

DISTRICT GROUND WATER INFORMATION BOOKLET



PANNA DISTRICT MADHYA PRADESH



Ministry of Water Resources

Central Ground Water Board

North Central Region

BHOPAL

2013

PANNA DISTRICT PROFILE

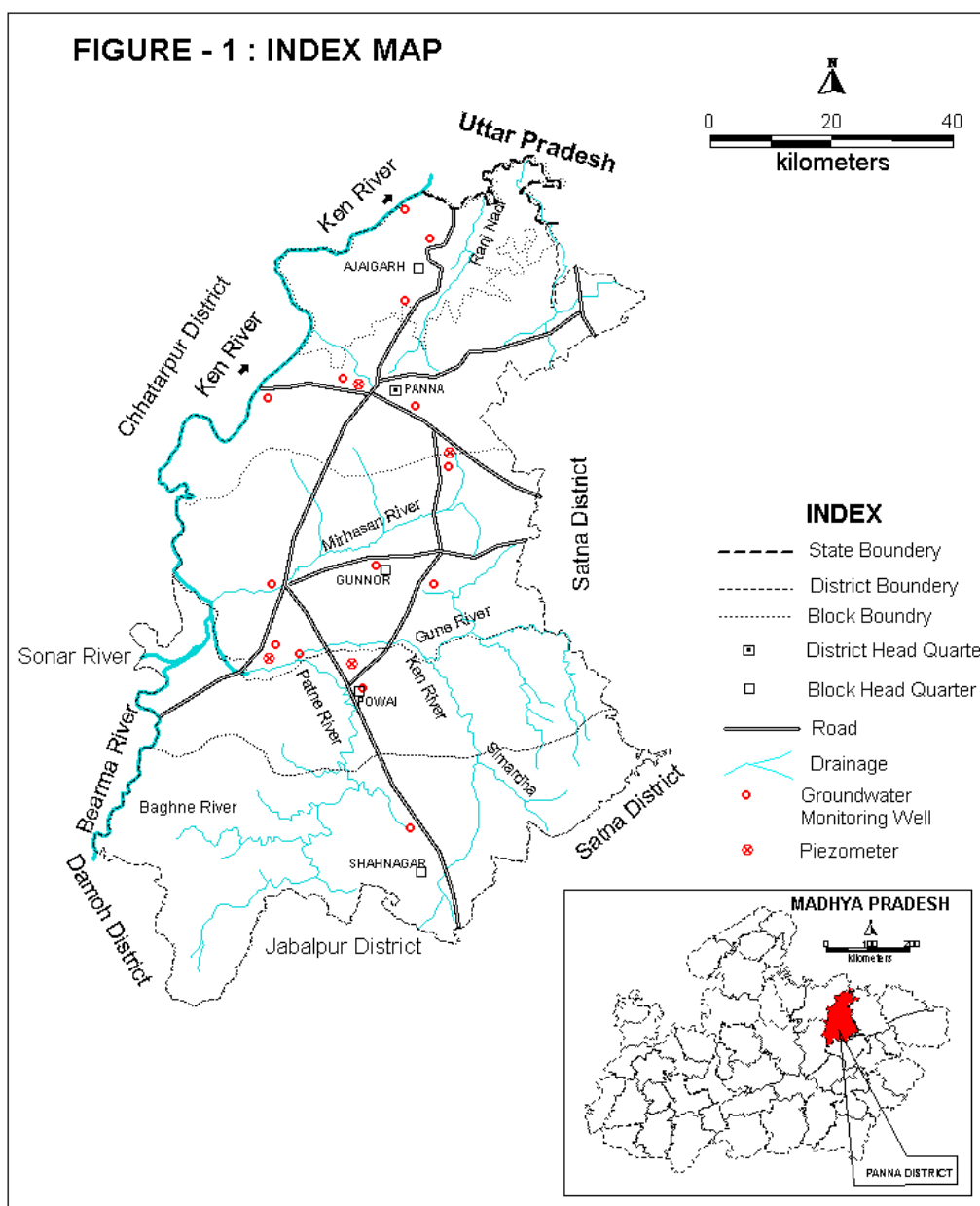
S.No.	Items	Statistics	
1.	General Information		
	i) Geographical area	7,135 km ²	
	ii) Administrative Divisions		
	Number of Tehsil/Blocks	8/5	
	Number of Panchayats	395	
	Number of Villages	1023	
	iii) Population (Census 2011)	10,16,028	
	iv) Normal Rainfall (mm)	1182.9	
2.	Geomorphology		
	1. Major Physiographic Units:	i. Plateaus on Vindhyan rocks ii. Denudational slope on Vindhyan rocks iii. Pediplain iv. Flood plain v. Older flood plain	
	2. Major Drainage:	Ken River & its tributaries like Bearma, Sonar, Patne, Baghain, Mirhasan, Simardha and Ranj Nadi.	
3.	Land Use		('000ha)
	a) Forest area	299.7	
	b) Cultivable area	270.2	
	c) Net area sown	234.1	
	d) Gross cropped area	268.9	
4.	Major Soil Types		Yellow clay and sandy soil
5.	Principal Crops		Gram, Wheat, Rice, Lentil
6.	Irrigation by Different Sources		No. Area irrigated ('000ha)
	Dug wells	13329	17.3
	Tube wells/Bore wells	380	5.2
	Tanks/Ponds	92	3.8
	Canals	61	6.5
	Other Sources	23	45.8
	Net Irrigated Area	-	78.5
	Gross Irrigated Area	-	78.6
7.	Number of Ground Water Monitoring Wells of CGWB (As on 31.3.2013)		
	Number of Dug Wells	20	
	Number of Piezometers	04 (Deep Piezometers)	
8	Predominant Geological Formations		Alluvium, Vindhyan Shales, Sandstone and Limestone.
9	Hydrogeology		
	Major Water Bearing Formation	Sandy alluvium, Jointed and fractured Sandstone, weathered Shale and solution cavity in Limestone.	

	Pre-monsoon depth to water level range during 2012	1.90 – 20.80 m bgl
	Post-monsoon depth to water level range during 2012	0.70 – 17.65 m bgl
	Long-term water level trend in 10 years (2003-2012) cm/yr	5.33 - 33.75 (fall)
10.	Ground Water Exploration By CGWB (As on 31.3.2013)	
	No of wells drilled (EW, OW, PZ, Total)	97 (EW-50, OW-8, PZ-39)
	Depth Range	82.88 – 200.0 m. bgl
	Discharge Range	Meager – 17.00 lps
	Specific Capacity Range	0 - 94.93 lpm/m of drawdown
	Transmissivity	-
11.	Ground Water Quality	
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	EC (98-1428) $\mu\text{s/cm}$ at 25 ⁰ C Nitrate-10-194 Flouride- 0.02-1.74
12	Dynamic Ground Water Resources (2009)	
	Net Annual Ground Water Availability	(ham) 47108
	Existing Gross Ground Water Draft	12938
	Projected Demand for Domestic and Industrial uses up to next 25 years	2807
	Stage of Ground Water Development	27
13	Awareness and Training Activity	
	Mass Awareness Programme Organised	Nil
	Water Management Training Programme	Nil
14	Efforts of Artificial Recharge & Rainwater Harvesting	
	Projects completed by CGWB	Nil
	Projects under technical guidance of CGWB	Nil
15	Ground Water Control and Regulation	
	Number of OE Blocks	Nil
	Number of Semi-Critical Blocks	1, Ajaygarh
	Number of Safe Blocks	4, Shahnagar, Pawai, panna, Gonour
16	Major Groundwater Problems and Issues	
	Depletion in groundwater level and deterioration of groundwater quality	

1.0 INTRODUCTION

Panna district is located at north central part of Madhya Pradesh, is bounded by Banda district of Uttar Pradesh in the north, Satna district in the east, Chhatarpur in the west and Damoh and Jabalpur districts in the south west and southeast respectively. The district extends between the parallels of North latitude $23^{\circ} 48' 55''$ and $25^{\circ} 05' 00''$ and between the meridians of East longitude $79^{\circ} 44' 00''$ and $80^{\circ} 40'$

The Panna district is entirely dependent on road transport. The district is well connected by state highways. The nearest railway station is Satna, which is directly connected to Bhopal, Jabalpur and Delhi and it is 70 km away from Panna town. The nearest Aerodrome is available for air service is at Khajuraho, which is 46 km from Panna on way to Chhatarpur. The Panna is famous for its diamond mines, stylish and huge temples, spectacular seasonal waterfalls and national tiger park.



The total geographical area of the District is 7,135 Sq.Km, with a population of 10,16,028 according to census 2011. The details of administrative units are given in table.

Table: Administrative units of Panna district, Madhya Pradesh.

S.No	Tehsil	Block	Area in Sq Km
1	Ajaigarh	Ajaigarh	612
2	Panna	Panna	1717
3	Gunnor	Gunnor	1112
4	Pawai	Pawai	2047
5	Shahnagar	Shahnagar	1647
	Total		7,135

Central Ground Water Board Activities

- Shri A. R. Bhaire Jr. Hydrogeologist, conducted systematic hydrogeological surveys in Son sub basin of Panna district during 1982-83.
- Shri A. Mukharji Asstt. Hydrogeologist, conducted systematic hydrogeological surveys in Ken sub basin of Panna district during 1984-85.
- Shri R. N. Sharma Jr. Hydrogeologist, conducted systematic hydrogeological surveys in Ken sub basin of Panna district during 1985-86.
- Shri Saurabh Gupta Jr. Hydrogeologist, conducted systematic Hydrogeological surveys in Ken sub basin of Panna district during 1989-90.
- Shri P. K. Das Jr. Hydrogeologist and Shri A K. Budhouliya Jr. Hydrogeologist conducted systematic hydrogeological surveys in parts of Panna district during 1990-91.
- Shri S. Gupta Jr. Hydrogeologist, Shri A K. Budhouliya Jr. Hydrogeologist and Shri Babu Nair Jr. Hydrogeologist conducted reappraisal hydrogeological surveys in Panna district during 1997-98.
- 15 number of exploratory well has been constructed by contractual drilling under drought assistance programme in Panna district during Jan-Feb 2002.

1.0 RAINFALL AND CLIMATE

The normal annual rainfall of Panna district is 1182.9 mm. Panna district receive maximum rainfall during southwest monsoon period i.e. June to November. About 89.5% of annual rainfall is received during monsoon season.

2.0 GEOMORPHOLOGY & SOIL TYPES

Physiographically, Panna district forms parts of Vindhya ranges in the south followed by Bundelkhand upland in the north. The Vindhya ranges contain two linear steps like tablelands trending ENE-WSW separated by an uneven narrow valley having an average elevation of 440 m above mean sea level. The Bundelkhand upland, having an average elevation of 170 m above mean sea level, is a peneplained surface dotted with mesa and linear ridges.

Ken River and its tributaries drain almost entire Panna district. The Ranj River drains the northeast parts of the Panna district. All the tributaries of Ken River are almost westerly flowing, while Ranj River flows in north direction.

Almost three-fourths area of the district is covered with alluvium soils formed by the weathering of Vindhyan sediments. The northern part of the district area is covered with yellowish sandy soils derived from weathering of granitic rocks. The thick alluvial soils are found along the river courses.

4.0 GROUNDWATER SCENARIO

4.1 Geology

The general geological successions in the district are given in table.

Table: General geological succession of Panna district.

System	Lithostratigraphic Unit	Lithological Description
Recent to Pleistocene	-	Alluvium
Rewa Group	Bhander Shale Sandstone and Limestone	Bhander Shale Sandstone and Limestone
----- Diamond Bearing Conglomerates -----		
Kaimur Group	Baghain Sandstone and conglomerates	Sandstone and conglomerates
Semri Group	Porcellanite Stage Basal Stage	Shales Quartzite and conglomerates
Archaean	Bundelkhand Granites	Granites

4.2 Hydrogeology

The general hydrogeological conditions of the district are as follows:

