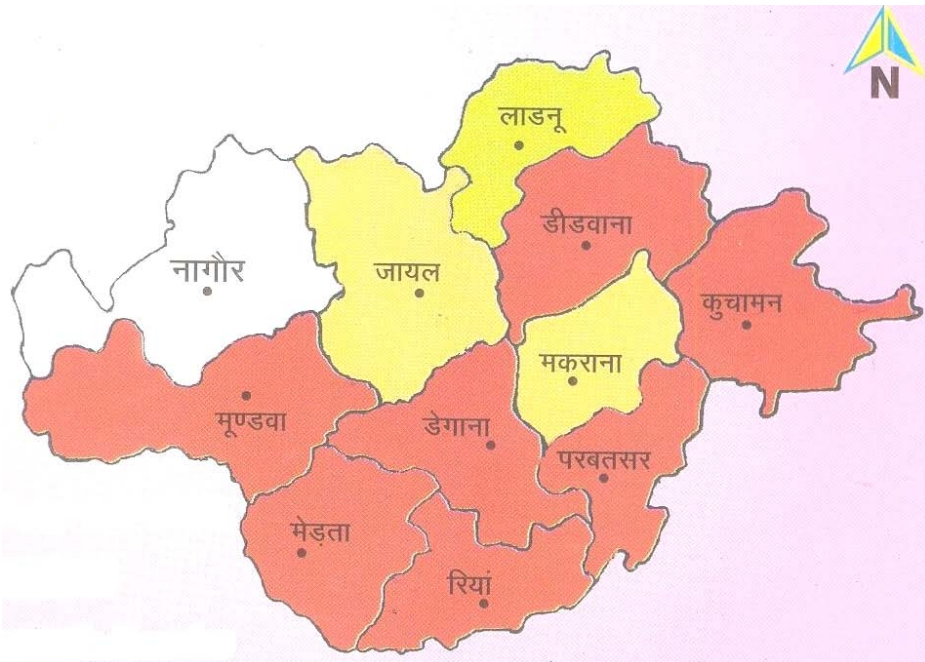




स्वच्छ सुरक्षित जल - सुन्दर खुशहाल कल  
**CONSERVE WATER - SAVE LIFE**

**CENTRAL GROUND WATER BOARD**  
Ministry of Water Resources  
Government of India

## GROUNDWATER SCENARIO



## NAGOUR DISTRICT, RAJASTHAN

Western Region  
Jaipur  
March, 2009

## DISTRICT AT A GLANCE – NAGOUR DISTRICT, RAJASTHAN

S No	Item	Information	
<b>1</b>	<b>GENERAL INFORMATION</b>		
	(i) Geographical area (sq km)	17718	
	(ii) Administrative Division (As on 31.3.2007)		
	Number of Tehsils	10	
	Number of Blocks	11	
	Number of Villages	1490	
	(iii) Population (As per 2001 Census)	2773894	
	(iv) Average Annual Rainfall (1971-2005)	410 mm	
<b>2</b>	<b>GEOMORPHOLOGY</b>		
	Major Physiographic Units	Sand Dunes, Alluvial plains, Ridges and Hillocks.	
	Major Drainage	Luni River	
<b>3</b>	<b>LAND USE (sq km)</b>		
	(a) Forest Area	182	
	(b) Net Sown Area	12542	
	(c) Cultivable Area	13554	
<b>4</b>	MAJOR SOIL TYPE	Red desertic soils, Desert soils, Sand dunes, Lithosol and regosols of hills, Saline soils	
<b>5</b>	<b>AREA UNDER PRINCIPAL CROPS (AS ON 2005-06)</b>	<b>Crops</b>	<b>Area in ha</b>
		Bajra	461800
		jowar	53800
		pulses	42600
		Guar	155800
		Till	10800
		G. Nut	18270
		Wheat	76384
		gram	17454
		Mustard	98538
Cotton	9200		
<b>6</b>	<b>IRRIGATION BY DIFFERENT SOURCES (as on 31-03-06)</b>		
	Source	No of structure	Gross Irrigated Area in hectare
	Tube wells/Bore wells	39104	390820
	Tanks/Ponds		-
	Canals		17
	Other Sources		464
	Net Irrigated Area (ha)	390820	
	Gross Irrigated Area (ha)	1321372	
<b>7</b>	<b>NUMBER OF GROUND WATER MONITORING WELLS OF CGWB(As on May 2007)</b>		
	Number of Dug wells	61	
	Number of Piezometers	28	
<b>8</b>	<b>PREDOMINANT GEOLOGICAL FORMATIONS</b>	Aeolian sand, Alluvium, Nagaur Sandstone, Bilara Limestone and Jodhpur Sandstone of Marwar Super Group, Eranpura granite & rocks of Delhi Super group.	

<b>9</b>	<b>HYDROGEOLOGY</b>	
	Major Water bearing formation	Quaternary Alluvium, Nagaur Sandstone, Bilara Limestone and Jodhpur Sandstone, Granite, Schist and Phyllites.
	Depth to water level (Pre-monsoon, 2006) (mbgl)	10 – 80
	Depth to water level (Post-monsoon, 2006) (mbgl)	6 – 75
	Long term water level trend (1994-2006)	-14.56m
<b>10</b>	<b>GROUNDWATER EXPLORATION BY CGWB (As on 31.3.2007)</b>	
	Number of wells drilled (EW, OW, PZ, SH)	EW – 40,OW- 19, SH –22 & PZ- 08
	Depth Range (m)	40 – 300
	Discharge (liter per second)	1 – 15
	Storativity	-
	Transmissivity (m <sup>2</sup> /day)	50-565 m <sup>2</sup> /day
<b>11</b>	<b>GROUND WATER QUALITY</b>	
	Presence of chemical constituents more than permissible limit (EC>1500 m mhos/cm at 25 <sup>o</sup> C, F>1.5 mg/l, No3> 45mg/l)	EC – 4500 sq km F – 6500 sq km No3 – 3000 sq km
<b>12</b>	<b>DYNAMIC GROUND WATER RESOURCES (March, 2004) in mcm</b>	
	Annual Replenishable Ground Water Resources	548.369
	Net Annual Ground Water Draft	921.272
	Projected Demand for Domestic and Industrial Uses up to 2025	228.897
	Stage of Ground Water Development	168%
<b>13</b>	<b>GROUND WATER CONTROL AND REGULATION</b>	
	Number of Over-exploited blocks	07
	Number of Critical Blocks	02
	No of Blocks Notified	01
<b>14</b>	<b>MAJOR GROUND WATER PROBLEMS AND ISSUES</b>	1. Water level decline. 2. Quality Problem. 3. Less recharge due to less & uneven rainfall.
<b>15</b>	<b>MASS AWARENESS AND TRAINING PROGRAM CONDUCTED BY CGWB</b>	Mass Awareness Program Mundwa Training Program 1. Nagaur

