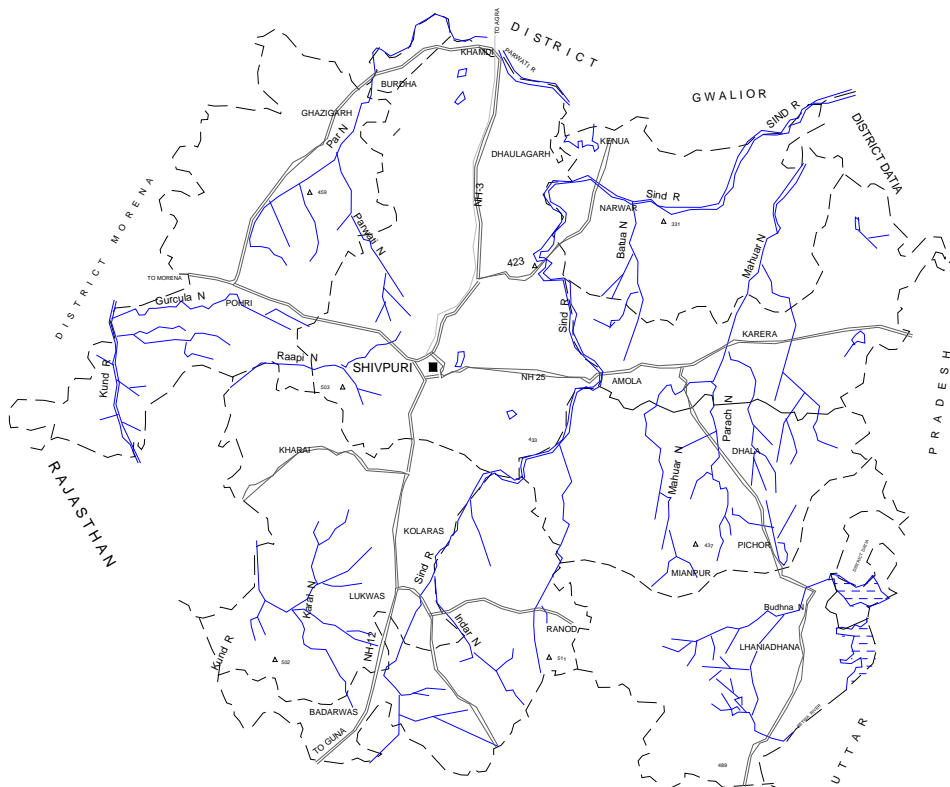


DISTRICT GROUND WATER INFORMATION BOOKLET



SHIVPURI DISTRICT MADHYA PRADESH



**Ministry of Water Resources
Central Ground Water Board
North Central Region
Government of India**

AUGUST, 2009

SHIVPURI DISTRICT AT A GLANCE

S.No.	Items	Statistics	
1.	General Information		
	i) Geographical area (sq. km)	10278	
	ii) Administrative Divisions (As on 2006)		
	Number of Tehsil/Blocks	7 / 8	
	Number of Panchayats/Villages	587/1326	
iii) Population (Census 2001)	1441950		
iv) Average Annual Rainfall (mm)	964.00		
2.	Geomorphology		
	i) Major Physiographic Units	1. Denudational Hills 2. Pediment (Granite) 3. Deccan Pleatu 4. Alluvial Plains	
	ii) Major Drainage	Sind - Parwati sub-basin Sind - Kuno sub-basin Sind - Betwa sub-basin Sind - Mahur sub-basin	
3.	Land Use (Sq.Km)		
	i) Forest area:	178.61	
	ii) Net area sown:	3990.89	
	iii) Cultivable area:	4642.15	
4.	Major Soil Types		
		Black cotton soil, Sandy loam, Clayey loam,, Murram	
5.	Area Under Principal Crops (June'2006)		
		Wheat, Rice, Groundnut, Gram, Jawar etc Total Kharif & rabi 5144.66 sq. km	
6.	Irrigation By Different Sources		
		No. of Structures	Area (Sq.km)
	Dugwells	61660	1031.63
	Tube wells/Bore wells	8075	258.52
	Tanks/Ponds	106	26.39
	Canals	36	116.52
	Other Sources	-	186.70
	Net Irrigated Area	-	1619.76
	Gross Irrigated Area)	-	1656.59
7.	Number of Ground Water Monitoring Wells of CGWB(As on 31.3.2007)		
	No. of Dug Wells	29	

	No. of Piezometers	07
8	Predominant Geological Formations	
		Bundelkhand Granite, Vindhayan, Deccan Trap.
9	Hydrogeology	
	Major Water Bearing Formation	Weathered/Fractured Granite, Vindhayan & deccan Trap
	(Pre-monsoon) Depth to water level during 2006	5.00 – 18.92 mbgl
	(Post-monsoon) Depth to water level during 2006	3.83 – 16.29 mbgl
	Long Term water level trend in 10 years (1997-2006) in m/yr	+ 0.13m to + 0.17m (Pre) - 0.08m to - 0.84m(Pre) +0.02m to +0.04 (post) - 0.10m to - 1.32m(post)
10.	Ground Water Exploration by CGWB (As on 31.3.2007)	
	No of wells drilled (EW,OW,PZ,SH, Total)	33,10,Nil, Nil, 43
	Depth Range (m)	25m – 203.90m
	Discharge (litres per second)	0.15 – 22lps
11.	Ground Water Quality	
	Presence of Chemical constituents more than permissible limit (eg EC, F, As,Fe) Type of Water	Fluoride Alkaline earth- bicarbonate
12	Dynamic Ground Water Resources (2004) in MCM	
	Annual Replenishable Ground Water Resources	996.80
	Net Annual Ground Water Draft	679.98
	Projected Demand for Domestic and Industrial Uses upto 2025	38.33
	Stage of Ground Water Development	68%
13	Efforts of Artificial Recharge & Rainwater Harvesting	
	Projects completed by CGWB (No. & Amount Spent)	Nil
	Projects under technical guidance of CGWB (Numbers)	Nil
14	Ground Water Control and Regulation	
	Number of OE Blocks	Nil
	Number of Critical Blocks	Nil
	Number of Notified Blocks	Nil

1.0 INTRODUCTION

1.1 Administrative Divisions

Shivpuri district is situated in the northern part of the Madhya Pradesh and covers an area of about 10,278 sq. km. It lies between N Latitude 26° 05' and 24° 40' and E longitude 77° 01' and 78° 29' and falling in Survey of India toposheet nos 54H,K & L. It is bounded in the North by district Gwalior, in the south by the district Guna, in the east by the district Datia and in the west by the Rajasthan state.

Shivpuri district is divided into 7 tehsils and 8 blocks. It has 1326 villages. total population of the district is 1441950 (As per census 2001) and density of the population is 140 persons in per sq. km. The block area and no of villages in each block are given in Table No. 1

Table No. 1 Block area & Number of villages

S. No	Block	Area in sq. km	No of villages
1.	Shivpuri	1956.01	190
2.	Kolaras	1164.97	778
3.	Badarwas	1128.78	145
4.	Karera	1014.67	134
5.	Narwar	1057.97	147
6.	Pichor	1077.9	125
7.	Khanniyadhana	1305.4	173
8.	Pohari	1572.7	234
Total		10278	1326

1.2 Basin & Sub basins

Betwa & Sind Rivers flowing northernly forms the major drainage in the eastern and central parts and river Kuno is another major river in the western parts. The district falls in the Yamuna basin. The district can be divided into four sub basins.

Sub – Parwati Sub basin

The Sind – Parwati sub basin of the Chambal River is in Yamuna basin. River Parwati flows west to east and forms the northern boundary of the district. This sub basin attains maximum height of 499.2 m above MSL at village Piparsuma and minimum 415.38 m above MSL. The general topography is hilly and sloping toward North & West.

Sind – Kuno Sub Basin

The River Kuno flows from south to north forms western boundary of the district. The general slope is south – east to north – west i.e. towards Sind River. Sub

basin attains maximum height of 575 m above MSL at village Bhaopur and minimum of 342 m above MSL at the confluence of river Kuno and Sind.

Sind – Betwa Sub Basin

River Betwa flows from SW to NE and forms eastern boundary of the district. The general slope is towards NE. The maximum height in the sub basin is 417 m above MSL in Loharchha reserve forest and minimum is 313 m above MSL near village Bharot.

Sind – Mahur Sub Basin

The River Mahur crosses the hilly area at an elevation of 296.91 m above MSL after flowing from south to north in Pichor block enters into Karera block at village Bardi. The general slope of the sub basin is towards North.

1.3 Irrigation

The gross irrigated area by all sources is 1657 Sq. Km. The Irrigation by different sources is given in Table No. 2

Table No. 2 Irrigation by different sources

Source	No. of Structures	Irrigated Area (sq. km.)
Dugwells	61660	1031.63
Tube wells/Bore wells	8075	256.52
Tanks/Ponds	106	26.39
Canals	36	116.52
Other Sources	-	186.70

1.4 Previous work

Systematic Hydrogeological studies was carried out by CGWB under Annual Action Plan 1990-90. After the systematic Hydrogeological surveys the ground Water management studies was carried out in the entire district under AAP 1998 99 & 1999 2000. The ground water exploration in the district was carried out under the AAP 1999 –2000, 2000-01 & 2001-02.

3.0 GEOMORPHOLOGY & SOIL TYPES

3.1 Geomorphology

Physiographically, the district is an upland region over the Bundelkhand plains, with escarp in the east, characterized by rugged up landing topography with north south trending parallel ridges and intervening valleys. The eastern part is a pediplain over the granite. The maximum elevation is 522 m above MSL and minimum elevation is 266 m above MSL. In Shivpuri district, landforms are mainly

Denudation hills of Vindhyan sediments and pediments of granites are predominant. Apart from these geomorphic units features like alluvial plain, Valley fills, intermundane valley and Deccan trap plateau arte also seen.

3.2 Soil

The district is generally covered with sandy clay soil derived from the weathering of Bundelkhand granites and the Vindhyan formations. The southern part of the district is covered by the black cotton soils derived by the weathering of the Deccan trap formation. Depth of the soil varies from paper-thin to 15m. The color of the sandy soil is light yellow to yellowish brown.

The central and southern parts of the district are covered by lateritic soil of dark brown to yellowish brown in color.

Alluvium is found all along the major and minor rivers, it consists of gravel, silt, sand and pebbles.

4.0 Ground Water Scenario

4.1 Hydrogeology

District is characterised by variety of geological formations representing vast period of geological time.

Alluvium -

Ground water occurs in the granular zones of sands and gravels. The extent and thickness of this formation is limited. The maximum thickness of the alluvium is 15m therefore large diameter dug wells can be constructed. Yield of this formation ranges from 5 to 10 lps and ground water occurs under water table condition.

Laterite -

Laterites are semi-consolidated rock and consist of cavities. Thickness of this rock ranges from 3 to 75 m. The porosity and permeability are sufficient to act as good aquifer when it is occurring in low-lying areas. The yield of the dug wells constructed in this formation ranges from 2 to 4 lps.

Deccan Trap -

Water bearing capacities in Deccan trap formation differ from flow to flow. Phreatic aquifer occurs in weathered, jointed and fractured basalts. In the areas where weathered basaltic layer is extensive, a continuous aquifer can be traced to some distance, however due to low permeability of the weathered basalt the aquifer sustain limited ground water withdrawal. The groundwater at deeper levels occurs under semi confined to confined conditions in vesicular, jointed & fractured basalts. Yield of the wells in this formation varies from 1 to 5 lps. Unit draft of the wells varies from 0.0027 to 0.036 mcm/year.

Under the Ground water Exploration Programme CGWB has constructed the exploratory wells & observation wells of 25.50 to 148.60 m deep. The depth to water levels in these wells varies from 6.00 to 29.60 m bgl and discharge of the wells ranges from negligible to 1.8 lps with a draw down maximum upto 48.00m.

Vindhyan Sandstone and Shale -

Sandstone of the Vindhyan formation is compact and having poor permeability, Joints and fractures in the sand stone controls the occurrence and movement of the ground water. Soil and weathered mantle developed in the Vindhyan formation is generally thin and as result ground water occurs at shallow depth under unconfined condition in jointed, fractured & weathered rocks. Yield of the wells ranges from 1 to 2 lps. Unit draft of the wells ranges from 0.001 to 0.026 mcm/year.

Under the Ground water Exploration Programme CGWB has constructed the exploratory wells & observation wells of 50.35 to 203.4 m deep. The depth to water levels in these wells varies from 4.38 to 29.60 m bgl and discharge of the wells ranges from 0.18 to 14.50 lps with a draw down ranges from 14.00 to 60.00 m.

Bundelkhand Granit: -

Granites are most extensive rock formation in the Karera & Narwar blocks. Ground Water occurs in the weathered part and vertical and horizontal joints. The yield of the wells is restricted to the weathered mantle and ranges from less than one to 3 lps. Unit draft of the wells in the formation varies from 0.00075 to 0.0051 mcm/year.

Under the Ground water Exploration programme CGWB has constructed the exploratory wells & observation wells of 135 to 203 m deep. The depth to water levels in these wells varies from 2.65 to 12.98 m bgl and discharge of the wells ranges from 0.2 to 5.4 lps with a draw down ranges from 36 to 65 m.

Depth to Water Level -

To monitor the change in ground water levels in the district, Central ground Water board is regularly monitoring 29 dug wells & 7 piezometers four times in a year.

Pre Monsoon Depth to Water Levels -

The depth to water levels during the pre monsoon period varies from 5.00 (Village Bhagora N lat.77⁰ 45', E long 25⁰ 24') to 18.92 (village Deharda Chouraha E lat 77⁰ 36', E long 25⁰ 7')m.bgl. The depth to water level of about 37% of the wells falls in the range of 5 to 10 m.bgl. 40% of the wells are falling in the depth to water level range of 10 to 12 m.bgl and in the remaining wells. The depth to water falls between 12 to 18.92 m.bgl. The pre monsoon depth to water level map is shown in Plate No. 3

Post Monsoon Water Levels: -

The depth to water levels during the pre monsoon period varies from 3.83 (Village Patera N lat.77⁰ 44', E long 25⁰ 36') to 16.29 (village Behgawan N lat.78⁰ 06', E long 25⁰ 37') m.bgl. The depth to water level of about 11% of the wells is less than 3 m.bgl. 70% of the wells are falling in the depth to water level range of 5 to 10

m.bgl, 7% of the wells are falling in the depth to water level range of 10 to 12 m.bgl, and in the remaining wells depth to water falls between 12 to 16.29 m.bgl.

Decadal Depth to water Level Trend: -

Block wise decadal depth to water level trend is presented in table no 3

Table No. 3 Block Wise Decadal Rise and Fall in DTW

S. No.	Block	Pre monsoon		Post monsoon	
		Decadal Range of Rise in DTW (m)/No of wells	Decadal Range of Fall in DTW (m)/No of wells	Decadal Range of Rise in DTW (m) /No of wells	Decadal Range of Fall in DTW (m) /No of wells
1.	Pohri	-	<u>0.41 –0.63</u> 2	-	<u>0.23 – 1.32</u> 3
2.	Shivpuri	-	<u>0.08 –0.84</u> 6	-	<u>0.05 –0.55</u> 8
3.	Narwar	-	<u>0.13 –</u> <u>0.52</u> 2	-	<u>0.4 – 0.98</u> 2
4	Kolaras	-	=	-	<u>0.34 –0.7</u> 3
5	Karera	-	<u>0.25 -0.65</u> 4	-	<u>0.35 0.59</u> 4
6	Badarwas	-	<u>0.11</u> 1	<u>0.2 – 0.4</u> 2	<u>0.1 -0.11</u> 2
7.	Khanniyadhana	<u>0.13 – 0.17</u> 2	<u>0.23</u> 1	-	<u>0.11 – 0.17</u> 3
8	Pichore	-	<u>0.18 - 0.35</u> 3	-	<u>0.28 – 0. 42</u> 3

4.2 Ground Water Resources

Block wise Groundwater Resources has been calculated for the base year 2004 on the basis of GEC'97. Over all ground water development of the district is 68.22% and all the blocks of the district falls in safe category of ground water development.

Net Ground water availability, existing ground water draft for all uses and allocation for the domestic and industrial use upto year '2029 are 996.80, 679.68 & 38.30 MCM respectively for the district.

Table No. 4 Block wise Ground Water Resources

Assessment Unit/ District	Command/ non-Command/ Total)	Net Annual Ground water Availability (MCM)	Existing Gross Groundwater Draft for Irrigation (MCM)	Existing Gross Groundwater Draft for Domestic & Industrial water Supply (MCM)	Existing Gross Groundwater Draft for All uses (MCM)	Allocation for domestic & industrial requirement supply upto nest 25 years (MCM)	Net Groundwater Availability for future irrigation development (MCM)	Stage of Groundwater Development (%)
Shivpuri	Command	6.34	0.42	0.04	0.46	0.07	5.86	7.25
	Non-Command	183.28	107.65	2.73	110.37	4.46	71.18	60.22
	Block Total	189.62	108.07	2.77	110.83	4.53	77.03	58.45
Pohri	Command	0.95	0.21	0.04	0.25	0.08	0.67	26.50
	Non-Command	145.59	63.48	3.35	66.83	5.46	76.64	45.90
	Block Total	146.54	63.69	3.40	67.08	5.54	77.31	45.78
Kolaras	Command	0.32	0.06	0.00	0.06	0.01	0.25	20.16
	Non-Command	104.68	63.16	2.16	65.32	3.42	38.10	62.40
	Block Total	105.00	63.22	2.16	65.38	3.43	38.35	62.27
Badarwas	Command	0.94	0.27	0.02	0.29	0.06	0.62	30.34
	Non-Command	104.47	76.23	2.50	78.74	3.68	24.55	75.37
	Block Total	105.41	76.50	2.52	79.02	3.74	25.17	74.97
Pichor	Command	2.04	0.56	0.05	0.61	0.14	1.34	29.95
	Non-Command	111.95	72.23	3.13	75.36	4.93	34.79	67.31
	Block Total	113.99	72.79	3.18	75.97	5.06	36.14	66.65
Khaniyadhana	Command	1.88	0.51	0.04	0.55	0.05	1.32	29.34
	Non-Command	120.35	100.05	3.60	103.66	4.32	15.98	86.13
	Block Total	122.24	100.56	3.64	104.21	4.37	17.30	85.25
Karera	Command	2.00	0.53	0.11	0.63	0.17	1.30	31.77
	Non-Command	111.02	90.50	3.45	93.95	6.05	14.47	84.63
	Block Total	113.02	91.03	3.56	94.59	6.23	15.76	83.69
Narwar	Command	1.42	0.93	0.08	1.01	0.24	0.25	70.73
	Non-Command	99.55	78.70	3.19	81.89	5.19	15.66	82.26
	Block Total	100.98	79.63	3.27	82.90	5.43	15.92	82.09
	District Total	996.80	655.49	24.50	679.98	38.33	302.98	68.22

4.3 Ground water quality -

In general the ground water is suitable for domestic and irrigation purposes in the entire district except a few villages located in the south of the Sind River in Narwar & Karera blocks are having high fluoride content in dug well and tube wells. Due to the high content of the fluoride ground water in these villages are not suitable for the drinking purpose.

4.4 Status of ground water development -

Block wise status of drinking water supply i.e. number of hand pumps and number of pipe water supply schemes are given in table no. 5

Table No. 5 : Status of drinking water supply

S.No.	Block	Hand pump fitted villages	Water supply village through tube wells
1.	Shivpuri	190	11
2.	Kolaras	178	7
3.	Badarwas	145	11
4.	Karera	99	15
5.	Narwar	147	12
6.	Pichor	125	13
7.	Khanniyadhana	173	05
8.	Pohari	234	11
	Total	1291	95

Ground water is the main source of irrigation in the district and about 95% of the irrigation is either through the dug well or tube wells. Till 1960 farmers were depend on mostly on monsoon rain fall and a few dug wells were existed. The deeper aquifers were totally unexploited upto the year 1960 but after that ground water development in the district progressed and till 1986 the number of dug wells and tube wells constructed for irrigation purpose reached up to 16524 & 18 respectively. The total number of dug wells & tube wells in the year 2004 are 61660 & 8075 respectively. The block wise details of number of dug wells & tube wells is given in table no. 6

Table No. 6 Block wise Number of Tube wells & Dug wells

S.No.	Block	Number of Dug wells	Number of Tube wells
1.	Shivpuri	5162	2721
2.	Kolaras	4286	2323
3.	Badarwas	3962	1824
4.	Karera	11520	18
5.	Narwar	10307	
6.	Pichor	9302	2
7.	Khanniyadhana	12732	19
8.	Pohari	4389	1168
	Total	61660	8075

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 Ground Water Development

As the ground water development in the Narwar block is 82.09% therefore, no further ground water development in this block should be taken. The areas recommended for ground water development by the construction of dug wells and tube wells are given in plate no IV.

5.2.1 Water Conservation & Artificial Recharge

So far CGWB has not constructed any ground water structures in the district. As the ground water development in the Narwar block is 82.09% therefore, it is suggested that artificial recharge structures in this block should be constructed to augment the ground water.

6.0 GROUND WATER RELATED ISSUES & PROBLEMS

Narwar & Karera blocks of Shivpuri district lies between North Latitude 25°15' – 26°00' and East Longitude 77°45' – 78°30' located in the northeastern parts of the district bordering Gwalior district. The high fluoride in the ground water is occurring in nearly 450 sq. km. area. The total affected population is about 7000. The high level of fluoride in the ground water is found in the influence zone of the lineament i.e. along and north of Sind river, About 90% of the total area falls in the range of 1.5 to 3 ppm, while rest of the area falls in the range of 3 to 6 ppm. The severely affected villages are Hateda and Phoolpur of Narwar block and Dumduma village of Karera block. Total affected villages are 24 (Hateda, Mithawan Doni Phoolpur, Chitri, Gokunda, Dehata ani, Bichi. Mohni, Ghasari, Narwar, Jujhai of Narwar block and Toda Rampura, Brhgawan Dunduma Silarpur, Damore Kalan, Palothar, Chinood, Algi, Nizampur, Sihore sarsod of Karera block)

7.0 RECOMMENDATION

The Ground Water development of the Narwar block is 82.09% therefore it is recommended that the further development in this block should be restricted and artificial recharge measures should be taken up to recharge the ground water.

Detailed micro level survey in the entire district should be carryout to pin point the fluoride affected villages and in the affected villages safe drinking water should be provided by using the draw and fill method and installation of hand pump attached defluoridation plants.

