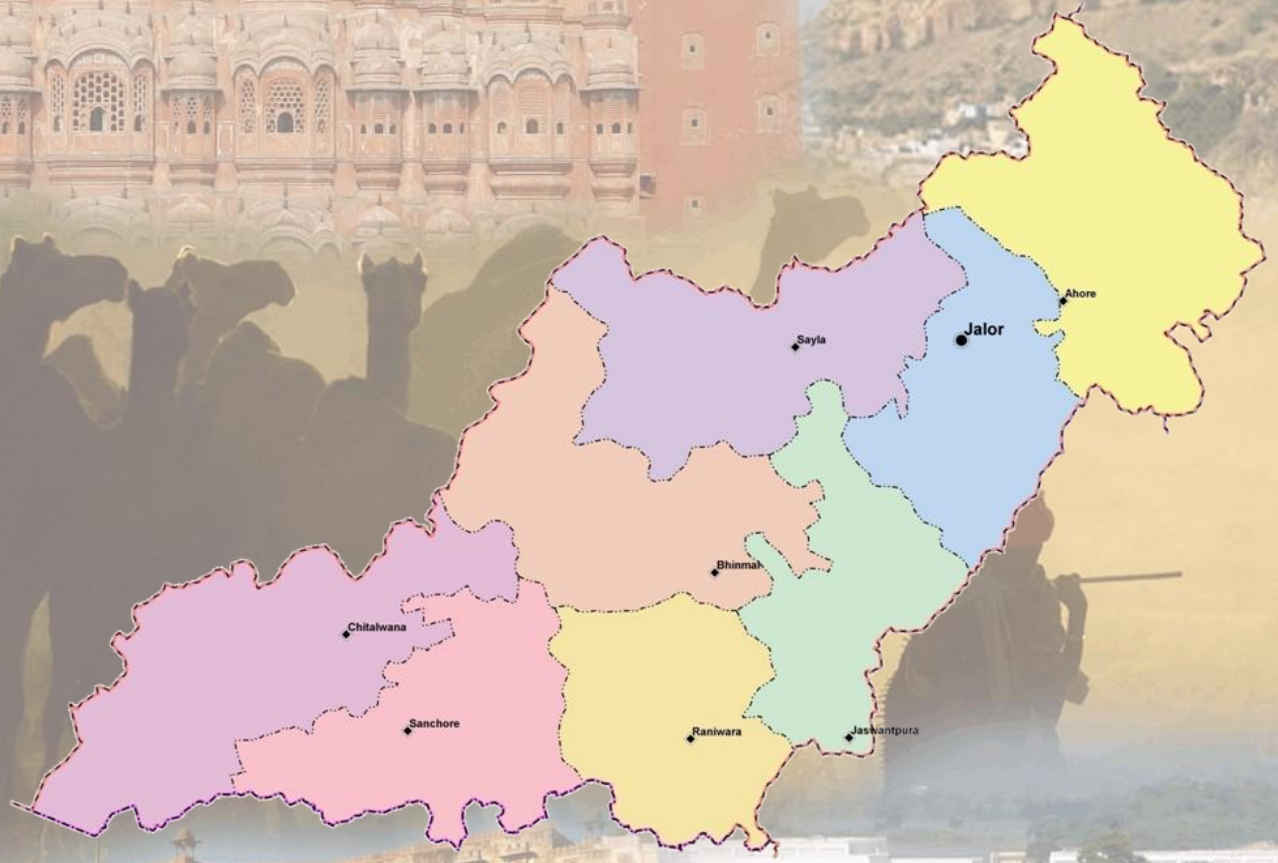
Ground Water Department,
Rajasthan

Hydrogeological Atlas of Rajasthan

Jalor District

European Union
State Partnership Programme



2013

ROLTA
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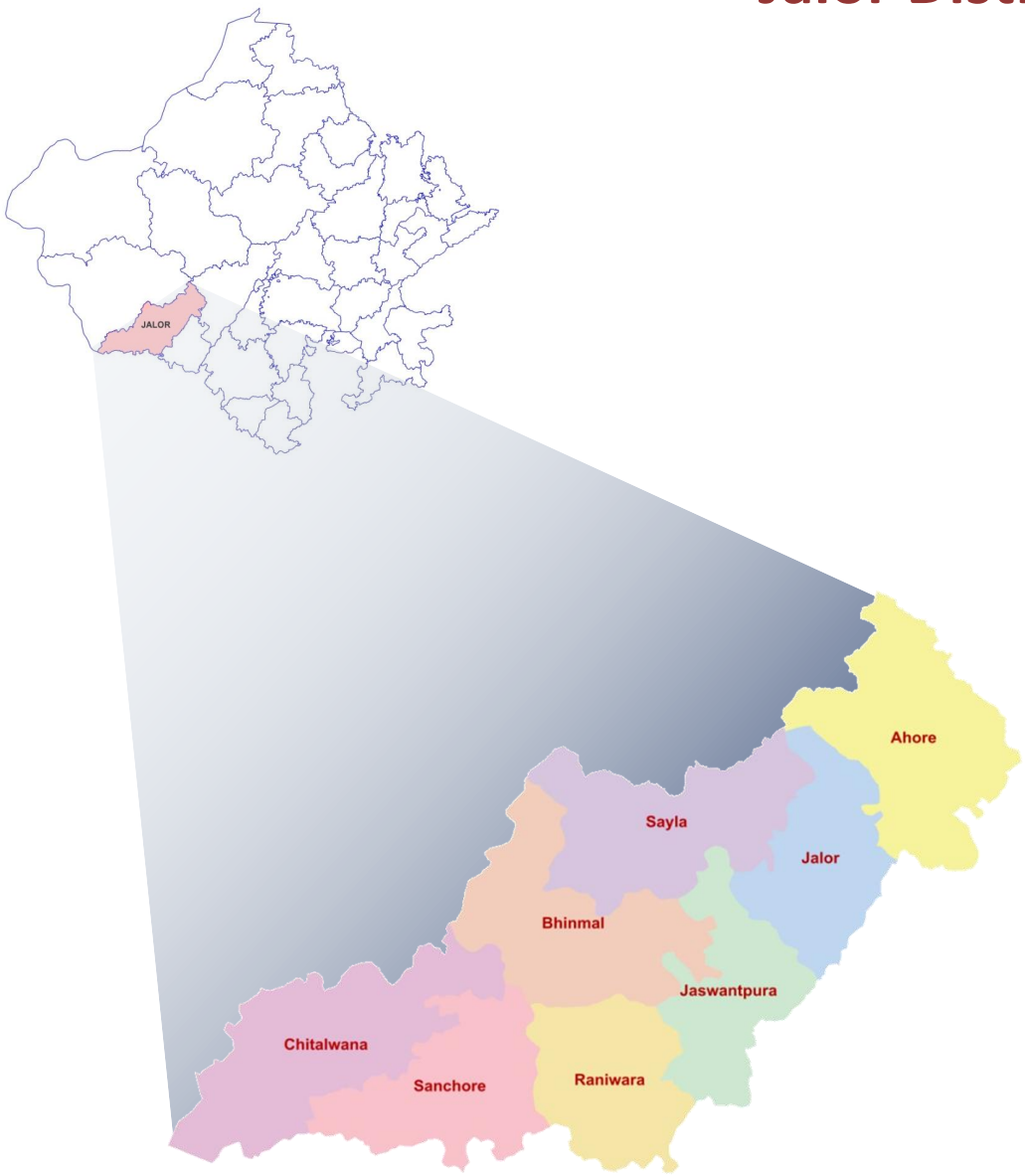
Hydrogeological Atlas of Rajasthan

Jalor District



Contents:

2013

ADMINISTRATIVE SETUP

DISTRICT – JALOR

Location:

Jalor district is located in the southern part of Rajasthan. It is bounded in northwestern side by Barmer district, in the northeast by Pali district, southeast by Sirohidistrict and the southern border is shared with Gujarat state. It stretches between 24° 35' 31.50" to 25° 48' 51.21" north latitude and 71° 09' 13.64'' to 73° 06' 16.62'' east longitude covering an area of 10,647.4 sq kms. The district is located at the eastern fringe of arid western Rajasthan adjoining the Aravali range and while some part of the drainage is covered by 'LuniRIver Basin'and the rest by 'Other Nallah' in the southern part. Important tributaries of Luni River are Sukri, Jawai, Bandi and Sagi.

Administrative Set-up:

Jalor district is administratively divided into eight blocks. The following table summarizes the basic statistics of the district at block level.

S. No.	Block Name	Population (Based on 2001 census)	Area (sq km)	% of District Area	Total Number of Towns and Villages
1	Ahore	1,77,342	1,631.7	15.3	113
2	Bhinmal	2,24,031	1,465.7	13.8	82
3	Chitalwana	1,55,756	1,707.9	16.0	112
4	Jalor	1,76,657	1,082.1	10.2	70
5	Jaswantpura	1,28,410	1,022.9	9.6	75
6	Raniwara	1,63,349	1,086.1	10.2	85
7	Sanchore	2,12,248	1,211.7	11.4	95
8	Sayla	2,11,147	1,439.3	13.5	77
Total		**14,48,940**	**10,647.4**	**100.0**	**709**

Jalor district has 709 towns and villages, of which eight are block headquarters as well.

Climate:

The district has a marginal arid climate that remains dry for most part of the year and has distinct seasons. Summer is most pronounced stretching between late March to July when temperatures soar to >44°C and occasionally reaching upto 50°C. This is followed by mild monsoon season that brings some rains to the district as average rainfall is 412.8 mm. Winters are very cold and extend from November to February and in the month of January, the lowest temperatures as low as 4°C is recorded.

Ground Water Department,
Rajasthan

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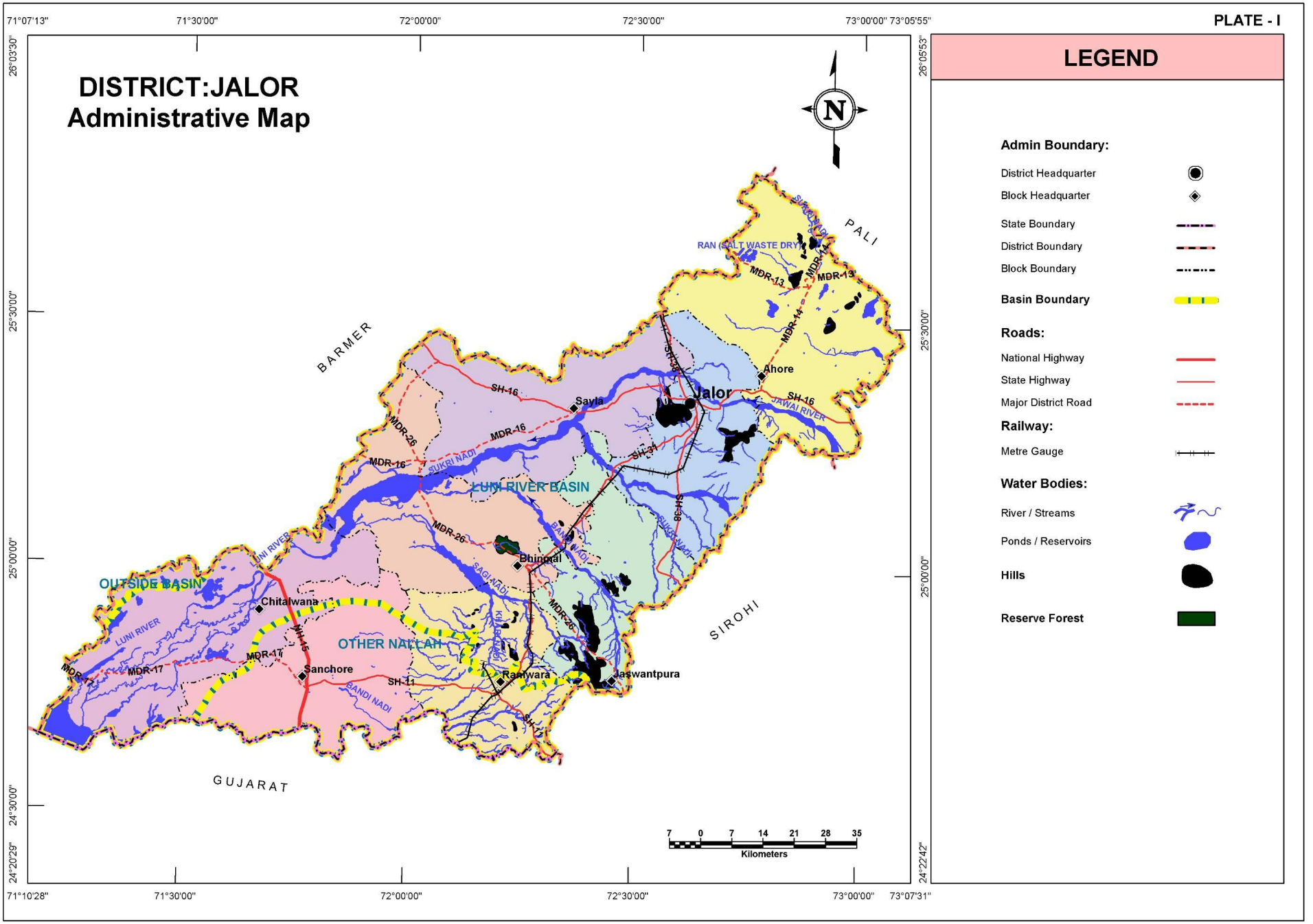
State Partnership Programme

PLATE - I



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Roads:

- National Highway
- State Highway
- Major District Road

Railway:

- Metre Gauge

Water Bodies:

- River / Streams
- Ponds / Reservoirs
- **Hills**
- **Reserve Forest**

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TOPOGRAPHY

DISTRICT – JALOR

Major part of the district consists of extensive alluvial plains and occasionally in the northeastern and central parts rugged hill ranges mark the topography. The Jalor district falls within parts ofLuni (Sanchore and Chitalwana blocks) Other Nallahs and small area by Outside Basin. The general topographic elevation in the district is between 0m above mean sea level to 250m amsl in most of the blocks. The minimum elevation of 0.0m amsl in found in Chitalwana block in the southwestern part of the district whereas the maximum of 967.4 m amsl is recorded in Jaswantpura block in the southeastern part of the district.

