DISTRICT GROUND WATER INFORMATION BOOKLET

MORENA DISTRICT
MADHYA PRADESH

Ministrstry of Water Resources
Central Ground Water Board
North Central Region
Government of India

2013

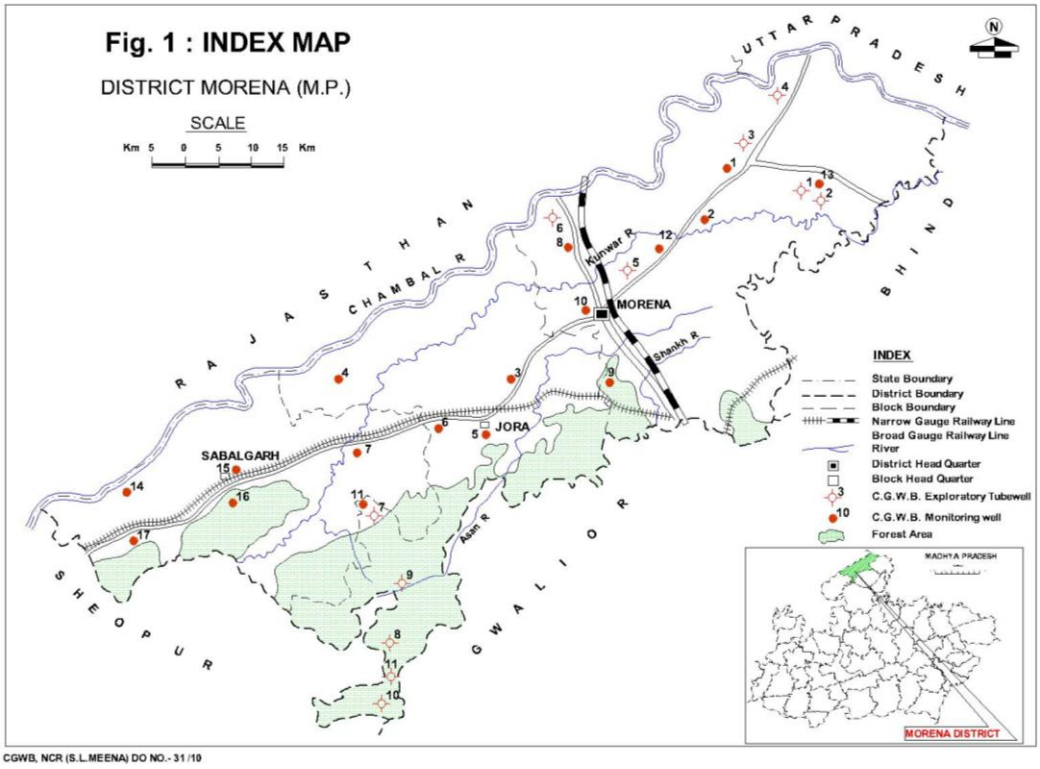
MORENA DISTRICT PROFILE

SN	ITEMS	STATISTICS	
1.	**GENERAL INFORMATION**		
	i) Geographical area ii) Administrative Divisions Number of Tahsil Block Gram Panchayat Number of Villages iii) Population (As on 2011Census) iv) Normal Rainfall (mm)	4,988 Sq. Km 06 07 489 782 1,965,137 753.7	
2.	**GEOMORPHOLOGY**		
	Major Physiographic units Major Drainages	Valley fills, valley flats, and Pedi plain Chambal ,Kuwanri and Asan rivers	
3.	**LAND USE**	**('000ha)**	
	a) Forest area: b) Net area sown: c) Cultivable area:	50.6 262.7 268.7	
4.	**MAJOR SOIL TYPES**	**Alluvium .**	
5.	**PRINCIPAL CROPS**	Wheat, Maize and Gram	
6.	**IRRIGATION BY DIFFERENT SOURCES**	**Number of Structures**	**Area irrigated ('000Ha)**
	Dug wells Tube wells/ Bore wells Tanks/ ponds Canals Others sources Net irrigated area Gross irrigated area	21019 2128 52 9 --- --- ---	48.4 580.1 1.4 68.0 176.7 167.0 166.7
7.	**NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31- 3- 2013)**	17 Dug Wells	
8.	**PREDOMINANT GEOLOGICAL FORMATIONS**	Vindhyan group of rocks (Sand stone and Shale) and Alluvium	
9.	**HYDROGEOLOGY**		
	➢ Major water bearing formation ➢ Pre- monsoon depth to water level range during 2012 ➢ Post- monsoon depth to water level range during 2012 ➢ Long term water level trend range in 10 yrs (2003-2012) in cm/yr	Fractured sand stone, Shale and Alluvium Min.=5.60 m bgl Max. =31.78m bgl Min.=1.60m bgl to Max. =31.78mbgl Declining trend= 0.61 to 106.12 cm /year	

10.	**GROUND WATER EXPLORATION BY CGWB (As on 31- 03- 2013)**	
	No of wells drilled (EW, OW, PZ, Total) