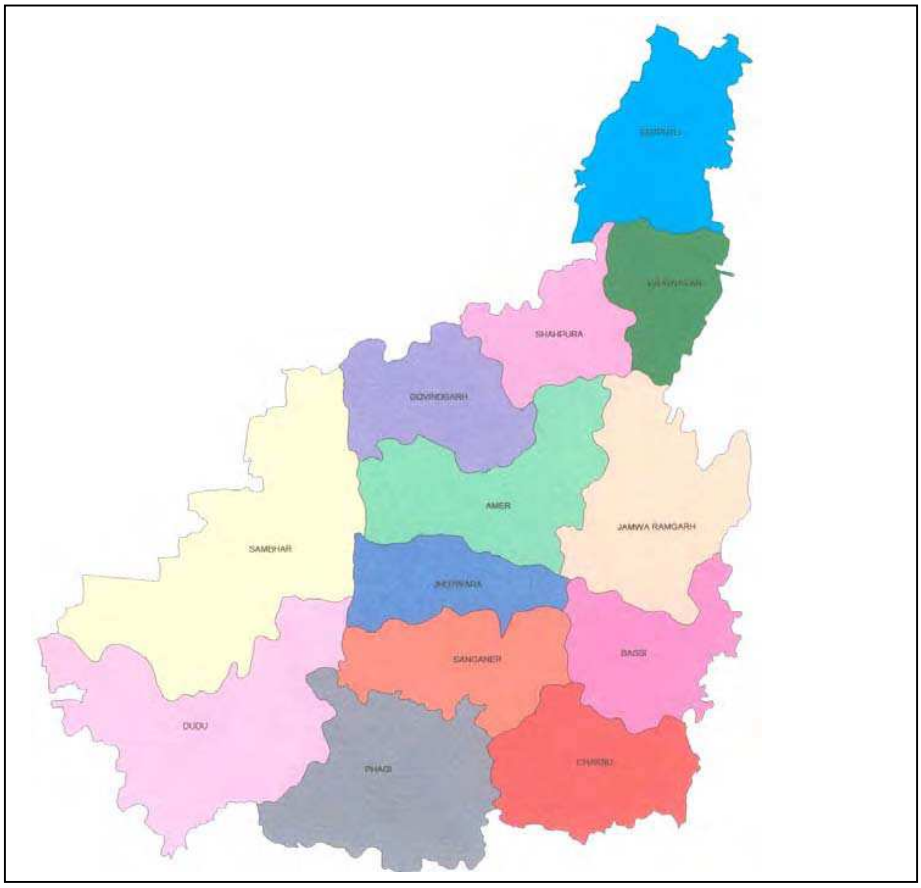
GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES
CENTRAL GROUND WATER BOARD

GROUND WATER INFORMATION
JAIPUR DISTRICT
RAJASTHAN



WESTERN REGION
JAIPUR
2013

DISTRICT AT A GLANCE

1. GENERAL INFORMATION

Geographical Area	:	11,061.44
Administrative Divisions	:	13
Villages	:	2263
Population (2011)	:	66,26,178
Average Annual Rainfall	:	565

2. GEOMORPHOLOGY

Major Physiographic unit	:	Alluvial plains, Hillocks, Pediments
Major Drainage	:	Banganga, Bandi, Dhund, Mendha, Sota and Sahibi

3. LAND USE (2010-11) Area in Hectare

Forest Area	:	82239
Net Area Sown	:	684431
Total cropped area	:	1171712

4. SOIL TYPE : Loamy sand to sandy loam, Sandy clay loam, Sandy clay, Wind blown sand, River sand

5. PRINCIPAL CROPS (2010-11) (Area in ha)

Cereals	:	597996
Pulses	:	200116
Condiments and spices	:	4909
Oilseeds	:	275641
Fruits and vegetables	:	33383

6. IRRIGATION BY DIFFERENT SOURCES (2010-11) (Area in ha)

Source		**Net Area Irrigated**	**Gross Area Irrigated**
Canal	:	4395	4446
Tank	:	289	289
Tubewells	:	215960	273554
Other wells	:	91704	110822
Total	:	312348	389111

7. GROUND WATER MONITORING WELLS (As on 31/03/2012)

Dugwells	:	16
Piezometers	:	41

8. GEOLOGY

Quaternary to Recent	:	Alluvium
Delhi Supper group	:	Quartzite and Schist
Bhilwara Supper group	:	Gneiss

9. HYDROGEOLOGY

Water Bearing Formation	:	Quaternary alluvium and quartzite
Premonsoon Depth to Water Level (May-2011)	:	7.08 to 84.00 m bgl
Postmonsoon Depth to Water Level (Nov.-2011)	:	4.15 to 82.80 m bgl
Premonsoon Water Level Trend (2002-2011)	:	Rise- 0.01 to 0.04 m/Year Fall - 0.05 to 0.34 m/Year

10. GROUND WATER EXPLORATION (As on 2011)

Wells Drilled	:	EW-99, OW-15, PZ-565, SH-1
Depth Range	:	19.9 – 169.4m
Discharge	:	18-1879 lpm
Transmissivity	:	0.76-3144 m^2/day

11. GROUND WATER QUALITY

Presence of chemical constituents (EC in µS/cm at 25^0 C, F in mg/l, Nitrate in mg/l, Fe in mg/l))	:	EC – 370 - 12310 F - 0.16 – 16.4 NO_3 – 0.68 – 716 Fe – 0.08 – 4.81

12. DYNAMIC GROUND WATER RESOURCES- (As on 31/03/2009) in MCM

Annually Replenishable Resource	:	742.1257
Net Annual Ground Water Availability		677.1407
Annual Ground Water Draft (Irrigation+Domestic)	:	253.1695
Stage of Ground Water Development	:	206.69

13. AWARENESS AND TRAINING ACTIVITY

Mass Awareness Programmes	:	Govindgarh (20.2.2007), Bassi (28.3.2012)
Water Management Training Programme	:	23.01.2002, 8.03.2002, 27.02.2003, 30 and 31.07.2003, 1.3.2011 RWH Week 21-25.02.2005

15. GROUND WATER CONTROL and REGULATION

Over-Exploited Taluka	11
Semi-Critical Taluka	1
Notified Taluka	1 (Jothwara)

16. MAJOR GROUND WATER PROBLEMS AND ISSUES

Over-exploitation of ground water resources leading to declining trends in water levels, Fluoride contamination.

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1.0 Introduction

Jaipur district, covering geographical area of 11,061.44 sq. km and extending between north latitudes 26° 25' and 27° 51' and east longitudes 74° 55' and 76° 15' forms east-central part of the Rajasthan State. For administrative convenience, the district is divided into 13 tehsils and 13 blocks. The district covers about 3.23% of total area of the State. According to 2011 census, total population of Jaipur district was 66,26,178 with rural population of 31,54,331and urban population of 34,71,847 and decennial growth of 26.91% (period 2001-2011). Jaipur, the capital city is also popularly known as Pink city and is situated towards central part of the district. Jaipur is very much on the world tourist map, known for gems and jewellery and is also popular for Sanganer and Bagru prints. A map of the district showing taluka boundaries, taluka headquarters, physical features and locations of monitoring wells is presented as **Figure 1**.

Systematic Hydrogeological Surveys in the district were first carried out by Geological Survey of India during 1965 - 1968. These surveys were continued by Central Ground Water Board, after its establishment in 1972. Various scientific studies carried out by Central Ground Water Board are listed in Table 1.

Table 1: Studies undertaken by CGWB.