# DISTRICT GROUND WATER BROCHURE

## NAGOUR DISTRICT

### 1.0 INTRODUCTION

Nagaur district is located almost in the middle of the state of Rajasthan and extends between North latitudes 26°25' and 27°40" and East longitudes 73°10" and 75°15". It covers an area of 17178 sq. km. and is bounded on north by Bikaner and Churu districts, on the east by Sikar and Jaipur districts, on the south by Ajmer, and Pali districts and on the west by Jodhpur districts.

Nagaur city is connected with all the surrounding districts headquarters by State Highways. All the blocks are well connected by metalled roads. Nagaur district with its present area covers only 5.18 percents of the total area of the state which is divided into 10 tehsils and 11 blocks. The following table shows the administrative division of the district.

Total Population (Census2001) of the district is 2773894 and Total Urban area is 269.28 sq km area i.e. 1.52% of the total geographic area of the district. Total urban population is 477159 and urban population density is 1272 per sq. km. There are seven large and medium scale industries existing in the district. Out of seven four are in Makrana and all are in the field of marble processing. One cement industry exists in Gotan, one chemical industry of large scale category exists in Didwana and one unit in Degana among small scale industries. The major units are food based, agriculture based etc. (source. DIC. Nagaur)

### Human Resources

Indicators of Human Resources		
Population	persons	27,73,894
Density of population	persons per sq.km.	157
Literacy	per cent	58.26
Total working population	per cent	39.74

Systematic Hydrogeological survey in the district was carried out by GSI during 1964-65. Reappraisal hydrogeological survey of district was carried out from 1979-80 to 1985-86 and ground water management studies in the district was carried out from 2002-03. During 1971-74 Ground water investigation was carried out under UNDP Project. Central Ground Water Board Under exploratory program have drilled 40 exploratory wells; OW19 and 22 slim holes. Since 1973, monitoring of water level is being carried out four times a year from 89 National Hydrograph Network Stations.

### 2.0 RAINFALL & CLIMATE

The district experiences arid to semi-arid type of climate. Mean annual rainfall (1971-2005) of the district is 410mm. whereas normal rainfall (1901-1970) is lower

than average rainfall and placed at 363.1 mm. It is obvious that there is significant increase in rainfall during the last 30 years. The rainy days are limited to maximum 15 in a year. Almost 80% of the total annual rainfall is received during the southwest monsoon. The probability of occurrence of mean annual rainfall is 38%. Based on agriculture criteria indicates that the district is prone to mild and normal type of droughts. Occurrence of severe and very severe type of drought is very rare. There is not much variation in areal distribution of rainfall. However, the southern part of the district gets slightly more rainfall than northern part. The mean annual rainfall is lowest at Didwana (347.8mm), which lies in northern part of the district, whereas the mean annual rainfall is highest at Degana (471.9mm) which lies in southern of the district.

**Seasonal Distribution** The rainfall in the district is highly seasonal. More than 90% of the total annual rainfall is received during the south – west monsoon season. The monsoon enters the district in the first week of July and withdraws by the middle of September. July is followed by August with monthly normal rainfall of 120.8mm. As the district lies in the desert area, extreme of heat in summer and cold in winter is the characteristic of the desert.. Both day and night temperature increases gradually and reaches their maximum values in May and June respectively. The temperature varies from 46 degree in summer to 7 degree in winter. The cold season starts by middle of November and lasts till February. January is the coldest month with both mean maximum and minimum temperatures being lowest at 22.5° and 6.7° respectively. The minimum temperature may sometime drop down to below the freezing point of water and frost may occur. The diurnal variation in temperature during winter is as high as 16°C. Both maximum and minimum temperature begins to rise rapidly from February onwards, reaching their respective maximum in late May or early June. The mean daily maximum temperature in May is 40.4°C and the mean daily minimum temperature is 25.7°C. Night temperatures in June are much higher than in May with mean daily minimum temperature of 27.9°C. During the summer month the maximum temperature sometimes exceeds 48°C. There is appreciable drop in temperature with the onset of south – west monsoon by about first week of July. After the withdrawal of monsoon by middle of September, the day temperatures register slight increase and a secondary maxima is observed in October. The night temperature, however, continue to fall gradually Atmosphere is generally dry except during the monsoon period. The humidity is highest in August with mean daily relative humidity is 80%. The annual maximum potential evapotranspiration in the district is quite high and it is highest (255.1 mm) in the month of May and lowest (76.5 mm) in the month of December

### **3.0 GEOMORPHOLOGY**

The general topography of the area is fairly even. Slope of the area is fairly even. Slope of the land surface is towards west and elevation varies from 250 meter above msl in south to 640 m above msl in north. South-eastern part of the district comprises small scattered hillock. The northern, north-western and north-eastern part of the district is having sand dunes. The offshoots of Aravalli range are projected along the common boundary of Ajmer district and Merta, Nawa and Parbatsar tehsils of Nagaur district.