Table: Block wise minimum and maximum elevation

S. No.	Block Name	Minimum Elevation (m amsl)	Maximum Elevation (m amsl)
1	Ahore	134.7	775.6
2	Bhinmal	41.5	373.8
3	Chitalwana	0.0	85.8
4	Jalor	126.8	771.3
5	Jaswantpura	113.2	967.4
6	Raniwara	81.7	504.2
7	Sanchore	15.9	156.4
8	Sayla	68.6	616.3

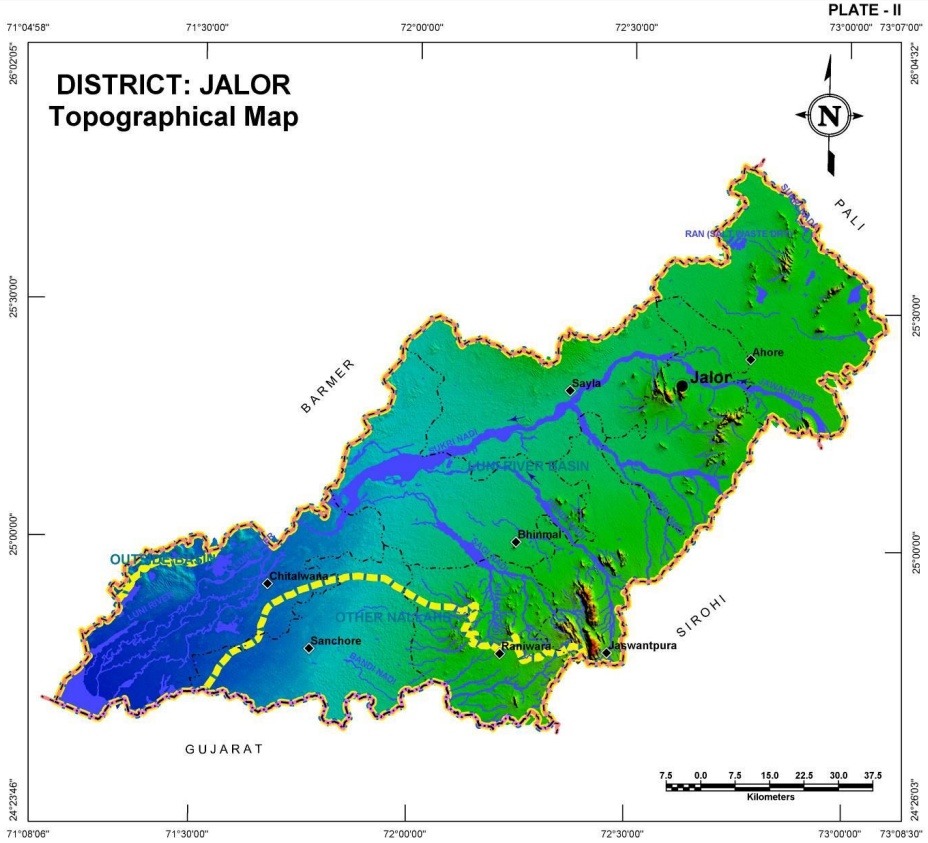
RAINFALL

Fairly good rainfall is received by the district. The general distribution of rainfall across can be visualized from isohyets presented in the Plate – III where rainfall is seen to gradually increase from northeast to southwest. The average annual rainfall is 762.3 mm based on the data of available blocks. Maximum rainfall occurs in Raniwara block (1,220.8 mm) whereas minimum was in Bhinmal block (499.2 mm). Raniwara block has received highest average annual rainfall of about 1,051.6 mm.

Table: Block wise annual rainfall statistics (derived from year 2010 meteorological station data)

Block Name	Minimum Annual Rainfall (mm)	Maximum Annual Rainfall (mm)	Average Annual Rainfall (mm)
Chitalwana	642.1	882.4	782.9
Ahore	525.9	638.8	558.0
Bhinmal	499.2	862.5	667.6
Jalor	535.5	782.9	618.7
Jaswantpura	699.0	1,090.8	849.2
Raniwara	816.2	1,220.8	1,051.6
Sanchore	774.9	1,086.5	923.2
Sayla	520.3	752.6	647.0

PLATE - II



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

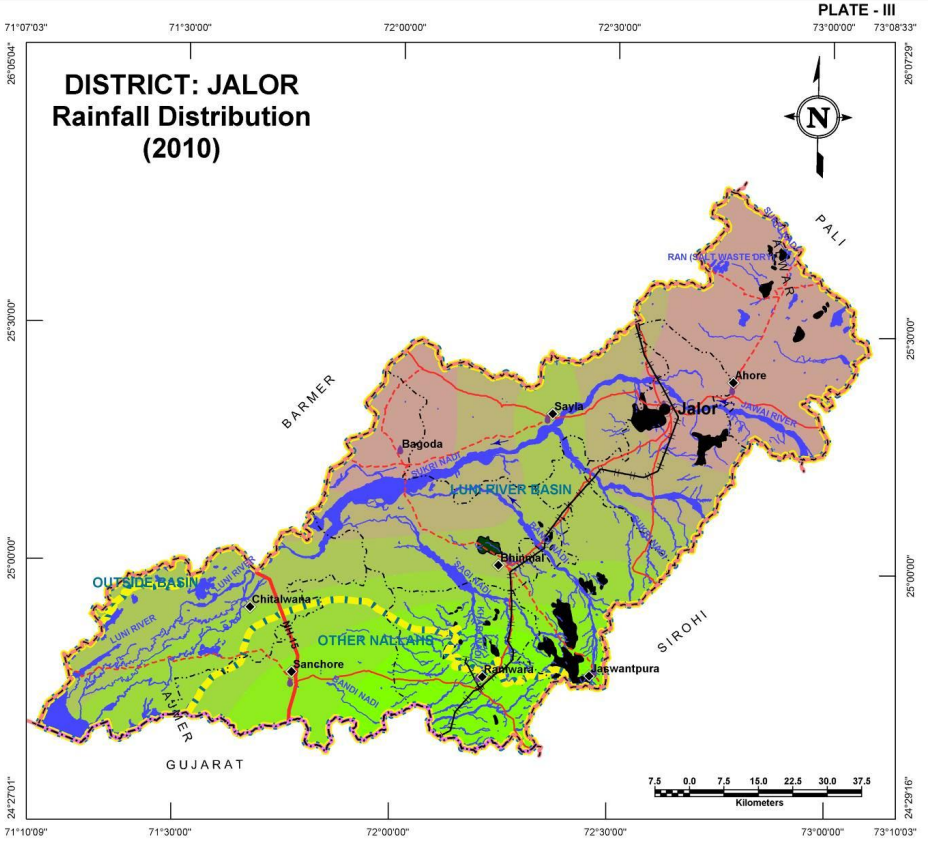
Water Bodies:
- River / Streams
- Ponds / Reservoirs

Source : SRTM DEM

Elevation (m amsl):

967
875
750
625
500
375
250
125
0

PLATE - III



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Raingauge Stations
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Roads:
- National Highway
- State Highway
- Major District Road

Railway:
- Broad Gauge
- Metre Gauge

Water Bodies:
- River / Streams
- Ponds / Reservoirs

Hills

Reserve Forest

Isohyets (mm):
- 400-500
- 500-600
- 600-700
- 700-800
- 800-900
- 900-1000
- > 1000

GEOLOGY

DISTRICT – JALOR

Geologically, the entire district is covered by a sand and alluvium except some exposure of different rock types. The metasedimentary rocks such as phyllite, schists, marble and quartzite belonging to Delhi Super Group occur only as inclusions within the dominant granites and rhyolites. Jalor granite is most common in the district. The Erinpura granite occupies the Eastern and Northeastern part of the district which is rare granite. Malani rhyolite occupies the small part of Northeastern and eastern part of the district.

Age	Group	Formation
Recent to sub Recent	Recent to sub Recent	Sand, alluvium etc
Proterozoic	Post-Delhi	Malani rhyolite
		Jalor granite
		Erinpura granite

GEOMORPHOLOGY

Table: Geomorphologic units, their description and distribution

Origin	Landform Unit	Description
Aeolian	Dune Valley Complex	Cluster of dunes and interdunal spaces with undulating topography formed due to wind-blown activity, comprising of unconsolidated sand and silt.
	Eolian Plain	Formed by aeolian activity, with sand dunes of varying height, size, slope. Long stretches of sand sheet. Gently sloping flat to undulating plain, comprised of fine to medium grained sand and silt. Also scattered xerophytic vegetation.
	Obstacle Dune	Formed on windward/leeward sides of obstacle like isolated hills or continuous chain of hills, dune to obstruction in path of sand laden winds. Badly dissected well cemented and vegetated.
	Sandy Plain	Formed of aeolian activity, wind-blown sand with gentle sloping to undulating plain, comprising of coarse sand, fine sand, silt and clay.
Denudational	Buried Pediment	Pediment covers essentially with relatively thicker alluvial, colluvial or weathered materials.
	Intermontane Valley	Depression between mountains, generally broad & linear, filled with colluvial deposits.
	Pediment	Broad gently sloping rock flooring, erosional surface of low relief between hill and plain, comprised of varied lithology, criss-crossed by fractures and faults.
Fluvial	Alluvial Plain	Mainly undulating landscape formed due to fluvial activity, comprising of gravels, sand, silt and clay. Terrain mainly undulating, produced by extensive deposition of alluvium.
	Alluvial Plain (Sandy)	Flat to gentle undulating plain formed due to fluvial activity, mainly consists of gravels, sand, silt and clay with unconsolidated material of varying lithology, predominantly sand along river.
	Flood Plain	The surface or strip of relatively smooth land adjacent to a river channel formed by river and covered with water when river over flows its bank. Normally subject to periodic flooding.
	Salt Encrustation/Playa	Topographical depression comprising of clay, silt, sand and soluble salts, usually undrained and devoid of vegetation.
Hills	Denudational, Structural Hill, Linear Ridge	Steep sided, relict hills undergone denudation, comprising of varying lithology with joints, fractures and lineaments. Linear to arcuate hills showing definite trend-lines with varying lithology associated with folding, faulting etc. Long narrow low-lying ridge usually barren, having high run off may form over varying lithology with controlled strike.