S. No.	Officer	AAP	Type of Survey/Study
1.	M. Mehta	1974-75	Systematic Hydrogeological Survey in Banganga river basin in Jaipur, Alwar, Bharatpur and Sawai madhopur districts
2.	M.S. Jethra	1986-87	Reappraisal Hydrogeological Survey in parts of Jaipur district
3.	S.K. Gupta	1987-88	Reappraisal Hydrogeological Survey in Dausa, Baswa, Sikrai and Lalsot blocks of Jaipur district and Mahuwa block of Sawai Madhopur district
4.	M.K. Sharma	1992-93	Reappraisal Hydrogeological Survey in Shahpura, Viratnagar and Jamwa Ramgarh blocks
5.	M.K. Sharma	2004-05	District Ground Water Management Studies in Jothwara, Sanaganer, Bassi, Chaksu, Jamwa Ramgarh and Amer blocks
6.	Vikas Chandra	2005-06	District Ground Water Management Studies in Dudu, Phagi and Sambhar blocks
7.	R.K. Kushwaha	2005-06	District Ground Water Management Studies in Bairath, Govindgarh, Kotputli and Shahpura blocks

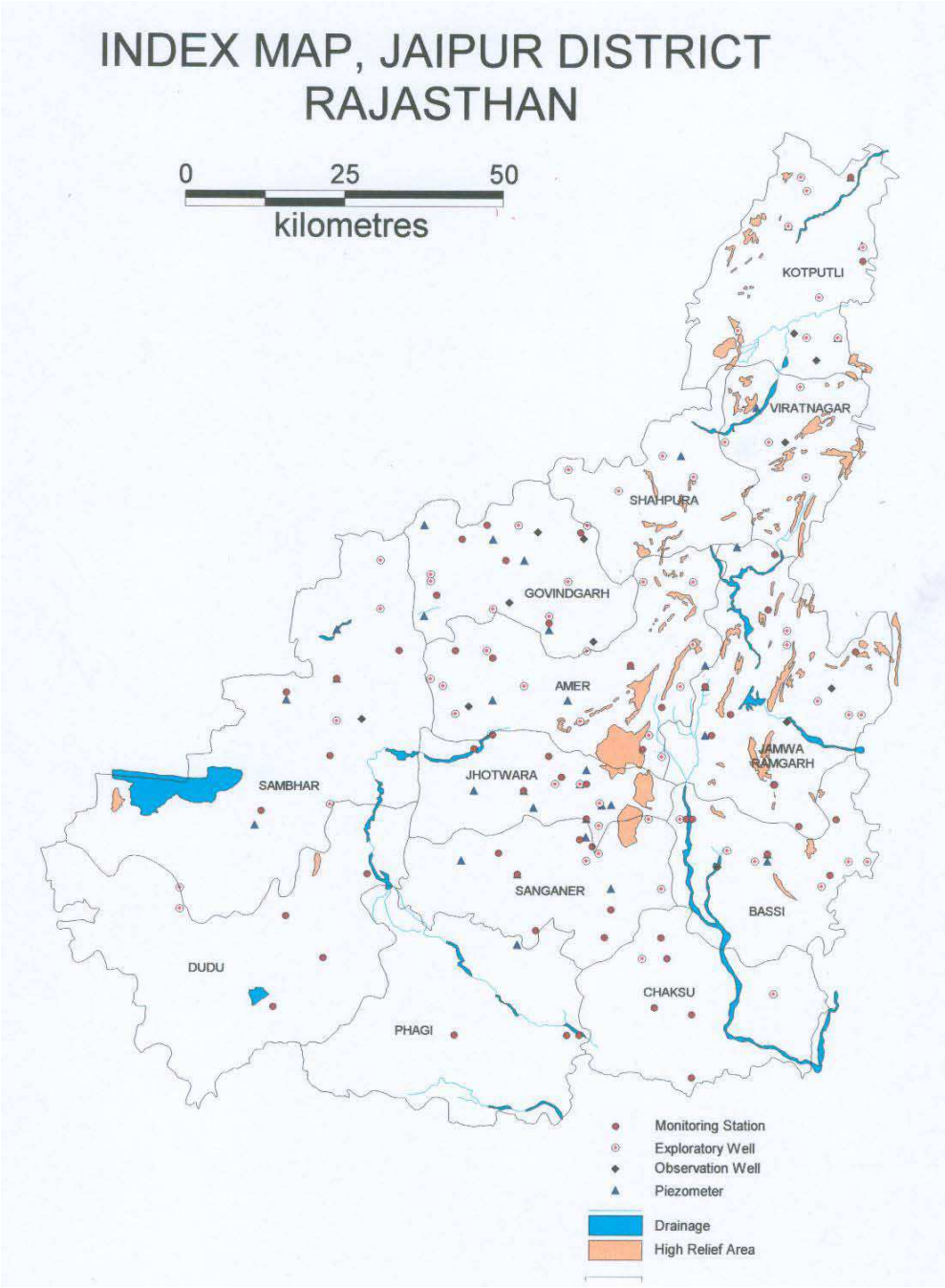

Figure 1: Administrative divisions, physical features and location of exploratory boreholes and monitoring wells

Besides the above studies, Report on hydrogeology of the district has been brought out in the years 1982 and 1994. Groundwater regime is monitored through 64 hydrograph stations (16 dug wells 41 piezometers) four times a year for water levels and once a year for water quality. Ground water exploration has been carried out to decipher aquifer geometry and ascertain potentiality and water quality parameters. A total of 100 EW, 15 OW, 01 SH and 56 piezometers have been constructed so far. Salient features of ground water exploration are given in Table 2.

Table 2: Salient Features of Ground Water Exploration

Type of well	No.	Depth drilled (m)	SWL (m)	T (m^2/day)	Discharge (lpm)	EC (µ/cm) at 25°C
EW	99	19.9-169.4	0.59-55.66	0.76-3144	18-1879	360-6270
OW	15	45.5-136	2.2-21.04	7.30	60-1200	490-2600
PZ	56	25-196.8	3.91-60.79		6-1200	325-10390
SH	1	18.37	-	-	-	-

2.0 Climate and Rainfall

The semi-arid district receives normal annual rainfall of 527mm (1901-71) while average annual rainfall for the last 30 years (1977-2006) is 565mm. Annual average rainfall during the period 2001 to 2010 has been 527mm (Table 3). Over 90% of total annual rainfall is received during monsoon. Total annual potential evapotranspiration is 1744.7mm. The coefficient of variation is moderate at 32.6% indicating slightly unreliable pattern of rainfall. Though, Jaipur city has experienced floods in 1981, the district is prone to drought spells as witnessed during 1984 to 1989 and 1999 to 2002.

Table 3: Annual Rainfall Data (2001-2010) (mm)

Sr. No.	BLOCK	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Average
1	AMER	432.00	235.00	679.00	790.00	470.00	354.00	529.00	547.00	277.00	729.00	504.20
2	BASSI	401.00	201.00	647.00	590.00	634.00	293.00	487.00	578.00	344.80	933.00	510.88
3	DUDU	403.95	152.40	409.05	467.40	313.10	311.15	341.90	634.30	258.55	716.30	400.81
4	GOVINDGARH	503.80	214.00	581.00	296.00	306.00	209.00	323.00	424.00	268.00	735.00	385.98
5	JAMWA RAMGARH	373.00	341.00	1066.00	1061.00	980.00	460.00	673.50	1160.00	572.00	1042.00	772.85
6	JHOTWARA	426.80	222.40	511.00	807.00	408.60	335.00	521.00	572.00	306.00	653.00	476.28
7	KOTPUTLI	407.60	273.67	906.73	591.37	916.67	576.00	608.10	928.00	278.00	711.67	619.78
8	PHAGI	429.30	202.00	531.80	525.25	524.20	351.30	568.75	634.70	376.50	869.00	501.28
9	SAMBHAR	519.10	141.50	518.45	501.05	464.85	310.90	367.60	631.20	232.05	800.75	448.75
10	SANGANER	585.00	237.00	552.30	805.00	397.00	407.00	557.30	572.00	275.00	745.00	513.26
11	VIRATNAGAR	628.50	262.00	1065.00	489.50	976.00	465.50	454.00	969.50	344.00	922.00	657.60
	Average	464.55	225.63	678.85	629.42	580.95	370.26	493.74	695.52	321.08	805.16	526.52