There is no river which originated from the district however; the river Luni which rises near Pushkar in Ajmer district draining western slopes of the Aravalli

crosses the district in the southern part flowing for about 37 km in the western direction. It is an ephemeral river and carries runoff that is generated in the upper reaches. Channel deposits of Luni facilitate percolation during rainstorm, thereby feeding the neighboring wells along its bank. Other nalas and streams are also ephemeral in nature which originate and die out in the district itself.

#### 4.0 SOIL, LAND USE & IRRIGATION PRACTICES

##### Soil characteristics

Four types of soils have been reported in the district viz, clay, clay loam, sandy loam and sandy soil. The general texture of the soil in the area is sandy loam to clayey loam which is further classified into “Barani” or unirrigated and “Chahi” or irrigated soil. A part of Nagaur tehsils and south-eastern part of Merta tehsils has deep sandy loam, while red loamy soil exists else where in the Merta tehsils except on the banks of river Luni, Light loamy soil occurs in Parbatsar tehsils away from hill ranges. A longitudinal belt from Didwana to Nawa extending up to Sambhar Lake has the characteristics of alkaline soil. Distribution of different types of soils is shown in the following table.

##### Soil types

S.No.	Soil type	Area(hec)	Block
1	Clay	22,840	Nagaur, Jayal, Merta, Riyan, Parbatsar
2	Clay loam	1,34,450	Nagaur, Kuchaman, Jayal, Riyan, Merta, Degana, Makrana, Ladnun, Parbatsar, Mundwa, Didwana.
3	Sandy loam	4,72,905	Makrana, Ladnu, Parbatsar, Mundwa, Didwana, Nagaur, Kuchaman, Jayal, Riyan, Merta, Degana.
4	Sandy	5,65,705	Nagaur, Khuchaman, Jayal, Riyan, Merta, Degana, Makrana, Ladnun, Parbatsar, Didwana.

#### AGRICULTURAL RESOURCES

Agriculture is the main occupation of a majority of the population of the Nagaur District & it would be clear from table below that more than 92.6 percent of the workers are engaged in agricultural activity. In order to assess the industrial potential of the district, it would be worthwhile to explore the land use pattern, irrigation facilities, crops, live stock, dairy development & other such variables which provide a broad idea of the resources inventory and the resource base.

##### LAND USE PATTERN

Village records in 2005-2006 show that out of the total geographical area of the Nagaur district of 17,64,468 hectares, the net area sown in 12,54,256 hectares. The classification of the land use in the year 2005-2006 in the district is given in the table below:

## Land use pattern

S. No.	Description	Area (Hect.)	Percentage to Total Area
1	Forest	18271	1.04
2	Land put to non Agriculture use	86791	4.92
3	Barren and Uncultivated land	58582	3.32
4	Other uncultivated land excluding fallow land	72854	4.13
5	Cultivable waste	14353	0.81
6	Fallow land	259361	14.70
7	Net area sown	1254256	71.08
	<b>Total :-</b>	1764468	.
8	Double Crop Area	228999	12.98

Major Crops (2006-07): Bajara, Wheat, Jowar, Til, Guawar, Moong, Moth, Barley & Pulses are the major crops of the Nagaur District. The other crops of the district are taramira, rape mustard & gram. Kharif crops constitute the bulk of the food production in the district since the agricultural activities are mostly dependent on Monsoons. Kharif crops include bajara, jowar, moong, choula, rice, groundnut, til & guar. Rabi crops are usually sown in November whereas Kharif crops are sown with the beginning of the first rains in July.

S. No.	Crops	Area & Production of major Crops	
		Area (Hect.)	Production (MT)
1	Bajara	461800	216400
2	Jowar	53800	18900
3	Pulses	426000	109600
4	Til	10800	1800
5	Ground-nut	18270	18770
6	Cotton	9200	9700
7	Guar	155800	42000
8	Wheat	76384	169047
9	Barley	11918	25687
10	Gram	17454	31233
11	Mustard etc.	98538	131133
12	Methi	4249	4986
13	Others	39883	28567
14	Zeera	12424	2959
15	Taramira	5708	3084

## **Surface water Resources**

No surface water resource in district has been reported except a few salt lakes. There is salt lake (Sambhar Lake) at south west of Didwana having an area of 777 hectare The Nawa tehsil also shares a part of well known Sambhar Lake in Jaipur district. There are eight (8) numbers of ponds in the district. Out of these 5 are in Degana and 3 in Parbatsar blocks.

## **Irrigation Projects**

Irrigation department has constructed 93 anicuts in Nagaur district. Out of which 16 anicuts are in running condition presently. The details of there 16 anicuts are given in Table 4.1 The anicut located at Bhakri in Parbatsar tehsil has the highest capacity of 301.10 MCFt whereas one located at Chhipolai has the lowest capacity of 4.50 MCFt. Apart from these, there is no major irrigation project exist in the present (Source; Irrigation Department, Merta city).

## **5.0 GROUND WATER SCENARIO**

### **5.1 GEOLOGICAL FRAMEWORK**

The geological set up of the district is presented by different sedimentary, igneous and metamorphic rocks belonging to Bhilwara super Group, Delhi super Group, Marwar super Group, Palana Formation and Quaternary alluvium. A few outcrops of gneisses belonging to the Mangalwar Complex of the Bhilwara Supergroup are exposed north- east of Nawa. The Delhi Super Group includes Alwar, Ajabgarh/ Kumbhalgarh and punagarh Group in descending order of antiquity. The rocks of Alwar Group are well exposed in the eastern part of the district and comprise arkose, grit, conglomerate and schist. The overlying Ajabgarh / Kumbhalgarh Group of rocks are exposed between kerkeri and Bijathal. The Ajabgarh Group mainly consists of Quartzite with schist and marble. Kumbhalgarh comprises mica schist and marble. The overlying punagarh Group of rocks (quartzite, slate phyllite, marble etc.) occur as isolated outcrops. The rocks of Bhilwara Super Group and Delhi Super Group are structurally isoclinal and recline fold which are exposed along south eastern margin (trend NE-SW) of the district adjacent to Ajmer district.