PLATE - IV

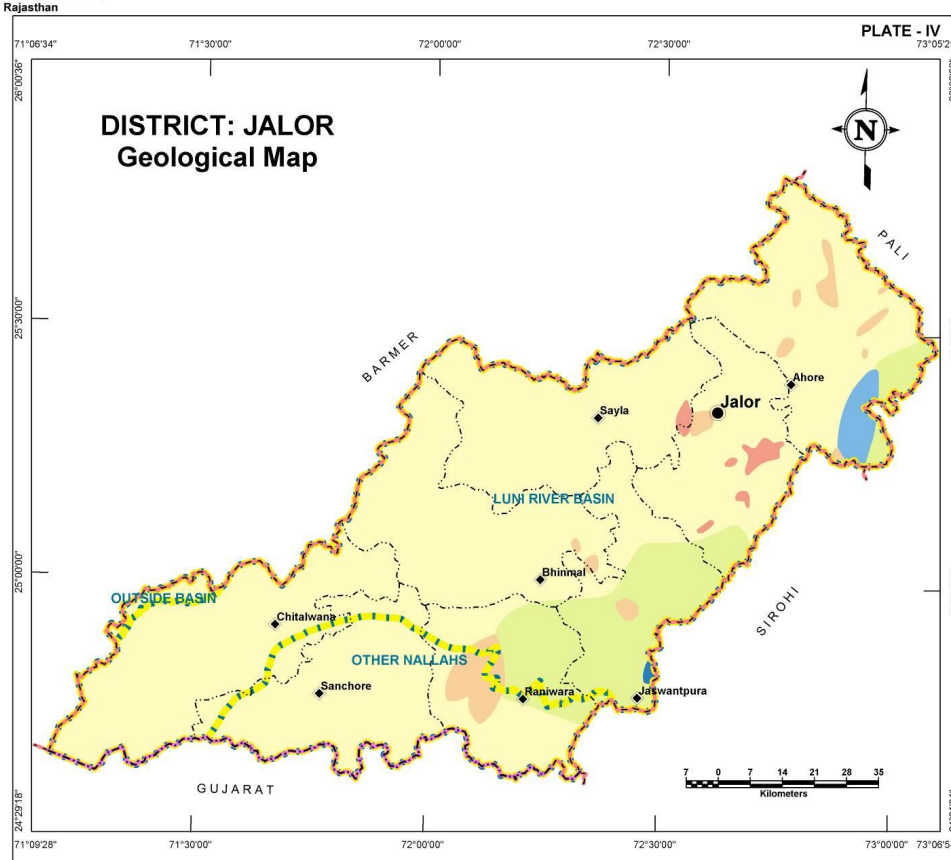
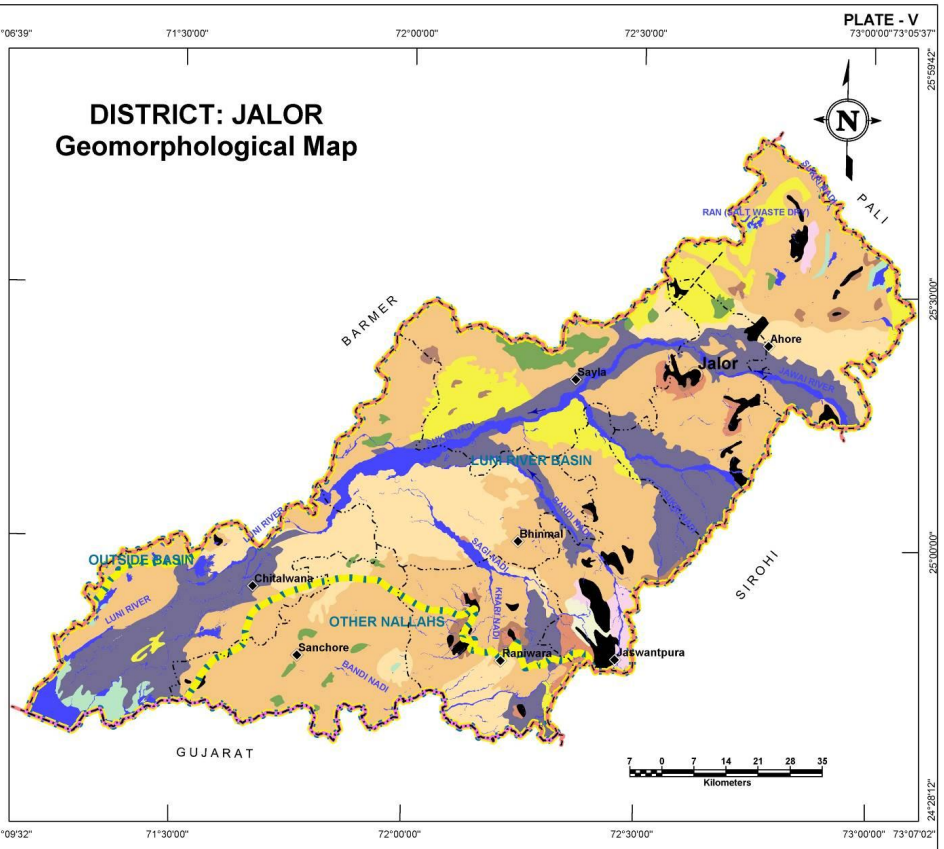


PLATE - V



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Geology:
- Alluvium and Wind blown sand
- Mundwara Alkaline Complex
- Malani Plutonic
- Erinpura Granite & Gneiss
- Volcanic Suite
- Sirohi Group

Source: District Resource Map of Rajasthan - GSI

LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:
- River/Ponds/Reservoirs

Structural Features:
- Fault/Fractures/Lineament

Hills:
- Structural/Denudational/Linear Ridge

Landform Units:

Fluvial Origin:
- Alluvial Plain
- Alluvial Plain (Sandy)
- Flood Plain
- Salt Encrustation/Playa

Denudational Origin:
- Pediment
- Burried Pediment
- Intermontane Valley

Aeolian Origin:
- Sandy Plain
- Eolian Plain
- Dune Valley Complex
- Obstacle Dune

Source: Ground Water Atlas of Rajasthan - SRSAC & GWD, Rajasthan

AQUIFERS

DISTRICT – JALOR

The aquifers in the district are formed primarily in alluvium, both Older and Younger alluvium which account for 77% and about 14% respectively. In addition, aquifers are also formed occasionally in the weathered, fractured and jointed hardrocks belonging to Rhyolite and Granitic rocktypes which together occupy about 7% of the district aquifer area.

Table: aquifer potential zones their area and their description

Aquifer in Potential Zone	Area (sq km)	% age of district	Description of the unit/Occurrence
Younger Alluvium	1,450.1	13.6	It is largely constituted of Aeolian and Fluvial sand, silt, clay, gravel and pebbles in varying proportions.
Older Alluvium	8,201.6	77.0	This litho unit comprises of mixture of heterogeneous fine to medium grained sand, silt and kankar.
Rhyolite	81.3	0.8	Rhyolite is porphyritic and has phenocryst of quartz and feldspar.
Granite	694.4	6.5	Light grey to pink colour, medium to coarse grained, and characteristically have porphyritic texture.
Non Potential Zone (Hills, RF)	220.0	2.1	
Total	**10,647.4**	**100.0**	

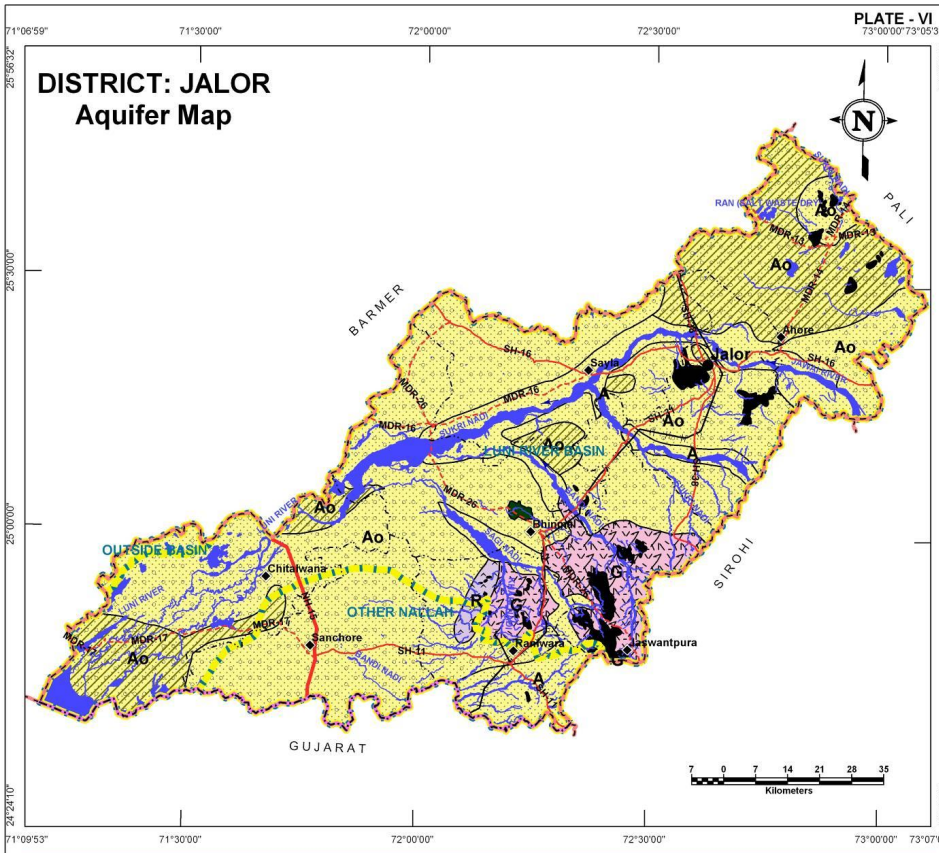
STAGE OF GROUND WATER DEVELOPMENT

Ground water in the district is under stress as indicated by the categorization of the blocks on the basis of stage of development. Three blocks fall under the 'Over Exploited' category which means the development of ground water already exceeds the recharge the area receives and the remaining five blocks are under severe stress because they fall under the 'Notified' category implying no further development of ground water is permitted.

Categorization on the basis of stage of development of ground water	Block Name
Over Exploited	Chitalwana, Jaswantpura, Ahore
Notified	Sanchore, Bhinmal, Raniwara, Salyla, Jalor

Basis for categorization: Ground water development 100% - Over-Exploited. In Notified blocks development of GW is not permitted any more.

PLATE - VI



Admin Boundary:
- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Roads:
- National Highway
- State Highway
- Major District Road

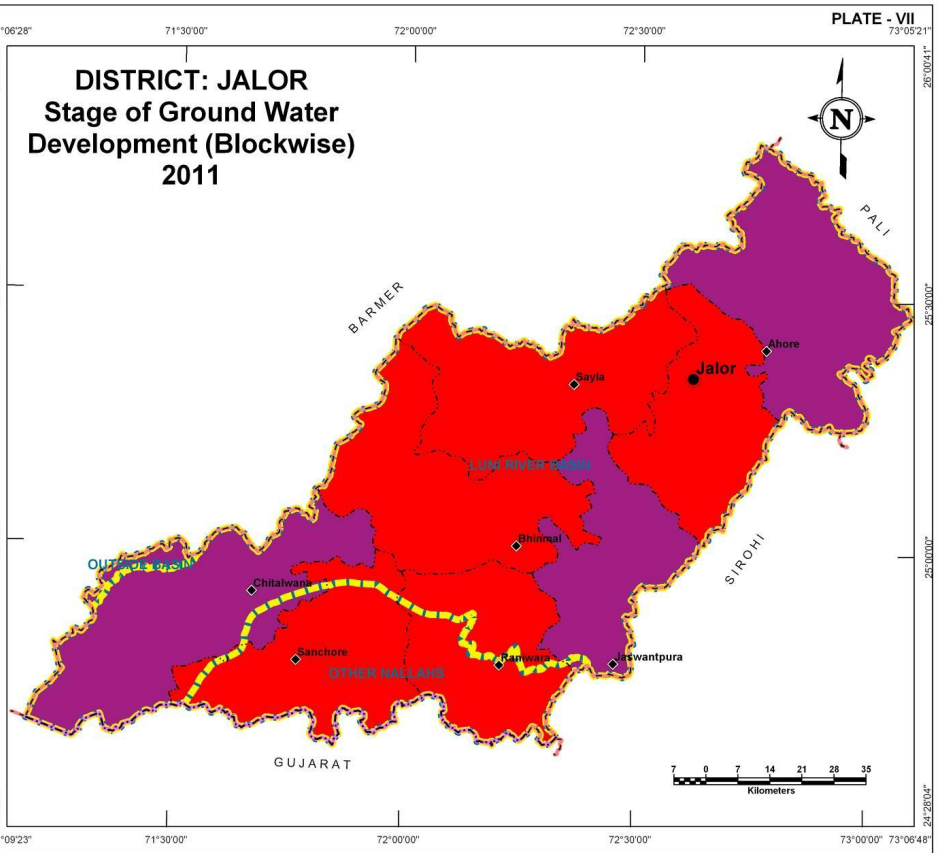
Railway:
- Broad Gauge
- Metre Gauge

Water Bodies:
- River / Streams
- Ponds / Reservoirs
- **Hills**
- **Reserve Forest**
- **Saline Area**

Aquifer:
- Younger Alluvium
- Older Alluvium
- Rhyolite
- Granite

Source: Ground Water Potential Zone Map - GWD, Rajasthan

PLATE - VII



Admin Boundary:
- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Stage of Ground Water Development:
- Over-Exploited
- Notified

Source: Ground Water Department, Rajasthan

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LOCATION OF EXPLORATORY AND GROUND WATER MONITORING WELLS DISTRICT – JALOR

Jalordistrict has a well distributed network of exploratory wells (300) and ground water monitoring stations (247) in the district owned by RGWD (280 and 233 respectively) and CGWB (20 and 14 respectively). The exploratory wells have formed the basis for delineation of subsurface aquifer distribution scenario in three dimensions. Benchmarking and optimization studies suggest that ground water level is being sufficiently monitored but for effectively monitoring the water quality in the district,116 additional wells mustbe added to the network.

