

# DISTRICT GROUND WATER INFORMATION BOOKLET



**KHANDWA DISTRICT**  
MADHYA PRADESH



**Ministry of Water Resources**  
Central Ground Water Board  
**North Central Region**  
**Bhopal**  
**2013**

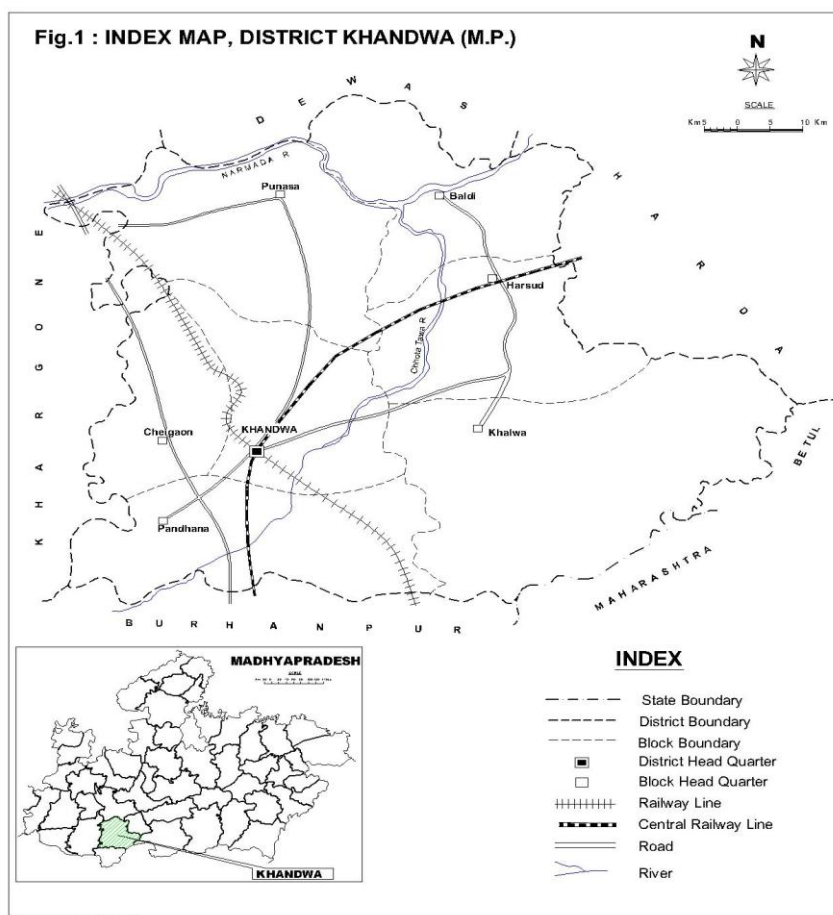
## KHANDWA DISTRICT PROFILE

S. No.	Items	Statistic	
<b>1</b>	<b>General Information</b>		
	(i) Geological Area	7,52,450 Ha	
	(ii) Administrative Division :		
	Number of Tehsils	3	
	Number of Blocks	7	
	Number of villages	716	
	(iii) Population	13,09,443	
	(iv) Normal Annual Rainfall (mm)	777.60	
<b>2</b>	<b>Geomorphology</b>		
	<b>Major Physiographic Units :</b>	Structural hills of deccan traps flood plain, valley fills inter montane depression pediment (Volcanic)	
	<b>Major Drainages</b>	Narmada, Chhota Tawa, Sukta, Bhim Nadi	
<b>3</b>	<b>Land Use in Ha ('000)</b>		
	(a) Forest Area	309.20 Ha	
	(b) Net area sown	300.60 Ha	
	(c) Gross cropped area	384.80 Ha	
<b>4</b>	<b>Major Soil Types</b>		
		Black Cotton	
<b>5</b>	<b>Principal Crops</b>		
		Paddy, Wheat, Jowar, Maize, Gram & Soyabean,	
<b>6</b>	<b>Irrigation by Different Sources</b>	<b>Nos.</b>	<b>Irrigated Area (Ha '000)</b>
	Dug wells	47224	77.20
	Tube well/Bore wells	4036	16.20
	Micro Irrigation	23	10.00
	Tanks/Ponds		15.40
	Total Irrigated Area	-	122.80
<b>7</b>	<b>Number of Ground Water Monitoring Wells of CGWB. (As on 31.3.2013)</b>		
	No. of Dug Wells	20	
	No. of Piezometers	01	
<b>8</b>	<b>Predominant Geological Formations :</b>		
		Archaeans, Bijawars, Vindhyan, Baghbeds, Deccan Traps Alluvium	
<b>9</b>	<b>Hydrogeology</b>		
	Major Water Bearing Formation.	Vindhyan sandstone Deccan trap, Basalts	
	<b>Pre-Monsoon</b> Depth to water level during 2012	4.90-14.98 mbgl	
	<b>Post-Monsoon</b> Depth to water level during 2012	1.45-7.07 mbgl	
	Long Term water level trend in 10 years (2003-2012)	Pre monsoon Rise: 2.18 – 7.09 cm/year Fall: 0.64 – 21.53 cm/year Post monsoon Rise: 3.55 – 43.75 cm/year	

<b>10</b>	<b>Ground Water Exploration by CGWB (As on 31.3.2013)</b>	
	No. of wells drilled EW	36 EW, OW 28, 22 PZ
	Depth range (m)	-
	Discharge (lps)	0.41 + 15.86 lps
<b>11</b>	<b>Ground Water Quality</b>	
	Presence of chemical constituents	EC 539 - 2243 NO <sub>3</sub> 29 – 258 mg/l F 0.02 – 0.77 mg/l
<b>12.</b>	<b>Dynamic Ground Water Resources (2009)</b>	