The rocks of Delhi super Group have been intruded by the Erinpura granite and the Malani Igneous suite. All these rocks are overlain by the marine sedimentary sequence of the Marwar Super Group which is subdivided into Jodhpur, Bilara and Nagaur group representing arenaceous, Calcareous and areno-argillaceous facies respectively. These rocks are overlain by sandstone and bentonite of the Palana formation. The Marwar Super Group of rocks showing horizontal to gently inclined disposition of different beds which are displaced by different faults. Palana and other Tertiary formations are showing same altitude.

### **5.2 HYDROGEOLOGY**

Hydrogeologically the whole district can be classified into three formations viz. consolidated formation, semi-consolidated formation and unconsolidated formation

## **Consolidated Formation**

The consolidated formations comprises of schist, gneiss, quartzite and phyllites of Precambrian metamorphic rocks and limestone & sandstone of Marwar Super Group. Metamorphic are normally impervious except in presence of a few weak planes, joints, weathered zones and kinks which contain moderate and limited quantity of ground water. These are basically phreatic aquifers and availability of ground water depends on good amount of precipitation. Such aquifers are mainly confined to eastern part of Riyan, Parbatsar blocks, central part of Makrana and eastern part of Ladnun blocks, northern part of Didwana block.

**Jodhpur sandstone:** These aquifers mainly consist of medium to coarse grained sand, cemented with silica and ferruginous matrix. This sandstone is intercalated with siltstone and shale. The sand stones are hard, compact and from medium aquifer. Wherever, ground water occurs, it mainly occupies either void space between the adjacent grains (primary porosity) and in the secondary porosity zones. Jodhpur sandstone mainly occurs in southwestern part of Mundwa block and central part of Ladnun block. Ground water in these formations is under semi-confined to unconfined condition. Thickness of sandstone varies from 100-250m

**Bilara limestone:** It is most important and potential aquifer comprising limestone, dolomite and shale. The limestone is white to grey colors, hard and compact, cherty and dolomitic in nature. However, it is cavernous at places and susceptible to solution activity which gives rise to high discharge in wells. These cover western and north-central part of Nagaur block, central part of Mundwa block, west central and eastern part of Jayal block, part of Ladnun block. Thickness of limestone is varies from 100- 300 m.

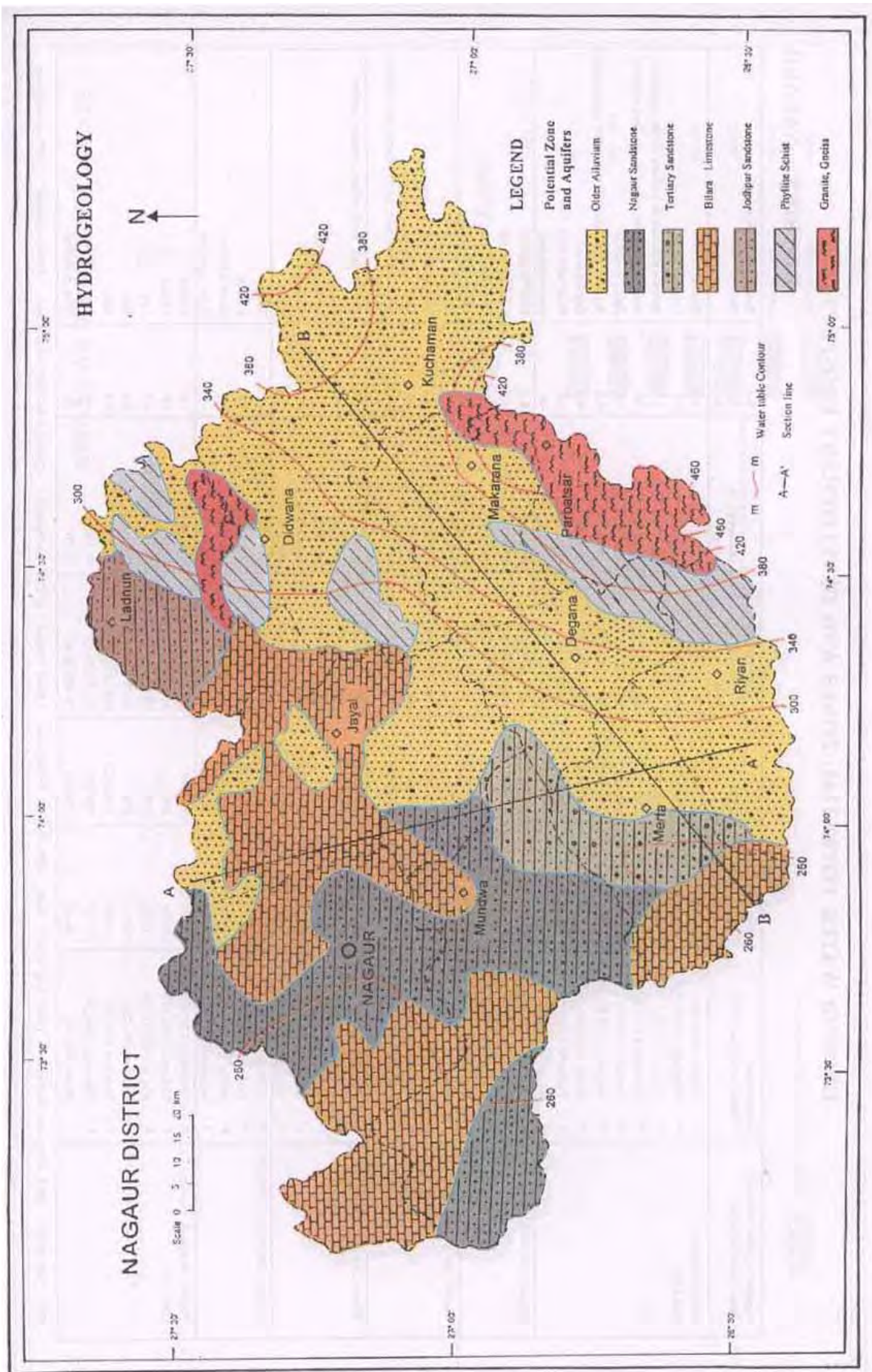
**Nagaur sandstone :** It is coarse to fine grained, loosely cemented with gravel at basal part which act as good aquifer and occupies mainly the part of Nagaur, Jayal, Mundwa and Merta blocks. The associated rocks are siltstone and shales. Its thickness varies from 140-240 m.