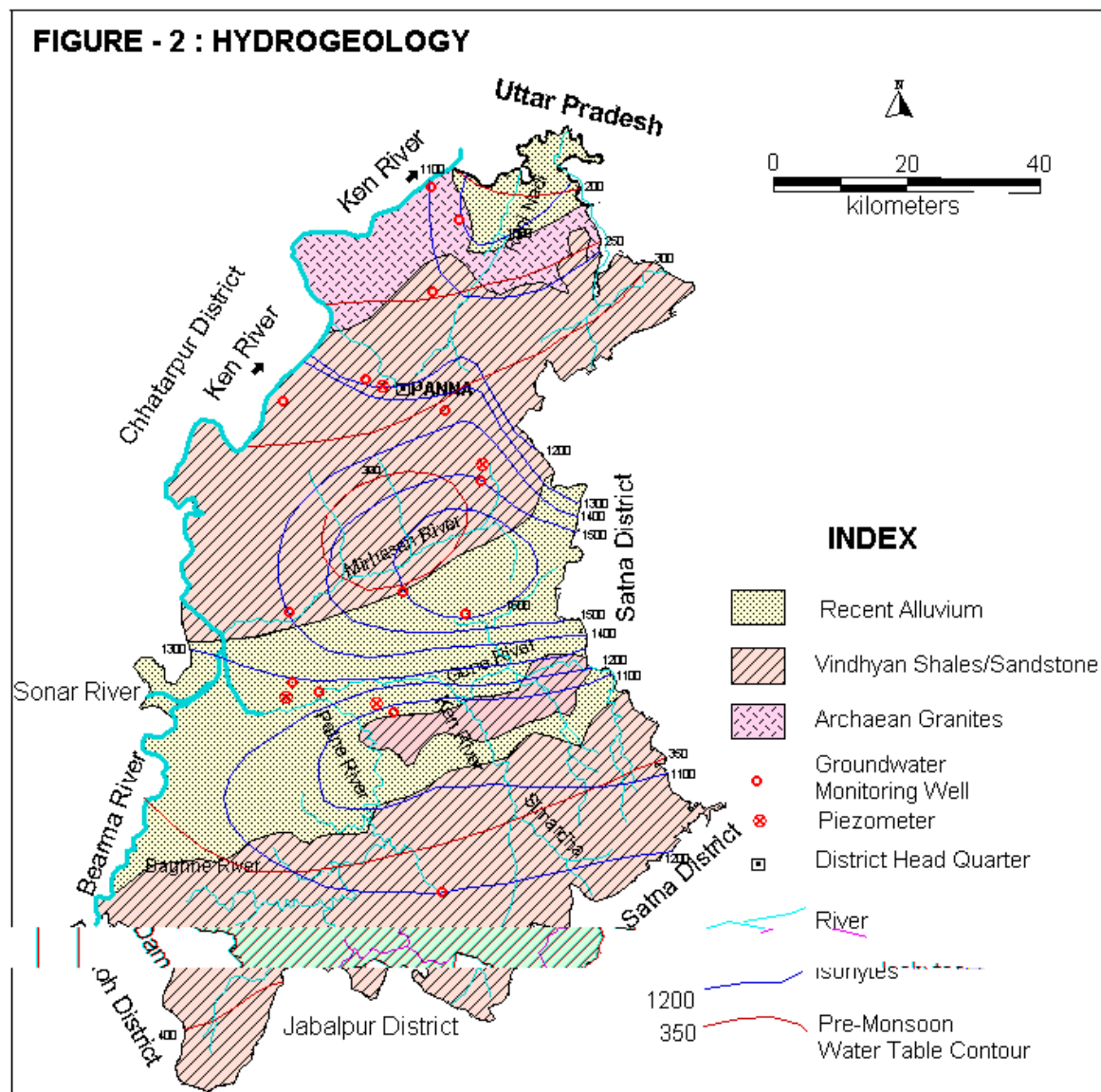
4.2.1 *Archaean*

The rocks of this group are basically pink colored Bundelkhand granites. The granitic rocks are observed in the Panna and Ajaigarh blocks of Panna district. The granites are fine to coarse grained with occasional porphyritic texture. The granites

are hard and compact and degree of weathering is not much in Panna block. However the granites rocks in Ajaigarh blocks are intensely weathered and form good aquifers. The dug wells located in these weathered granites sustain good yields even during summer.

4.2.2 Vindhyan

Vindhyan sandstones belong to Kaimur group are exposed near Rampur, Dalhan Chowki, Majhgawan and Inota village. These sandstones are white, fine grained hard and purely siliceous in nature. The sandstone of Rewa group is well bedded, jointed, hard and compact, reddish to purple colored as observed in Bikrapur, Bilha, Kherbund, akoula and Gandha villages. Sandstone of Bhandar group is reddish brown, jointed, hard and compact in nature and observed in many villages around Shahnagar, Rajapura, Chowmukha and Pawai. The Vindhyan sandstone is fine-grained, impermeable and has no primary porosity. Circulation of groundwater is through joints, fractures and bedding planes.



There are five types of Vindhyan shales that occur in the district- Semri shale (oldest) followed by Jhirri shale, Ganurgarh shales and Sirbu shale (Youngest) in their chronological order.

In general all the shales are fine-grained, soft, friable, thinly bedded and split along bedding planes. The shales form poor aquifer system. However based on the density of joints and fractures, shales often form good aquifer and form very good fertile land between Mirhasan and Ken River.

There is only one limestone layer, which is called as Nagod limestone. It is fined grained jointed and dark grey in colour. Solution activity in limestone formation creates potential aquifer.

