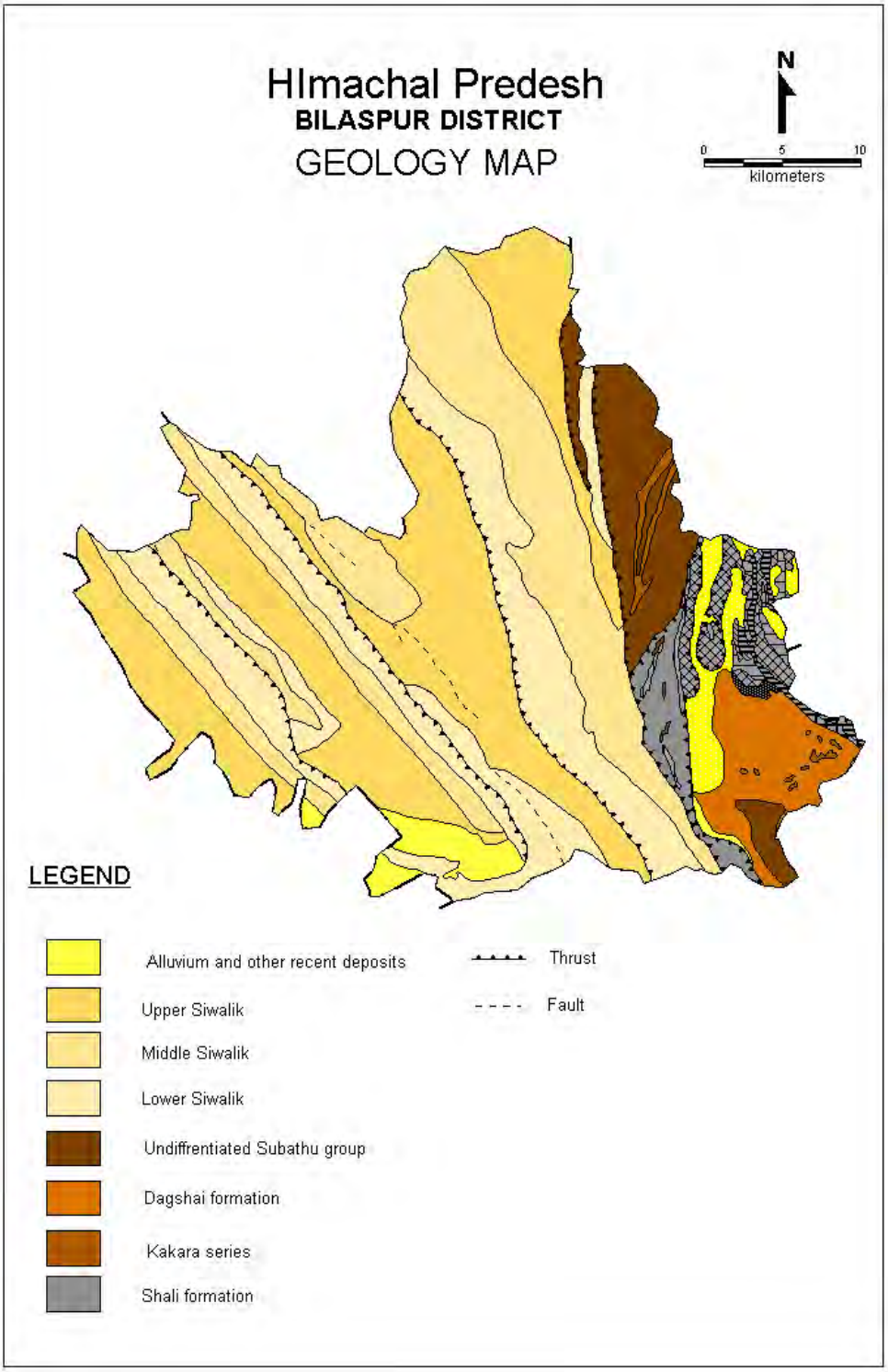
The major river that passes through the middle of the district from east to west is Satluj. It enters the district near a place known as *Kasol* in the North- West and after traversing a course of 90 kms, leaves it near Naila and enters the territory of Punjab in the South- West. The Satluj is joined by several tributaries from both the sides, the main three tributaries are Ali Khad, Gamrola Khad and Seer Khad.. The length of Ali khad is about 26 kms. It rises in the Shimla district and after passing through Bahadurpur Dhar joins the river Satluj at Bilaspur. Gamrola khad alos rises in the Shimla district and after draining the Rattanpur Dhar joins the river about 5 kms. Downwards from Bilaspur town. Seer Khad which is the third tributary of Satluj originates at Wah Devi which is 10 kms from Sarkaghat in Mandi district. After draining Kot-Ki-Dhar and a greater portion of Ghumarwin tahsil it joins Satluj river at village Serimatla nearly 15 kms. Downwards from Bilaspur town.