## **Semi-consolidated Formation**

These include only Palana sandstone consisting of very coarse grained, gravelly sand with intercalation of clay with kankar and lignite. Ground water occurs under phreatic to confined condition and saturated thickness of 40 m constitutes a potential aquifer. This mainly occurs in part of Merta, Mundwa and Jayal blocks. Its thickness varies from 100-250 m.

## **Unconsolidated Formation**

Quaternary alluvium is the main aquifer which comprises unconsolidated to loosely consolidated fine to coarse grained sand having intercalations and intermixing silt, clay with `kankar`. Ground water occurs under unconfined to semi-confined conditions, Quaternary alluvium covers part of Riyan, Merta, Degana, Parbatsar, Makrana, Khuchaman, Didwana, Ladnu and Jayal blocks. Its thickness limited to 200 m.



## **Aquifer Parameters**

The deeper aquifer are being exploited extensively through low to medium duty tube wells and the aquifer parameters of dug wells and tube wells have been studied from pumping tests. The yield of tube wells\dug wells in metamorphic rocks schist, gneiss, quartzite, phyllite and gneisses range from 5-20 m<sup>3</sup>\hr. The tube wells in Jodhpur sandstone give discharge in range of 12 to 32 m<sup>3</sup>\hr. Discharge\yield of tube wells in Bilara limestone varies from 5 to 40 m<sup>3</sup>\hr. Nagaur sand stone varies from 6.5 m<sup>3</sup>\hr to 36 m<sup>3</sup>\hr. The discharge of tube wells in Palana sand stone ranges from 5.0 m<sup>3</sup>\hr to 30 m<sup>3</sup>\hr. The yield of tube wells\dug wells in Quaternary alluvium varies from 12 m<sup>3</sup>\hr to 32 m<sup>3</sup>\hr.

## **Depth to Water Level**

Depth to water level in the district ranges from 10 to 80 meter below ground level (mbgl) In Precambrian meta-sediments depth to water level varies from 10 to 55m in rocks of Marwar super group and Tertiary formation it varies from 25 to 80m and in alluvium formation it varies from 10 to 60m. Depth to water level is shallower in the eastern, northern and southern part of the district where as in the southern western, western and central part of the district water level is deeper.

All the potential zones of the district shows decline trend of water level except few local patches having saline quality of ground water and there is no ground water development. Long term change in ground water regime in the district it is observed that over a major part of the district lying in southern, south western, western, north eastern central and eastern part of the district shows alarming rate of water level declining. This significant decline is observed due to increased ground water draft to meet the increased demand of agriculture, domestic and industrial sector. In some areas of Mundawa, Merata, Rian, Parbatsar, Kuchaman, Degana and Didwana water level decline is 10 to 25m has been noticed during last 15 years.

On the basis of water table contour map, it has been observed that overall ground water flow direction is towards west. In the central portion heavy exploitation of ground water in Bilara limestone and Tertiary sandstone (Palana sandstone) creates a ground water trough with flow direction towards south. Due to salinity problem in Nagaur sandstone particularly in the western part of the district creates a water divide.



Block	Pre-monsoon water level in m bgl		Post-monsoon water level in m bgl		Water level fluctuation in m (Pre– Post)			
	Min	Max	Min	Max	Rise		Fall	
					Min	Max	Min	Max
Degana	8.09	39.87	7.74	42.94	0.12	0.35	0.59	3.07
Didwana	5.87	37.43	4.80	37.30	0.13	15.29	1.26	1.95
Jayal	14.51	49.25	15.80	48.92	0.33	2.73	1.03	1.29
Kuchaman	18.37	18.37	18.84	18.84	-	-	0.47	0.47
Ladnun	27.90	27.90	26.38	26.38	1.52	1.52	-	-
Merta	21.98	62.30	22.27	63.72	-	-	0.17	1.42
Mundwa	50.05	57.29	50.61	50.61	-	-	0.56	0.56
Nagaur	34.02	61.86	31.78	65.46	0.40	0.40	2.87	3.60
Parbatsar	38.80	38.80	11.39	11.39	-	-	-	-
Riyan	18.11	47.15	47.77	47.77	-	-	0.62	0.62
<b>District</b>	<b>23.77</b>	<b>44.02</b>	<b>23.74</b>	<b>41.33</b>	<b>0.50</b>	<b>4.06</b>	<b>0.95</b>	<b>1.62</b>

### 5.3 Ground Water Quality

Chemical quality of ground water in Nagaur district is generally brackish to saline with few pockets having fresh water with E.C. less than 2000 micro mhos/cm at 25°C. Then there are some areas suffering from high fluoride. The ground water quality is brackish to saline from east of Merta to Degana and from Didwana to Nagaur via Jayal block in the central, western, northwestern part of the district. In this big pocket E.C. of ground water is more than 3000 micro mhos/cm at 25°C. There are some pockets namely eastern part of Rian southern part of Degana, major part of Parbatsar, north and northeastern part of Kuchaman, western and northwestern part of the Merta block, major part of Mundawa, Kuchera-Khanwar-Gagawana area of Jayal block, south eastern part of Didwana, northern and south western part of Ladnun block, where the E.C. of ground water is within 3000 micro mhos/cm at 25°C. There are two salt lake area where ground water having E.C. more than 10000 micro mhos.

