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भारत सरकार
Government of India
जल संसाधन मंत्रालय
Ministry of Water Resources
केंद्रीय भूमि जल बोर्ड
CENTRAL GROUND WATER BOARD

GROUND WATER INFORMATION BOOKLET
UNA DISTRICT, HIMACHAL PRADESH

उतरी हिमालय क्षेत्र
NORTHERN HIMALAYAN REGION
धर्मशाला
DHARAMSALA
सितम्बर, 2013
September, 2013

जल संरक्षण वर्ष 2013
स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल
CONSERVE WATER - SAVE LIFE

जल संरक्षण वर्ष 2013

स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल

CONSERVE WATER - SAVE LIFE

Ground Water Information Booklet
Una District, Himachal Pradesh

CONTENTS

जल संरक्षण वर्ष 2013
स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल
CONSERVE WATER - SAVE LIFE

UNA DISTRICT AT A GLANCE

Sl. No	*ITEMS*	*Statistics*
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	1,540
	ii) Administrative Divisions (2011)	
	• Number of Tehsil & sub-tehsils	4 &1
	• Number of CD Blocks	5
	• Number of Panchayats	235
	• Number of Villages	814
	iii) Population (2001 Census) • Total population • Population Density (pers/sq km) • Rural & Urban Population • SC & ST Population (in percent) • Sex Ratio	 5,21,173 338 91% & 9% 22 % & 0.02% 976
	iv) Average Annual Rainfall (mm)	1,165
2.	GEOMORPHOLOGY	
	Major Physiographic units	• Structural hills & upland (elevation 650–1041 m asl) • Valley/ alluvial plain (elevation 360-550 m asl)
	Major Drainages • Satjuj basin (95%) • Beas basin	 Soan River, Lunkhar khad Sohan Nadi
3.	LAND USE (ha) (2009-10) Directorate of Land Records)	
	• Forest area	182
	• Cultivated area	232
	• Net area sown	380
4.	MAJOR SOIL TYPES	• Alluvial soil • Non-calcic soil
5.	AREA UNDER PRINCIPAL CROPS, (2011-12, Directorate of Agriculture)	In hectares
	• Rice	1,803
	• Wheat	32,452
	• Maize	31,168
	• Pulses	396
6.	IRRIGATION BY DIFFERENT SOURCES (MI census)	In Sq km
	• Net area irrigated by maj / med schemes	1.97
	• Net area irrigated through Ground water	66.40
	• Net area irrigated through surface water	16.66
	• Net area irrigated (Total)	85.03

7.	NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on March 2013)	
	• Number of Dug Wells	20
	• Number of Piezometers	Nil
8.	PREDOMINANT GEOLOGICAL FORMATIONS	• Alluvium/valley-fill (Quaternary) • Siwalik Group (Tertiary)
9.	HYDROGEOLOGY	
	Major Water Bearing Formations	
	1. Semi consolidated sediments (Siwalik Group)	Covers major part (70%)
	• Yield prospects	Low to moderate (1-5 lps)
	• GW structures	Springs, open wells & tube wells
	2. Unconsolidated porous sediments (Alluvium)	In Una valley
	• Yield prospects	High (10-25 lps)
	• GW structures feasible	Open wells & tube wells
	Avg. Depth to water level (pre-monsoon)	2.00 – 45 m
	(post-monsoon)	1.50 – 42 m
	Long term water level trend (2003-2012)	0-2 m fall in major part of valley area
10	GROUND WATER EXPLORATION BY CGWB (as on 31.03.2013)	
	• No of wells drilled	56 (EW-54: OW-2)
	• Depth Range (m)	51.00 - 220
	• Discharge (lps)	2.00 - 55.00
	• Static Water Level	1.45 m agl - 43.00 m bgl
	• Transmissivity (m^2/day)	85 - 2600
11.	GROUND WATER QUALITY	
	Presence of Chemical constituents more than permissible limits (eg. EC, F, As, Fe)	Nil
	Quality of Ground Water (EC Range in µS/cm)	Good (345 – 1380)
12.	DYNAMIC GROUND WATER RESOURCES (2011) A. Una valley	
	• Net Annual Ground Water Draft for all uses	20,966 ham
	• Net Ground Water availability for future Irrigation	-1,493 ham
	• Projected Demand for Domestic and industrial Uses up to 2025	5,486 ham
	• Stage of Ground Water Development	108 % (Critical)

	B. Hum valley	
	• Net Annual Ground Water Draft for all uses	561 ham
	• Net Ground Water availability for future Irrigation	-16 ham
	• Projected Demand for Domestic and industrial Uses up to 2025	125 ham
	• Stage of Ground Water Development	99 % (Critical)
13.	AWARENESS AND TRAINING ACTIVITY	
	A. Mass Awareness Programmes i. KVK, Rampur, Una on 28-03-2006 ii. Badshera on 11.12.2007	2
	B. Training Programme on Aquifer Mapping i. Tier –III Training programme at Gagrate w.e.f. 30.01.2013 to 31.01.2013 ii. Tier –III Training programme at Una w.e.f. 01.02.2013 to 02.02.2013 iii. Tier-II Training programme at Una w.e.f. 04.02.2013 to 08.02.2013 iv. Tier-III Training programme at Amb w.e.f. 12.03.2013 to 13.03.2013	4
	C. Other Trainings i. Awareness Raising Training Porgramme under Hydrology Project-II at Una on 06.02.2009. ii. Orientation Training Course to State Govt. Officers on at Una w.e.f. 21.02.2103 to 25.02.2013	2
14.	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	Under progress at Dhamandhari
15.	GROUND WATER CONTROL AND REGULATION	
	• Number of OE & Critical valley	2
	• No of blocks notified	Nil
16.	MAJOR GROUND WATER PROBLEMS AND ISSUES	
	• Depletion of water table	In valley area, mild declining trend in parts
	• Water scarcity & Deep water levels	In upland, *Beet* area, very deep water level; require exploration
	• Water logging	In patches along Soan river-requires remedial measures

जल संरक्षण वर्ष 2013
स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल
CONSERVE WATER - SAVE LIFE