Two types of soils are observed in the district viz., alluvial soil and non-calcic brown soil. Most of the area in district is covered with alluvial soil and only hilly area in the district is covered with Non-calcic brown soil. Soils are rich in nutrients and thus are fertile

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

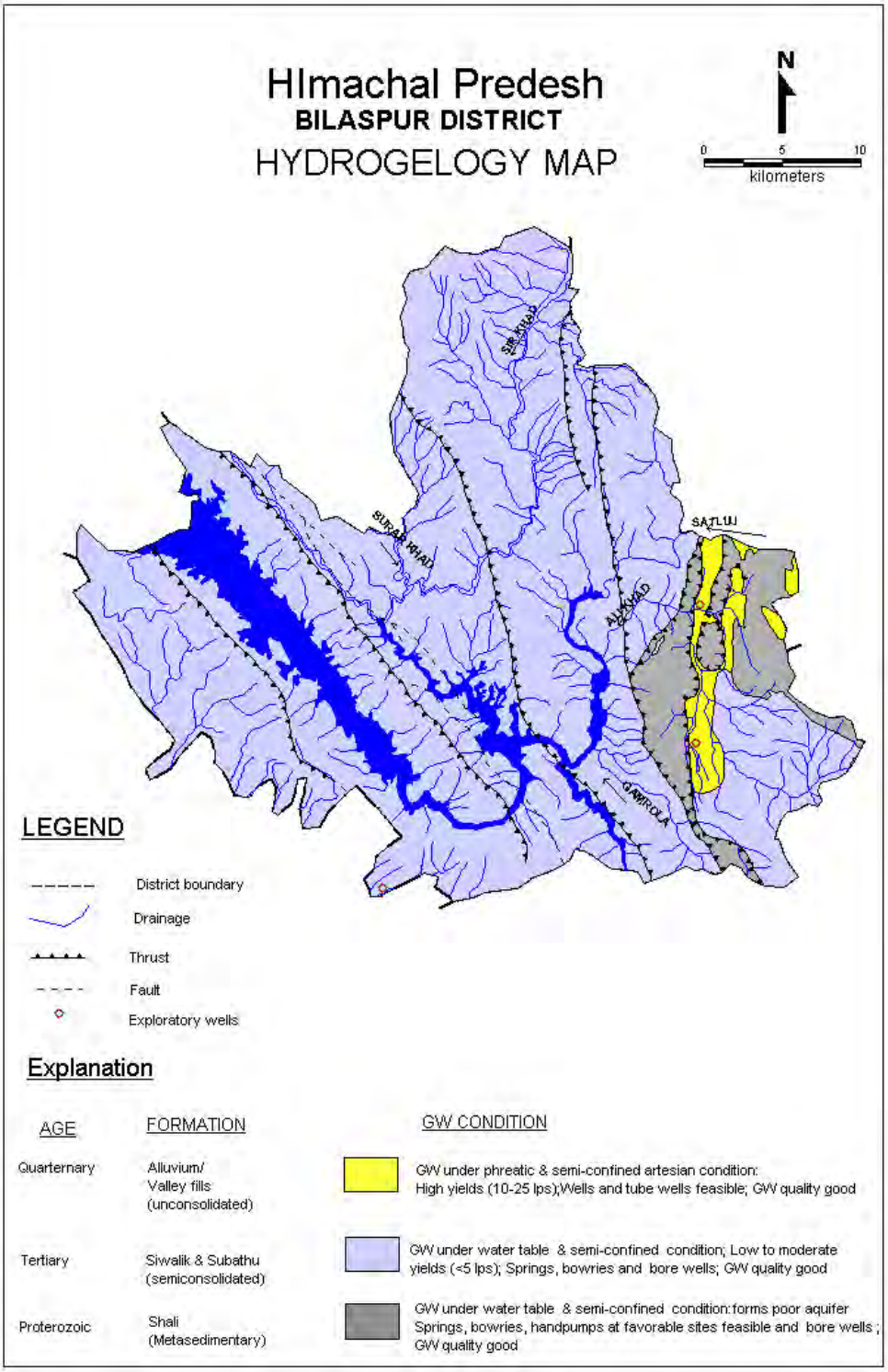
The rock formations occupying the district range in age from pre-Cambrian to Quaternary period. The generalized geological succession in the district is given below