Ground water in the alluvium is in general better in quality than that found in the sandstones of Nagaur and Palana series, and Meta sediments. The fluoride content of ground water in Nagaur district varies from less than 1 ppm to 10 ppm. In a longitudinal belt extending from Manasar in Nagaur blocks to Indawar in Merta block the fluoride is more than 4 ppm. There is another big pocket in the south-eastern part of the district covering parts of Parbatsar, Makrana and Degana blocks where the fluoride is much over 4 ppm and the area is called Banka-patti (fluoride affected area).

#### Ground water quality in deeper aquifers

The ground water quality is brackish to saline from east of Merta to Degana and from Didwana to Nagaur via Jayal block in the central part of the district. In this big pocket covering about 6000 km<sup>2</sup> area the E.C. of ground water is more than

5000 micro mhos/cm at 25°C. There are three pockets namely around Nimri in Ladnun block, around Gotan in Merta block and in a longitudinal belt in the eastern part of the district where the E.C. of ground water is within 2000 micro mhos/cm at 25°C.

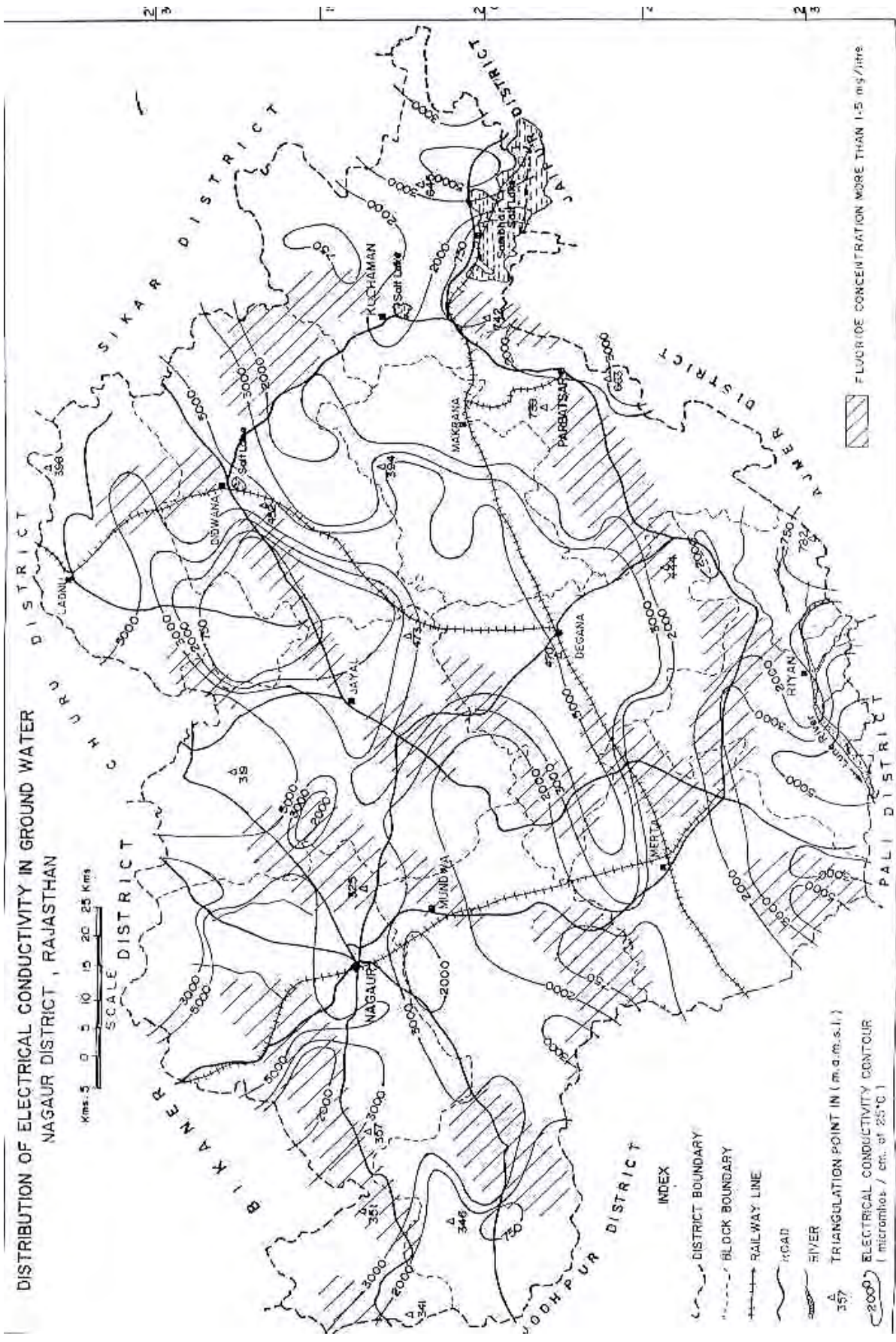
Ground water in the alluvium is in general better in quality than that found in the sandstones of Nagaur and Palana series. Table 20 indicate that the ground water in quaternary alluvium has less than 1000 ppm T.D.S. (E.C. less than 2000 micro mhos/cm) only in the eastern part which in the widely spread area the range is between 1000-3000 ppm T.D.S. in the wells penetrating Tertiary sediments the salinity exceeds 3000 ppm. T.D.S.

The E.C. of ground water in the shallow aquifer of Nagaur and Palana sandstone varies from 900 to 6000 micro mhos/cm at 25°C. However the quality of water deteriorates with depth. At Merta city the borehole of 421.20 m deep, the ground water was with 28496 micro mhos/cm electrical conductance. The tube wells of the average depth of around 80 m tapping sandstones, the E.C. of ground water is around 2000 micro mhos/cm. The tube wells tapping phyllites, schists and gneisses, the quality of ground water is very poor.