DISTRICT GROUND WATER BOOKLET
UNA DISTRICT, HIMACHAL PRADESH

1.0 INTRODUCTION

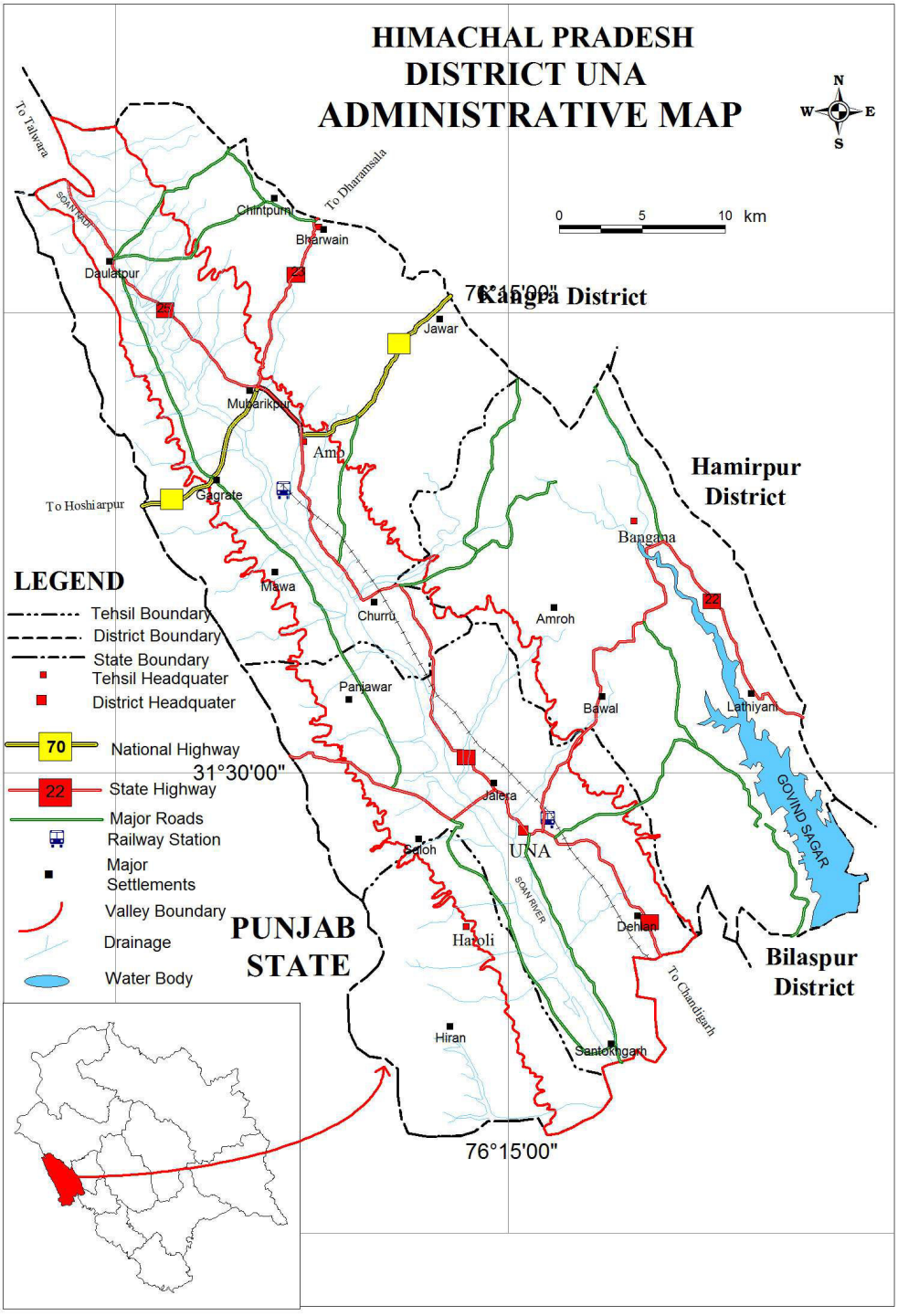
Una district came into existence on 1st September, 1972 and is situated in the southwestern part of the State of Himachal Pradesh. The district, with its headquarter at Una town, has a geographical area of 1540 sq km and covers 2.8 % area of the State. It lies between North latitude 31°18'00" & 31°55'00" and East longitude 75°55'00" & 76°28'00" and is covered by Survey of India degree sheet No.53A & 44M. Towards the north, it is bounded by Kangra district, towards north and east by Hamirpur and Bilaspur districts respectively and towards south-west by the State of Punjab.

Administratively, the district has been divided into two sub-divisions (Una & Amb) and comprises of 4 tehsils [Una, Amb, Bangana, Haroli] and 1 sub-tehsil (Bharwain). Further, there are 5 CD blocks [Una, Amb, Gagret, Dhundla (Bangana) & Haroli]. There are 5 towns (Una, Mehtpur Badshera, Gagret, Santhokhgarh and Daulatpur), 758 inhabited villages, 56 uninhabited and 235 Gram Panchayats in the district. Una district is well developed in the industrial sector due to close proximity to Punjab state with Mehatpur, Gagret, Tahliwal & Amb as main industrial centers. The district is well connected by rail and road network. The nearest airport is at Chandigarh.

As per 2011 census, district has a population of 5,21,173 with 338 persons /sq km. The male/female sex ratio is 976. Rural population is about 91% indicating thereby, that the district has a agricultural economy. Scheduled caste & scheduled tribe population constitutes about 22% & 2% of the total population respectively.

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 vegetables in the district. Total cultivable area is 443 sq km and net area sown area is 388 sq km. Net area irrigated in the district is about 85 sq km. Ground water is the major source of water in the district for irrigation and domestic use. There are large number of water supply wells, tube wells, springs, *kulhs* (water channels) and lift irrigation schemes, implemented exclusively for irrigation purposes. The irrigated command area under the Bhabaur Sahib lift irrigation scheme, phase I and Phase II are 923 hectares and 2640 hectares respectively.

Central Ground Water Board (CGWB) has carried out extensive hydro-geological studies and ground water exploration in the district. Hydrogeological studies and exploration commenced in sixties, and under exploratory drilling programme 56 exploratory wells ranging in depth from 42 to > 200 m bgl have been drilled. CGWB under its national network, maintains 34 stations for ground water regime monitoring, where water level and ground water quality is monitored.


HIMACHAL PRADESH
DISTRICT UNA
ADMINISTRATIVE MAP
N
W
E
S
0 5 10 km
To Talwara
SOAN RIVER
To Dharamsala
Chintpurni
Bharwain
Daulatpur
76°15'00"
Kangra District
Jawar
Mubarikpur
Amb
To Hoshiarpur
Gagrate
Hamirpur
District
Bangana
Mawa
Churru
Amroh
Panjawar
Bawal
Lathiyani
GOVIND SAGAR
31°30'00"
Jaiera
Bahoh
UNA
SOAN RIVER
Dehlan
Haroli
PUNJAB
STATE
Bilaspur
District
To Chandigarh
Hiran
Santokhgarh
76°15'00"
LEGEND
Tehsil Boundary
District Boundary
State Boundary
Tehsil Headquater
District Headquater
70 National Highway
22 State Highway
Major Roads
Railway Station
Major Settlements
Valley Boundary
Drainage
Water Body