Table: Block wise count of wells (existing and recommended)

Block Name	Exploratory Wells			Ground Water Monitoring Stations			Recommended additional wells for optimization of monitoring network	
	CGWB	RGWD	Total	CGWB	RGWD	Total	Water Level	Water Quality
Ahore	-	41	**41**	-	35	**35**	0	2
Bhinmal	5	38	**43**	1	36	**37**	0	23
Chitalwana	3	14	**17**	3	7	**10**	0	0
Jalor	-	47	**47**	1	35	**36**	0	17
Jaswantpura	1	12	**13**	-	27	**27**	0	17
Raniwara	7	20	**27**	4	32	**36**	0	18
Sanchore	2	30	**32**	2	21	**23**	0	6
Sayla	2	78	**80**	3	40	**43**		33
Total	**20**	**280**	**300**	**14**	**233**	**247**	**0**	**116**

DEPTH TO WATER LEVEL (PRE MONSOON – 2010)

10m interval has been adopted to depict the depth to ground water levels in Jalor district as shown in Plate – IX. Depth to water level varies significantly from less than 10m below ground level to more than 90mbgl. Central part of the district i.e., Sayla-Bhinmal-Raniwara region shows deeper water levels of 60m to 80m bglin general, and reaching upto>90m bgl. Northwards, the water level is moderately shallow (about 20-30m bgl) but in down south in the district in Sanchore, Chitalwanablcks around Luni river, the water level is quite shallow occurring 10m-20m bgl occasionally even less than 10m bgl.

Depth to water level (m bgl)	Block wise area coverage (sq km) *								Total Area (sq km)
	Ahore	Bhinmal	Chitalwana	Jalor	Jaswantpura	Raniwara	Sanchore	Sayla	
< 10	68.3	8.5	1,086.7	-	0.2	0.8	245.3	-	**1,409.8**
10-20	439.6	100.4	374.6	72.5	103.9	128.6	269.6	-	**1,489.2**
20-30	791.4	291.9	164.1	513.7	435.8	457.3	237.8	27.0	**2,919.0**
30-40	222.1	292.8	71.1	234.1	169.1	210.6	186.6	118.4	**1,504.8**
40-50	80.5	329.7	11.4	114.9	132.6	155.1	207.0	433.4	**1,464.6**
50-60	6.0	228.2	-	92.5	79.4	97.2	65.4	428.2	**996.9**
60-70	-	105.1	-	-	-	22.7	-	317.2	**445.0**
70-80	-	57.1	-	-	-	0.1	-	108.2	**165.4**
80-90	-	28.3	-	-	-	-	-	-	**28.3**
> 90	-	4.4	-	-	-	-	-	-	**4.4**
Total	**1,607.9**	**1,446.4**	**1,707.9**	**1,027.7**	**921.0**	**1,072.4**	**1,211.7**	**1,432.4**	**10,427.4**

* The area covered in the derived maps is less than the total district area since the hills have been excluded from interpolation/contouring.

PLATE -VIII

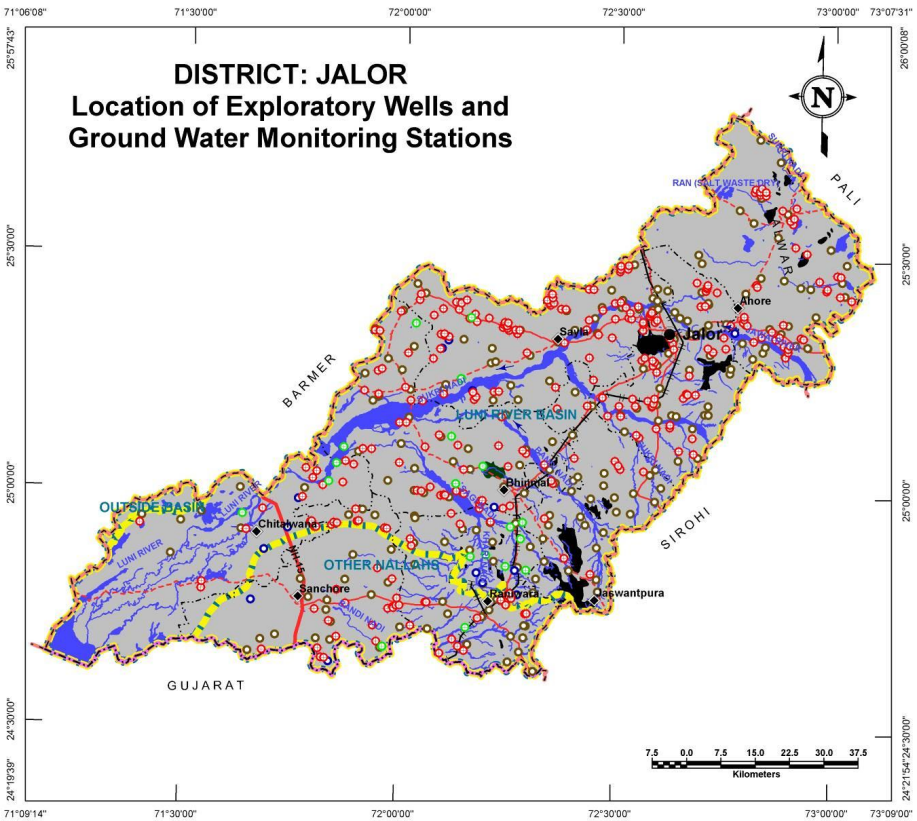
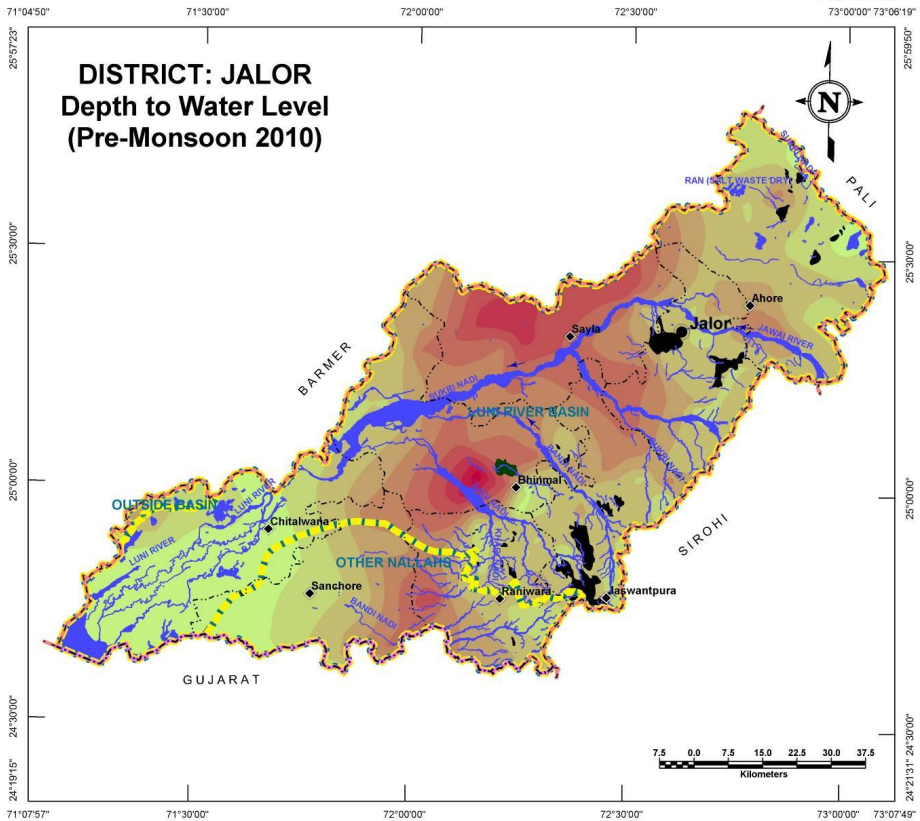


PLATE - IX



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Roads:
- National Highway
- State Highway
- Major District Road

Railway:
- Metre Gauge

Water Bodies:
- River / Streams
- Ponds / Reservoirs
- **Hills**
- **Reserve Forest**

Exploratory Wells:
- CGWB
- RGWD

Ground Water Monitoring Stations:
- CGWB
- RGWD

LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Water Bodies:
- River / Streams
- Ponds / Reservoirs
- **Hills**
- **Reserve Forest**

Depth to Water Level(m bgl):
- < 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- > 90

WATER TABLE ELEVATION (PRE MONSOON – 2010) DISTRICT – JALOR

Major part of the district falls under the lower elevation ranges. The eastern part starting from northeast to southeast shows higher elevation values whereas the western and southwestern part comes under the lower water table. The highest water table elevation is>260m amsl in southeast part (Jaswantpura Block) of the district whereas minimum elevation (<20m amsl) in the Sayla, Sanchore and Chitalwana blocks. The general flow gradient is from east to west and finally the ground water leaves the district from southwest.

Table: Block wise area covered in each water table elevation range

Block Name	Block wise area coverage (sq km) within water table elevation range (m amsl)														Total Area (sq km)
	< 20	20 - 40	40 - 60	60 - 80	80 - 100	100 - 120	120 - 140	140 - 160	160 - 180	180 - 200	200 - 220	220 - 240	240 - 260	> 260	
Ahore	-	-	-	-	-	3	120.9	524.7	491.1	419.5	48.7	-	-	-	**1,607.9**
Bhinmal	-	505	531	133.4	100.3	61.7	84.3	30.7	-	-	-	-	-	-	**1,446.4**
Chitalwana	-	1,707.80	0.1	-	-	-	-	-	-	-	-	-	-	-	**1,707.9**
Jalor	-	-	-	-	29.1	119.4	257.4	236.3	246.1	132.7	6.7	-	-	-	**1,027.7**
Jaswantpura	-	-	-	34.8	64	85	97.2	103	149	113.6	129.2	66.9	50.5	27.8	**921.0**
Raniwara	-	-	11.2	40.2	81.6	97.6	117.9	164.3	202.8	147.1	100.2	58.9	50.6	-	**1,072.4**
Sanchore	-	575.9	416.1	193.5	26.2	-	-	-	-	-	-	-	-	-	**1,211.7**
Sayla	-	95.6	468	497.8	192.7	128.8	49.5	-	-	-	-	-	-	-	**1,432.4**
Total	**-**	**2,884.3**	**1,426.4**	**899.7**	**493.9**	**495.5**	**727.2**	**1,059.0**	**1,089.0**	**812.9**	**284.8**	**125.8**	**101.1**	**27.8**	**10,427.4**

WATER LEVEL FLUCTUATION (PRE TO POST MONSOON 2010)

Ground water level fluctuation maps, Plate – XI reveals a fall of 6 m to rise of upto 14m in the water levels in the district. The –ve fluctuation areas (indicated by pink and red regions) are the areas where water level has gone down in post monsoon period with respect to pre-monsoon levels. Such ground water depletion areas are located in the central, southern and western parts of the district. Rest of the district has shown a general to significant rise in ground water level in the post monsoon season with respect to pre monsoon region. Maximum rise by more than 14m is noticed in the central part i.e., in Raniwara and Jaswantpura blocks.