The fluoride content in ground water of tube wells constructed at Kanwai (Didwana block), Roru and As Ki Dhani (Ladnun block) is more than 3 ppm. The production well at Luniawas (Morta block) and Gorera ( Nagaur block) also yielded water with more than 3 ppm fluoride.

DISTRIBUTION OF ELECTRICAL CONDUCTIVITY IN GROUND WATER  
 NAGOUR DISTRICT, RAJASTHAN

Scale: 5 10 15 20 25 Kms



FLUORIDE CONCENTRATION MORE THAN 1.5 mg/litres

- INDEX
- - - DISTRICT BOUNDARY
  - - - BLOCK BOUNDARY
  - +—+—+ RAILWAY LINE
  - +—+ ROAD
  - RIVER
  - △ TRIANGULATION POINT IN (m.a.m.s.l.)
  - ELECTRICAL CONDUCTIVITY CONTOUR (micromhos / cm. at 25°C)

## 5.4 Ground Water Resources

Ground water resources have been reassessed as on 31.3.2004 based on Ground Water Estimation Committee (1997) are given below:

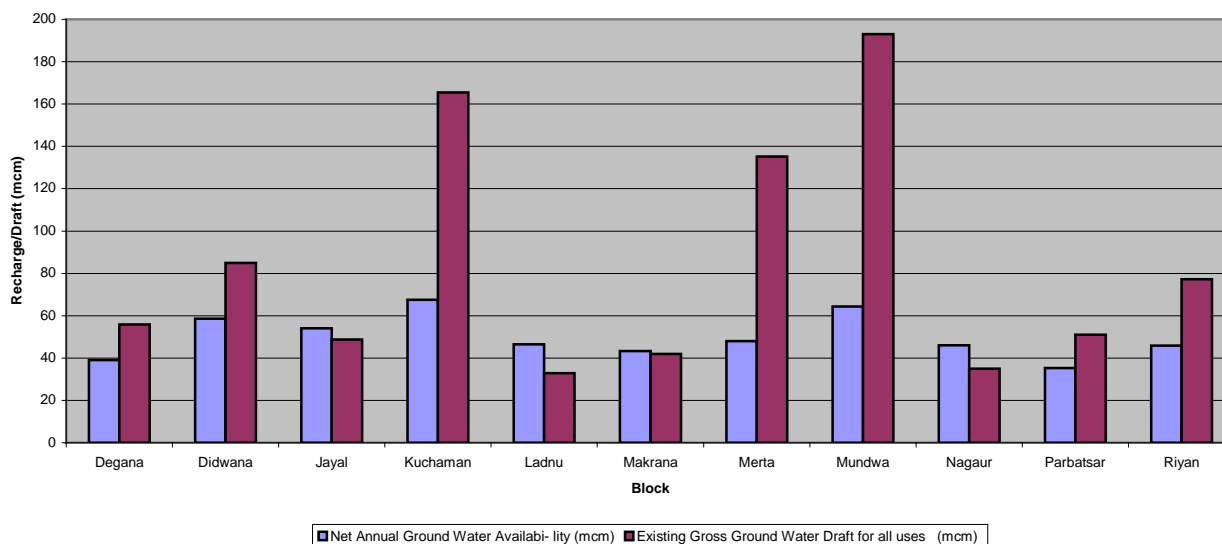
### GROUND WATER POTENTIAL OF NAGOUR DISTRICT AS ON 31.3.2004

Block	Area of Block (Sq.m.)	Type of Area	Potential zone area (Sq.m)	Net Annual Ground Water Availability (mcm)	Existing Gross Ground Water Draft for Irrigation (mcm)	Existing Gross G.W. Draft for Dom. & Ind. Use (mcm)	Existing Gross Ground Water Draft for all uses. (mcm)	State of G.W. Development (%)	Category
1	2	3	5	6	7	8	9	12	15
Degana	1463.34	NC	1203.34	39.0929	42.0638	13.8317	55.8955	142.98	O. E.
Didwana	1637.59	NC	1637.59	58.6661	72.0970	12.7920	84.8890	144.70	O. E.
Jayal	1948.08	NC	1724.58	53.9753	33.2385	15.5200	48.7585	90.33	CRITICAL
Kuchaman	1507.13	NC	1125.88	67.4973	151.5210	13.9280	165.4490	245.12	O. E.
Ladnu	1530.08	NC	1448.83	46.4546	22.9604	9.9267	32.8871	70.79	SEMI-CRITICAL
Makrana	1140.08	NC	1065.08	43.2992	32.2490	9.6794	41.9284	96.83	CRITICAL
Merta	1434.80	NC	1378.55	47.9542	122.1430	13.1040	135.2470	282.03	O. E.
Mundwa	2207.29	NC	2207.29	64.3185	168.4015	24.5760	192.9775	300.03	O. E.
Nagaur	2532.90	NC	2270.40	45.9825	19.2950	15.7440	35.0390	76.20	SAFE
Parbatsar	1071.70	NC	1071.70	35.2337	44.3875	6.5683	50.9558	144.62	O. E.
Riyan	1245.26	NC	1245.26	45.8950	65.9475	11.2979	77.2454	168.31	O. E.
<b>Total of District (Excluding Saline)</b>			<b>16378.50</b>	<b>548.3694</b>	<b>774.3041</b>	<b>146.9680</b>	<b>921.2721</b>	<b>168.00</b>	
<b>TOTAL OF SALINE</b>			<b>1339.75</b>	<b>49.9563</b>	<b>7.5420</b>	<b>3.0880</b>	<b>10.6300</b>	<b>21.28</b>	