	Net Ground Water Availability	76949 Ham
	Gross Ground Water Draft	47583 Ham
	Projected Demand for Domestic and Industrial uses up to 2033	4644 Ham
	Stage of Ground Water Development	62 %
<b>13</b>	<b>Awareness and Training Activity</b>	
	Mass Awareness Programme organized No. of Participant	1 200 At Urja Vihar Autitoriun Omkareshwar
	Water Management Training Programme  Number of Participants	2 1. At Samudayik Bhawan Narmada Sagar Punasa 2. Zilla Panchayat Khandwa  150 & 81
<b>14</b>	<b>Major Ground Water Problems and Issues</b>	Depletion of Water levels
<b>15</b>	<b>Ground Water Control and Regulation</b>	
	No. of Over Exploited Blocks	Nil
	No. of Critical Blocks	Nil
	Semi – Critical Block	Chhegaon Makan
	No. of Blocks notified	Nil

## 1.0 INTRODUCTION

Dhar district East Nimad is situated in the south – western part of Madhya Pradesh. The Indira Sagar Project on Narmada River near Punasa village in Khandwa district is unique project with the largest reservoir on the country. The district is bounded by Devas in the north Harda and Burhanpur district in eastern, western & southern directions respectively. The district lies between north latitude  $21^{\circ} 31'$  and east longitude of  $75^{\circ} 57' 27''$  and  $77^{\circ} 13''$  Falling in survey of India toposheet No. 55 B, 55C. E. The total population of the district as per 2011 census is 1309443. The area of the district is 7524.50 sq km and it has been divided into three tehsil and seven blocks. There are 716 villages.



### Drainage :

Entire Khandwa district falls under the Narmada basin Narmada and its tributaries form the main source of surface water in the area. Narmada flows along the northern boundary of the district main rivers which drains the area of

the district which drains the area of the district are Chhota Tawa, Sukta & Bhim Nadi.

## **2.0 Rainfall and Climate**

The climate of Khandwa district, MP is characterized by hot summer and general dryness except during the south west monsoon season. The year may be divided into four seasons. The cold season, December to February is followed by the hot season from March to about the middle of June. The period from the middle of June to September is the south west monsoon season. October and November form the post monsoon or transition period.