4.2.3 Alluvium

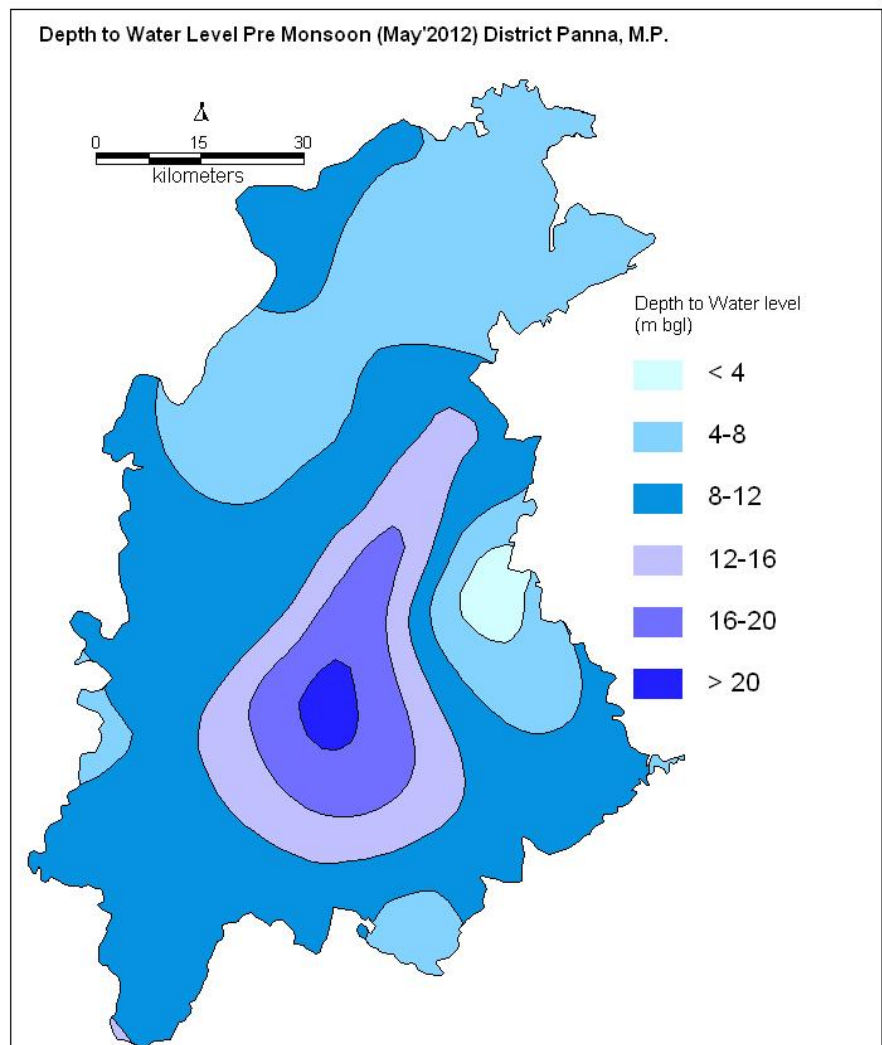
Localized patches of alluvium cover occur along the banks of major and minor rivers and streams in the district. The thickness of alluvium varies from few meters to 30 m. The thickness of alluvium found more on granitic rocks and shales, while it is minimum on sandstone and limestone rocks formation.

4.3 Groundwater Levels

To monitor the seasonal and annual change in quantity and quality of groundwater, CGWB has established 20 Groundwater Monitoring Wells and 4 Piezometers in the district.

4.3.1 Pre-monsoon (May 2012)

During pre-monsoon period, depth to water level ranges between 1.90 m bgl to 20.80 m bgl. The major part of the district have water level in the range of 6-9 m bgl.