Table: Block wise area covered in each water fluctuation zone

Block Name	Block wise area coverage (sq km) within water level fluctuation range (m)												Total Area (sq km)
	< -6	-6 to -4	-4 to -2	-2 to 0	0 to 2	2 to 4	4 to 6	6 to 8	8 to 10	10 to 12	12 to 14	> 14	
Ahore	-	-	-	4.2	762.4	602.2	133.8	51.7	32.0	18.5	3.1	-	**1,607.9**
Bhinmal	0.3	3.6	21.7	306.0	726.0	314.5	70.8	3.5	-	-	-	-	**1,446.4**
Chitalwana	-	-	2.7	220.8	1,433.5	50.9	-	-	-	-	-	-	**1,707.9**
Jalor	-	-	-	0.8	267.0	406.3	225.1	94.0	34.5	-	-	-	**1,027.7**
Jaswantpura	-	-	-	-	57.8	163.5	311.8	196.0	116.2	37.0	21.7	17.0	**921.0**
Raniwara	0.9	6.7	30.8	142.4	203.4	257.3	129.0	95.7	59.6	46.6	43.8	56.2	**1,072.4**
Sanchore	-	-	-	68.2	1,038.5	105.0	-	-	-	-	-	-	**1,211.7**
Sayla	-	5.8	25.4	237.0	876.8	242.5	28.2	12.9	3.8	-	-	-	**1,432.4**
Total	**1.2**	**16.1**	**80.6**	**979.4**	**5,365.4**	**2,142.2**	**898.7**	**453.8**	**246.1**	**102.1**	**68.6**	**73.2**	**10,427.4**

Ground Water Department,
Rajasthan

European Union
State Partnership Programme

PLATE - X

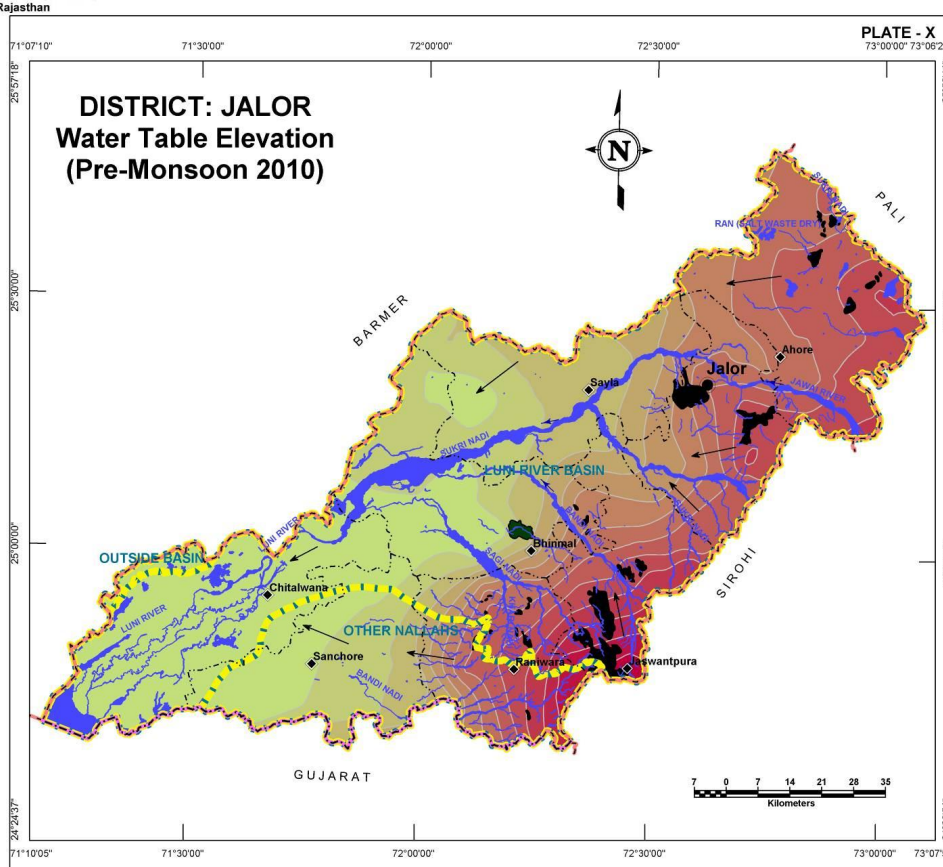
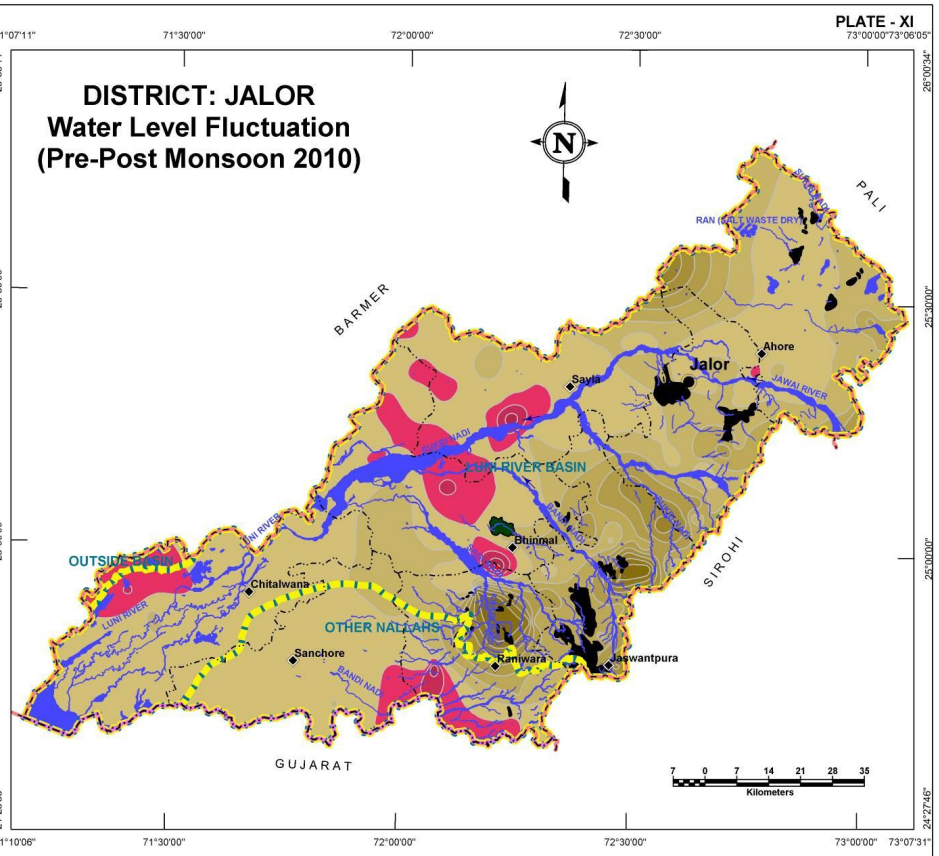


PLATE - XI



Admin Boundary:

- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Water Bodies:

- River / Streams
- Ponds / Reservoirs
- **Hills**
- **Reserve Forest**
- **Water Table Elevation**

Water Table Elevation(m amsl):

- < 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100
- 100 - 120
- 120 - 140
- 140 - 160
- 160 - 180
- 180 - 200
- 200 - 220
- 220 - 240
- 240 - 260
- >260

Admin Boundary:

- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Water Bodies:

- River / Streams
- Ponds / Reservoirs
- **Hills**
- **Reserve Forest**

Water Level Fluctuation (m):

- <-6
- -6 to -4
- -4 to -2
- -2 to 0
- 0 to 2
- 2 to 4
- 4 to 6
- 6 to 8
- 8 to 10
- 10 to 12
- 12 to 14
- >14

ROLTA
Rolta India Limited

GROUND WATER ELECTRICAL CONDUCTIVITY DISTRIBUTION DISTRICT – JALOR

The Electrical conductivity (at 25°C) distribution map is presented in Plate – XII. The district in general, has moderate (2000 -4000 µS/cm of EC, green colour in map) to high (>4000 µS/cm, red colour in map) EC values of ground and together these areas occupy about 85% of the district area that has limited or no potential for domestic purposes. Remaining part of the district (approximately 15%) has low EC values in ground water (<2000 µS/cm) as shown in yellow color occupying areas largely around Raniwara where the ground water is not suitable for domestic purpose.

Table: Block wise area of Electrical conductivity distribution

Electrical conductivity range (µS/cm) at 25° C (Ave. of years 2005-09)	Block wise area coverage (sq km)																Total Area (sq km)
	Ahore		Bhinmal		Chitalwana		Jalor		Jaswantpura		Raniwara		Sanchore		Sayla		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 2000	56.1	3.5	61.2	4.2	-	-	165.9	16.1	297.8	32.3	727.7	67.8	23.4	2.0	236.4	16.5	**1,568.5**
2000-4000	378.5	23.5	731.8	50.6	689.0	40.3	345.2	33.6	232.8	25.3	157.0	14.6	366.9	30.2	814.0	56.8	**3,715.2**
>4000	1,173.3	73.0	653.4	45.2	1,018.9	59.7	516.6	50.3	390.4	42.4	187.7	17.6	821.4	67.8	382.0	26.7	**5,143.7**
Total	**1,607.9**	**100.0**	**1,446.4**	**100.0**	**1,707.9**	**100.0**	**1,027.7**	**100.0**	**921.0**	**100.0**	**1,072.4**	**100.0**	**1,211.7**	**100.0**	**1,432.4**	**100.0**	**10,427.4**

GROUND WATER CHLORIDE DISTRIBUTION

High chloride concentration in ground water also renders it unsuitable for domestic and other purposes. The red colored regions in Plate – XIII are such areas where chloride concentration is high (>1000 mg/l) and occupy approximately 48% of the district area and is not suitable for domestic purpose. The areas with moderately high chloride concentration (250-1000mg/l) are shown in green color occupy approximately 42% of the district area, which also has limited or no suitability for domestic purpose. Remaining part of the district approximately 10% falls under low chloride concentration (<250 mg/l) area which is shown in yellow color, largely around Raniwara where ground water is potable.

Table: Block wise area of Chloride distribution

Chloride Concentration Range (mg/l) (Ave. of years 2005-09)	Block wise area coverage (sq km)																Total Area (sq km)
	Ahore		Bhinmal		Chitalwana		Jalor		Jaswantpura		Raniwara		Sanchore		Sayla		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 250	22.4	1.0	14.6	1.0	-	-	61.3	6.0	181.7	20.0	635.8	59.3	3.0	-	80.1	6.0	**998.9**
250-1000	430.1	27.0	873.9	60.0	492.8	29.0	386.0	38.0	397.7	43.0	272.6	25.4	492.9	41.0	1,037.4	72.0	**4,383.4**
> 1000	1,155.4	72.0	557.9	39.0	1,215.1	71.0	580.4	56.0	341.6	37.0	164.0	15.3	715.8	59.0	314.9	22.0	**5,045.1**
Total	**1,607.9**	**100.0**	**1,446.4**	**100.0**	**1,707.9**	**100.0**	**1,027.7**	**100.0**	**921.0**	**100.0**	**1,072.4**	**100.0**	**1,211.7**	**100.0**	**1,432.4**	**100.0**	**10,427.4**

PLATE - XII

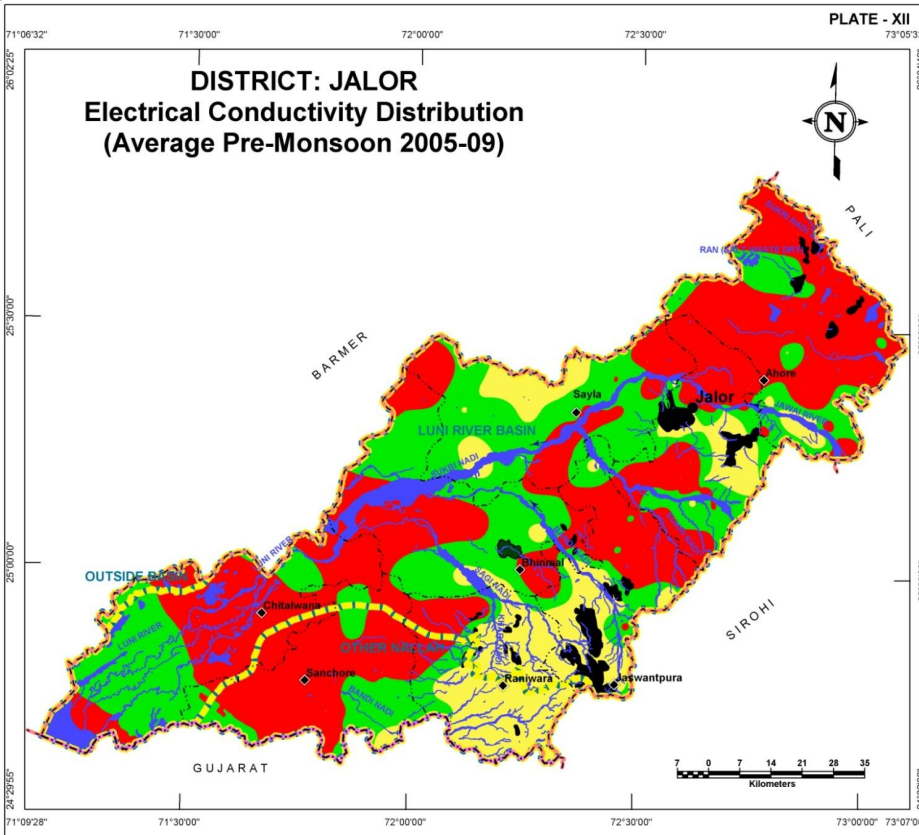
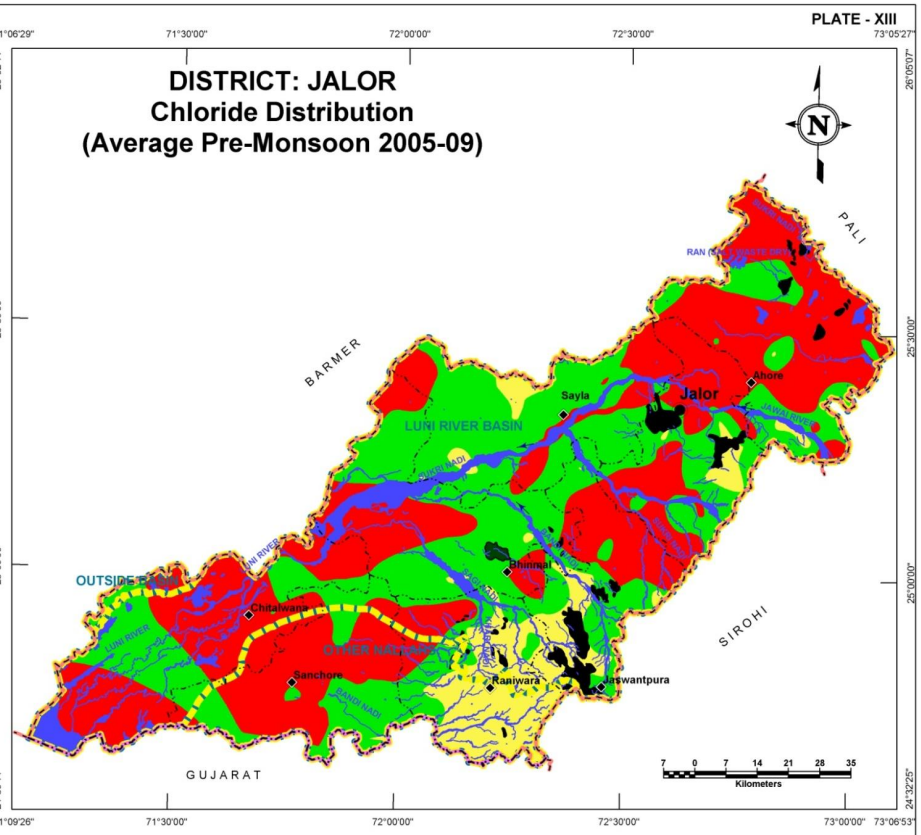