2.0 CLIMATE & RAINFALL

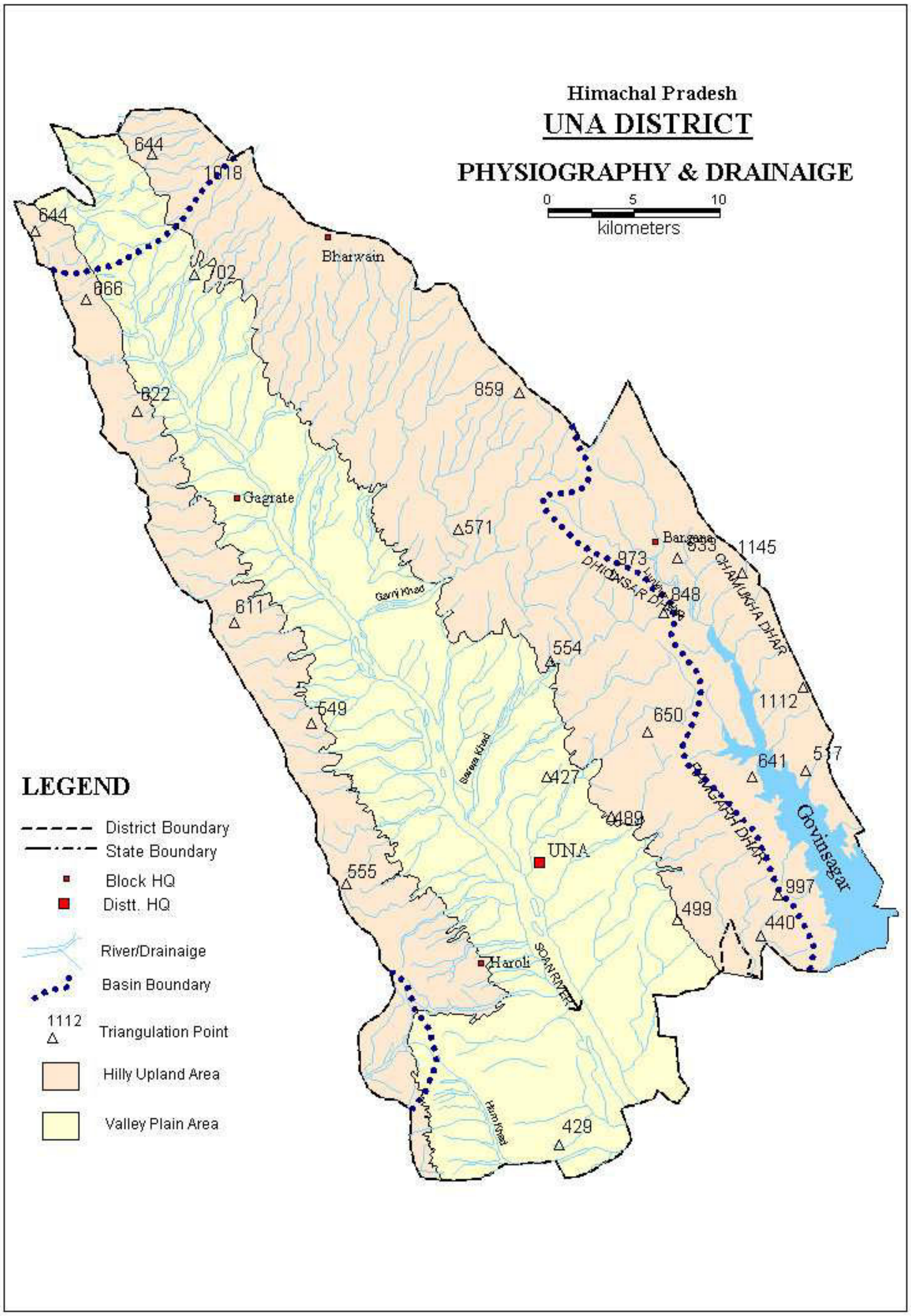
Climate of the district is tropical to temperate in nature, as the terrain varies from plains to high hills. Temperature varies from minimum of 4°C in winter to maximum of 46°C in summer. The area receives rainfall during monsoon period, extending from June to September and also non-monsoon period (winter). The annual average rainfall in the area is about 1040 mm, with about 55 average rainy days. The winter season starts from November and continues till the middle of March. Thereafter, the mercury continues rising till the onset of Monsoon which starts from the last week of June and continues till the middle of September.

3.0 GEOMORPHOLOGY & SOILS

Una district nestles between Siwalik ranges and forms part of the lesser Himalayas. It has a diverse landscape made of hills, valleys with piedmont zone, terraces. The elevations of the land surface in the district, vary from 340 m in south-eastern part to 1041 m above mean sea level (amsl) in eastern part of the district. There are three hill ranges i.e. *Chamukha Dhar* with maximum elevation of 1041m amsl, which borders with district Hamirpur, *Dhionsar Dhar* with maximum elevation of 950m amsl and *Ramgarh Dhar* with maximum elevation of 997m amsl. In the southwest along the border with Punjab, Siwalik hill ranges form hilly upland or plateau area with elevation up to 666 m amsl. The vast area between the northwesterly & southeasterly hill ranges, on both sides of river Soan is known as *Una valley*. The undulating to plain fertile Una valley has an area of about 455 sq km and it extends from Daulatpur in the north - west to Santokhgarh in the south - east.

Soan or Swan River, a tributary of river Satluj, drains the major part (80%) of the Una district. Soan is an intermittent river and maintains base flow in the lower reaches. Soan river has about 80% catchment area in Una district and divides the district into two parts. Soan river flows in a southeastern direction and has a wide channel and exhibits braided nature. It originates near Daulatpur in the northeastern part and leaves the district near Santokhgarh and subsequently joins river Satluj. Number of local streams (about 73 *khads*) joins the river within the district. During monsoon Soan river gets flooded due to shallow bank heights and large area on both sides get affected. Govt. of HP has initiated riverbank protection cum flood control measures and the work is in progress. In Bangana area, another stream (*Khad*), flowing parallel to Soan river, is Lunkhar khad, which debouches in Govind Sagar lake. Also, in the extreme north-western part of the district small area forms the catchments of a tributary of Beas river basin.

Two types of soils are observed in the district viz., alluvial soil and non-calcic brown soil. Most of the area in the district is covered with alluvial soil and only about 25% of the area i.e. hilly area in the district is covered with non-calcic brown soil. Soils are rich in nutrients and thus are fertile.


Himachal Pradesh
UNA DISTRICT
PHYSIOGRAPHY & DRAINAIGE
0
5
10
kilometers
LEGEND
District Boundary
State Boundary
Block HQ
Distt. HQ
River/Drainaige
Basin Boundary
1112
Triangulation Point
Hilly Upland Area
Valley Plain Area
Bharwain
Gagrate
Bangana
UNA
Haroli
Govinsagar
DHIOASAR DHAR
CHAMUKHA DHAR
SOAN RIVER
Garni Khad
644
1018
702
666
822
859
571
1145
973
848
611
554
1112
650
549
641
427
489
555
997
499
440
429