(Source: Revenue Department, Ajmer)

3.0 Geomorphology and Soil Types

Jaipur district is characterized by wide spectrum of landscapes including hillocks, pediments, undulating fluvial plains, aeolian dune fields, ravines, palaeo-channels etc. Structural hills (mainly in northern and northeastern parts) trending NNE-SSW are generally composed of Delhi quartzite. Main peaks include Jaigarh (648mamsl), Nahargarh (599mamsl), Manoharpura (747mamsl) and Bichun (656mamsl). Pediments with thin to thick soil cover can be seen around Dudu, Phagi and Chaksu forming flat gneissic outcrops. Undulating plains of fluvial/ fluvial-aeolian origin forming landforms of river terraces, floodplains and buried channels of various drainage systems dominate in the district. Aeolian sand dunes are found mainly in western parts (Sambhar, Jobner, Renwal area) which are a few metres to 10m high. Obstacle and shadow dunes can also be seen in parts of the district in addition to ravine and badland topography at places. The district area is drained by ephemeral rivers Banganga, Bandi, Dhund, Mendha, Mashi, Sota and Sabi and their tributaries. Sota and Sabi rivers in the northern part of district flow northeasterly while southwesterly flowing Banganga river passes through Shahpura, Bairath and Jamwa Ramgarh blocks and contribute water to the famous Ramgarh lake from where it flows easterly to enter Dausa district. Mendha River in northwest portion of the district merges with famous Sambhar lake whereas Mashi river in the southwestern part flows easterly.

Soils in the district may be classified as:

- • Loamy sand to sandy loam
- • Sandy clay loam
- • Sandy clay
- • Wind blown sand
- • River sand

4.0 Ground Water Scenario

4.1 Hydrogeology

Gneisses and schists of Bhilwara Super Group are the oldest rock types overlain by quartzites, schists, conglomerates, dolomitic limestone etc. belonging to Alwar and Ajabgarh Groups of Delhi Super Group along with granite, pegmatite and amphibolite intrusives of Post Delhi age. Hard rocks in major parts of the district are covered by Quaternary fluvial and aeolian deposits mainly composed of sand, silt, clay, gravel and kankar. Alluvial thickness is less in southern and southwestern parts of the district i.e. in Naraina, Sakhun, Dudu, Mozamabad, Phagi, Chaksu areas etc. Alluvial thickness between 90 and 100m has been observed at Chomu, Jairampura, Nangal Bharra, Dhaunauta areas whereas its thickness over 100m has been found at Risani village (104m).

In the northern part of the district, altitude of bedrock ranges from 426.72mamsl at Mairh to 276.82 mamsl at Kotputli indicating northerly sloping bed rock. In the northwestern and western parts, altitude of bedrock varies from 446 mamsl at Kariri (Shahpura) to 337 mamsl at Dhani Boraj (Sambhar block) showing southwesterly sloping bed rocks. Around Jaipur urban area, altitude is higher at Harmada area (417.11 mamsl) with southerly and southeasterly sloping bedrock and low altitudes of bedrock have been observed as 310.79 mamsl at Chandlai and 273.47 mamsl at Kotkaoda in Chaksu block.

Groundwater in the district occurs both in unconsolidated Quaternary formations and consolidated formations of Bhilwara and Delhi Super Groups and also Post Delhi Granites. In greater part of the district, alluvial deposits comprising of mainly fine sand and silt serve as potential aquifers in addition to gravel zones as encountered at Sanganer, Ambabari, Bajaj Nagar (Jaipur city) and Shahpura, Dhanauta, Nayan, Kalyanpur, Mohana and Chandalai. Groundwater at shallow depth occurs under water table condition and under semi-confined conditions at depth. Talus and scree deposits at foothills form potential aquifer at places including Banskho in Bassi block and parts of Amber, Jamwa Ramgarh and Govindgarh blocks. Yield of wells in these formations ranges from 100 to 500 m^3/day. Hard rocks of Bhilwara Super Group, comprising of granulitic gneisses, quartz mica schist, phyllite along with granite and pegmatite intrusives, form main aquifers in southern and south western parts of the district in Dudu, Phagi and Chaksu blocks. Similarly, quartzite, schist and phyllite of Delhi Super Group form aquifers in Jamwa Ramgarh, Bairath, Kotputli, Shahpura, Amer and Bassi blocks. Movement of groundwater in these hard rocks is controlled by size, continuity and interconnectivity of weathered and fractured parts and other secondary porosities. Depth of wells in the district generally varies from 50 to 100m in alluvium and 50 to 200m in combination/consolidated formation areas. Specific capacity of wells varies from 58 to 500 lpm/m. Transmissivity value and storage coefficient varies from 10 to 850m^2/d and 4.70 x 10^{-5} to 1.05x 10^{-3} respectively.

A map depicting hydrogeological features is presented as **Figure 2**.