PLATE - XIII



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:

- River / Streams
- Ponds / Reservoirs

Hills

Reserve Forest

Electrical Conductivity (µS/cm at 25°C):

- < 2000
- 2000-4000
- >4000

LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:

- River / Streams
- Ponds / Reservoirs

Hills

Reserve Forest

Chloride Concentration (mg/l):

- < 250
- 250 - 1000
- > 1000

GROUND WATER FLUORIDE DISTRIBUTION — DISTRICT – JALOR

The Fluoride concentration map is presented in Plate – XIV.The areas with low concentration (i.e.,>1.5 mg/l) are shown in yellow color and occupies almost 33% of the district area which is suitable for domestic purpose. The areas with moderately high concentration (1.5-3.0 mg/l) are shown in green color and occupy 44% of the district area. Remaining part of the district areas approximately 24% has high Fluoride concentration (>3.0 mg/l) are shown in red color where the ground water is not suitable for domestic purpose. All the three regions are intermixed and distributed as pockets in the district

Table: Block wise area of Fluoride distribution

Fluoride concentration Range(mg/l) (Ave. of years 2005-09)	Block wise area coverage (sq km)																Total Area (sq km)
	Ahore		Bhinmal		Chitalwana		Jalor		Jaswantpura		Raniwara		Sanchore		Sayla		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 1.5	482.4	30.0	111.0	7.7	833.4	48.8	210.7	20.5	182.6	19.8	535.2	49.9	554.1	45.7	499.4	34.9	**3,408.8**
1.5-3.0	524.6	32.6	880.0	60.8	721.4	42.2	510.7	49.7	471.4	51.2	364.7	34.0	502.9	41.5	568.2	39.6	**4,543.9**
> 3.0	600.9	37.4	455.4	31.5	153.1	9.0	306.3	29.8	267.0	29.0	172.5	16.1	154.7	12.8	364.8	25.5	**2,474.7**
Total	**1,607.9**	**100.0**	**1,446.4**	**100.0**	**1,707.9**	**100.0**	**1,027.7**	**100.0**	**921.0**	**100.0**	**1,072.4**	**100.0**	**1,211.7**	**100.0**	**1,432.4**	**100.0**	**10,427.4**

GROUND WATER NITRATE DISTRIBUTION

High nitrate concentration in ground water renders it unsuitable for agriculture purposes. Plate - XV shows distribution of Nitrate in ground water. High nitrate concentration (>100 mg/l) is shown in red color and occupies approximately 48% of the district area, which is not suitable for agriculture purpose. Such areas are seen in western central and northern parts of the district. The areas with moderately high nitrate concentration (50-100 mg/l) are shown in green color and occupy approximately 36% of the district area. Remaining part of the district area is covered with low nitrate concentration (<50 mg/l) which is shown in yellow colored patches, largely eastern part of Ahore where the ground water is suitable for agriculture.

Table: Block wise area of Nitrate distribution

Nitrate concentration Range(mg/l) (Ave. of years 2005-09)	Block wise area coverage (sq km)																Total Area (sq km)
	Ahore		Bhinmal		Chitalwana		Jalor		Jaswantpura		Raniwara		Sanchore		Sayla		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 50	640.2	39.8	180.2	12.5	17.9	1.1	275.9	26.8	107.6	11.7	185.9	17.3	10.7	0.9	229.9	16.1	**1,648.3**
50-100	646.1	40.2	767.8	53.0	249.0	14.6	564.8	55.0	415.9	45.1	426.4	39.8	137.4	11.3	559.1	39.0	**3,766.5**
>100	321.6	20.0	498.4	34.5	1,441.0	84.3	187.0	18.2	397.5	43.2	460.1	42.9	1,063.6	87.8	643.4	44.9	**5,012.6**
Total	**1,607.9**	**100**	**1,446.4**	**100**	**1,707.9**	**100**	**1,027.7**	**100**	**921.0**	**100**	**1,072.4**	**100**	**1,211.7**	**100**	**1,432.4**	**100**	**10,427.4**

PLATE - XIV

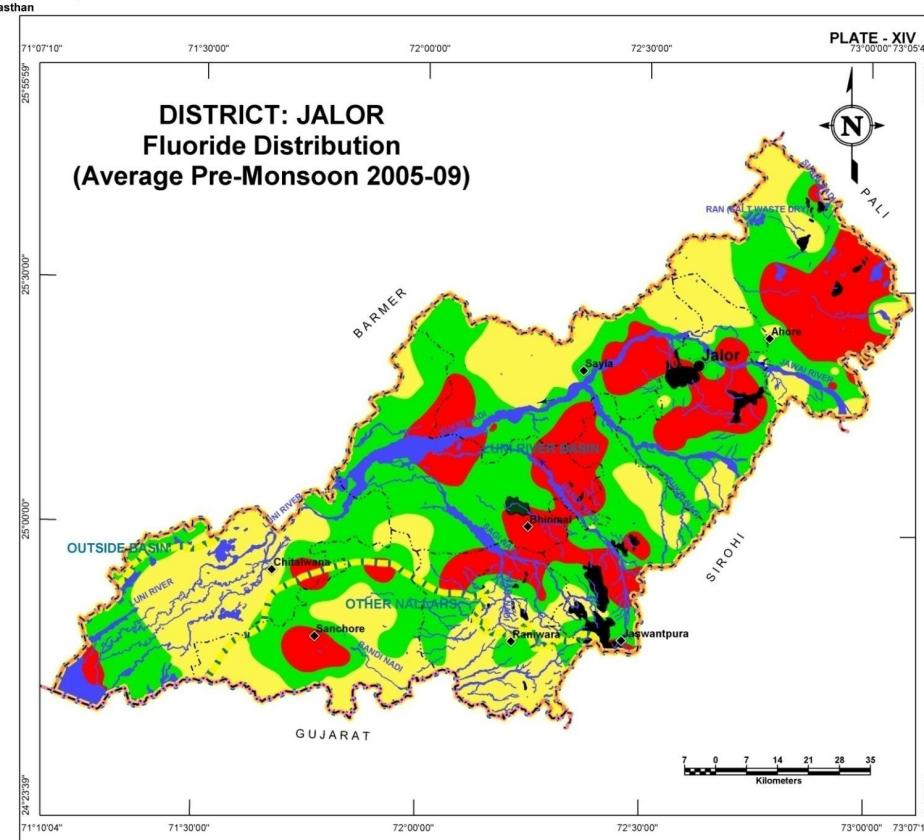
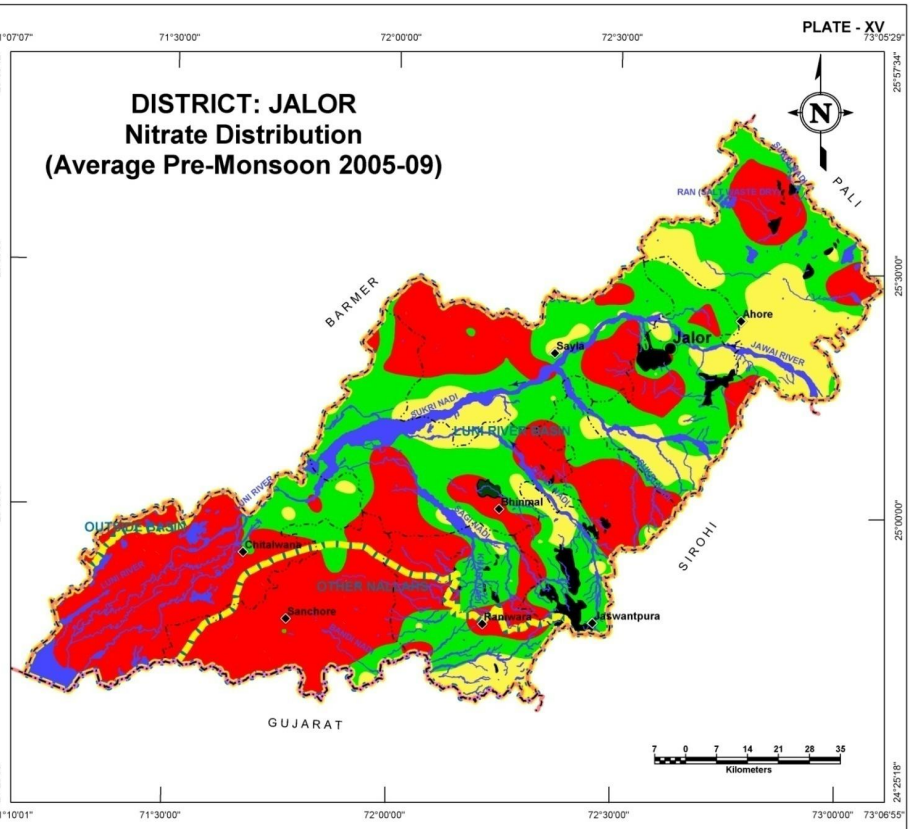


PLATE - XV



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:
- River / Streams
- Ponds / Reservoirs

Reserve Forest

Hills

Fluoride Concentration (mg/l):
- < 1.5
- 1.5-3.0
- >3.0

LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:
- River / Streams
- Ponds / Reservoirs

Reserve Forest

Hills

Nitrate Concentration (mg/l):
- < 50
- 50-100
- >100

DEPTH TO BEDROCK

DISTRICT – JALOR

The entire area of the district is underlain by the hardrocks at different depths. From hydrogeological perspective, the beginning of massive bedrock has been considered for defining top of bedrock surface. The major rocks types occurring in the district are Rhyolite and Granite. These rocks are overlain by alluvial deposits of sand, clay, silt and admixture of these in different proportions and thicknesses. Depth to bedrock map of Jalor district (Plate – XVI) reveals wide variation from more than 80m reaching a maximum depth of more than 120m bgl in the western and southern part of the district. Central part of the district has moderately deep bedrock from 40m bgl to a depth of upto 120m bgl. Shallow depth to bedrock are found in eastern parts of Ahore, Bhinmal, Jalor, Jaswantpura and Sayla blocks where it is reported to be less than 20m bgl.