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

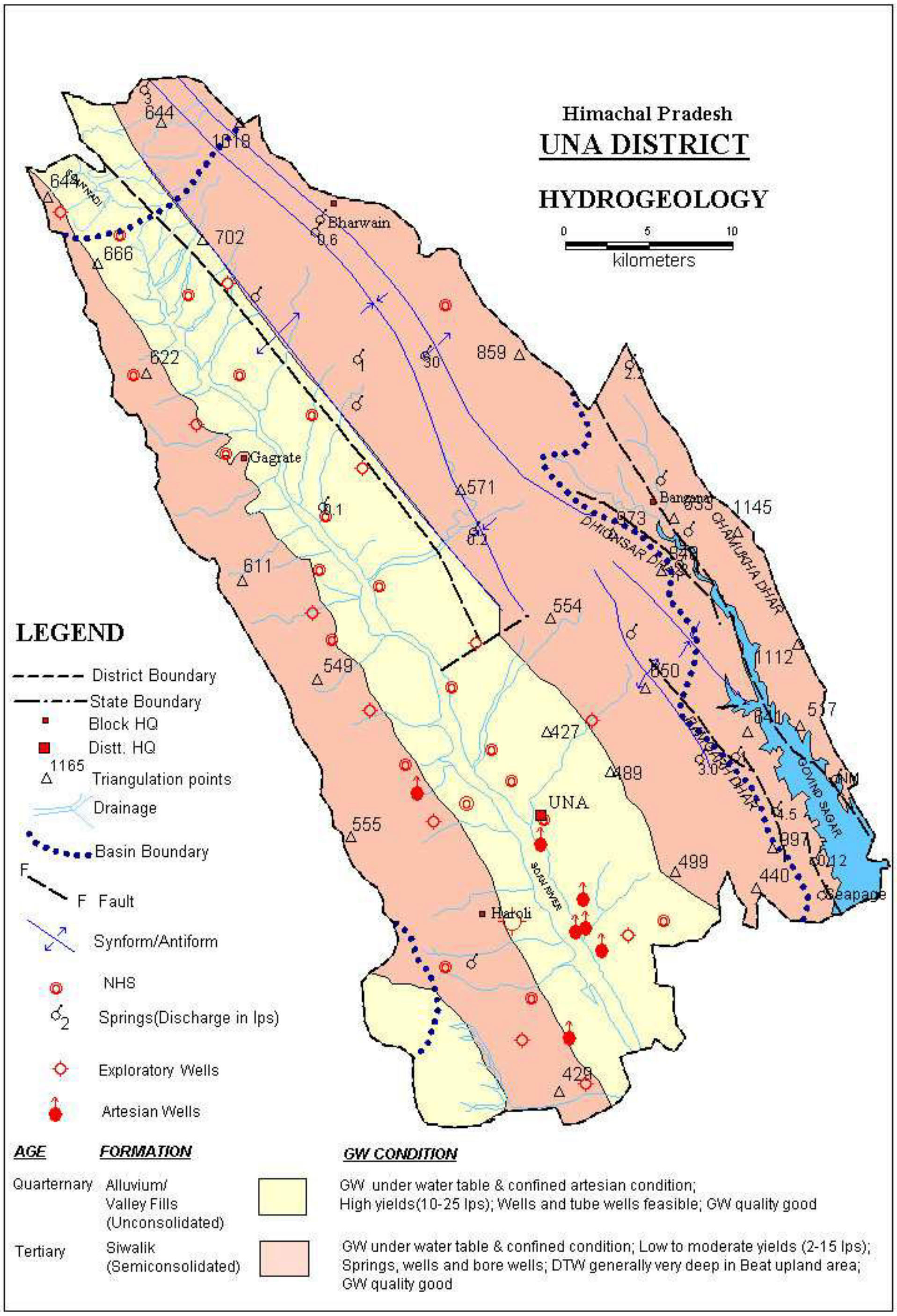
The rock formations occupying the district, range in age from pre-Cambrian to Quaternary period. The generalized geological succession in the district is given below:

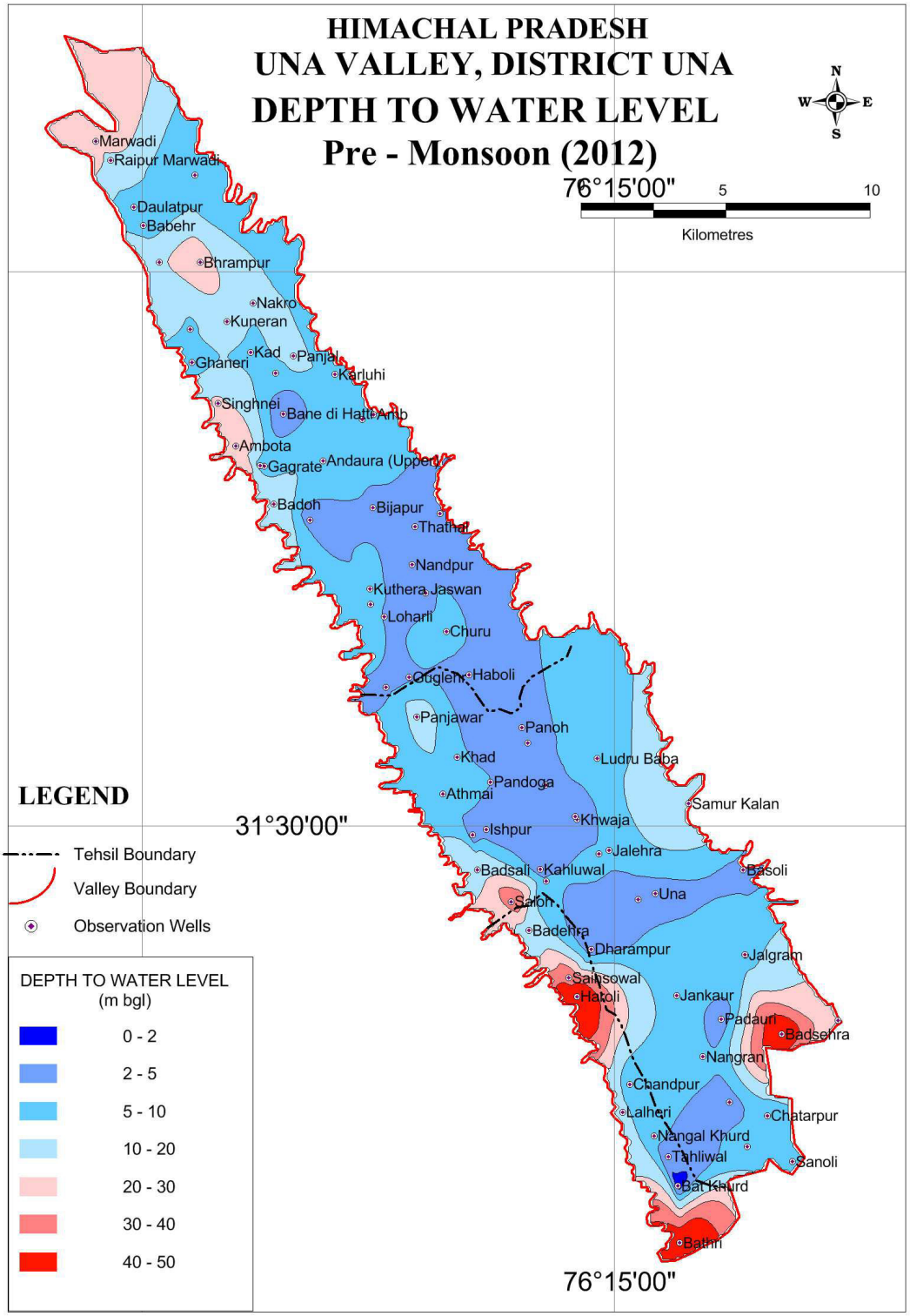
ERA	*PERIOD*	*FORMATION*	*DESCRIPTION*
Quaternary	Recent to sub-Recent	Alluvium; fluvial, terrace, piedmont	Sand, silt, clay, gravel, pebble and cobble etc.
		Undifferentiated	Sand, clay, gravel, pebble, cobble and boulders
Tertiary	Pliocene to Mid. Miocene	Upper Siwalik	Soft sandstone, brownish clay, shale, poorly sorted, crudely bedded conglomerate & boulder beds.
		Middle Siwalik	Gray sandstone, and brownish clay/ shale
		Lower Siwalik	Red and purple sandstone and shale