The normal annual rainfall of Khandwa District is 777.60 mm. The district receives maximum rainfall during south – west monsoon period i.e. June to September. About 90.5% of the annual rainfall is received during monsoon season. Only 9.5% of the annual rainfall takes place between October to May period. Thus surplus water for ground water recharge is available only during the south – west monsoon period.

The normal maximum temperature received during the month of May is 41.8<sup>0</sup> C and minimum during the month of January 11.2<sup>0</sup> C. The normal annual mean maximum and minimum temperature of Khandwa district is 34<sup>0</sup> C & 19.5<sup>0</sup> C respectively.

During the south- west monsoon season the relative humidity generally exceeds 86% (July / August month). The rest of the year is drier. The driest part of the year is the summer season, when relative humidity is less than 33%. April is the driest month of the year.

The wind velocity is higher during the pre monsoon period as compared to post monsoon period. The maximum wind velocity is 15.6 km / hr. observed during the month of June and minimum 4.0 km/hr during the month of November. The average normal annual wind velocity of Khandwa district is 8.7 km / hr.

## **3.0 Geomorphology and Soil Types**

### **3.1 Geomorphology :**

Structural hills of vindhyans, denudation hills of Deccan traps are predominant in Khandwa district. Apart from these above geomorphic features like flood, plain, alluvial plain, valley fills, intermountain depressions, pediment (Volcanic) are also seen in the district.

### **3.2 Soils :**

The nature & Characteristics of soils is dependent primarily on Relief of the area which influences the variation in soil formation. The soil of Khandwa district are classified on medium black soils under the broad classification of soil of India & are low fertility soils. There are alluvial deposits constitute gravel sand, silt or clay sized unconsolidated alluvium found along the narrow strips of rivers.