HImachal Predesh
BILASPUR DISTRICT
GEOLOGY MAP
N
0
5
10
kilometers
LEGEND
Alluvium and other recent deposits
Upper Siwalik
Middle Siwalik
Lower Siwalik
Undiffrentiated Subathu group
Dagshai formation
Kakara series
Shali formation
Thrust
Fault

Eon	*ERA*	*PERIOD*	*GROUP FORMATION*	*DESCRIPTION*
Phanerozoic	Cenozoic	Quaternary (Recent to sub-Recent)	Alluvium; fluvial, terrace, piedmont	Sand, silt, clay, gravel, pebble and cobble etc.
			Undifferentiated	Sand, clay, gravel, pebble, cobble and boulders
		Tertiary Pliocene to Mid. Miocene	Upper Siwalik	Soft sandstone, brownish clay, shale, poorly sorted, crudely bedded conglomerate & boulder beds.
			Middle Siwalik	Gray sandstone, and brownish clay/ shale
			Lower Siwalik	Red and purple sandstone and shale
		Oligocene-Lower Miocene	Subathu Group	
			Kasauli Formation	Grey sandstone, shale, Clay
			Daghshai Formation	Greenish to greyish hard sandstones
			Subathu Formation	Dark-red and purple coloured shales Dark nodular clays
Proterozoic	Upper proterozoicIII		Krol Formation	Greyish massive dolomites and Limestones
	Proterozoic II		Shali Formation	Cherty Dolomite, Quartzite and Lime stone

Hydro-geologically, both the unconsolidated valley fill or alluvial formation occurring in the valley area and semi-consolidated sediments belonging to Siwalik Group form aquifer system in the district. Porous alluvial formation forms the most prolific aquifer system in the valley area where as the sedimentary semi-consolidated formation for aquifer of low yield prospect.

The ground water in the Siwalik group of rocks occur under the unconfined to semi confined conditions mainly in the arenaceous rocks viz., sandstone, siltstone, gravel boulder beds etc. The occurrence and


HImachal Predesh
BILASPUR DISTRICT
HYDROGELOGY MAP
N
0 5 10
kilometers
SIWALIK
SUBATHU
ALUVIAL
SATLUJ
GAMROLA
LEGEND
District boundary
Drainage
Thrust
Fault
Exploratory wells
Explanation
AGE
FORMATION
GW CONDITION
Quarternary
Alluvium/ Valley fills (unconsolidated)
GW under phreatic & semi-confined artesian condition: High yields (10-25 lps);Wells and tube wells feasible; GW quality good
Tertiary
Siwalik & Subathu (semiconsolidated)
GW under water table & semi-confined condition; Low to moderate yields (<5 lps); Springs, bowries and bore wells; GW quality good
Proterozoic
Shali (Metasedimentary)
GW under water table & semi-confined condition: forms poor aquifer Springs, bowries, handpumps at favorable sites feasible and bore wells ; GW quality good

movement of ground water is controlled by inter granular pore spaces and also the fracture porosity. Siwalik sediments underlie Hilly/undulating areas where springs (mostly gravity/contact type) and *bowries* are the main ground water structures apart from the hand pumps. The discharges of the springs, varies from seepages to 0.50 lps. B*owries* are dug well type constructed on the hill slopes/ nalas for tapping the seepages. In the low lying areas underlain by Siwalik rocks, dug wells and hand pumps are the main ground water structures that range in depth from 3.00 to 25.00 m bgl where in depth to water level ranges from 2.50 to 15.00 m bgl. In upland/plateau areas the water level is generally deep. In B*eet* area water level more than 60 m below land surface are observed.