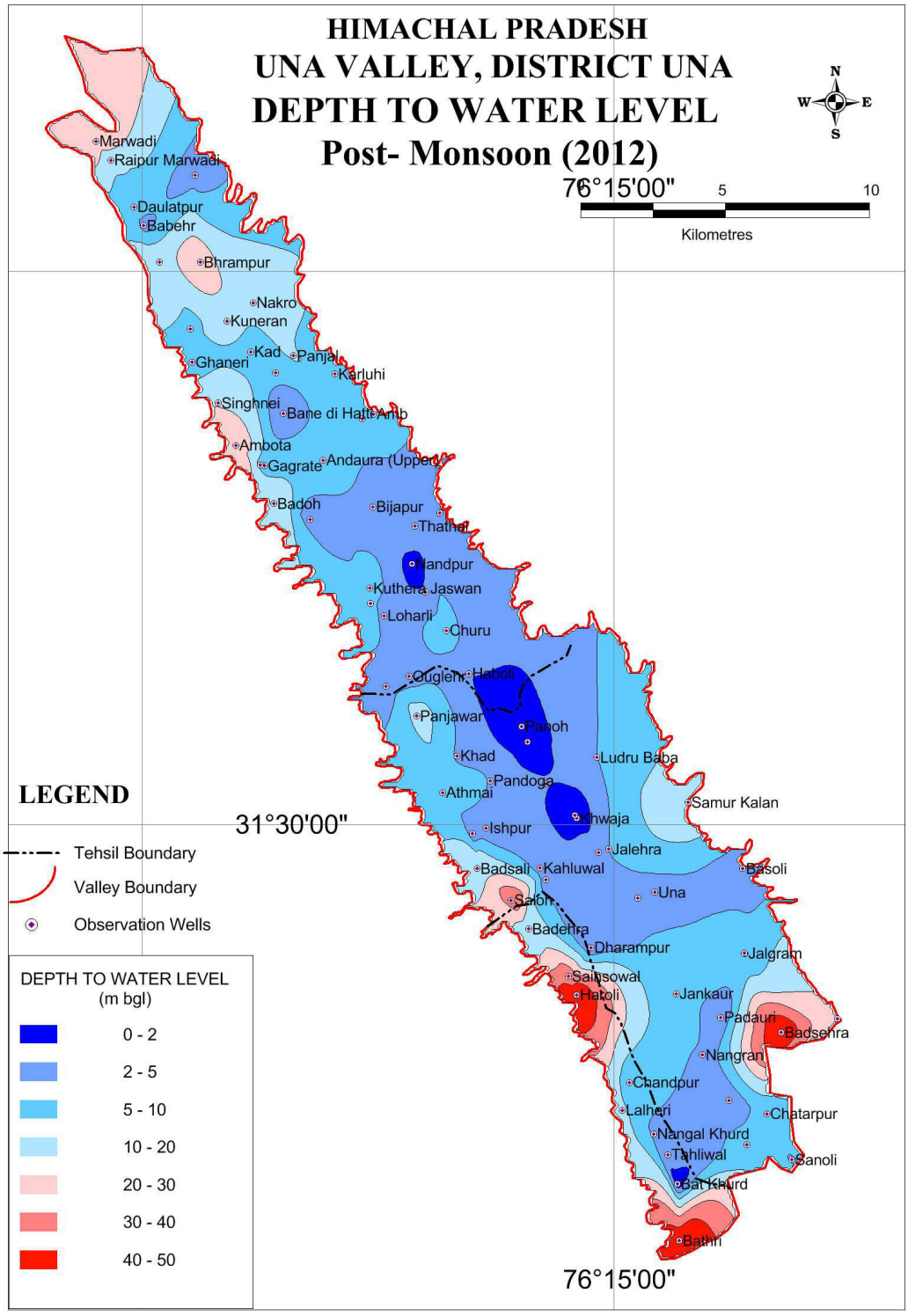
Hydro-geologically, the unconsolidated valley fill or alluvial formations, occurring in the valley area and semi-consolidated sediments belonging to Siwalik Group form aquifer system in the district. Porous alluvial formation, forms the most prolific aquifer system in the valley area, where as the sedimentary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

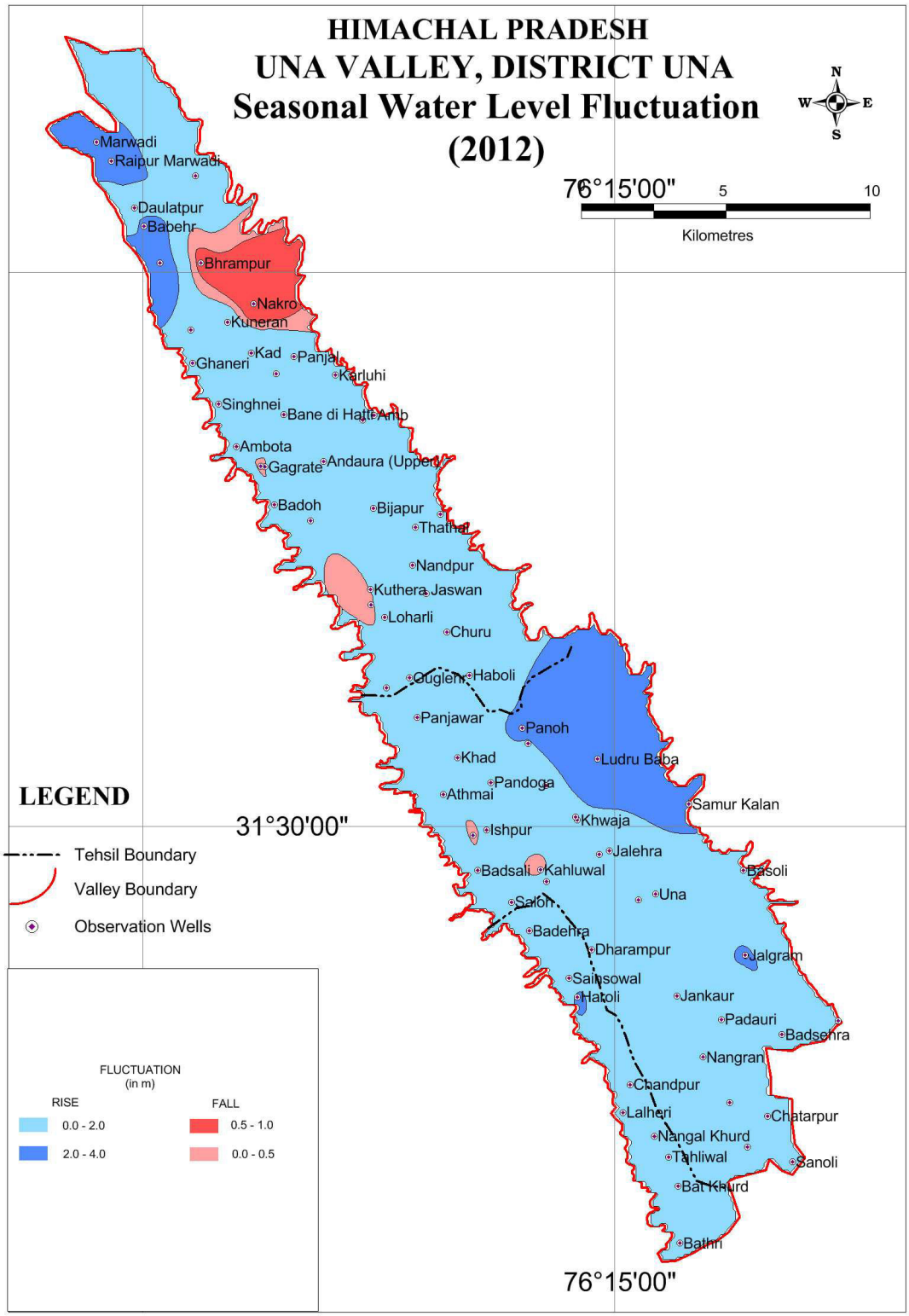
The ground water in the Siwalik group of rocks occur under the unconfined to semi confined conditions, mainly in the arenaceous rocks viz., sandstone, siltstone, gravel boulder beds etc. The occurrence and movement of ground water is controlled by inter granular pore spaces and also the fracture porosity. Siwalik sediments underlie Hilly/undulating areas, where springs (mostly gravity/contact type) and *bowries* are the main ground water structures apart from hand pumps. The discharges of the springs, varies from seepages to 0.50 lps. B*owries* are dug well type constructions 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 is more than 60 m below land surface has been observed.