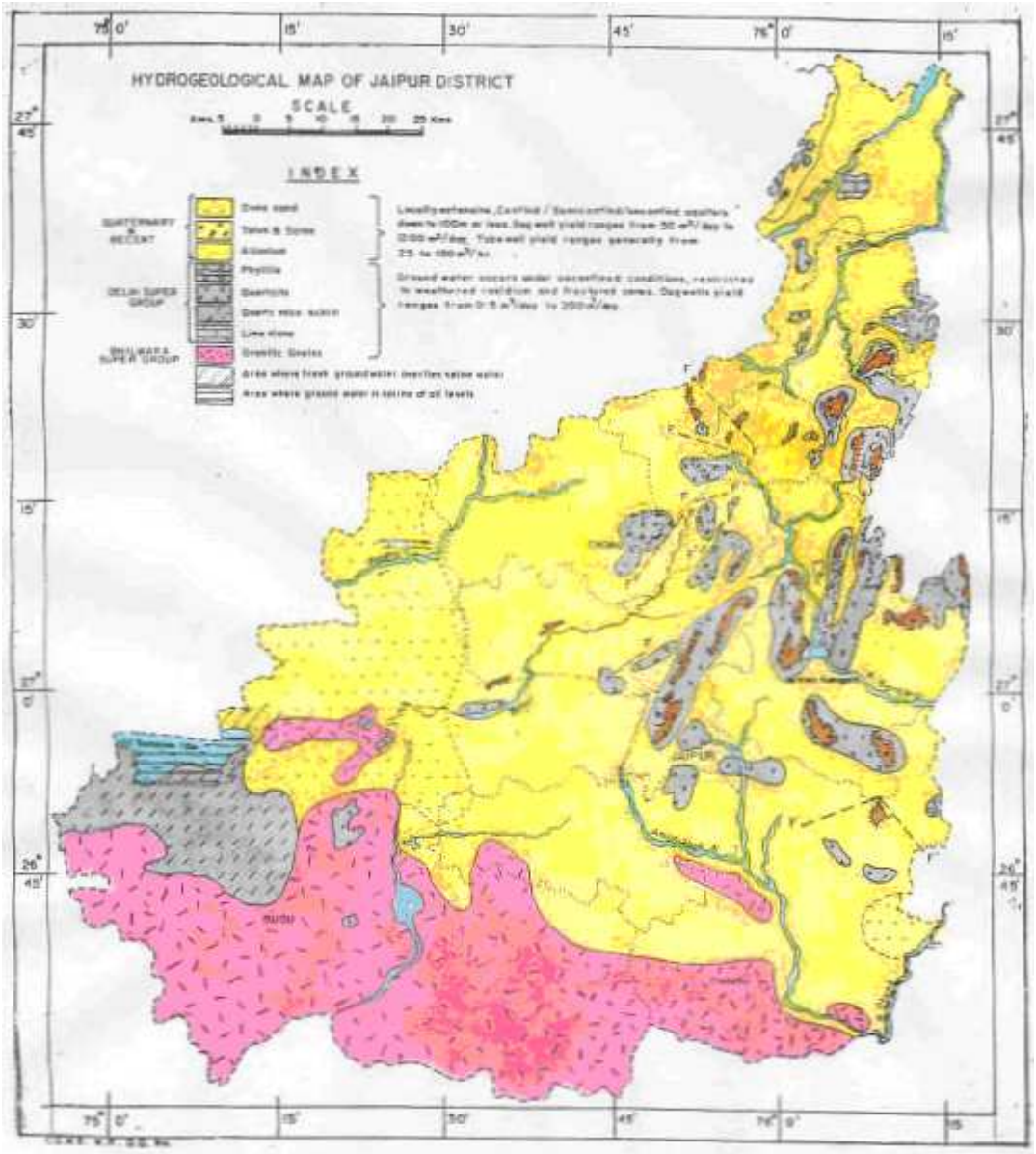

Figure 2: Hydrogeology

4.1.1 Water Level Scenario

Central Ground Water Board periodically monitors the National Hydrograph Network Stations (NHNS) stations in the Jaipur district, four times a year i.e. in January, May (Premonsoon), August and November (Postmonsoon).

4.1.1.1 Depth to Water Level – Premonsoon (May-2011)

During premonsoon period (May, 2011), depth to water levels varied from 7.08 mbgl at Dawach in Sambhar block to 84.00 mbgl at Chomu in Govindgarh block (**Figure 3**). Deeper water levels of more than 40 mbgl were recorded in the central part of district covering most parts of Govindgarh, Shahpura Amer, Jothwara and Sanganer blocks. Shallow water level less than 10 mbgl has been recorded in the southwestern part of the district mostly in the blocks of Dudu and Phagi.

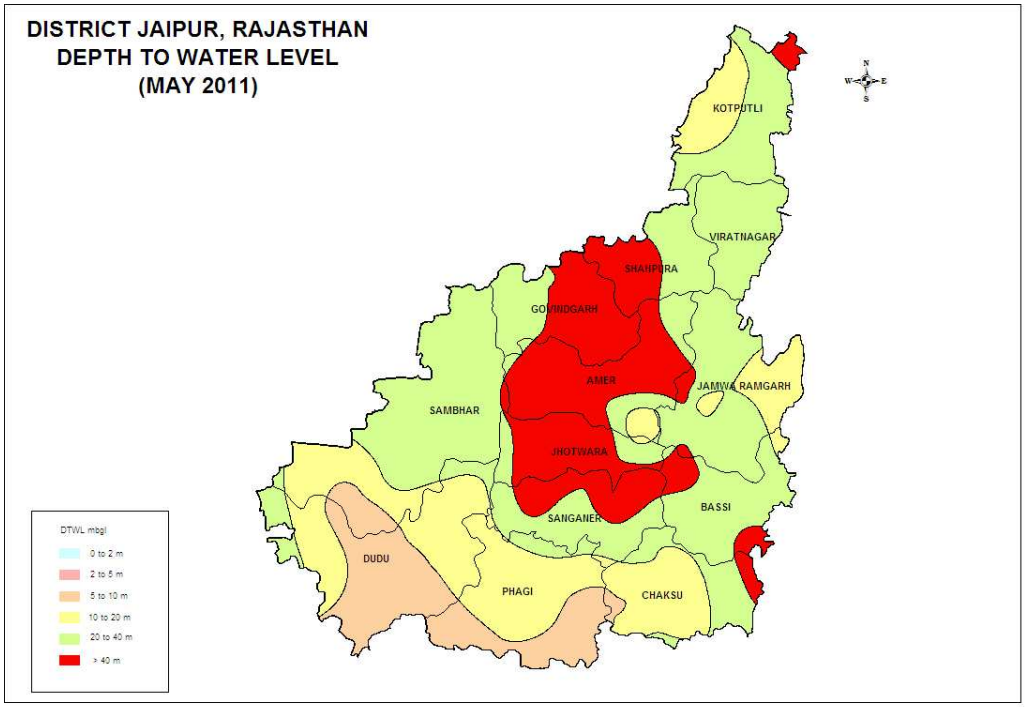

Figure 3: Depth to Water Level (Premonsoon- May 2011)

4.1.2 Depth to Water Level – Postmonsoon (Nov-2011)

During postmonsoon period (November, 2011), depth to water level varied from 4.15 mbgl at Rasala, Jamwa Ramgarh block to 82.8 mbgl at Chiomu, Govindgarh block. Water levels more than 40 mbgl were observed in the central parts of the district covering blocks of Govindgarh, Amer, Jotwara, Sanagner and Bassi (**Figure 4**). Shallow water level less than 5 mbgl were registered in the south-western parts of the district in Dudu and Phagi blocks.

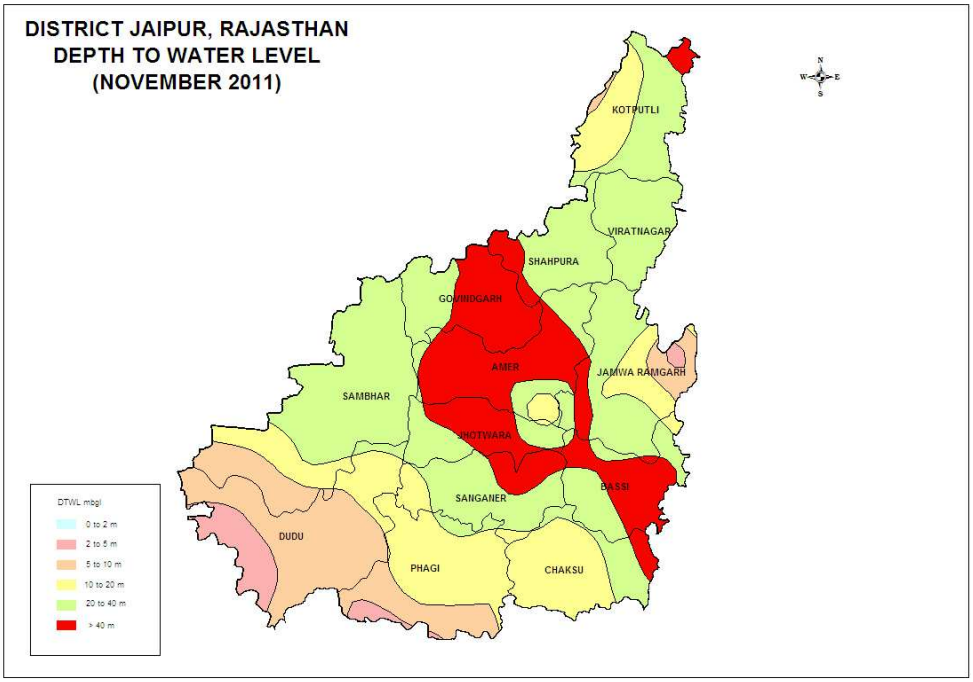

Figure 4:Depth to Water Level (Post-monsoon- November 2011)

4.1.3 Seasonal Water Level Fluctuation (May-Nov. 2011)

Analysis of water level data of Premonsoon and Postmonsoon period during 2011 indicates that about 71% of the monitoring stations in the district have registered rise (**Figure 5**). Rise of more than 4m has been registered mostly in Shahpura, Dudu, Sambhar and Jamwa Ramgarh blocks. Fall of more than 4 m has been recorded in small isolated patches in Jamwa Ramgarh and Jothwara blocks. Max rise of 12.14 m has been registered at Rasala and maximum fall of 9.05m has been registered at Malawala in Jamwa Ramgarh block.