## **4.0 Ground Water Scenario**

### **4.1 Hydrogeology :**

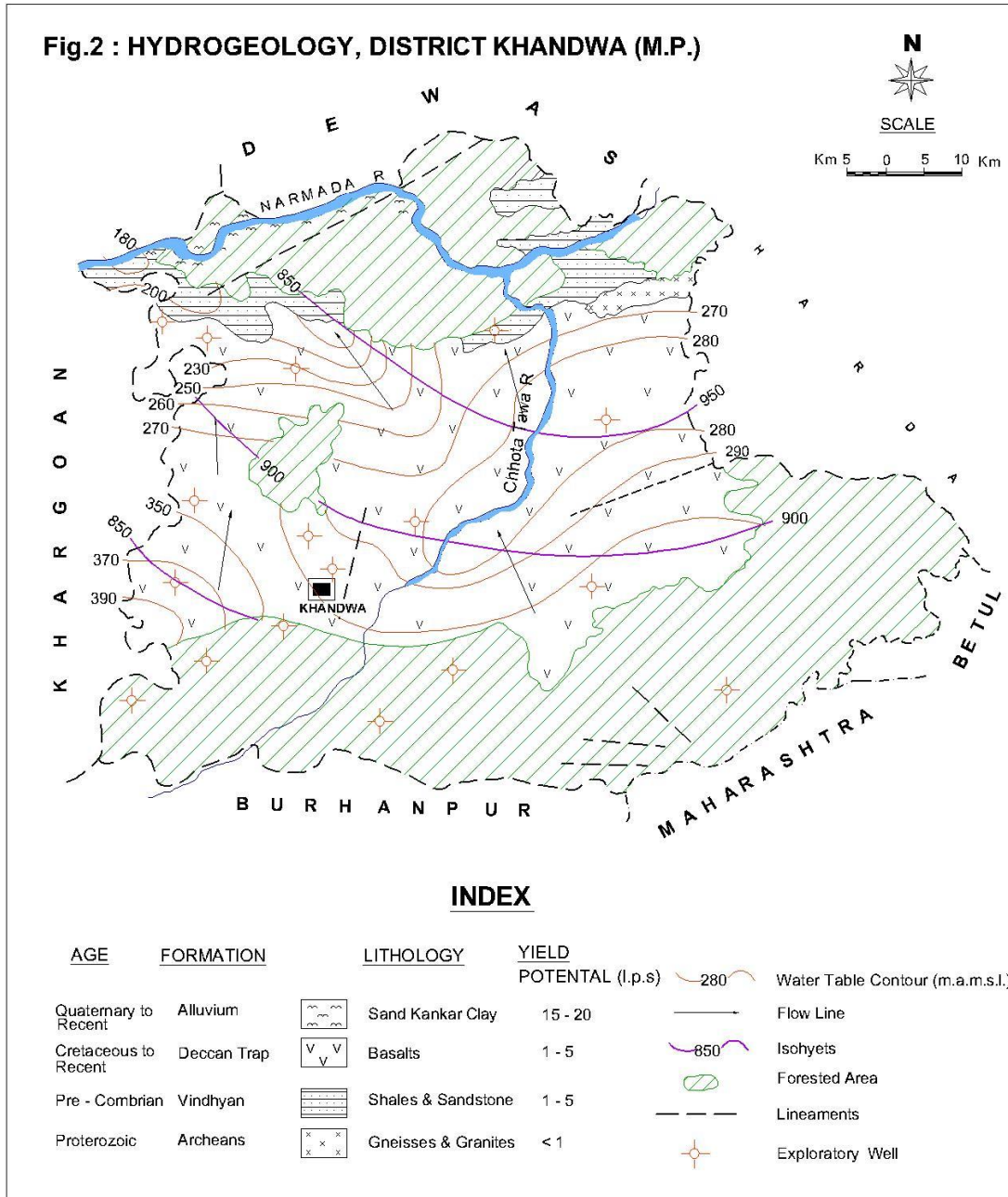
Khandwa district is underlain by various geological formation, forming different types of aquifers in the area. Main geological units of the area are Archaean, upper vindhyan, Bagh beds, Deccan traps and alluvium. Occurrence and movement ground water in hard rocks is mainly controlled by secondary porosity through joints and fractures. Primary porosity in Bagh sandstone and vesicular basalts in Deccan traps play an important role in ground water occurrence and movement bagh beds may also form potential aquifer made up of relatively loose and friable shale and sand stone. Ground water is general occurs under unconfined to semi confined. The occurrence and movement of ground water in different geological formation is described below :

#### **a) Archaeans -**

Weathered portions and fractured zones of granite and gneisses when saturated from moderate aquifers. The yield of wells in the formation, ranges from 1 to 3 lps these rocks are exposed in the north eastern part of the district falling in Baldi block.

#### **b) Bijawars -**

The Bijawars are exposed in the north eastern part of the district falling in Baldi blocks. Bijawar sandstone and shale breccia occupy an area of 85 sq. km in this block. Generally yield of wells in this formation is less than 1 lps. But if the formation is consists of limestone with well development solution opening the yield may be 2 to 5 lps.



**c) Vindhyan-**

The upper vindhyans sandstone shale and are exposed in northern part of the district all along the Narmada river falling in Punasa block. The total area occupied by the vindhyans formations, is about 1115 sq. km which included part of Baldi block in the district. The sandstone and shale of vindhyan formations are compact and having poor permeability. The jointed & fractures and bedding planes in sandstone and shales control the occurrence and movement of ground water in the areas located in favourable geomorphic and topographic conditions. The soil and weathered profile developed in this

formation is generally thin and as a result ground water occurs at shallow depth under unconfined condition. The yield of well in formation ranges from 1 to 3 lps. The exploratory well drilled at Bir bad Nimarkheda trapping basalt and vindhyan sandstone has yield 3.28 and 8.16 lps discharge.