In valley areas, the ground water occurs in porous unconsolidated / alluvial formation (valley fills) comprising sand, silt, gravel, cobbles / pebbles etc., & forms prolific aquifer. Ground water occurs both under phreatic & confined artesian conditions. Water logging areas are observed in northern part of Jukhola valley. Ground water is being extensively developed in the area by medium tube wells & dug wells, and also by hand pumps. Depth of dugwells ranges from 4.00 to 15.00 m bgl whereas depth to water level ranges from near surface to 6 mbgl in pre monsoon. Yield of shallow aquifer is moderate with well discharges up to 10 lps.

CGWB has drilled/constructed 3exploratory wells in the district in the depth range of 3.00 to 115 mbgl. Static water level of the tubewells ranges from 3.35 to 36.55 mbgl and discharge ranges from 7.7 to 20.75 lps with the drawdown less than 3-19 m..

4.2 Ground Water Resources

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

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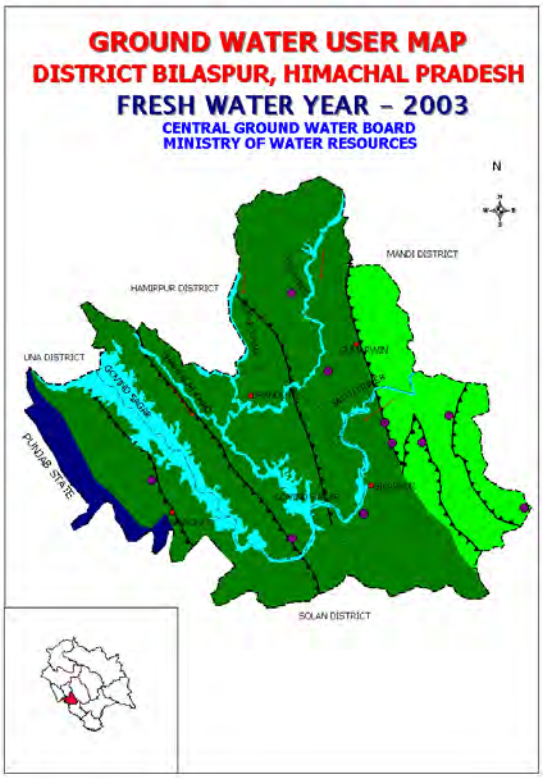

LEGEND

	Wells feasible	Rigs suitable	Depth of Well (m)	Discharge (lpm)	Suitable artificial Recharge structures
Soft rock aquifers	Tube well Dug well	Percussion & Percussion cum Rotary Manual	100-150 10-20	1200-2500 300-500	Check dam, Check dam cum ground water dam, Recharge shaft
Hard rock aquifers	Bore well Dug well Spring development	DTH with Odex Manual	100-200 10-20	1000-2000 300-500 30-2000	

Spring	Thrust
Major drainage Reservoir	Tehsil boundary District boundary State boundary

The district has a hilly terrain having very high slopes. The valley areas are narrow and isolated. The areas therefore not considered for estimation of the ground water resources being discontinuous aquifers.

4.3 Ground Water Quality

National hydrograph Network Stations has not been established in the district so far.

5.	NO_3	(mg/l)	0.78	65
6.	F	(mg/l)	0.19	0.71
7.	Ca	(mg/l)	58	148
8.	Mg	(mg/l)	2.6	58
9.	Na	(mg/l)	5	133
10.	K	(mg/l)	0.7	6.2
11.	TH as CaCO3	(mg/l)	177	446

Quality of ground water in shallow aquifer is good for domestic and irrigation purpose in the district.

4.4 Status of Ground Water Development

The entire demand for domestic and irrigational use is fulfilled by means of either spring or nallah sources. Most of these sources are perennial with low to moderate seasonal fluctuation. Such sources are tapped by the irrigation department for its further use.

Ground water exploration has been carried out by CGWB in Bilaspur district but not in entire the entire area of the district because of hard approachability for the heavy machinery. However state Irrigation department has drilled number of shallow bore wells fitted with handpump in various parts of the district for domestic use. The depth of these bore wells ranges between 100 to 120 feet. At places where the discharge is sufficient, depending upon the need, they are energized. These handpumps are installed in hardrock hilly terrain and also along the River valleys. Tubewells are presentin all these valleys.