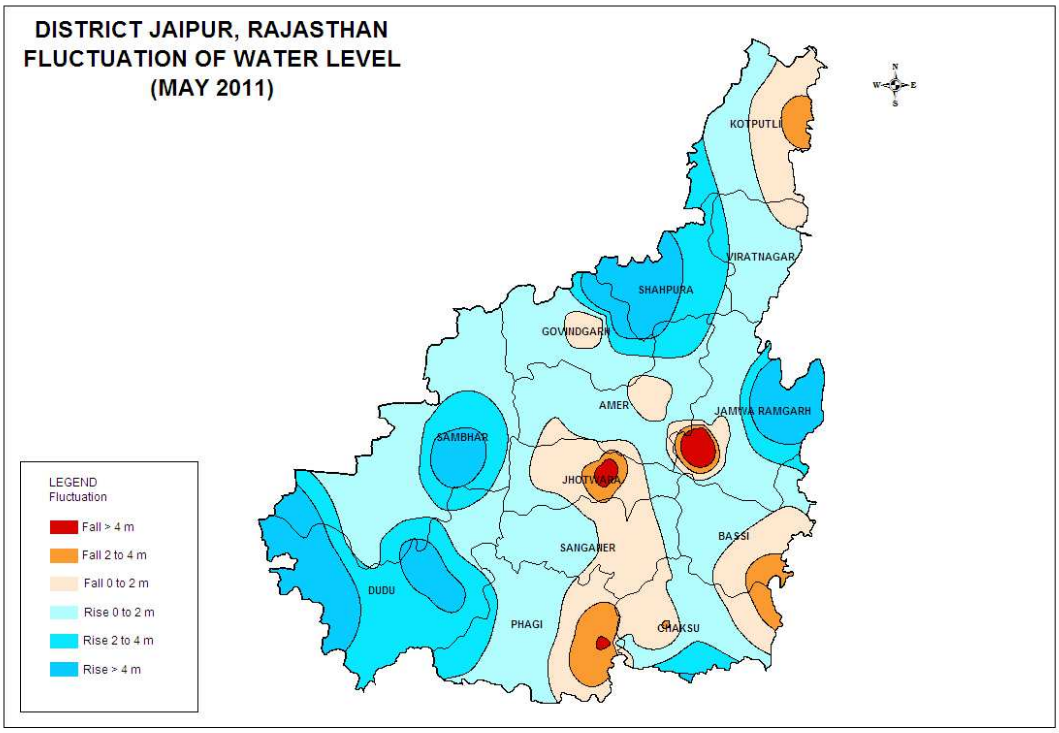

Figure 5: Seasonal water level fluctuation map (May - November, 2011)

4.1.4 Water Level Trend (2002-11)

Analysis of decadal premonsoon water level data (May, 2002-2011) shows that almost the entire district has experienced falling trends of water level except a few isolated patches of rising trend mostly in the blocks of Dudu, Phagi and Chaksu (**Figure 6**). Rising trends in the district range from 0.01 m/year to 0.04 m/year and falling trend range from 0.05 m/year to 0.34 m/year.

4.2 Ground Water Resources

Central Ground Water Board and Rajasthan Ground Water Department (RGWD) have jointly estimated the ground water resources of Jaipur district (as on 2009) based on GEC-97 methodology. Ground Water Resource estimation was carried out for 9994.67 sq. km. area in non-command area and 340.06 sq. km area falling in Phagi block is saline. The total annually replenishable resource of the district has been assessed to be 750.45 mcm and net annual ground water availability has been estimated to be 677.14 mcm. Gross annual ground water draft for all uses has been estimated to be 1399.58 mcm with stage of ground water development at 207 %. In addition, net annual availability of saline ground water resource in Phagi block has been assessed to be 23.47mcm against which net annual withdrawal has been estimated as 23.96 mcm with stage of ground water development at 102%.

Graphical representation of the resources is shown in **Figure 7**. Blockwise details of ground water resources are given in Table 4.

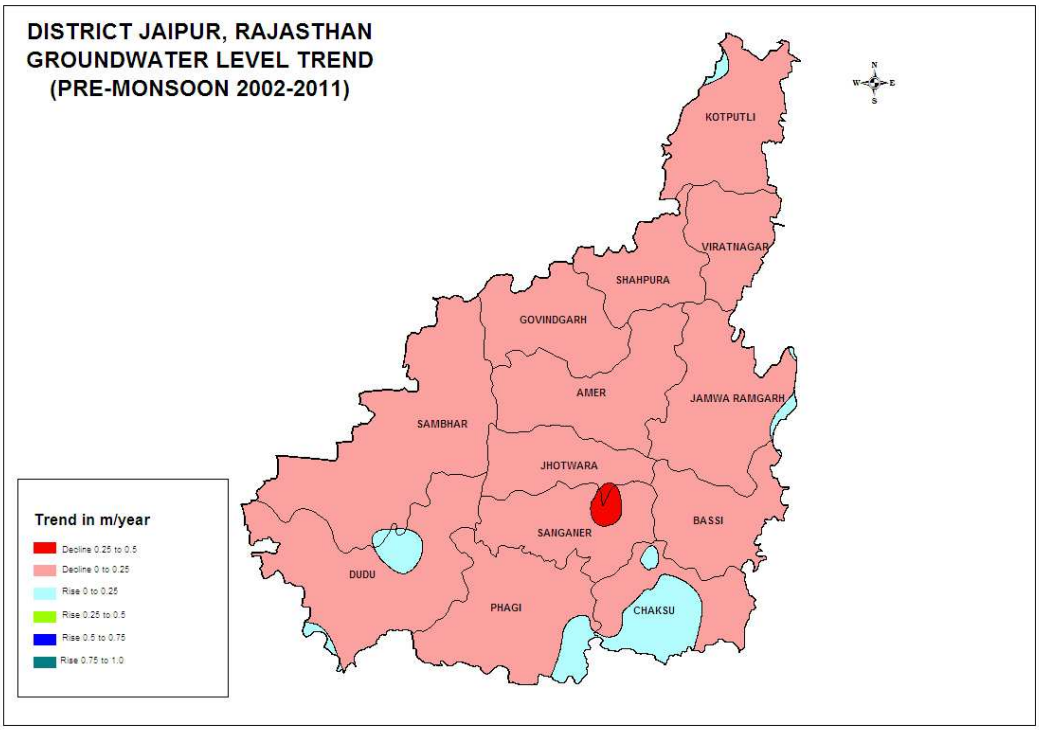

Figure 6: Water Level Trend (Premonsoon- 2002-2011)

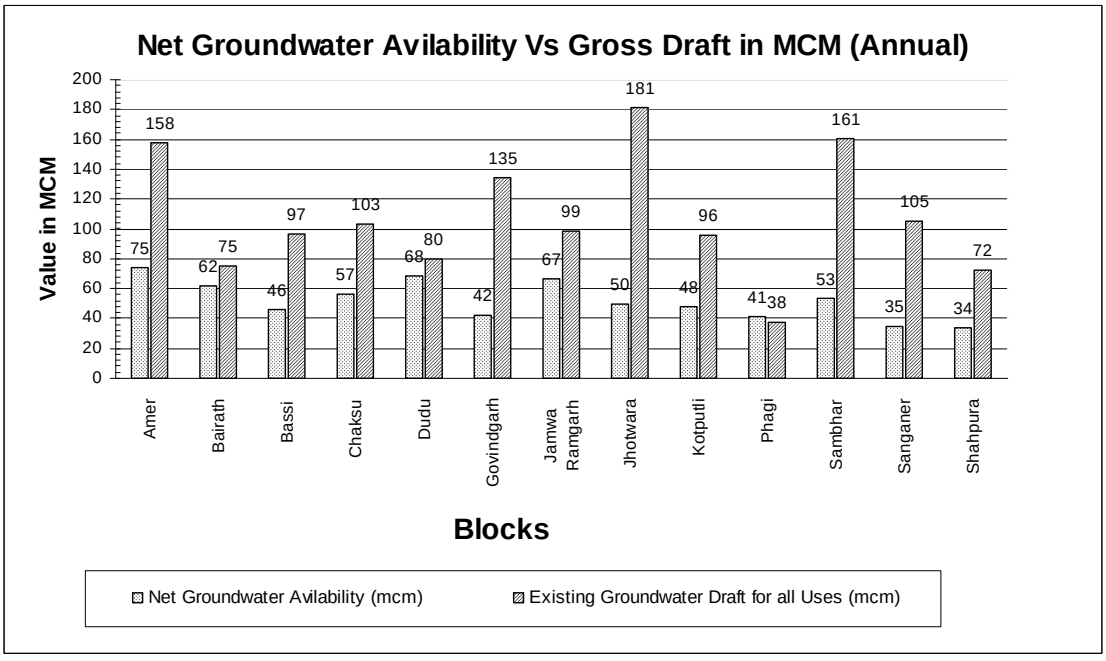

Figure 7: Ground Water Resources (March 2009)