**d) Bagh Beds-**

Bagh beds are exposed in the north central part of the district falling in Punasa block. Bagh beds comprises of sandstone and shales are sedimentary formation but have a limited extent and poor to moderate permeability. The lime stone and calcareous clay when Certified form productivity aquifers.

**e) Deccan Traps-**

The Khandwa district is underlain by 13 basaltic flows, which are distinguished by either foresence of reg bole, vesicular zone or break in slope. Most of .the lava flow are Aa type bad thickness of flows varies from 7 to 35m. These flow are confined between 265 and 698 m amsl. The Deccan trap flow, basic intrusion and the calcite veins at some place constitutes the basaltic terrain ground water generally occure under pheratic condition in shallow weathered, jointed and fractured horizons. Basalt does not exhibit uniform nature, both vertically and laterally. Physiographic location, thickness of weathered, mantle, degree of joints, fractures or sheared zones, characteristic of vesicular horizons and their inter connections are important factors, that play a decisive role in the yield capacity of open wells tapping shallow aquifers. The deeper aquifer system appear to be under semi confined conditions. The deeper aquifer mainly governed by secondary porosity. Jointed fractured from of massive unit is creating possibility of their acting as heavy confining bed, consequently resulting into semi confined conditions for water bearing vesicular unit occurring beneath it on other hand is massive unit is compact and have not developed fractured porosity then they may act as a confining bed for water being vesicular horizon, occurring below it and thus leading to confined conditions dug wells in basaltic flows of deccan traps vary in depth from 6 to 15 mbgl. CGWB has drilled number of tube wells in deccan trap in Khandwa District water bearing capacities in deccan traps varies from



flow to flow. The ground water in this formation occurs in weathered vesicular and fractured basalt.

**f) Alluvium-**

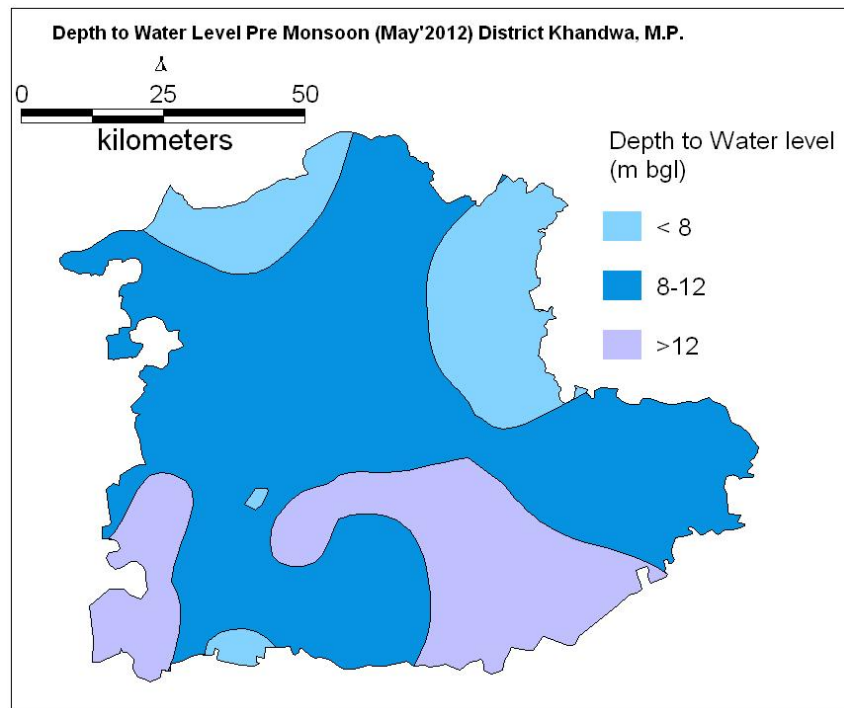
Alluvium consist of coarse grained sand to silty material, gravel and hard brownish soil and clay. The alluvium stretch comprise horizontal to sub horizontal thin horizons. Ground water occurs in the granular zones of sand and gravel the yield of formation depends upon the percentage of sand and clay and thickness of alluvium. The yield of well in the formation ranges from 5 to 20 lps.