In Una valley area, the ground water occurs in porous unconsolidated / alluvial formation (valley fills) comprising sand, silt, gravel, cobbles / pebbles etc., and forms prolific aquifer. Ground water occurs both under


Himachal Pradesh
UNA DISTRICT
HYDROGEOLOGY
0 5 10
kilometers
Bharwain
Gagrate
Bangana
UNA
Haroli
GOVIND SAGAR
Seapage
LEGEND
District Boundary
State Boundary
Block HQ
Distt. HQ
Triangulation points
Drainage
Basin Boundary
Fault
Synform/Antiform
NHS
Springs(Discharge in lps)
Exploratory Wells
Artesian Wells
AGE
FORMATION
GW CONDITION
Quarternary
Alluvium/ Valley Fills (Unconsolidated)
GW under water table & confined artesian condition; High yields(10-25 lps); Wells and tube wells feasible; GW quality good
Tertiary
Siwalik (Semiconsolidated)
GW under water table & confined condition; Low to moderate yields (2-15 lps); Springs, wells and bore wells; DTW generally very deep in Beat upland area; GW quality good


HIMACHAL PRADESH
UNA VALLEY, DISTRICT UNA
DEPTH TO WATER LEVEL
Pre - Monsoon (2012)
N
W
E
S
76°15'00"
5
10
Kilometres
Marwadi
Raipur Marwadi
Daulatpur
Babehr
Bhrampur
Nakro
Kuneran
Kad
Panjal
Ghaneri
Karluhi
Singhnei
Bane di Hatt
Amb
Ambota
Gagrate
Andaura (Upper)
Badoh
Bijapur
Thathal
Nandpur
Kuthera Jaswan
Loharli
Churu
Ouglehr
Haboli
Panjawar
Panoh
Khad
Ludru Baba
Pandoga
Athmai
Samur Kalan
31°30'00"
Khwaja
Ishpur
Jalehra
Badsali
Kahluwal
Basoli
Una
Saloh
Badehra
Dharampur
Jalgram
Saihsowal
Haroli
Jankaur
Padauri
Badsehra
Nangran
Chandpur
Lalheri
Chatarpur
Nangal Khurd
Tahliwal
Sanoli
Bat Khurd
Bathri
76°15'00"
LEGEND
Tehsil Boundary
Valley Boundary
Observation Wells
DEPTH TO WATER LEVEL
(m bgl)
0 - 2
2 - 5
5 - 10
10 - 20
20 - 30
30 - 40
40 - 50


HIMACHAL PRADESH
UNA VALLEY, DISTRICT UNA
DEPTH TO WATER LEVEL
Post- Monsoon (2012)
N
W
E
S
76°15'00"
5
10
Kilometres
Marwadi
Raipur Marwadi
Daulatpur
Babehr
Bhrampur
Nakro
Kuneran
Kad
Panjal
Ghaneri
Karluhi
Singhnei
Bane di Hatti
Amb
Ambota
Gagrate
Andaura (Upper)
Badoh
Bijapur
Thathal
Nandpur
Kuthera
Jaswan
Loharli
Churu
Ouglen
Haboli
Panjawar
Paboh
Khad
Ludru Baba
Pandoga
Athmai
Samur Kalan
Khwaja
Ishpur
Jalehra
Badsali
Kahluwal
Basoli
Una
Saloh
Badehra
Dharampur
Jalgram
Saiusowal
Haloli
Jankaur
Padauri
Badsehra
Nangrani
Chandpur
Lalheri
Chatarpur
Nangal Khurd
Tahliwal
Sanoli
Bari Khurd
Bathri
31°30'00"
76°15'00"
LEGEND
Tehsil Boundary
Valley Boundary
Observation Wells
DEPTH TO WATER LEVEL
(m bgl)
0 - 2
2 - 5
5 - 10
10 - 20
20 - 30
30 - 40
40 - 50


HIMACHAL PRADESH
UNA VALLEY, DISTRICT UNA
Seasonal Water Level Fluctuation
(2012)
N
W
E
S
76°15'00"
5
10
Kilometres
Marwadi
Raipur Marwadi
Daulatpur
Babehr
Bhrampur
Nakro
Kuneran
Kad
Panjal
Ghaneri
Karluhi
Singhnei
Bane di Hatt
Amb
Ambota
Gagrate
Andaura (Upper)
Badoh
Bijapur
Thathal
Nandpur
Kuthera
Jaswan
Loharli
Churu
Gugleh
Haboli
Panjawar
Panoh
Khad
Ludru Baba
Pandoga
Athmai
Samur Kalan
Khwaja
Ishpur
Jalehra
Badsali
Kahluwal
Basoli
Una
Saloh
Badehra
Dharampur
Jalgram
Saiusowal
Hatoli
Jankaur
Padauri
Badsehra
Nangran
Chandpur
Lalheri
Chatarpur
Nangal Khurd
Tahliwal
Sanoli
Bat Khurd
Bathri
LEGEND
Tehsil Boundary
Valley Boundary
Observation Wells
FLUCTUATION
(in m)
RISE
0.0 - 2.0
2.0 - 4.0
FALL
0.5 - 1.0
0.0 - 0.5
31°30'00"
76°15'00"

phreatic and confined/artesian conditions. Free flowing wells are also observed in the lower part of Soan river. Ground water is being extensively developed in the area by medium to deep tube wells, dugwells, dug cum borewells and also by hand pumps. Depth of dugwells and dug cum bored wells in area, ranges from 4.00 to 70.00 m bgl, whereas depth to water level ranges from near surface to 26.46 m bgl in pre monsoon. Yield of shallow aquifer is moderate with well discharges up to 10 lps.