Table 4: Block wise Ground Water Resources (March 2009)

Block	Total Annual Ground Water Recharge (mcm)	Net Annual Ground Water Availab-Ility (mcm)	Gross Ground Water Draft For Irrigation (mcm)	Gross Ground Water Draft For Dom.& Ind. Use (mcm)	Gross Ground Water Draft For All Uses (mcm)	Stage of G.W. Develop ment (%)	Category
Amer	82.8154	74.5339	137.3925	20.6352	158.0277	212.02	OE
Bairath	69.1687	62.2519	63.8759	11.1239	74.9998	120.48	OE
Bassi	51.2634	46.2319	85.5095	11.2581	96.7676	209.31	OE
Chaksu	62.9661	56.6694	96.7102	6.1156	102.8258	181.45	OE
Dudu	76.0314	68.4283	60.7148	19.5307	80.2455	117.27	OE
Govindgarh	46.9764	42.2788	120.7710	13.8125	134.5835	318.32	OE
J. Ramgarh	73.9829	66.5846	93.1739	5.5619	98.7358	148.29	OE
Jothwara	46.9764	49.7755	72.4213	109.0141	181.4355	364.51	OE
Kotputli	53.0348	47.7313	85.8234	9.7675	95.5909	200.27	OE
Phagi	43.9864	41.2260	34.3176	3.3876	37.7052	91.46	Critical
Sambhar	58.9852	53.0867	149.5234	11.3876	160.9110	303.11	OE
Sanganer	38.3462	34.5092	82.7363	22.6631	105.3994	305.42	OE
Shahpura	37.5924	33.8332	63.4388	8.9117	72.3505	213.84	OE
TOTAL	742.1257	677.1407	1146.4086	253.1695	1399.5782	206.69	OE

4.3 Ground Water Quality

For the evaluation of hydrochemical status and distribution of various chemical constituents in ground water, a total of 55 water samples were collected from various observation wells located throughout the district during May 2011.

4.3.1 Electrical Conductivity (EC)

Electrical conductivity varies from 370 µS/cm at 25°C at Datal Gurjaran in Jamwa Ramgarh block to 12310 µS/cm at 25°C at Nasnota in Dudu block. Electrical conductivity more than 3000 µS/cm at 25°C has been observed in parts of Dudu, Sambhar, Chaksu, Jamwa Ramgarh and Kotputli blocks (Fig. 8). Electrical conductivity more than 10000 µS/cm at 25°C has been observed only from isolated pocket in Dudu block.

4.3.2 Fluoride (F)

Occurrence of high fluoride in ground water in the district is a great concern. Fluoride concentration in the district ranges from 0.16 mg/ litre at Nasnota, Dudu block to 16.4 mg/litre at Phulera, Sambhar block. About 29% of ground water samples collected for chemical analysis have shown fluoride value beyond maximum permissible limit of 1.5 mg/litre (**Figure 9**). Around 64% and 7% of samples have Fluoride content within the desirable (1 mg/litre) and maximum permissible limits respectively. Dudu, Sambhar, Phagi, Chaksu, Sanganer, Jothwara and Jamwa Ramgarh blocks are the worst affected blocks with Fluoride contamination.

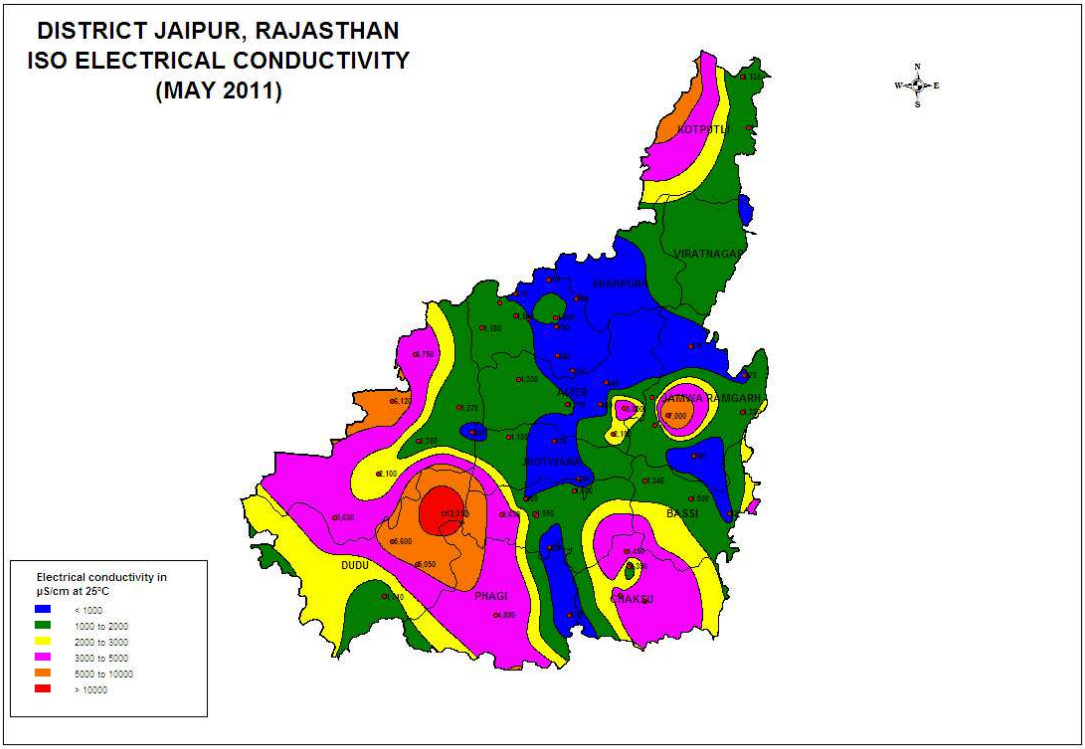

Figure 8: Iso Electrical Conductivity(May, 2011)