Depth to bedrock (m bgl)	Block wise area coverage (sq km)																Total Area (sq km)
	Ahore		Bhinmal		Chitalwana		Jalor		Jaswantpura		Raniwara		Sanchore		Sayla		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 40	747.5	46.5	20.1	1.4	-	-	1,008.2	98.1	687.6	74.6	-	-	-	-	408.7	29.0	**2,872.1**
40-60	550.7	34.2	74.4	5.2	-	-	19.5	1.9	200.1	21.8	467.9	43.6	-	-	172.6	12.0	**1,485.2**
60-80	309.7	19.3	435.2	30.1	-	-	-	-	33.3	3.6	209.3	19.5	-	-	691.0	48.0	**1,678.5**
80-100	-	-	703.8	48.6	333.2	19.5	-	-	-	-	178.8	16.7	774.9	64.0	134.1	9.0	**2,124.8**
100-120	-	-	212.9	17.7	554.7	32.5	-	-	-	-	135.7	12.6	428.9	35.0	26.0	2.0	**1,358.2**
> 120	-	-	-	-	820.0	48.0	-	-	-	-	80.7	7.6	7.9	1.0	-	-	**908.6**
Total	**1,607.9**	**100.0**	**1,446.4**	**100.0**	**1,707.9**	**100.0**	**1,027.7**	**100.0**	**921.0**	**100.0**	**1,072.4**	**100.0**	**1,211.7**	**100.0**	**1,432.4**	**100.0**	**10,427.4**

UNCONFINED AQUIFER

Alluvial areas

The entire district has thick cover of alluvium both younger and older except some regionsin the southeastern part. Such aquifers attain more than 120m thickness. Perusal of Plate – XVII reveals generally moderate thickness of upto 70m all over the district. The thickest part of alluvial aquifer is seen in Bhinmal block. Isolated patches of thick alluvial materials are found in viz. blocks – Bhinmal, Chitalwana and Jalor.

Unconfined aquifer Thickness (m)	Block wise Area (sq km) coverage								Total Area (sq km)
	Ahore	Bhinmal	Chitalwana	Jalor	Jaswantpura	Raniwara	Sanchore	Sayla	
<10	-	0.3	-	-	18.1	166.9	-	-	**185.3**
10-20	0	13.3	-	-	159.7	80.6	-	-	**253.6**
20-30	0.1	6.3	-	-	231.9	21.0	-	-	**259.3**
30-40	-	1.4	-	-	69.6	3.5	-	-	**74.5**
> 40	-	-	-	-	3.0	0.3	-	-	**3.3**
Total	**0.1**	**21.3**	**0**	**0**	**482.3**	**272.3**	**0**	**0**	**776.0**

Hard rock areas:

Weathered, fractured and jointed rock formations occurring at shallower depths constitute good unconfined aquifers. Such zone ranges in thickness from less than 10 meter to around 50 meter and concentrated in southeastern parts of the district in parts of Bhinmal, Jaswantpura and Raniwara blocks

Unconfinedaquifer Thickness (m)	Block wise Area (sq km) coverage								Total Area (sq km)
	Ahore	Bhinmal	Chitalwana	Jalor	Jaswantpura	Raniwara	Sanchore	Sayla	
< 10	1,522.1	370.2	61.9	706.2	246.0	462.6	45.1	1,128.6	**4,542.7**
10-20	64.7	380.5	97.2	152.1	160.7	172.0	139.6	120.7	**1,287.5**
20-30	19.8	239.3	146.3	72.0	25.0	105.6	218.5	92.4	**918.9**
30-40	1.2	122.5	358.1	47.1	5.6	47.1	200.9	52.7	**835.2**
40-50	-	96.0	565.4	25.8	1.4	12.3	277.2	21.8	**999.9**
50-60	-	81.2	354.0	9.8	-	0.5	227.1	10.9	**683.5**
60-70	-	45.2	81.4	5.5	-	-	103.3	5.3	**240.7**
70-80	-	29.0	10.3	3.5	-	-	-	-	**42.8**
80-90	-	18.8	8.2	2.4	-	-	-	-	**29.4**
90-100	-	15.6	7.7	1.6	-	-	-	-	**24.9**
100-110	-	20.6	13.7	1.1	-	-	-	-	**35.4**
110-120	-	5.9	3.7	0.6	-	-	-	-	**10.2**
> 120	-	0.3	-	-	-	-	-	-	**0.3**
Total	**1,607.8**	**1,425.1**	**1,707.9**	**1,027.7**	**438.7**	**800.1**	**1,211.7**	**1,432.4**	**9,651.4**

PLATE - XVI

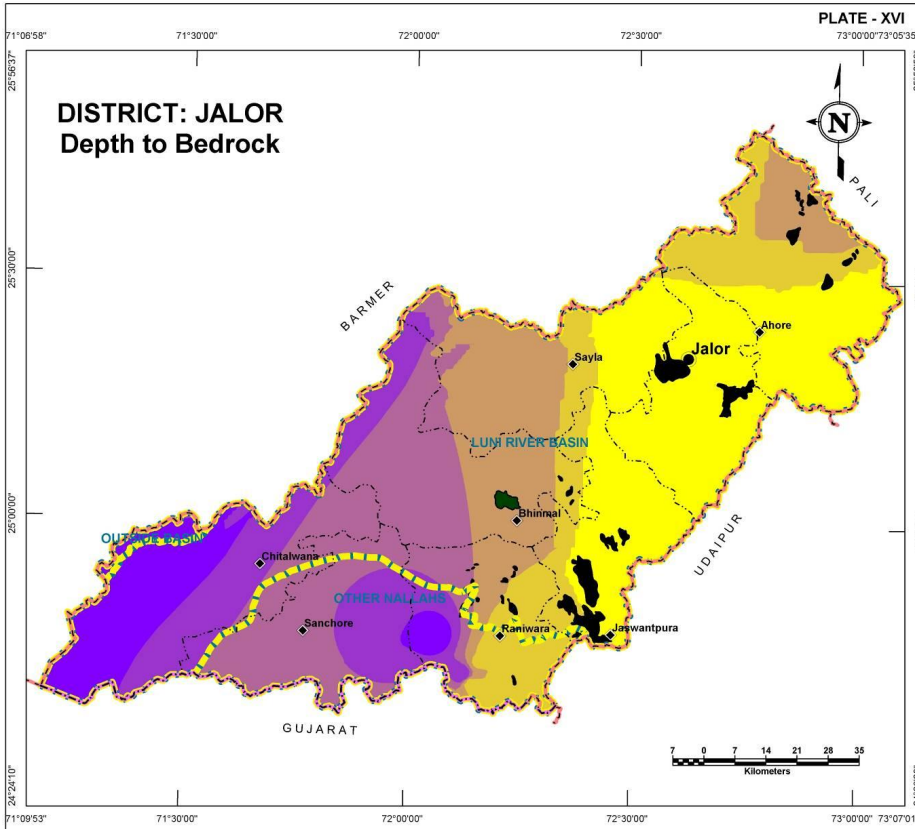
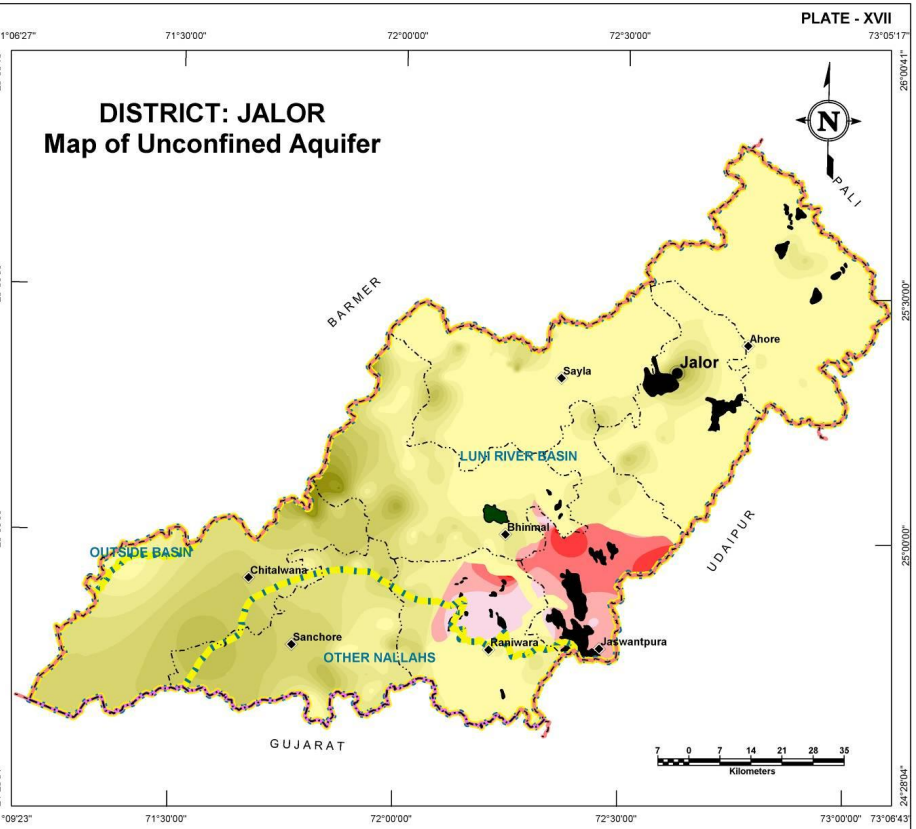


PLATE - XVII



Admin Boundary:

- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**
- **Hills**
- **Reserve Forest**

Depth to Bedrock(m bgl):

- <40
- 40-60
- 60-80
- 80-100
- 100-120
- >120

Admin Boundary:

- District Headquarter
- Block Headquarter
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**
- **Hills**
- **Reserve Forest**

Aquifer Thickness (m):

Alluvial Area			Weathered & Fractured Zone in Hardrock Area
<10	70-80		<10
10-20	80-90		10-20
20-30	90-100		20-30
30-40	110-120		30-40
40-50	100-110		>40
50-60	>110		
60-70			

Glossary of terms

S. No.	Technical Terms	Definition
1	AQUIFER	A saturated geological formation which has good permeability to supply sufficient quantity of water to a Tube well, well or spring.
2	ARID CLIMATE	Climate characterized by high evaporation and low precipitation.
3	ARTIFICIAL RECHARGE	Addition of water to a ground water reservoir by man-made activity
4	CLIMATE	The sum total of all atmospheric or meteorological influences principally temperature, moisture, wind, pressure and evaporation of a region.
5	CONFINED AQUIFER	A water bearing strata having confined impermeable overburden. In this aquifer, water level represents the piezometric head.
6	CONTAMINATION	Introduction of undesirable substance, normally not found in water, which renders the water unfit for its intended use.
7	DRAWDOWN	The drawdown is the depth by which water level is lowered.
8	FRESH WATER	Water suitable for drinking purpose.
9	GROUND WATER	Water found below the land surface.
10	GROUND WATER BASIN	A hydro-geologic unit containing one large aquifer or several connected and interrelated aquifers.
11	GROUND WATER RECHARGE	The natural infiltration of surface water into the ground.
12	HARD WATER	The water which does not produce sufficient foam with soap.
13	HYDRAULIC CONDUCTIVITY	A constant that serves as a measure of permeability of porous medium.
14	HYDROGEOLOGY	The science related with the ground water.
15	HUMID CLIMATE	The area having high moisture content.
16	ISOHYET	A line of equal amount of rainfall.
17	METEOROLOGY	Science of the atmosphere.
18	PERCOLATION	It is flow through a porous substance.
19	PERMEABILITY	The property or capacity of a soil or rock for transmitting water.
20	pH	Value of hydrogen-ion concentration in water. Used as an indicator of acidity (pH < 7) or alkalinity (pH > 7).
21	PIEZOMETRIC HEAD	Elevation to which water will rise in a piezometers.
22	RECHARGE	It is a natural or artificial process by which water is added from outside to the aquifer.
23	SAFE YIELD	Amount of water which can be extracted from ground water without producing undesirable effect.
24	SALINITY	Concentration of dissolved salts.
25	SEMI-ARID	An area is considered semiarid having annual rainfall between 10-20 inches.
26	SEMI-CONFINED AQUIFER	Aquifer overlain and/or underlain by a relatively thin semi-pervious layer.
27	SPECIFIC YIELD	Quantity of water which is released by a formation after it's complete saturation.
28	TOTAL DISSOLVED SOLIDS	Total weight of dissolved mineral constituents in water per unit volume (or weight) of water in the sample.