**Depth to water level:**

Central Ground Water Board is carrying out water level monitoring since year 1972 in the district. Water levels of these monitoring wells are being monitored four times in a year during the month of January, May, August and November. To study ground water regime of the area pre monsoon and post monsoon depth to water level maps has been prepared. Southern and northern part of the district is highly undulating and forested.

**Pre monsoon (May 2012):**

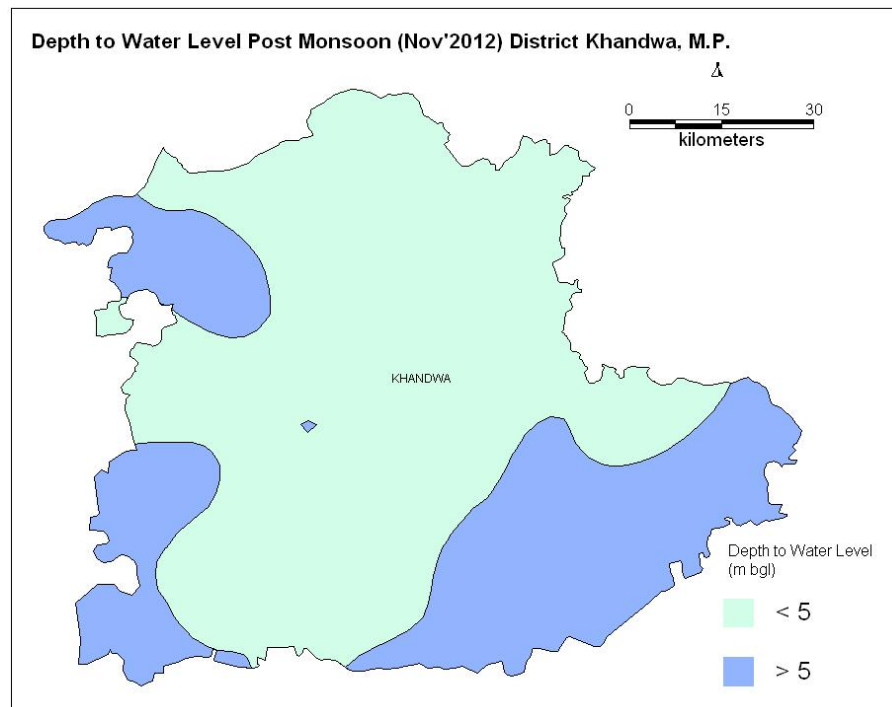
In general depth to water level in the district ranges between 4.90 mbgl to 14.98mbgl. In major part of the district depth to water level is between 8 & 12 mbgl.



### Post Monsoon (November 2012):

During post monsoon season, depth to water level varies from 1.45 mbgl to 7.07mbgl.

Shallow water level less than 5 mbgl are observed in north central part of the district and more than 5 mbgl water level in recorded in Chhegaon



Makhan and Khandwa block.

### 4.2.3 Groundwater level trend (May2003 to May 2012)

Analyses of Groundwater level data of pre-monsoon period indicate that there is rise as well as decline in water level in the district. In general, rise in water level is in the range of 2.18 to 7.09 cm/year whereas decline is in the range of 0.64 to 21.53 cm/yr.

#### Aquifer parameters :

CGWB had drilled 36 exploratory well, 28 observation wells and 22 piezometer in the district. Yield of Deccan traps ranges from meagre to 15.86 lps and draw down ranges between 1.03 to 45.27 m. Depth of these exploratory bore wells ranges from 165 (Bir) to 266.42 (Deshgoan) mbgl.