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 Ground Water Development

The district being hilly & mountainous, traditional sources of ground water mainly springs has played a major role since past in providing assured irrigation and water supply. These include the nallas, springs. In some of the areas, at present too these are the only sources for the water of the settlements. However modern means for tapping the ground water have been employed in recent years.

During the last 15-20 years, Irrigation and Public Health Department has constructed number of small depth bore wells fitted with handpumps in these areas. High hill ranges occupy the more than 95 % of the area of the district. During the very past years, the traditional ground water source has served the settlements. Ground water development on small scale is seen in the valleys areas particularly in the Jokhola valley. Handpumps have been installed in these areas and are energized for the water supply. There exists a scope to explore the potentialities of rest of the areas for ground water in low lying valley areas. The entire hilly area of the district is feasible for only drilling shallow to medium depth bore wells.

5.2 Water Conservation & Artificial Recharge

Ground water extraction through springs and hand pumps are the major sources of water supply, but the availability of water during summer is limited particularly in lean periods and requires immediate attention to augment the ground water resource. Based upon the climatic conditions, topography, hydro-geology of the area, suitable structure for rain water harvesting and artificial recharge to ground water are required. Proper scientific intervention for spring development and revival is required in water scarce areas. In the hilly areas, roof top rainwater harvesting structures like storage tanks are recommended while in low hill ranges, check dam and roof top rainwater harvesting structures can be adopted.

6.0 GROUND WATER RELATED ISSUES & PROBLEMS

The district being hilly and mountainous, most of the rainfall goes waste as runoff. This has resulted in varying degree of recharge to the ground water. In such hard rock terrain, since the aquifers are discontinuous and of different geological/hydrogeological setup, the ground water scenarios are different in various parts of the districts.

Most of the ground water issues and problems so far noted in the district are localized and need to be treated independently by taking micro level studies in a particular area. Some of the common issues are deeper water level because of the terrain and hydrogeological setup,

7.0 AWARENESS & TRAINING ACTIVITY

Mass Awareness Programme (MAP) & Water Management Training Programme (WMTP) by CGWB

Nil

Participation in Exhibition, Mela, Fair etc

CGWB has not participated in exhibition, Melas so far.

Presentation & Lectures delivered in public forum / Radio/TV/Institution of repute/Grassroots association /NGO/Academic institutions etc

No presentation/lectures has been delivered in public forum so far.

8.0 AREAS NOTIFIED BY CGWA / SGWA

Nil

9.0 RECOMMENDATIONS

- In valley areas, in addition to traditional ground water structures like springs, shallow to medium depth tube wells can be constructed for developing the ground water resource.
- In hilly terrain, springs and perennial nallas are the major sources of water. Shallow to medium depth bore wells fitted with hand pump are useful ground water structures for meeting the domestic needs and are feasible at favorable areas.
- Traditional resources like springs needs to be revived, developed & protected on scientific lines for various use. The discharge of such springs can be sustained by construction of small check dams or subsurface dykes across the nallahs/tributaries in the downstream at favorable locations.
- Small ponds/tanks/talavs can be utilized for recharging ground water. These structures can be constructed for harvesting water and utilized for both recharging and meeting the domestic needs.
- Roof top rainwater harvesting practices must be adopted in hilly areas since the district receives ample rainfall. Because of hilly terrain, maximum rainfall goes of as runoff, and a very small quantity contributes towards ground water replenishment.
- Rainwater harvesting in general & RTRWH in particular is an ideal solution for augmenting water resources particularly in sloppy hilly & chronic water scarce areas. There is thus need to create awareness for water conservation and augmentation and proper waste disposal for protecting water sources
- People's participation is a must for any type of developmental activities. So they should be made aware for proper utilization and conservation of water resources available. In addition, micro level efforts are required for proper implementation of development programme.

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For Technical Assistance Relating to

Rainwater Harvesting
&
Artificial Recharge to Ground Water

Contact:

CENTRAL GROUND WATER BOARD
NORTHERN HIMALAYAN REGION
Lower Barol, Dari, Dharmsala

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SAVE WATER SERVE HUMANITY