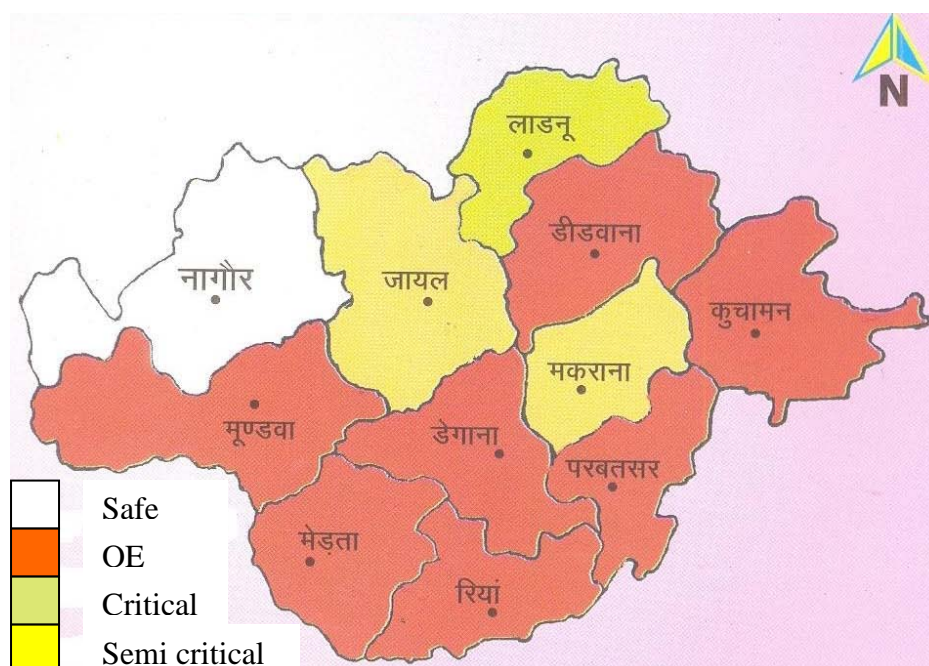
O. E - Over Exploited

NC- Non Command

Net GW Recharge Vs Gross Draft for All Uses (Annual)



## Category of Blocks in Nagaur District as on March, 2004



## 6.0 GROUND WATER DEVELOPMENT STRATEGY

### 6.1 Ground Water Development

Ground water is only source of irrigation in the district. The ground water development in the district is being done by dug wells and tube wells. Stage of ground water development in the district is 168%, which indicate that the scope of ground water development is already exhausted in 7 blocks where groundwater development has already exceeded 100% and categorized as “Over-exploited”. 2 blocks falls under “Critical” category and 1 block falls under semi-critical category where ground water development is approaching 100%. Only one block (Nagaur) fall under safe category. Stage of groundwater development is even above 250% in Mundwa block, Kuchamen and Merata blocks, 150% in Riyian, Parbatsar, Degana and Didwana blocks. Two blocks Jayal and Ladanu falls under “Critical” category, so there is a need of systematic groundwater development in these blocks. However, exploratory drilling can be taken up in unexplored area for estimation of aquifer parameters.

### 6.2 Water Conservation and Artificial Recharge

Precious Groundwater resources have to be conserved for sustainable availability. Artificial recharge measure to be employed for augment ground water resources by roof top rain water harvesting, construction of sub surface barriers and anicuts at suitable locations.

## **7.0 GROUND WATER RELATED ISSUES & PROBLEMS**

Major part of the district is covered by hard formation such as Jodhpur sandstone, Nagaur sandstone Bilara Limestone, Delhi Super Group metamorphic and granites. These have poor water yielding capacity except Marwar Super Group rocks. Also such areas suffer from water quality problem and in some of the areas ground water is highly saline. Villages located in such areas have the basic problem of drinking water requirement and the situation becomes very critical in summers and in drought years.

Another problem of concern in the district is the that most of the potential zones have registered heavy ground water development causing lowering of water table and drying up of large number of shallow wells or reduction in their yields. Heavy decline of more than 15 m observed in Mundwa, Merata, Jayal and Kuchaman blocks during last 10 years.

## **8.0 Recommendations**

1. Heavy Ground water withdrawal from potential zones areas of Mundawa, Merata & Kuchaman for agriculture use, where stage of ground water development has reached more than 250%, it has to be controlled by preventing further ground water development for agriculture and industrial use.
2. Awareness program to educate about conservation of precious ground water resources and training on rainwater harvesting will be beneficial to check decline in water level and justified use. So mass Awareness program may be organized in every gram-panchayat level.
3. Financial assistance for ground water like sprinklers development in over-exploited, critical and semi-critical area should not be encouraged.
4. Use of water saving devices, drip irrigation, close field distribution channels etc. should be promoted.
5. Modern agricultural management techniques have to be adopted for effective and optimum utilization of the water resources. This can be achieved by maintaining irrigation through minimum pumping hours as per minimum requirement of water by the crop and also selecting most suitable cost effective crop pattern.
6. High water requirement crops to be discouraged. Proper agriculture extension services should be provided to the farmers so that they can go for alternate low water requirement economical crops. Changing from higher water intensity to low water intensity cropping pattern & adoption of sprinklers & drip irrigation techniques can minimize heavy exploitation of ground water for irrigation.
7. Salt resistant crops can be sown in the area having brackish to saline ground water.
8. Areas having EC values more than 3000 micro mhos/cm should be avoided for drinking water supply. The areas having high fluoride & nitrite should be mixed

with piped water supply schemes for drinking purpose from the areas where T.D.S. are within permissible limit.

9. Traditional rainwater harvesting structures like 'Tankas', roof top rain water storage should be encouraged for day to day requirements which will reduce ground water draft.
10. Large-scale recharge potentials exist in depleted aquifers. Mega ground water recharge to such areas through outside surface water sources like lift canal from IGNP system or floodwater during excess rainy years be implemented.
11. Small check dams or earthen dams, at suitable sites, may be constructed to store rainwater. This will increase recharge to ground water which ultimately result in increase of yield of wells.
12. Ground water Legislation should be implemented for regulation and control of Ground water in over-exploited areas with immediate effect.

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