CGWB has drilled/constructed 56 exploratory wells in the district, in the depth range of 51.00 to 220.00 mbgl. Static water level of the tubewells ranges from 1.45 m agl to 43.20 m bgl and discharge ranges from 553 to 3500 lpm with the drawdown less than 8-10 m Free flowing bore wells are observed along the terrace deposits on the both banks of Soan river.

In Una valley depth to water level shows wide variation. During pre-monsoon period (May 2012) it ranged from less than 1.00 to 65.00 m bgl. Deeper water levels are confined mainly in south west (*Beet* area) and localized patches in north eastern and central part of Una valley. In major parts of Una valley, depth to water level ranged between 2.00 to 10.00 m bgl. Some areas in discharge zone along the river Soan, show water logging conditions, where water level is less than 1.5 m bgl. Seasonal fluctuation (rise) up to 3.56 m was observed between pre and post monsoon (2012) period. Long-term water level fluctuation was analysed for the period of May 2012, with respect to decadal average of 2002 - 2011. In general, fall in water level up to 2 m is observed in most part of the valley. However, in isolated pockets in north western and south eastern part of Una valley rise of water level up to 4 m is also observed.

4.2 Ground Water Resources

Rainfall is the major source of 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.

Ground water resources and irrigation potential for Una valley and Hum valley of the district, have been computed as per the GEC-97 methodology, the resources for the year 2011 are presented below.

DYNAMIC GROUND WATER RESOURCES (2011)

A. Una valley

• Net Annual Ground Water Draft for all uses	20966 ham
• Net Ground Water availability for future Irrigation	-1493 ham
• Projected Demand for Domestic and industrial Uses up to 2025	5486 ham
• Stage of Ground Water Development	108%
• Category	Critical

B. Hum valley

- Net Annual Ground Water Draft for all uses — 561 ham
- Net Ground Water availability for future Irrigation — -16 ham
- Projected Demand for Domestic and industrial Uses up to 2025 — 125 ham
- Stage of Ground Water Development — 99%
- Category — Critical

The stage of ground water development in Una valley and Hum valley of Una district, is 108% & 99% and both valleys fall under "Critical" category. There is thus no scope for further ground water development.

4.3 Ground Water Quality

Chemical quality data of ground water from shallow as well as deep aquifers in the district, indicates that ground water is generally alkaline in nature and suitable both for domestic and irrigation use. All the parameters analysed are well within the permissible limit of safe drinking water, set by Bureau of Indian Standard (BIS). The range of chemical parameters of Ground Water Monitoring Stations of CGWB (May 2011) in the district, are summarized below:

S. No	***Parameter***		***Range***	
			Min	***Max***
1.	pH		7.3	8.01
2.	EC	µS/cm	310	1080
3.	HCO_3	(mg/l)	79	362
4.	Cl	(mg/l)	15	142
5.	NO_3	(mg/l)	Tr	46
6.	F	(mg/l)	Tr	0.38
7.	Ca	(mg/l)	10	68
8.	Mg	(mg/l)	10	50
9.	Na	(mg/l)	8.2	110
10.	K	(mg/l)	0.2	34
11.	TH as CaCO3	(mg/l)	85	265

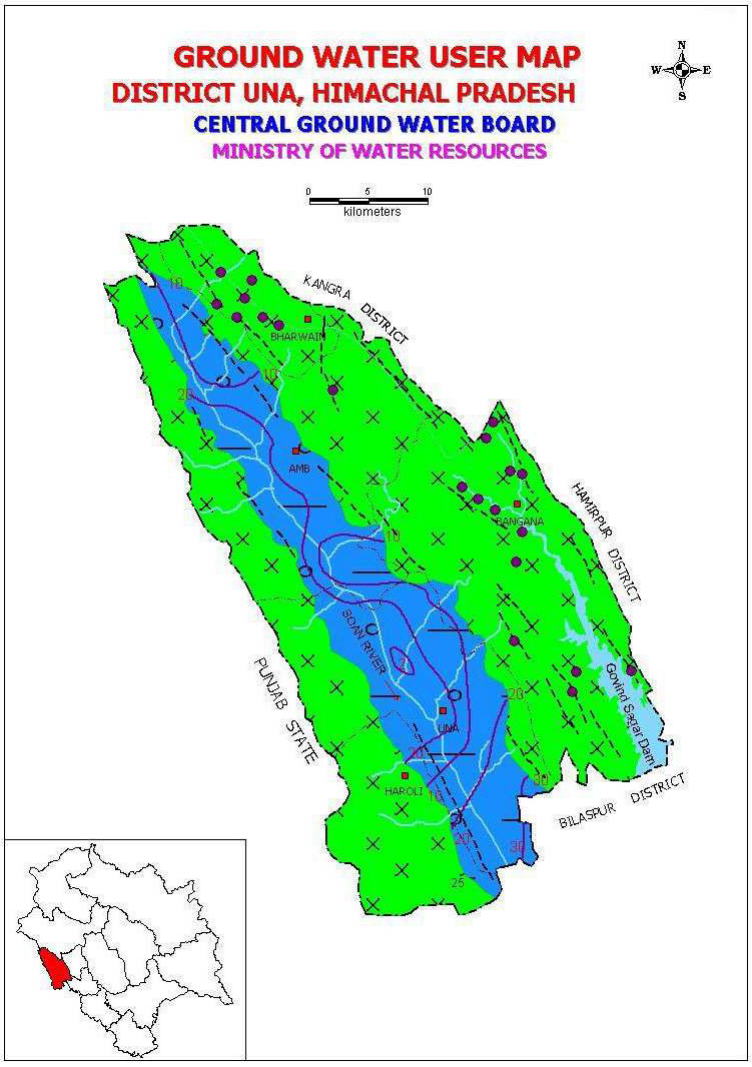
Quality of ground water in shallow aquifer,r is good for domestic and irrigation purpose in the district.

4.4 Status of Ground Water Development

Ground water development, particularly in valley areas underlain by alluvium/valley fills of the district, is moderate to high. In these areas, all the major irrigation and drinking water supplies depend on ground water viz., open wells and tube wells. The

deeper aquifers in the area are being extensively developed by tube wells and about 600 tube wells have been constructed in Una valley, most of them in govt. sector. The tube wells range in depth from 51.0 to 220.0 m bgl where water level rest above ground level (Free flow) to 45.00 m bgl in valley area. The well yields are high, with discharge ranging from 553 to 3500 lpm, for 7-10 m draw down. An average tube well of about 100m depth yields about 20 - 25 lps. In the sedimentary areas (Siwalik Group) deep exploration has not been carried out. The piezometric head in tube wells are reported to be more than 100m bgl in upland areas.