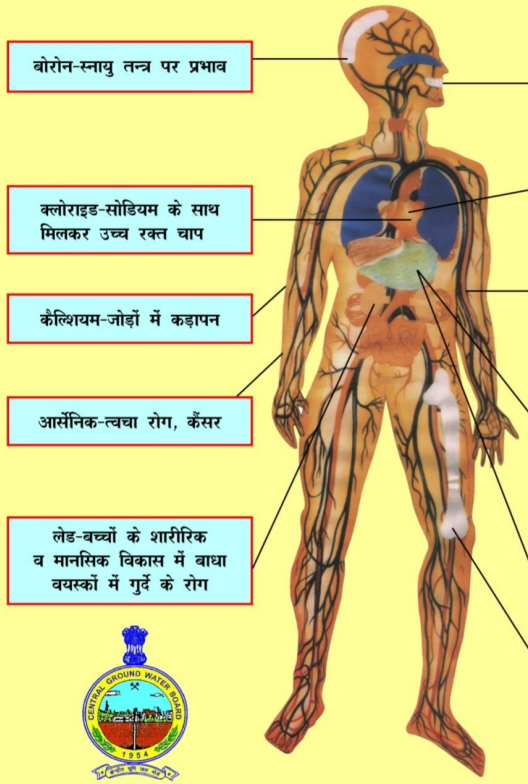
(Contd…)

S. No.	Technical Terms	Definition
29	TRANSMISSIBILITY	It is defined as the rate of flow through an aquifer of unit width and total saturation depth under unit hydraulic gradient. It is equal to product of full saturation depth of aquifer and its coefficient of permeability.
30	UNCONFINED AQUIFER	A water bearing formation having permeable overburden. The water table forms the upper boundary of the aquifer.
31	UNSATURATED ZONE	The zone below the land surface in which pore space contains both water and air.
32	WATER CONSERVATION	Optimal use and proper storage of water.
33	WATER RESOURCES	Availability of surface and ground water.
34	WATER RESOURCES MANAGEMENT	Planned development, distribution and use of water resources.
35	WATER TABLE	Water table is the upper surface of the zone of saturation at atmospheric pressure.
36	ZONE OF SATURATION	The ground in which all pores are completely filled with water.
37	ELECTRICAL CONDUCTIVITY	Flow of free ions in the water at 25C mu/cm.
38	CROSS SECTION	A Vertical Projection showing sub-surface formations encountered in a specific plane.
39	3-D PICTURE	A structure showing all three dimensions i.e. length, width and depth.
40	GWD	Ground Water Department
41	CGWB	Central Ground Water Board
42	CGWA	Central Ground Water Authority
43	SWRPD	State Water Resources Planning Department
44	EU-SPP	European Union State Partnership Programme
45	TOPOGRAPHY	Details of drainage lines and physical features of land surface on a map.
46	GEOLOGY	The science related with the Earth.
47	GEOMORPHOLOGY	The description and interpretation of land forms.
48	PRE MONSOON SURVEY	Monitoring of Ground Water level from the selected DKW/Piezometer before Monsoon (carried out between 15th May to 15th June)
49	POST-MONSOON SURVEY	Monitoring of Ground Water level from the selected DKW/Piezometer after Monsoon (carried out between 15th October to 15th November)
50	PIEZOMETER	A non-pumping small diameter bore hole used for monitoring of static water level.
51	GROUND WATER FLUCTUATION	Change in static water level below ground level.
52	WATER TABLE	The static water level found in unconfined aquifer.
53	DEPTH OF BED ROCK	Hard & compact rock encountered below land Surface.
54	G.W. MONITORING STATION	Dug wells selected on grid basis for monitoring of state water level.
55	EOLIAN DEPOSITS	Wind-blown sand deposits

Ground Water Department,
Rajasthan

European Union
State Partnership Programme

भूजल में घुले मुख्य तत्वों की अधिकता का मानव शरीर पर दुष्प्रभाव



- बोरोन-स्नायु तन्त्र पर प्रभाव
- क्लोराइड-सोडियम के साथ मिलकर उच्च रक्त चाप
- कैल्शियम-जोड़ों में कड़ापन
- आर्सेनिक-त्वचा रोग, कैंसर
- लेड-बच्चों के शारीरिक व मानसिक विकास में बाधा वयस्कों में गुर्दे के रोग
- फ्लोराइड - दंत क्षरण
- सोडियम-हृदय, गुर्दा व रक्त परिसंचरण रोगों से ग्रसित लोगों को हानिकारक
- नाइट्रेट-नवजात शिशुओं में ब्लू बेबी बीमारी (मेथमोग्लोबिनिमिया)
- सल्फेट-अधिकता में मैग्नेशियम के साथ मिलकर दस्तावर
- आयरन-आयरन जीवाणु से आमाशय संबंधी रोग
- फ्लोराइड-जोड़ों में अकड़न, हड्डियों में मुड़ाव

केन्द्रीय भूमि जल बोर्ड,
पश्चिमी क्षेत्र, जयपुर
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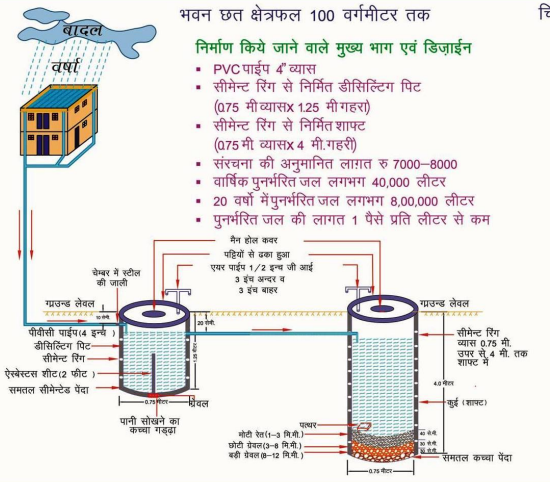
भूजल अमूल्य है इसे प्रदूषित न करें।

चित्र–1

भवन छत क्षेत्रफल 100 वर्गमीटर तक

निर्माण किये जाने वाले मुख्य भाग एवं डिज़ाईन

- PVC पाईप 4" व्यास
- सीमेन्ट रिंग से निर्मित डीसिल्टिंग पिट (0.75 मी.व्यास x 1.25 मी.गहरा)
- सीमेन्ट रिंग से निर्मित शाफ्ट (0.75 मी.व्यास x 4 मी.गहरी)
- संरचना की अनुमानित लाग़त रु 7000–8000
- वार्षिक पुनर्भरित जल लगभग 40,000 लीटर
- 20 वर्षो में पुनर्भरित जल लगभग 8,00,000 लीटर
- पुनर्भरित जल की लागत 1 पैसे प्रति लीटर से कम

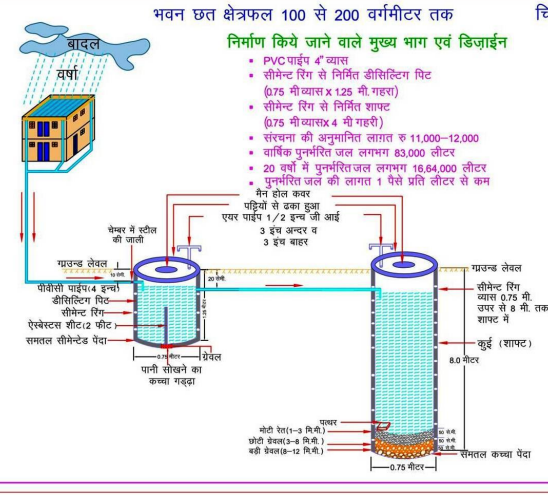


चित्र–2

भवन छत क्षेत्रफल 100 से 200 वर्गमीटर तक

निर्माण किये जाने वाले मुख्य भाग एवं डिज़ाईन

- PVC पाईप 4" व्यास
- सीमेन्ट रिंग से निर्मित डीसिल्टिंग पिट (0.75 मी.व्यास x 1.25 मी.गहरा)
- सीमेन्ट रिंग से निर्मित शाफ्ट (0.75 मी.व्यास x 4 मी.गहरी)
- संरचना की अनुमानित लाग़त रु 11,000–12,000
- वार्षिक पुनर्भरित जल लगभग 83,000 लीटर
- 20 वर्षो में पुनर्भरित जल लगभग 16,64,000 लीटर
- पुनर्भरित जल की लागत 1 पैसे प्रति लीटर से कम

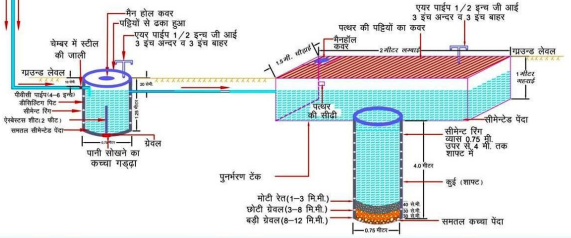


चित्र–3

भवन छत क्षेत्रफल 200 से 300 वर्गमीटर तक

निर्माण किये जाने वाले मुख्य भाग एवं डिज़ाईन

- PVC पाईप 4"– 6" व्यास
- सीमेन्ट रिंग से निर्मित डीसिल्टिंग पिट (0.75 मी.व्यास x 1.25 मी.गहरा)
- रीचार्ज टेंक 1.5 मी.चौड़ा x 2 मी.लम्बा x 1 मी.गहरा
- सीमेन्ट रिंग से निर्मित शाफ्ट (0.75 मी.व्यास x 4 मी.गहरी)
- संरचना की अनुमानित लाग़त रु 15,000–16,000
- वार्षिक पुनर्भरित जल लगभग 1,25,000 लीटर
- 20 वर्षो में पुनर्भरित जल लगभग 25,00,000 लीटर
- पुनर्भरित जल की लागत 1 पैसे प्रति लीटर से कम

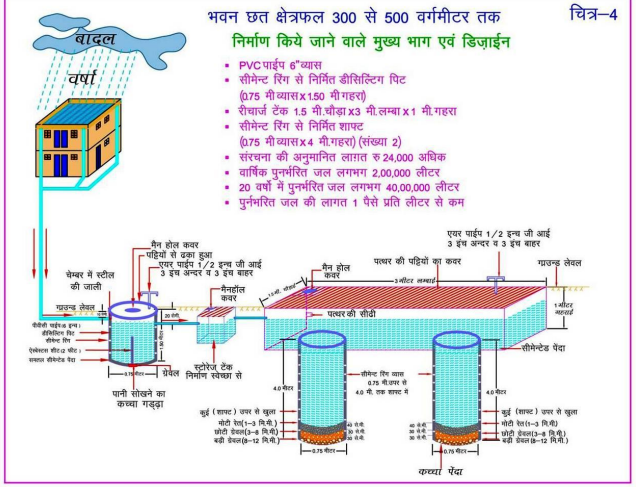


चित्र–4

भवन छत क्षेत्रफल 300 से 500 वर्गमीटर तक

निर्माण किये जाने वाले मुख्य भाग एवं डिज़ाईन

- PVC पाईप 6" व्यास
- सीमेन्ट रिंग से निर्मित डीसिल्टिंग पिट (0.75 मी.व्यास x 1.50 मी.गहरा)
- रीचार्ज टेंक 1.5 मी.चौड़ा x 3 मी.लम्बा x 1 मी.गहरा
- सीमेन्ट रिंग से निर्मित शाफ्ट (0.75 मी.व्यास x 4 मी.गहरा) (संख्या 2)
- संरचना की अनुमानित लाग़त रु 24,000 अधिक
- वार्षिक पुनर्भरित जल लगभग 2,00,000 लीटर
- 20 वर्षो में पुनर्भरित जल लगभग 40,00,000 लीटर
- पुर्नभरित जल की लागत 1 पैसे प्रति लीटर से कम



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Myths and Facts about Ground Water

S No	Myths	Facts
1	What is Ground Water • an underground lake • a net work of underground rivers • a bowl filled with water	Water which occurs below the land in geological formations/rocks is Ground water
2	Ground Water occurs everywhere beneath the Land Surface	Not really, it depends on the nature of rock formation
3	There is a relationship between ground water and surface water	Not all the places. Near streams/rivers there is relation
4	Groundwater is not renewable resource	It is renewable source and every year it is being recharged through rain/applied irrigation etc
5	Ground water is unlimited and deeper you drill more discharge	It is limited to annual recharge from rain/applied irrigation. The discharge may not increase if you go deeper
6	Ground Water moves rapidly	The movement of ground water is very slow
7	Ground water pumped from wells is thousands of years old	Generally the ground water being tapped through wells is a few years old
8	If water taste good—it is safe to drink	It may have other chemicals e.g. fluoride, nitrates etc which are harmful
9	Water from free flowing tube wells is very pure	This water can also be contaminated so test before use
10	If I recharge my TW/DW/HP it will not benefit me	It will also benefit you and also adjoing wells
11	There is no static ground water resources in Rajasthan	Rajasthan is also having Static GW resources, and being tapped in most of areas as GW annual withdrawal is more than annual recharge
12	I cannot meet annual cooking and drinking water requirement by rain water harvesting	The water requirement for drinking and cooking is only 8 lit/day. You can harvest this water for family of 5 persons from roof top or paved area of 75 Sq m to meet annual requirement
13	You can increase ground water recharge	This can be done by harvesting the rain water and storing in sub surface reservoir (GW) by constructing the recharge structures
14	You cannot use abandoned TW/HP/DW for ground water recharge	These should be used as recharge structures as harvested rain water is directly put into GW reservoir
15	Putting waste near HP/TW will not cause any problem	Such actions will pollute wells and water

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