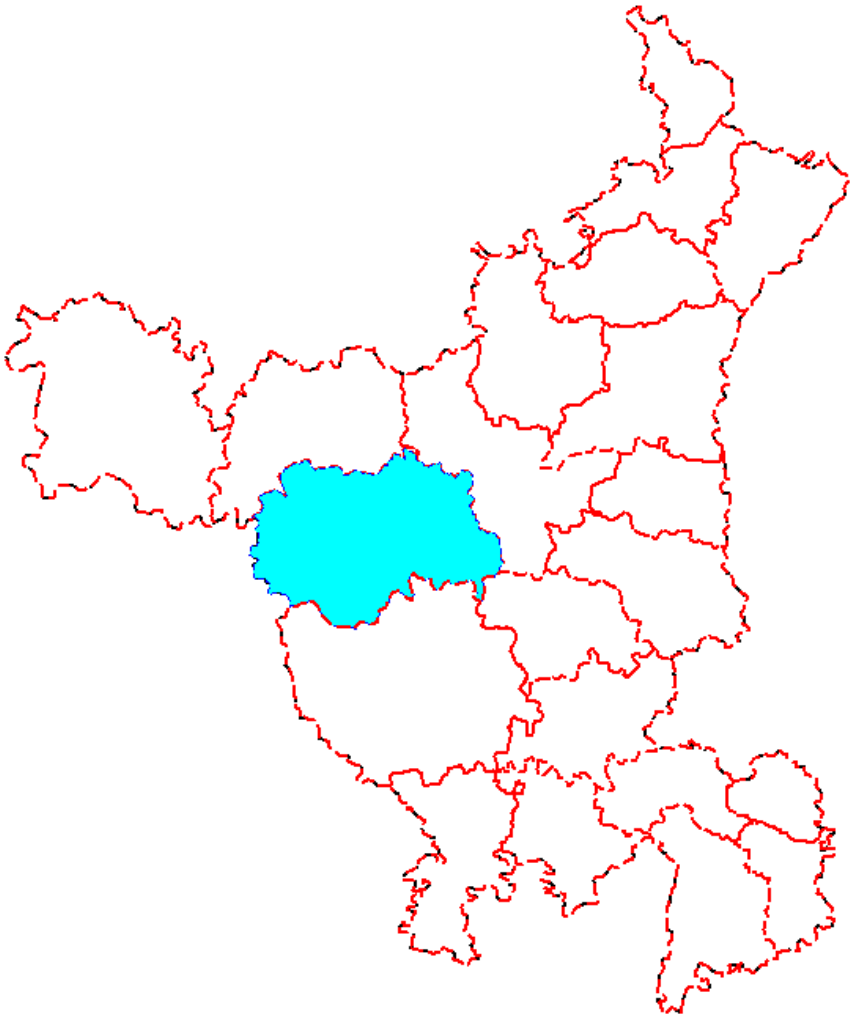
HISSAR DISTRICT, HARYANA



GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES
CENTRAL GROUND WATER BOARD
NORTH WESTERN REGION
CHANDIGARH
2013

Contributors

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Prepared under supervision of

A.K Bhatia

Regional Director

Our Vision

"Water Security through Ground water Management"

GROUND WATER INFORMATION BOOKLET

HISAR DISTRICT, HARYANA

C O N T E N T S

HISAR DISTRICT AT A GLANCE

Sl.No	Contents	Statistics
1.	**GENERAL INFORMATION**	
	i. Geographical Area (Sq.Km)	3983
	Administrative Divisions	As per 17.01.2013
	ii. Sub Divisions	03 (Uklana mandi, Baas, Narnaund)
	iii. Number of Tehsils	05 (Hisar, Adampur, Hansi, Barwala and Narnaund)
	iv. Number of Blocks	09 (Barwala, Uklana, Hansi-I,Hansi-II, Agroha, Adampur, Hisar-I, Hisar-II, Narnaund)
	v. Number of Villages	269
	vi. Population (As per Census 2011)	17,42,815
	vii. Average Annual Rainfall (mm)	330
2.	**GEOMORPHOLOGY**	
	i. Major Physiographic Units	Alluvial Plain
	ii. Major Drainage	Artificial Drains
3.	**LANDUSE (Sq.Km)**	
	i. Forest Area	63
	ii. Net area sown	3330
	iii. Cultivable Area	3550
4.	**MAJOR SOIL TYPES**	Sierozem, Arid Brown solonized and Aeolian soils
5.	**AREA UNDER PRINCIPAL CROPS**	455700 ha
	(Wheat- 230000, Rice- 44700, Bajra- 57000, Cotton - 124000 ha)	
6.	**IRRIGATION BY DIFFERENT SOURCES (Area and Number of Structures)**	
	i. Dugwells	--
	ii. Tubewells/ Borewells	63000 ha
	iii. Tanks/Ponds	-- 260
	iv. Canals	209000 ha
	v. Other sources	--
	vi. Net Irrigated Area	272000ha
	vii. Gross Irrigated Area	550000ha
7.	**NUMBERS OF GROUNDWATER MONITORING STRUCTURES / WELLS OF CGWB**	
	i. Number of Dugwells	26
	ii. Number of Piezometers	15