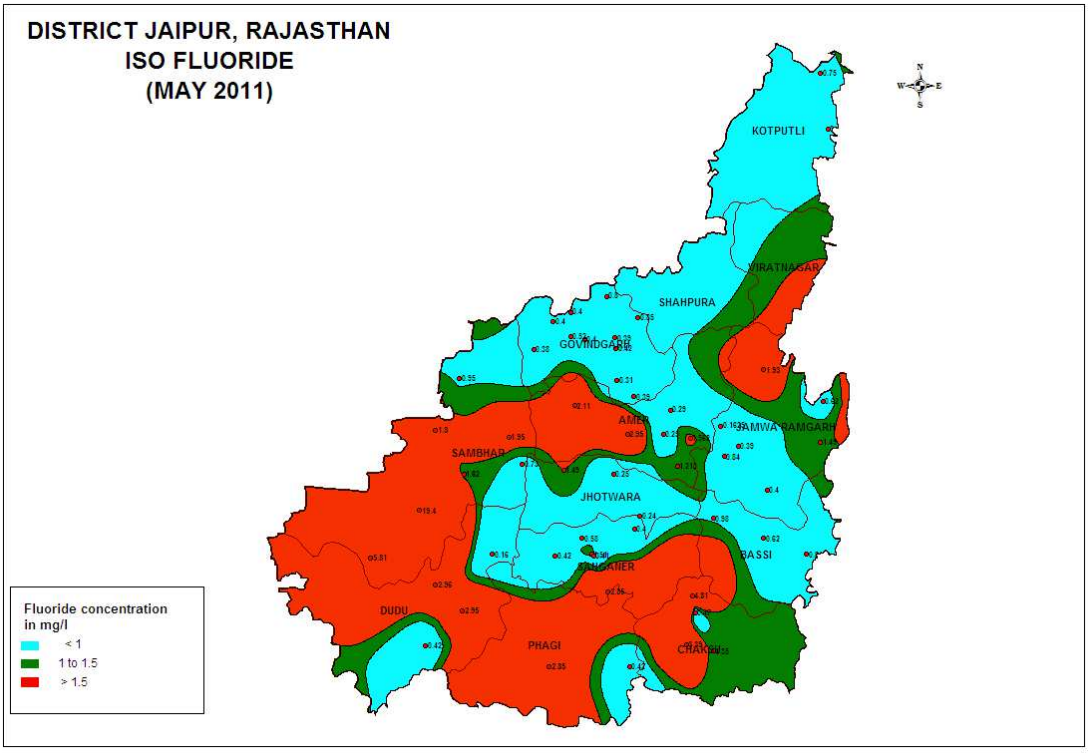

Figure 9: Iso Fluoride Map (May, 2011)

4.3.3 Nitrate (NO_3)

Nitrate concentration in ground water has been found to vary from <1mg/litre at Gonera, Kotputli block to 716 mg/litre at Kukas, Amer block. Nitrate concentration beyond maximum permissible limit of 45 mg/litre has been reported from parts of Amer, Chaksu, Dudu, Phagi, Sambhar and Sanganer blocks **(Figure 10)**. Around

91% of samples have nitrate values within the maximum permissible limit and rest 9% samples have nitrate beyond permissible limit.

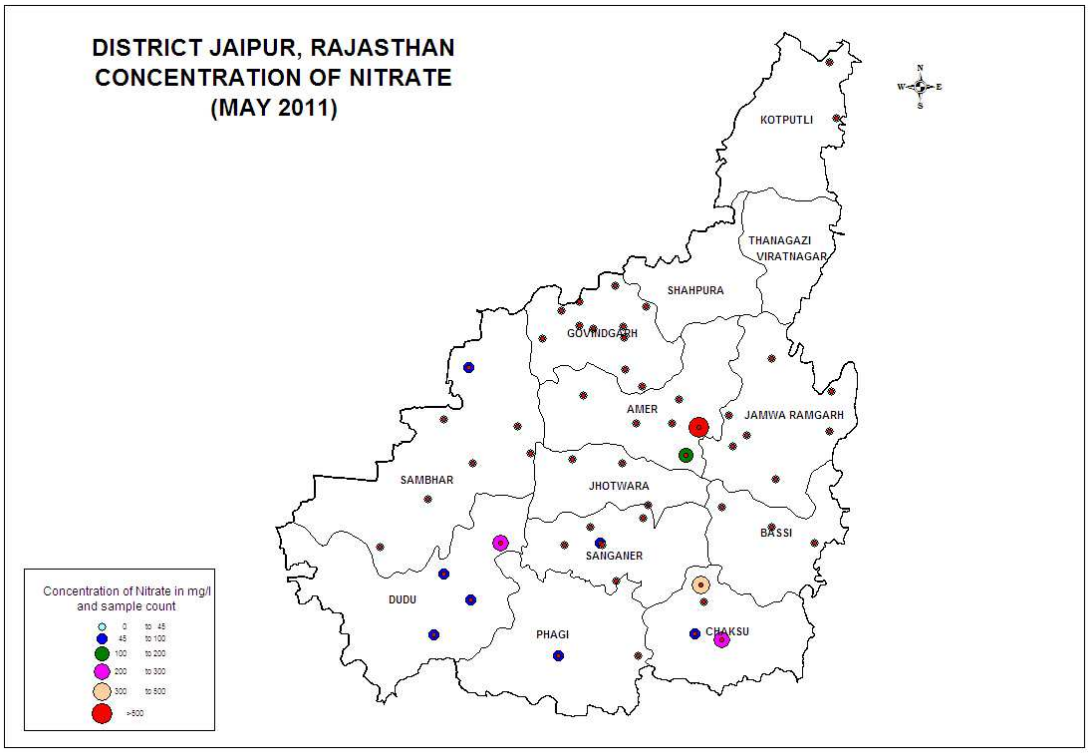

Figure 10: Nitrate distribution (May, 2011)

4.3.4 Iron (Fe)

Iron concentration in ground water in the district varies from 0.08 mg/litre at Datal Gurjaran, Jamwa Ramgarh block to 4.81 mg/litre at Mozmabad, Dudu block. In major part of the district, iron content in ground water is within the maximum permissible limit of 1.0 mg/litre (**Figure 11**). Out of 55 water samples analysed, only 16% of samples have iron concentration beyond the permissible limit of 1.0 mg/litre, 58% samples have iron content within the desirable limit of 0.3 mg/litre and the rest 26% samples have iron content within maximum permissible limit (0.31 to 1.0 mg/litre). Higher concentration of iron has been reported from Dudu, Phagi, Sanganer, Chaksu, Bassi, Amer and Jamwa Ramgarh blocks.

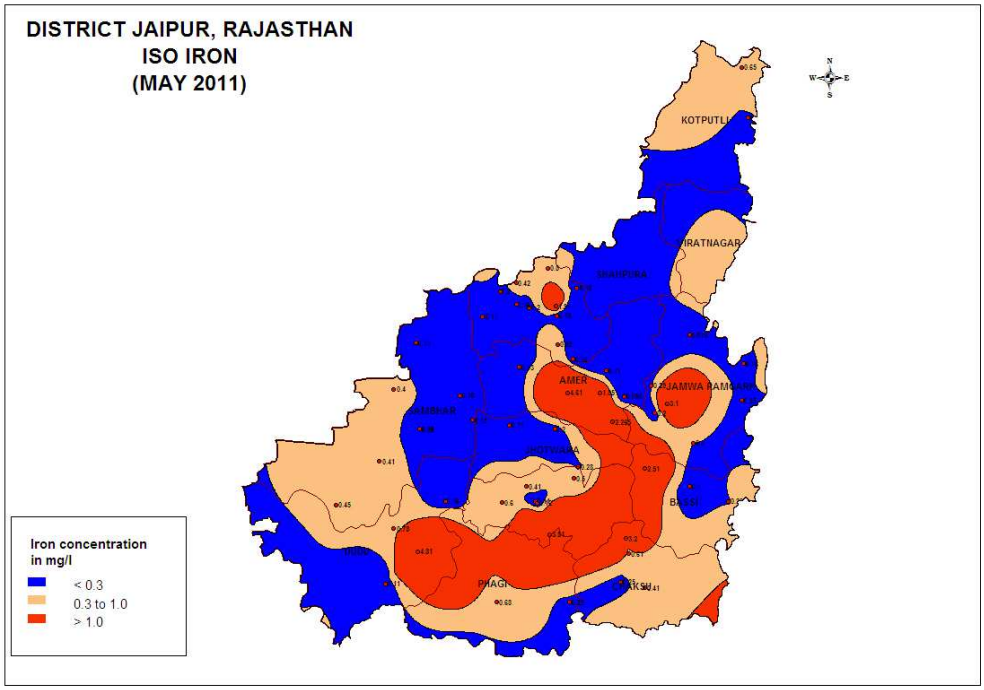

Figure 11: Iso Iron

Classification of ground water samples was carried out based on the desirable and maximum permissible limits for the parameters viz., TDS, TH, Ca, Mg, Cl, SO_4 and NO_3 prescribed in the Drinking Water Standards by BIS and is given in **Table 5**.