### 4.2 Ground Water Resources (2009) :

Khandwa district is underlain by mainly Basaltic lava flows of Deccan trap. Dynamic ground water resources of the district have been estimated for base year - 2008/09 on block-wise basis (table 1). There are seven number of assessment units (block) in the district which fall under non-command (97 %) and command (3%-Chhegaon Makhan, Khnandwa and Pandhana) sub units. All the blocks except, Chhegaon Makhan are categorized as safe. The highest stage of ground water development is computed as 88.2 % in Chhegaon Makhan. The net ground water

availability in the district is 76,949 ham and ground water draft for all uses is 47583 ham, making Stage of Ground water development 62 % (59 % in 2003/04) as a whole for district. After making allocation for future domestic and industrial supply for next 25 years, balance available ground water for future irrigation would be 27,417 ham .

**Table 1: Ground water availability and Stage of development**

DYNAMIC GROUND WATER RESOURCES (As on March, 2009)										
S. No.	Assessment Unit	Sub-unit Command/ Non-Command/	Net Annual Ground water Availability (ham)	Existing Gross Ground water Draft for Irrigation (ham)	Existing Gross Ground water Draft for Domestic & Industrial water Supply (ham)	Existing Gross Ground water Draft for All uses (ham)	Provision for domestic, and industrial requirement supply to next 25 year (2033) (ham)	Net Ground water Availability for future irrigation d development (ham)	Stage of Ground water Development (%)	Category
1	Baldi	Command								Safe
		Non-Command	5970	2030	166	2196	291	3649	37	
		<b>Block Total</b>	<b>5970</b>	<b>2030</b>	<b>166</b>	<b>2196</b>	<b>291</b>	<b>3649</b>	<b>37</b>	
2	Chhegaon Makhan	Command	448	57	49	106	80	311	24	Safe
		Non-Command	11955	10406	503	10909	1028	521	91	Semi Critical
		<b>Block Total</b>	<b>12403</b>	<b>10463</b>	<b>552</b>	<b>11015</b>	<b>1108</b>	<b>832</b>	<b>89</b>	
3	Harsud	Command								Safe
		Non-Command	7706	4409	187	4595	223	3074	60	
		<b>Block Total</b>	<b>7706</b>	<b>4409</b>	<b>187</b>	<b>4595</b>	<b>223</b>	<b>3074</b>	<b>60</b>	
4	Khalwa	Command								Safe
		Non-Command	12814	5484	425	5909	746	6584	46	
		<b>Block Total</b>	<b>12815</b>	<b>5484</b>	<b>425</b>	<b>5909</b>	<b>746</b>	<b>6585</b>	<b>46</b>	
5	Khandwa	Command	377	67	52	118	85	225	31	Safe
		Non-Command	10176	6207	497	6704	822	3148	66	
		<b>Block Total</b>	<b>10553</b>	<b>6273</b>	<b>549</b>	<b>6822</b>	<b>907</b>	<b>3373</b>	<b>65</b>	
6	Pandhana	Command	1967	255	33	289	55	1657	15	Safe
		Non-Command	15370	10095	379	10474	613	4662	68	
		<b>Block Total</b>	<b>17336</b>	<b>10350</b>	<b>412</b>	<b>10762</b>	<b>667</b>	<b>6319</b>	<b>62</b>	
7	Punasa	Command								Safe
		Non-Command	10166	5878	405	6283	703	3586	62	
		<b>Block Total</b>	<b>10166</b>	<b>5878</b>	<b>405</b>	<b>6283</b>	<b>703</b>	<b>3586</b>	<b>62</b>	
		<b>District Total</b>	<b>76949</b>	<b>44887</b>	<b>2696</b>	<b>47583</b>	<b>4644</b>	<b>27417</b>	<b>62</b>	

### 4.3 Ground Water Quality

Ground water quality in Khandwa district is accessed annually by CGWB on the basis of water samples collected from hydrograph stations in the district. Groundwater in the district is generally medium to high saline as electric conductivity values varies between 539 to 2243  $\mu\text{s}/\text{cm}$  at 25° C. Fluoride in the district ranges from 0.02 to 0.77 mg/l and the nitrate concentration ranges from 29 to 258 mg/l.