8.	**PREDOMINANT GEOLOGICAL FORMATIONS**	Alluvium
9.	**HYDROGEOLOGY**	
	i. Major Water Bearing Formation	Sand and gravel
	ii. Pre-monsoon depth to water level	1.53 m to 19.25 m bgl
	iii. Post-monsoon depth to water level	0.43 m to 18.3 m bgl
	iv. Long-term water level trend in 10 yrs in m/yr (2002 – 2011)	Fall : -0.01 to -0.46 m/yr Rise: 0.02 to 0.41 m/yr
10.	**GROUNDWATER EXPLORATION BY CGWB**	
	i. Number of wells drilled	28
	Exploratory Well Observation Well Piezometer Slim Holes	11 -- 15 02
	ii. Depth Range (m)	44 m to 324 m
	iii. Discharge (lpm)	1905
	iv. Storativity (S)	0.0072
	v. Transmissivity (m^2/day)	2440
11.	**GROUNDWATER QUALITY**	
	i. Presence of chemical constituents more than the permissible limit	
	EC, in micromhos	290 – 5409
	F, in mg/l	0.18 – 4.02
	As, in mg/l	Nil
	Fe, in mg/l	1.94
	ii. Type of water	$NaHCO_3$
12.	**DYNAMIC GROUNDWATER RESOURCES (MCM)**	As on 31.03.2011
	i. Annual Replenishable Groundwater Resources	662.49
	ii. Net Annual Groundwater Draft	602.85
	iii. Projected Demand for Domestic and Industrial uses upto 2025	5.72
	iv. Stage of Groundwater Development	91%
13.	**AWARENESS AND TRAINING ACTIVITY**	
14.	**EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING**	
15.	**GROUNDWATER CONTROL AND REGULATION**	
	i. Number of Over Exploited blocks	2
	ii. Number of Critical blocks	-
	iii. Number of Semi Critical blocks	4
	iv. Number of blocks notified	Nil
16.	**MAJOR GROUNDWATER PROBLEMS AND ISSUES**	Twin problem of water logging and salinity, water table depletion, fluoride and water marketing

GROUND WATER INFORMATION BOOKLET

HISAR DISTRICT, HARYANA

1.0 INTRODUCTION

Hisar, the west central most district of Haryana State with a total geographical area of 3983.00 sq. km is lies between the North latitudes 28°56'00": 29°38'30" and East longitudes 75° 21'12": 76°18'12". The district is under control of Hisar division and administratively divided into nine community development blocks namely Agroha, Adampur, Barwala, Bass (Hansi-II), Hansi-I, Hisar-I, Hisar-II, Narnaund, and Uklana Mandi. The district has 05 towns namely Hisar, Hansi, Narnaund, Barwala and Uklana and 269 villages.

The district area falls in Yamuna sub-basin of Ganga basin. There is no natural drainage in the district area. However, the area is drained by network of canals and the artificial drains (field drains/channels). These artificial drains are mainly confined in Bass, Hansi-I, Narnaund and Barwala blocks. There are a total of 39 drains existing in the area, which run for a distance of 126.25 km.

The area is irrigated by shallow tubewells and network of Bhakra Canal Systems and Western Yamuna Canal Systems. The main canals are the Fatehabad branch of Bhakra Canal, Barwala Branch, Balsamandh and Pabra Sub-branch of Barwala Link and Sirsa branch from Bhakra Main Line, Hisar major distributary and Deosar feeder of Western Yamuna canal System through Hansi branch. Canals are irrigating about 76.83 % (209000 ha) of the area, 23.17 % (63000 ha) is irrigated by ground water. There are sand dunes in canal command area, over which rain fed crops are grown. A total of 269 villages of the district come under Canal Irrigation System.

The district has been covered under Hydrogeological Studies and Geophysical Surveys (Hansi, Bass & Narnaund blocks) by the Central Ground Water Board. Besides, Ground Water Exploration has also been carried out at 11 sites including 02 slim holes and 15 piezometers.

2.0 RAINFALL AND CLIMATE

The climate of Hisar owes to its continental location on the outer margins of the south-west (SW) monsoon region. It has tropical monsoonal climate and is characterized as arid type of climate. The district has characteristically four seasons during the year viz., Summer (March to May), SW Monsoon (June to September), Post-Monsoon (October to November) and Winter (December to February) season. SW monsoon also known as summer monsoon brings