Table 5: Classification of Ground Water Samples based on BIS Drinking Water Standards (IS-10500-91, Revised 2003)

Parameters	DL	MPL	Samples with conc. < DL	Samples with conc. in DL-MPL	Samples with conc. >MPL
TDS	0 to 500	501 to 2000	8	34	13
TH	0 to 300	301 to 600	38	8	9
Cl	0 to 250	251 to 400	37	17	7
SO4	0 to 200	201 to 400	46	5	4
NO3	0 to 45	46 to 100	43	7	5
Ca	0 to 75	76 to 200	38	11	6
Mg	0 to 30	31 to 100	35	15	5
F	0 to 1	1.01 to 1.5	35	4	16
Fe	0 to 0.30	0.31 to 1.0	32	14	9

(Here, DL- Desirable Limit, MPL- Maximum Permissible Limit)

Overall, the ground water quality in the wells monitored is good for irrigation purpose and there is a less possibility of developing sodium hazard.

4.4 Status of Ground Water Development

Rainfall in the district is the main source of ground water recharge. Due to less rainfall and increased ground water withdrawals, the groundwater levels are declining. Irrigation in the area is mainly done by ground water i.e. dug wells and tube wells. At present there are 120471 dugwells/ dug cum borewells/ tubewells for irrigation and 27378 handpumps/ dug cum borewells/ tubewells for domestic and industrial use. The stage of ground water development for the district is 207% as on

31.03.2009. Out of 13 blocks, only one block viz. Phagi falls under Critical Category and the remaining blocks are Over-exploited with stage of ground water development varying from 117% in Dudu to 364 % in Jothwara.

5.0 Ground Water Related Issues and Problems

Long term water level data (pre monsoon 2002-2011) have indicated declining water level trend in the district. All the blocks except one block fall under Over exploited category, which necessitates regulation and control of ground water withdrawals through notification of blocks and further imposing ban on construction of ground water abstraction structures except under indispensable cases.

Dudu, Sambhar, Chaksu, Jamwa Ramgarh and Kotputli blocks are affected by salinity problem. Further many areas in the district have problem of fluoride contamination in ground water.

6.0 Ground Water Management Strategy

Due to pressure of population and improvement in the standard of living, the demand of fresh water for both agriculture and domestic use has substantially increased. As surface flow is available only for a limited period, ground water withdrawal has sharply increased. The top layer of fresh ground water is also reducing every year. Artificial recharge serves as a means for restoring the depleted ground water storage, slow down the quality deterioration and put back into operation many groundwater abstraction structures.

6.1 Ground Water Development

Stage of ground water development in twelve out of thirteen blocks in the district has exceeded 100%, which indicates that the scope of ground water development is already exhausted in these blocks and the blocks have been categorized as “Over-exploited”. There is no scope for further development of ground water in the district for irrigation or industrial use. However, exploratory drilling can be taken up in unexplored area for estimation of aquifer parameters. There is need to control and regulate ground water development in all the over-exploited blocks in the district. In Phagi block, which falls under Critical category, caution needs to be exercised so as not to further deplete the resource. Further, there is need to check over-exploitation of ground water resources in the district.

6.2 Water Conservation and Artificial Recharge

After detailed scientific studies, massive programme needs to be taken up for artificial recharge to groundwater using suitable techniques like harvesting roof top rainwater (RTRWH), urban storm rainwater runoff, village storm water run off, dug well recharge in farms, constructing sub surface barriers across streams/rivers and nallas along with watershed development projects in hard rock terrains. Grey water like sewerage water needs to be recharged after proper treatment. Amanishah Nala and other recharge areas should be taken care of in order to prevent pollution and encroachment. State Government has made it mandatory for all new houses with plot area over 500 sq. m (presently reduced to 300 sq. m) in urban/suburban areas for RTRWH. However, there is urgent need to make it mandatory for all sizes of plots and existing houses for effective results. Awareness creation along with financial incentives is the need of the hour for promoting construction of recharge structures. Techniques of groundwater recharge should percolate down to common man through numerous Training Programmes

Central Ground Water Board has implemented demonstrative projects for construction of roof top rain water harvesting structures in Jaipur urban area under the Central Sector scheme during VIII and IX Plan periods. Details of these structures constructed are given in Table 6.

Table 6: RTRH structures constructed by CGWB in Jaipur Urban Area

S. No.	Name of scheme / building	No. of sites	Catchment area (m_2)	Benefits (Average annual recharge to groundwater in m^3)
1	Central Ground Water Board	1	1250	411
2	Governor's House	2	1598	525
3	Chief Minister's residence	1	2546	836
4	Secretariat (SE) and (SW)	2	8528	2802
5	High Court	1	4420	1452
6	Malviya Regional Engineering College (MREC)	1	5348	1757
7	Vitta Bhawan	1	4167	1369
8	Ground Water Department	1	1050	345
9	Reserve Bank of India	1	7000	2300
10	Officers Training School (Nehru Bhawan)	1	7626	2505
11	Sinchai Bhawan	1	5197	1707
12	Public Health Engineering Department (New)	1	3385	NA
13	Collectorate	1		NA

7.0 Mass Awareness and Training Activities

Central Ground Water Board has been organizing Mass Awareness Programmes in different parts of the state to educate local people about the existing ground water situation and need for water conservation and rainwater harvesting. Two Mass Awareness Programme were organized in Jaipur during 2006-07 and 2011-12. Further, 5 Water Management Training Programmes were conducted during 2001-02, 2002-03, 2003-04 and 2010-11 at Alwar, Behror and Neemrana respectively. Besides, these Rain Water Harvesting Week was observed at Jaipur during 21-25 February, 2005. In addition State level painting competitions for students of classes IV, V and VI were organised at Jaipur during 2010-11, 2011-12 and 2012-13.

8.0 Notification of Areas by Central Ground Water Authority

Central Ground Water Authority constituted under Section 3(3) of Environment (Protection) Act of 1986 has notified Jothwara block w.e.f. 14.9.2006 and Sambhar,

Govindgarh, Sanaganer, Shahpura, Bassi and Amer blocks w.e.f. 13.8.2011. In such areas, construction of new ground water abstraction structures is banned without prior permission of the District Advisory Committee formed by CGWA. The District Collector is authorised for implementation of regulatory measures. NOC for drilling of tubewells by Industries/infra structure projects is not granted in the notified areas.

9.0 Recommendations

- Ground water draft is very high in the blocks. Stage of ground water development in the district has reached 207% due to indiscriminate use. It has to be controlled by preventing further development.
- Revival of traditional rainwater storage system i.e. Baori, open wells, tanka etc. for rainwater conservation for use in day to day life will reduce ground water draft.
- Awareness programme on rainwater harvesting will be beneficial to check decline in water level and justified use.
- Taking advantage of uneven topography of the hard rock area small water harvesting system or earthen dams, up streams of irrigation commands at suitable sites may be constructed to store rainwater. This will increase recharge of ground water which ultimately results in increase yield of wells.
- Modern agriculture management techniques have to be adopted and optimum utilization of the water resource
- High water requirement crops should be discouraged. Proper agricultural extension services should be provided to the farmers so that they can go for alternate low water requirement economical crops.
- Pricing of ground water for irrigation use may also be considered to reduce the stress on ground water.
- Reuse of domestic wastewater for gardening, recharge etc.
- Promoting economic use of water in bathing, cleaning, cooking etc.
- Leakage from domestic taps, pipelines for water supply to urban/ rural areas be checked effectively.
- Treatment of industrial effluents so as to check pollution of fresh groundwater resources
- Use of treated industrial wastewater for irrigation, horticulture and recharge to groundwater