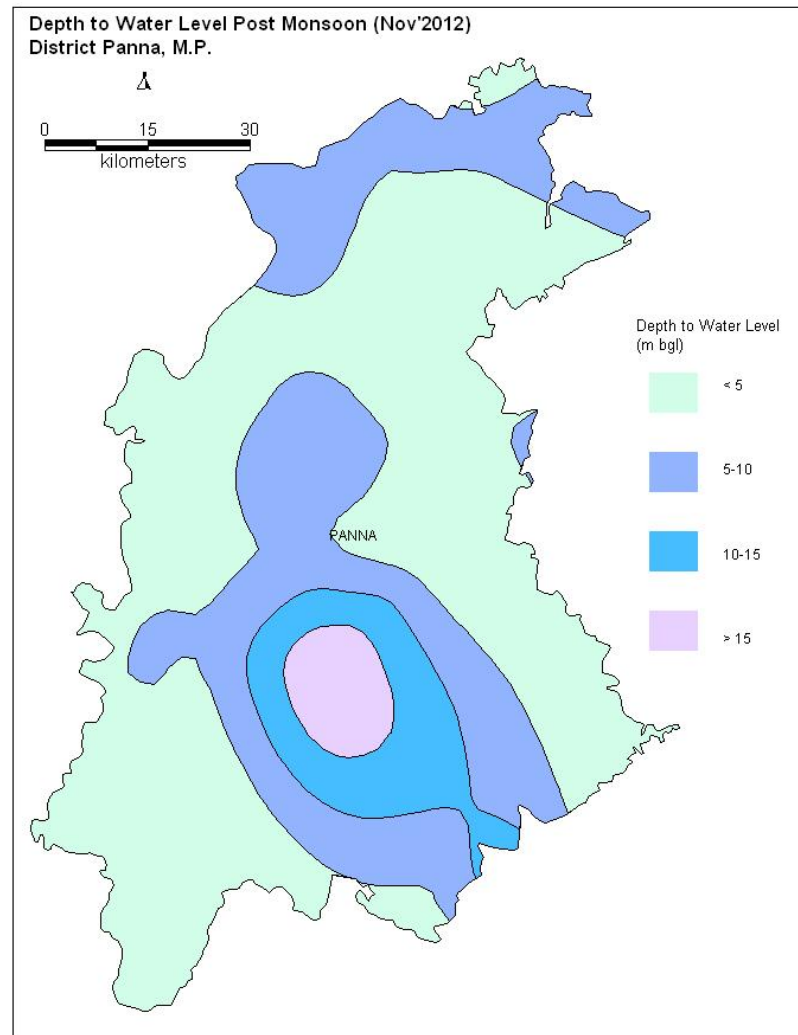


4.3.2 Post-monsoon (November 2012)

During post-monsoon period, water level ranges from 0.70 m bgl to 17.65 m bgl. In major part of the district, water level lies between 3 to 6 m bgl.

4.3.3 Groundwater level trend (May 2003 to May 2012)

Analyses of Groundwater level data of pre-monsoon period indicate that there is declining trend in water level in the entire district except in few wells. In general, a 5.33 to 33.75 cm/year water level decline has been observed in the district.



4.4 Aquifer Parameters

CGWB has drilled 50 exploratory wells, 8 observation wells and 39 piezometers. The accelerated exploratory drilling has been carried out in areas occupied by Vindhyan shale and sandstone. Fractured shales and sandstone form the aquifer system in the district. These exploratory wells have been drilled down to the maximum depth of 200.0 m bgl.

4.5 Groundwater Resources (2009)

Panna district is underlain by Vindhyan Shale, Limestone and Sandstone and Alluvium. Dynamic ground water resources of the district have been estimated for base year - 2008/09 on block-wise basis (Table). There are five assessment units (block) in the district which fall under non-command (99 %) and command (1.% Panna) sub units. All the blocks, except Ajaygarh, of the district are categorized as safe blocks. Ajaygarh is categorized as semi critical. The highest stage of ground water development is computed as 80 % in Ajaygarh block. The net ground water availability in the district 47,108 ham and ground water draft for all uses is 12938 ham, making stage of ground water development 27 % (24 % 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 33,295 ham.

Table: 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
	Ajaygarh	Command								
		Non-Command	6476	4869	314	5183	495	1112	80	Semi Critical
		Block Total	6476	4869	314	5183	495	1112	80	Semi Critical
	Gonour	Command								
		Non-Command	5784	1063	352	1414	519	4202	24	Safe
		Block Total	5784	1063	352	1414	519	4202	24	Safe
	Panna	Command	802	51	29	80	58	692	10	Safe
		Non-Command	10356	1518	501	2019	698	8139	19	Safe
		Block Total	11649	1570	530	2099	757	9322	18	Safe
	Pawai	Command								
		Non-Command	12305	2086	364	2450	506	9713	20	Safe
		Block Total	12305	2086	364	2450	506	9713	20	Safe
	Shahnagar	Command								
		Non-Command	10894	1419	373	1792	530	8945	16	Safe
		Block Total	10894	1419	373	1792	530	8945	16	Safe
		District Total	47108	11006	1933	12938	2807	33295	27	

4.6 Groundwater Quality

Groundwater quality in the district is fresh with EC value ranges from 98 to 1428 $\mu\text{s}/\text{cm}$ at 25⁰C. Nitrate was observed in the range of 10 to 194 mg/l whereas fluoride ranges from 0.02 to 1.74 mg/l.