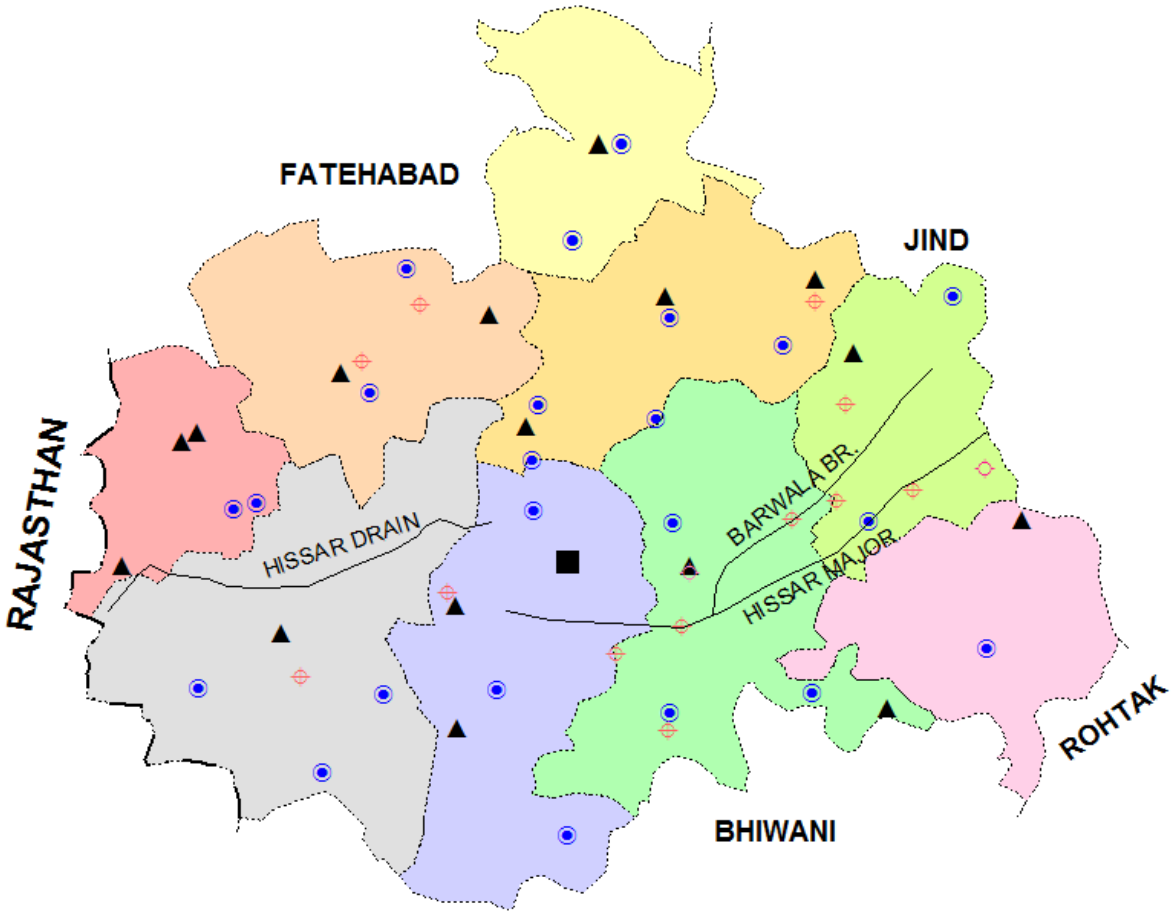
PLATE-I

INDEX MAP

HISSAR DISTRICT, HARYANA

0 15 30

kilometers



INDEX

- DUG WELL
- PIEZOMETER
- EXPLORATORY WELL
- SLIM HOLE
- STATE BOUNDARY
- DISTRICT BOUNDARY
- BLOCK BOUNDARY
- DISTRICT HEAD QUARTER

rain during last week of June to mid-September. The period from October onward until next June remains almost dry except, few light showers received due to westerly depressions/western disturbances (WDs). The summers are generally quite hot and winters are fairly cool. The main characteristics of climate of in the district are its dryness, extremes of temperature and scanty rainfall.

Rainfall: The normal annual rainfall of the district is 330 mm which is unevenly distributed over the area 22 days .Around 75 to 80 per cent of the annual rainfall is received during South West Monsoon season (June to September) with 50 per cent coefficient of variation (CV). The average annual rainfall is around 450 mm, of which the average monthly rainfall received during July and August months is 133.4 and 116.2 mm, respectively. The average monthly rainfall during September is 54.5 mm and June 49.8 mm. The average rainfall received during normal monsoon season is 283 mm. Generally rainfall in the district increases from southwest to northeast.

Normal Annual Rainfall	330 mm
Normal Monsoon Rainfall	283 mm
Temperature Mean Maximum Mean Minimum	 43^{O}C (May & June) 5^{O}C (January)
Normal Rainy days	22

3.0 GEOMORPHOLOGY AND SOIL TYPES

• GEOMORPHOLOGY

The district area forms a part of Indo-Gangetic plain. The area as a whole is almost flat alluvial plain dotted with sand hummocks and sand dunes. The general altitude of the area varies from 203 to 225 m amsl and having a gentle slope towards south-westerly direction. Physiographically, the district is characterized by two distinct features i.e. upland plain and Sand dune clusters.

• SOILS

The soils of the district are of three types i.e. Arid brown solonized (in north eastern parts covering north eastern part of Narnaund and Uklana Mandi blocks.), Sierozem (in major parts covering Barwala, Hansi-I, Bass (Hansi-II), Hisar-I & Agroha blocks and parts of Uklana, Narnaund, Adampur & Hisar-II blocks) and desert soils (in southern western parts covering part of Adampur and Hisar-II blocks).

4.0 GROUND WATER SCENARIO

4.1 HYDROGEOLOGY

The geological formations met within the district comprised unconsolidated alluvial deposits of Quaternary age. The Central Ground Water Board has drilled 11 Exploratory Wells including 02 slim holes (Rajthal and Bhatla) in the depth range of 152 m to 310 m. and 15 piezometers. Drilling has revealed the presence of 4 to 5 tier of aquifer groups down to the drilled depth in the northern half of the district whereas 2 to 3 tier of aquifer group in the southern half of the district. No exploratory well could be converted into production well either because of insufficient granular zones or bad quality of ground water. It is also inferred that the clay group of formations dominate over the sand group. The bed-rock has been touched in boreholes drilled in south and south western part of the district and comprises of Granite and Mica Schists of Pre-cambrian age. The thickness of alluvium varies from 228 (Dhiranwas, Block-Hisar-II) to 310 m (Madha, Block Narnaund) and the thickness increases towards north – east part of the district.

Aquifer System and Parameter

The principal aquifer material comprises of fine-grained sand mixed with gravel and kankar forms the potential ground water reservoir. Ground water in the district occurs in the alluvium under water table and semi-confined to confined conditions. In general, the water table (unconfined) aquifers occurs from 10 m to 60 m depth below ground level in the district. The ground water in unconfined condition is abstracted through hand pumps, dug wells and shallow irrigation tubewells.

At Madha (Block-Narnaund) only the APT was conducted and was successful. The yield (discharge) of the exploratory well determined to be of 1905 LPM with a drawdown of 9.30 m. The transmissivity value of the aquifers worked out 2440 m^2/day. The hydraulic conductivity worked out to be 146 m/day.