State departments have also drilled shallow bore wells or handpumps in the district, with the depth ranging from 25 to 60 m, depending upon the lithology of the area, with a discharge varying from 0.5 lps to 3 lps. Few of them are energized with submersible pumps fitted. As per MI census, there are about 227 dug wells and 1448 shallow tube wells in the district.



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	100-120 10-20	1200-2500 300-500	Check dam, Check dam cum ground water dam, Recharge shaft
Hard rock aquifers	Dug well Spring development	Manual	10-20	300-500 30-2000	
• Spring			5 Water level contour (m bgl) (Pre monsoon decadal mean, 1993-2002)		
Major drainage Reservoir			Fault/lineament Tehsil boundary District boundary State boundary		

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 Ground Water Development

As on March 2011, the stage of groundwater development in Una and Hum valleys of the district is 108% & 99% and falls under *Critical category* of development. There is thus no scope for further ground water development by constructing additional wells and tube wells in the valley area. However tubewells can be constructed by tapping deeper aquifers of depth range of 300m. There is thus an urgent need to simultaneously monitor the behavior of deeper aquifers, in order to take preventive measures in future. Water logged areas along the Soan river should be developed for water supply schemes and for irrigated agriculture in the district.

In hilly upland and plateau areas underlain by Siwalik sedimentary formation, there is need to explore deep aquifers say down to the depth of 300 m to evaluate aquifer potentialities, as these areas are in general water scarce due to typical hydro-geomorphic set up.

5.2 Water Conservation & Artificial Recharge

Ground water is the major source for irrigation & domestic water supply, both in rural and urban areas. Water level observation data has revealed declining trends in water

level, in some parts of the district. The stage of ground water development in valley is under *critical category*, and declining water levels in patches suggest need for cautious and well-planned ground water development. Further, there is an urgent need to monitor development pattern by the implementing agencies.

In some parts, the availability of water during summer is limited, particularly in drought years and requires immediate attention to conserve and augment this resource. Based upon the climatic conditions, topography, hydro-geology of the area, suitable structure for rain water harvesting and artificial recharge to ground water body, need to be planned and implemented. There is need to switch over from development phase to management phase in GW sector. Roof top rainwater harvesting in urban/rural areas and water harvesting in rural area need to be adopted and proper scientific intervention for spring development and revival of traditional water storage is required in water scarce hilly upland areas.

In hilly areas structures like nalla bunds, gabbion structures, check dams, check dam cum ground water dams, subsurface dykes, revival of ponds are recommended while in low hill ranges, check dam and roof top rain water harvesting structures can be adopted.

6.0 GROUND WATER RELATED ISSUES & PROBLEMS

Most of the ground water issues and problems in the district are localized and need to be treated independently, by taking the micro level studies in a particular area. The most common issues are deep water level and development of deep aquifer in some areas, viz, the *Beet* area, where water level are more than 100 m bgl. In valley area, extensive development has resulted in depleting water levels in parts and there is need to conserve and augment resources by adopting appropriate recharge measures.

Further, in Una valley due to extensive ground water development for irrigation and the recently set up industrial units, the water levels are likely to show depleting trend. There is urgent need for the State government to initiate water level monitoring network, both in shallow and deep aquifers to monitor its behavior on short as well as long term basis.

On both sides of Soan River, localized areas remain waterlogged through out the year. There is need to develop ground water resources in such areas, so that the water levels are 3-4 m below ground level and area can be reclaimed for use.

7.0 AWARENESS & TRAINING ACTIVITY

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

CGWB, under the aegis of CGWA, conducted one Mass Awareness Programme on Rainwater Harvesting and Water Management on 28th March, 2006 at Krishi Vigyan Kendra at Rampur and at Bsdehra on 11th December, 2007.

Farmers including the officers and officials of Agriculture and I&PH department attended the programme. Lectures were delivered by CGWB and agriculture department officers on the need for harvesting water for various uses and artificial recharge to ground water for future use. The Regional Director, CGWB stressed the need for change in cropping pattern, optimum utilization of water to various crops and to adopt water conservation measures.

An exhibition displaying roof top rainwater harvesting models, charts, maps and other displays were arranged by CGWB to aware the gathering on the theme.

Participation in Exhibition, Mela, Fair etc

CGWB exhibited its models, posters, displays during the mass awareness programmes at KVK Una in the district.

Aquier Mapping Training Programme

Tier –II Training programme on "Aquifer information system and aquifer management plan" was organized at Una w.e.f. 04.02.2013 to 08.02.2013. Engineers and Hydrogeologists from I & PH Deptt., NGOs participated in this training.

Tier-III Training programme on "Village Level Aquifer Management Plan" was organised at Gagrate w.e.f. 30.01.2013 to 31.01.2013 and at Una w.e.f. 01.02.2013 to 02.02.2013 and at Amb w.e.f. 12.03.2013 to 13.03.2013. The officers from I&PH Deptt., & Forest Deptt., NGOs and farmers of respective area participated in the training.

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

So far presentation and lectures are delivered amongst the gathering during the MAP and WMTP only.

8.0 AREAS NOTIFIED BY CGWA / SGWA

The stage of ground water development in Una and Hum valleys of the district, as on March, 2011, is 108% & 99% respectively and falls under critical category. No area or block has been notified from groundwater development point of view.

9.0 RECOMMENDATIONS

- The stage of ground water development in Una and Hum valley of Una district (2011), is 108% & 99% respectively, and area falls in *critical category*. There is no scope for developing the ground water resource in the district.
- Groundwater development by constructing open wells and shallow tube wells can be constructed on both sides of Soan river, where water level is shallow or has water-logged.
- There is need to take up deep exploration in upland plateau and hilly areas underlain by sedimentary formations, to effectively tackle water scarcity problems.
- Construction of roof top rain water harvesting structures should be made mandatory, in all new constructions and rain water harvesting in rural areas should be promoted. Traditional water storage systems need to be revived.
- There should be mandatory provision of water level monitoring in all tube wells by implementing departments. Extensive ground water monitoring is required in and around industrial areas in the district.
- Traditional resources like springs & *bowries* needs to be revived and developed/protected for use. Public participation in water resource development projects should be encouraged.

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CONSERVE WATER - SAVE LIFE

Contributors

Vidya Nand Negi

Scientist-C

Prepared under the guidance of

J.S. Sharma

Regional Director Incharge

and

Dalel Singh

Suptdg Hydrologist

Our Vision

Water security through sound groundwater management

जल संरक्षण वर्ष 2013

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CONSERVE WATER - SAVE LIFE

For Technical Assistance Relating to Rainwater Harvesting & Artificial Recharge to Ground Water

Contact:

CENTRAL GROUND WATER BOARD
NORTHERN HIMALAYAN REGION
Dove Cottage, Near Ramnagar, Dharmsala
District Kangra, (H.P.)

Phone: 01892- 224775, 227160
Telefax: 01892-223535

e-mail: rdnhr-cgwb@nic.in
website: www.cgwb.gov.in

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