Water Level Behaviour

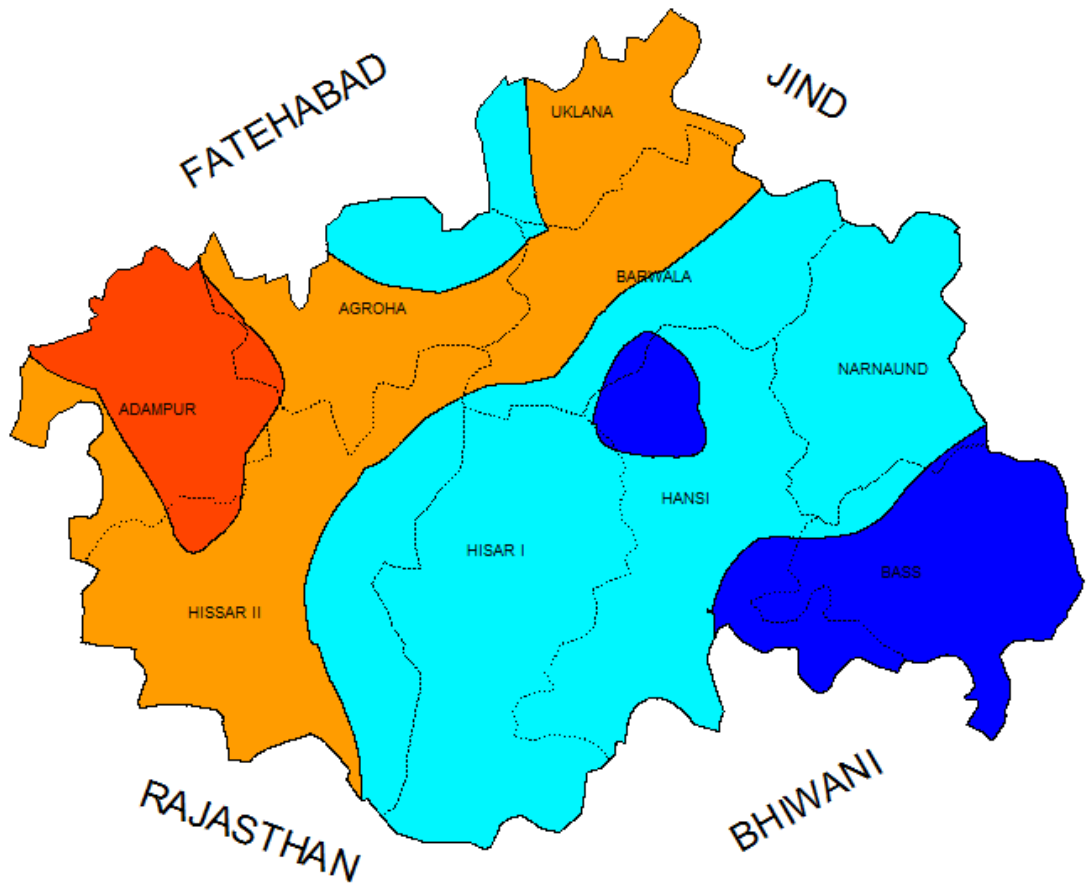
The alluvium forms the principal ground water reservoir and the principal aquifer material constitutes fine to medium grained sand and sand mixed with silt and kankar. The depth to water level varies from 1.53 m to 19.25 m bgl during pre monsoon period and 0.43 m to 18.30 mbgl during post monsoon period. The deeper water level has been recorded in south western part in Adampur, where it rests between 10 and 15 m bgl and spread over 935.5 sq km (23.48 %) in southern and north central part of the district covering part of Hisar-II, Agroha, Uklana, and Barwala blocks;. The water level in the depth range of 5 m to 10 m bgl spreads over

PLATE -II

DEPTH TO WATER LEVEL

(PRE MONSOON - MAY 2011)

HISSAR DISTRICT, HARYANA



LEGEND

MAP SYMBOL	DTWL Range (m.bgl)
	<5.00
	5.00 -- 10.00
	10.00 -- 15.00
	> 15.00

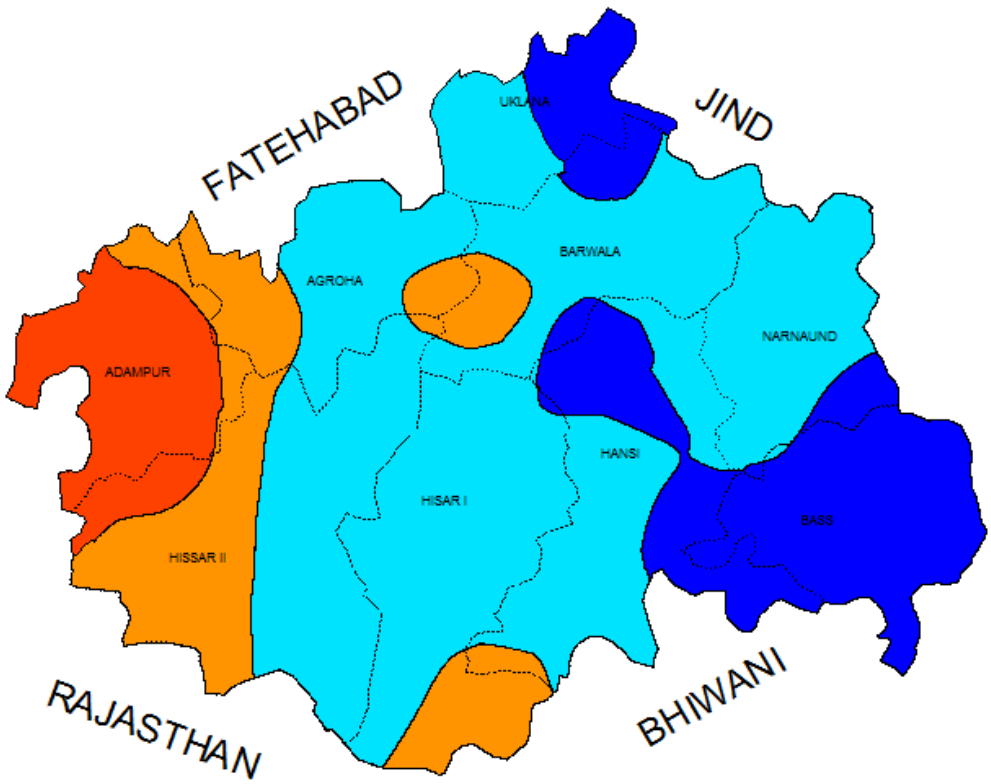
0 12.5 25
kilometres

PLATE - III

DEPTH TO WATER LEVEL

(POST MONSOON, NOVEMBER- 2011)

HISSAR DISTRICT, HARYANA



LEGEND

MAP SYMBOL	DTWL Range (m.bgl)
	<5.00
	5.00 -- 10.00
	10.00 -- 15.00
	> 15.00

0 12.5 25

kilometres

large area, which is worked out to be 2046 sq km (51.36 %) in Hisar, Hansi, Narnaund and parts of Barwala and Uklana blocks. The water level in the depth range of less than 5 m bgl spreads over to be 678 sq km (17.02 %) as compared to the other depth ranges.

Water Logging

Water logging (water level < 2 m bgl) and prone to water logging (water level between 2 and 3 mbgl) conditions exists in the district covering part of Bass (Hansi-II), Hansi-I and Barwala blocks. The water logged area accounts for 37.65 sq km (0.93 %) of the total district area during Pre-monsoon and 264.55 sq km (6.55 %) during post-monsoon period. However, the area under water logging conditions increases almost 7 fold in post monsoon period.

Ground Water Flow

The elevation of the water table in the district varies from 188.82 to 224.42 m amsl. The average gradient of the water table worked out for the district in the order of 0.09 m/km. The overall flow of the ground water is towards south-west direction. However, in northern, western and south western and southern parts the ground water flow is towards south western direction whereas in south eastern part is towards western and north western direction.

Seasonal Fluctuation

The seasonal fluctuation in water level ranges in the district from - 0.02 to 1.77 m. In general there is rise in water table in almost whole of the district. About 67 % of the hydrograph stations has shown seasonal rise in water levels whereas 33 % has shown seasonal decline.

Long Term Trend

The long-term water level trend over a period of 10 years (2002- 2011) indicates a rising as well as declining trend in the entire district area. The maximum rise in the order of 0.415 m/year has been observed at Barwala (Block- Barwala) whereas maximum decline in the order of 0.462 m/year observed at Rajthal (Block- Narnaund). The long term declining trend has been observed approximately in 55 % of the district varies between 0.0112 and 0.462 m/ year and covering major part of Narnaund, Bass, Hansi-I, Hisar-I, Hisar-II and Adampur blocks in the central part of the district and minor part of Uklana and Barwala blocks in the northern part of the district. An area of 45 % approximately has shown rising trend of water levels varies between 0.021 and 0.415 m/ year covering parts of Hisar-I, Hisar-II in the south western part and Agroha, Hansi-I in the northern part of the district.

4.2 GROUND WATER RESOURCES

The block wise ground water resource potentials and draft for the district have been worked out based on methodology recommended by 'Ground Water Estimation Committee (1997) 'as on 31.03.2009. The present stage of block wise ground water development varies from 45 % (Barwala) to 176 % (Narnaund). The Narnaund block falls in over-exploited category. The net annual ground water availability in the district is 662.49 MCM, out of which 598.36 MCM is comes in the head of ground water draft for irrigation sector. Thus, a balance of 58.41 MCM ground water for future development. The stage of groundwater development in the district is 91 % and falls in semi critical category.

GROUND WATER RESOURCE AND DEVELOPMENT POTENTIAL OF HISAR DISTRICT, HARYANA AS ON 31ST MARCH, 2011 in ha m

Block Name	Net Annual Ground Water Availability (Ham)	Existing Gross Ground Water Draft for irrigation (Ham)	Existing Gross Ground Water Draft for all uses (Ham)	Allocation domestic industrial up to next 25 years (Ham)	Net Ground Water Availability for future irrigation development (Ham)	Stage of Ground Water Develop-ment (%)	Category of Block
Adampur	4577	4027	4062	50	500	89	SEMICRITICAL
Agroha	5066	2938	2963	35	2093	58	SAFE
Barwala	9106	3989	4060	100	5017	45	SAFE
Hansi-I	10437	12213	12271	58	-1834	118	OVER EXPLOITED
Hansi-II	6224	6219	6251	32	-27	100	SEMI CRITICAL
Hissar-I	7935	6368	6427	75	1492	81	SEMICRITICAL
Hissar-II	10059	5346	5445	140	4573	54	SAFE
Narnaund	8377	14695	14727	32	-6350	176	OVER EXPLOITED
Uklana	4468	4041	4079	50	377	91	SEMI CRITICAL
TOTAL	**66249**	**59836**	**60285**	**572**	**5841**	**91**	

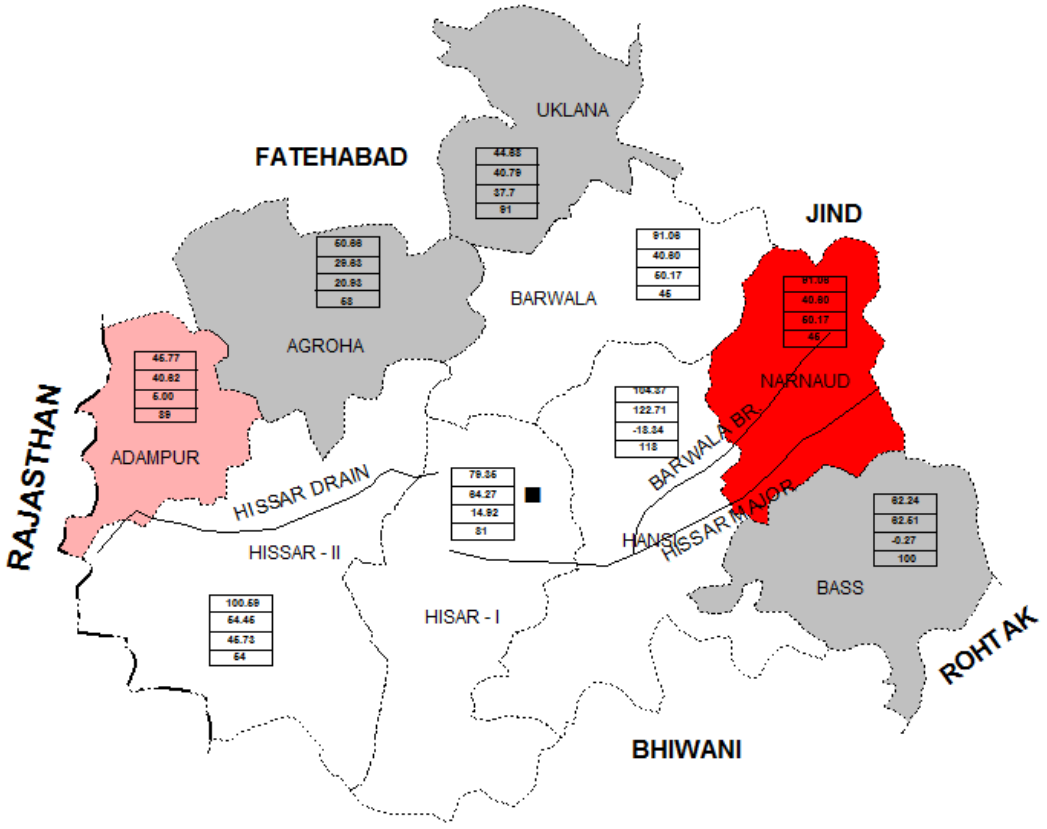
PLATE-IV

GROUND WATER DEVELOPMENT POTENTIAL AND CATEGORISATION OF BLOCKS

HISSAR DISTRICT, HARYANA

0 15 30

kilometers



INDEX

662.49	NET GROUND WATER AVAILABILITY (MCM/YR)
602.85	GROSS GROUND WATER DRAFT FOR ALL USES (MCM/YR)
58.41	NET GROUND WATER AVAILABILITY FOR FUTURE USES (MCM/YR)
91	STAGE OF GROUND WATER DEVELOPMENT (%)

SAFE

SEMI CRITICAL

CRITICAL

OVER EXPLOITED

STATE BOUNDARY

BLOCK BOUNDARY

DISTRICT BOUNDARY

DISTRICT HEAD QUARTER

4.3 GROUND WATER QUALITY

Domestic and Drinking Sector

Chemical quality of ground water representing shallow aquifers reveals that the ground water is alkaline in nature and fresh to marginally and highly saline. Concentration of various chemical parameters in most of the water samples is within the permissible limit except EC, F, NO3, SO4, Hardness and Fe, the concentration of these parameters is found beyond permissible limit set by BIS (1991) for safe drinking water. In general ground water is dominated by bicarbonate and Chloride anions and among cations, none dominants. The aerial distribution of specific conductance shows that saline waters (EC>3000) are found in pockets throughout the district especially in western, south western and northern parts covering Hisar-I, Hisar-II, Agroha, Adampur and Uklana block of the district. The specific conductance value ranges from 290 to 5409 micromhos/cm at 25oC.The area having less than 2000 EC constituting 62.92 % (2450.95 sq km) whereas area having more than 2000 EC constituting 37.08 % (1577.4 sq km) of the district area. It has also been studied that the distribution of specific conductivity of shallow ground water is not distributed on any regular pattern but evidently is controlled by the presence/ absence of the canal system and irrigation by canal. The high fluoride concentration of more than 1.5 mg/l has been found in about 21 % of water samples and recorded maximum up to 4.02 mg/l at Rajli Cross (Block-Hansi-II). The high concentration is found in Hisar-II, Agroha, Bass, Barwala and Hansi-I blocks of the district. The trace metals analysis reveals that in shallow ground water concentration of all metals except Iron, lead and to some extent manganese is within desirable limit. Iron is found to be higher than the permissible limit of 1.0 mg/l at Muklan and Alipur (1.20 mg/l) and Dhansu (1.94 mg/l). Thus, by and large, quality of ground water from shallow aquifer is of permissible class for domestic and drinking purposes.

Irrigation Sector

Specific Conductance (EC), Sodium Adsorption Ratio (SAR) and Residual Sodium Carbonate (RSC) are the basic parameters considered for ascertaining the irrigational suitability of ground water. Based on the plot of Specific Conductance (EC) and SAR on USSL diagram for rating irrigation waters, it is observed that most of waters fall under C2S1, C3S1 and C4S1 Classes. Such waters are likely to cause medium to very high salinity hazards, but no sodium hazards when used for customary irrigation. However, some waters having with S2 and S3 classes may cause sodium hazards when used for irrigation on normal soils. Such waters, nevertheless, can be used on well-drained soils and for semi salt tolerant to salt tolerant crops such as wheat, rice etc.

4.4 STATUS OF GROUND WATER DEVELOPMENT

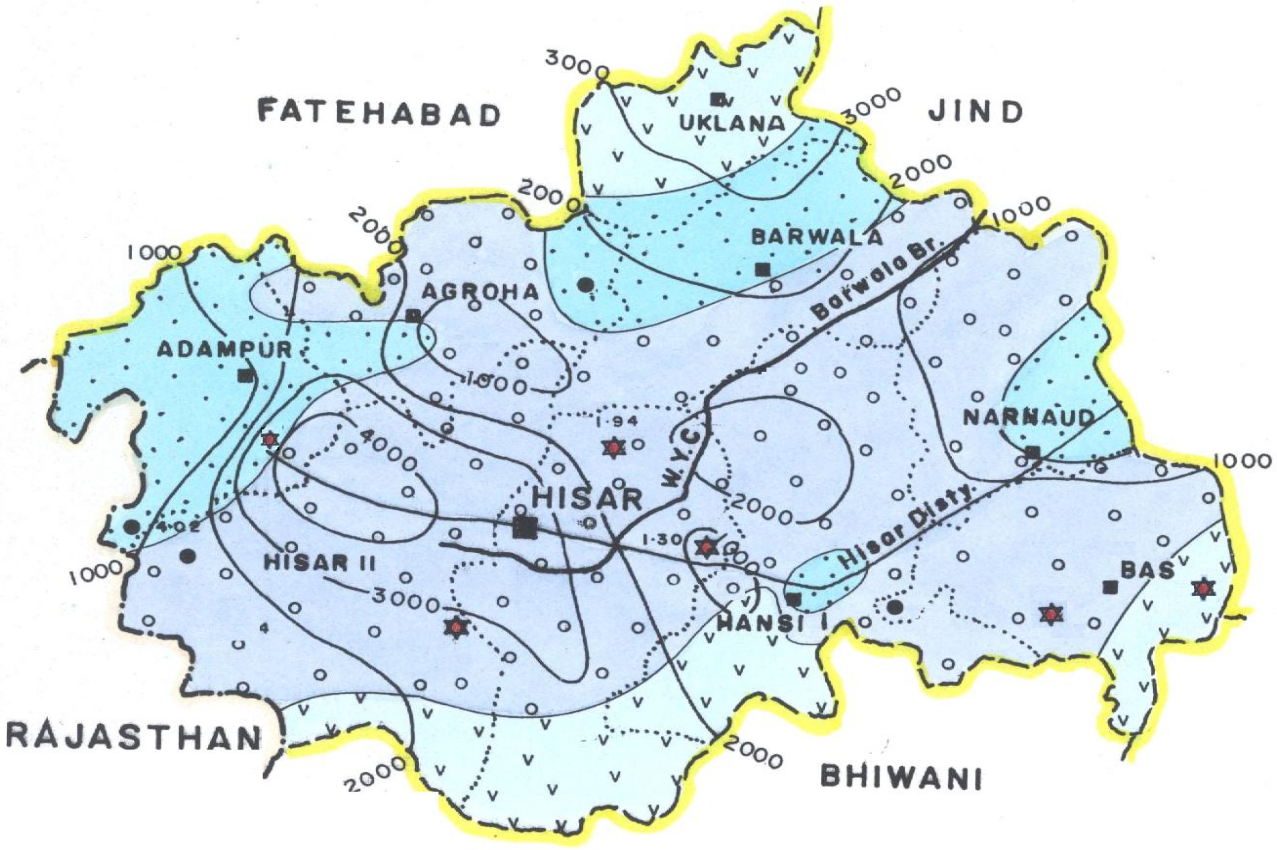
The present stage of block wise ground water development varies from 45 % (block Barwala) to 176 % (block-Narnaund). Out of nine blocks, 04 blocks (Barwala, Hansi- I, Hissar- I & Hissar- II) are fall in white category (Safe), 03 blocks (Agroha, Hansi-II & Uklana) fall in grey category (Semicritical or safe with caution for future development) , 01 block (Adampur) fall in Critical category and 01 block (Narnaund) fall in over-exploited category. There is no scope of large-scale ground water resource development in blocks falling under white category since fresh water is underlain by saline to brackish water at deeper levels. However shallow tubewells (down to 60 m depth) can be constructed at places where ground water is fresh in pockets and along the canals. The shallow tubewells, which is an important unit as far as the ground water development is concerned, have shown a tremendous growth in the district. Most of the existing units are of cavity type in the area, filter type tubewells are commonly found in the Narnaund block. The depth of shallow tubewells varies from 10 m to 60 m, with discharge varying from 6 LPS to 15 LPS. The majority of shallow tubewells are of cavity type. These tubewells are generally operated by centrifugal pump driven by either Electric Motor or Diesel Engine of 5 to 10 Horse Power. Out of the total geographical area of 398300 ha of the district, the net area sown is 333000 ha (2011-12) and 63000 ha area is irrigated by tube wells 209000 ha by canals and remaining by other means. There are 38,584 no of MIU's installed in the district with density of 9 MIU/sq km for irrigation purposes. The number of minor irrigation units varies from 1,246 (Block- Agroha) to 11,989 (Block- Narnaund) and the density varies from 4 to 29 MIU/sq km. The block Narnaund, having 11,989 no of MIU's with a density of 29 MIU/sq km,and is maximum in the district. It has increased many folds during past 10 years, causing over-exploitation of ground water. Thus there is need to notify the block. The drinking water supply to all the rural as well as urban parts of the district is based mainly on canal water. At few places ground water is also being used for water supply purposes. The total number of rural water supply schemes, which are in function, is 187. The ground water based schemes are run using about 142 tubewells drilled in the depth range of 30 m to 175 m with discharge about 480 LPM. The Urban water supply is canal water and groundwater based. Out of 05 towns, 02 towns namely Hansi and Narnaund are also based on ground water through tubewells. For urban area 05 tubewells have been installed in Hansi which are mainly along the canal and 01 tubewell is installed in Narnaund. These tubewells are drilled in the depth range of 100 to 130 m with 375/200 mm dia assembly. These tubewells are installed to augment the drinking water supply. However the quality of ground water is fresh to marginal. In Adampur and Barnala blocks, the deep tubewells of 175m are feasible at some isolated places.

PLATE-V

HYDROGEOLOGY

HISAR DISTRICT, HARYANA

0 10 20 K.M.



INDEX

	WELLS FEASIBLE	RIGS SUITABLE	DEPTH OF WELL(m)	DISCHARGE (lpm)
SOFT ROCK AQUIFER	TUBE WELLS	REVERSE / DIRECT ROTARY	30 — 175	> 480
SOFT ROCK AQUIFER	TUBE WELLS	REVERSE / DIRECT ROTARY	30 — 60	360 — 480
SOFT ROCK AQUIFER	TUBE WELLS	REVERSE / DIRECT ROTARY	20 — 40	240 — 360

ELECTRICAL CONDUCTIVITY (MICROMHOS/CM AT 25°C)

2000

1·30 IRON > PERMISSIBLE LIMIT (1·0ppm)

3·78 FLUORIDE > PERMISSIBLE LIMIT (1·5ppm)

4.5 GEOPHYSICAL STUDIES

CGWB has carried out surface geophysical studies in eastern part of the district covering Bass, Narnaund and Hansi-I blocks to delineate the fresh and saline aquifer interface. The result indicates that over small area in north, east and south-west fresh water has been inferred within a depth of 20 to 60m. Such prominent locations are Rajpura, Narnaund, Bass, Premnagar, Bad Chhapar and Samain. Comparatively large thickness of fresh water granular zones of the order of 50 to 60 m has been inferred at Narnaund and Rajpura. At other places namely Bass, Premnagar, Bad Chhapar and Samain only 12 to 13m thickness of fresh water granular zone has been inferred. Major part of the Bass block is affected with the agony of surface level salinity. About 90% of the area in combined blocks of Hansi and Bass (Hansi-II) blocks has saline ground water at all levels.

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 Ground Water Development

The hydrogeological data generated through exploratory drilling reveals that the deeper aquifer is either having insufficient granular zones or the quality of ground water is saline and at most of the places salinity increases with depth, thus the area is not fit for deep ground water exploitation. The shallow ground water is extensively exploited through shallow tubewells mainly cavity type. The depth of shallow tubewells varies from 10 m to 60 m, with their discharge varies from 6 LPS to 15 LPS. Most of the shallow tubewells are now being installed along the canals, where the quality of ground water is improving by the recharging effect of canal water seepage or canal water irrigation. The tubewells (mainly filter type) in the depth range of 60 m are installed in the parts of Narnaund and Adampur blocks. Recently, PVC pipe assembly is being commonly used.

5.2 Water Conservation and Artificial Recharge

There are in all 260 numbers of ponds/tanks in the district. Thereby the recharge to ground water takes place in the order of 139 Ham. Out of nine blocks Narnaund and Agroha are the blocks where maximum recharge from ponds takes place. Their block-wise distribution and recharging contribution is as follows.

BLOCKWISE DETAILS OF LAKES AND PONDS AND RECHARGE

Sl.No	Block Name	No. of tanks/ ponds	Average water spread area (ha)		No. of days water is available		Recharge in Ham during	
			Monsoon	Non-Monsoon	Monsoon	Non-Monsoon	Monsoon	Non-Monsoon
1	Adampur	25	30	20	120	180	1326	2187
2	Agroha	30	60	40	120	180	1180	2315
3	Barwala	35	60	30	120	180	2252	4169
4	Hansi-I	25	30	20	120	180	2880	4357
5	Hansi-II	25	30	20	120	180	1754	2620
6	Hissar-I	35	40	30	120	180	1414	2728
7	Hissar-II	30	40	30	120	180	1254	2951
8	Narnaund	30	60	40	120	180	2931	3307
9	Uklana	25	40	20	120	180	960	1930
	TOTAL	**260**	**390**	**250**	**-**	**-**	**15951**	**26564**

The three multipurpose irrigation projects namely Hisar – Ghaggar Multipurpose Channel, Bass Multipurpose Channel & Hansi Multipurpose Channel are being taken up by the Irrigation Department. The main purpose of these multipurpose channels is to store rain water and flood water and seepage from the field in water logged areas and to irrigate the area of its command.

6.0 GROUND WATER RELATED ISSUES & PROBLEMS

Twin Problem of Water Logging & Salinity

The south eastern and north central part of the district covering part of Bass (Hansi-II) and Hansi-I, block are severely affected from water logging point of view. Besides, the part of Barwala also exists under water logging conditions. The following measures are suggested to reduce the impact of problem:

- Installation of sub-surface and vertical drainage to drain out surplus water.
- Use of multi well point system.
- Reduction in canal allowance at least 25 % during the whole year.
- Conjunctive use of surface/ canal water and ground water should also be in practice.
- Encouraging salt tolerant crops like Barley, cotton, sunflower etc so that ground water of marginally quality can be used for irrigation.

The phenomenon of water logging is associated with the twin problem of salinity. Conjunctive use of surface and ground water of marginally saline quality gives better results.

Water Table Depletion

The long term depletion in water table is observed in the stretch of central part of the district, covering part of Adampur, Hisar-II, Hansi-I, Uklana and Narnaund blocks, water table has declined in the order of 0.01 to 0.46 m in ten years, which is worked out to be 0.46 m per year. The maximum decline has been observed at Rajthal in Narnaund block. It is mainly due to the change in cropping pattern. Paddy crop is being sown in the area, and its cultivation has increased many fold over few years which has resulted in substantial decline of water level in Narnaund block. Thus the Narnaund block falls in over exploited category.

Water Marketing

There is scarcity of fresh potable water in the district. In view of this, Water Marketing has taken place on a large scale in the district. The water is being sold by the owner of shallow tubewells sunk in fresh water areas for drinking and domestic purposes on monthly rental of Rs. 100/- for a supply of half to an hour per day. The user besides monthly rental has also to deposit a refundable security of Rs. 1500/-. This trend of water marketing needs attention as it is in practice on a large scale especially in the Adampur block of the district.

Fluoride

Fluoride (> 1.5 ppm) content in ground water is the sole criteria for the rejection of ground water for drinking uses. The high concentration of fluoride is found in Hisar-II, Agroha, Bass, Barwala and Hansi-I blocks of the district and recorded maximum up to 4.02mg/l at Rajli Cross (Block-Hansi-II). The high fluoride concentration of more than 1.5 ppm has been found in about 21 % of water samples. Therefore, precaution is required to be taken before such water is supplied or used for drinking purposes.

7.0 RECOMMENDATIONS

1. Narnaund block of the district falls in over exploited category and present stage of ground water development has reached 176 %, the block may be declared as 'Notified Area' by the Central Ground Water Authority.
2. The shallow tubewells down to 10 m to 60 m depths can be constructed at places where ground water is fresh i.e. along the canals and in pockets.
3. Sub-surface drainage and vertical drainage system may be provided in Bass (Hansi-II) block and parts of Hansi-I and Barwala blocks to tackle the problem of water logging.
4. In order to arrest the declining trend of water levels in Adampur, Hisar-II, Hisar-I and Narnaund blocks of the district artificial recharge practices should be taken up. For this purpose, roof top rain water harvesting is one of the good exercises to be adopted.
5. Micro level ground water regulation and protection studies may be carried out to map the aerial distribution of high fluoride concentration and salinity and the public may be educated about its harmful effect on human health.
6. Intensive study may be carried out in Western Yamuna Canal command area of the district covering Bass, Hansi-I and Narnaund blocks to work out the strategy for conjunctive use of surface and ground water.
7. Water marketing should be checked, as it is in practice on a large scale in the district especially in the Adampur block.
8. Mass Awareness Program should be organized to make people of the district aware about the consequences of over-exploitation of ground water and for its economic use.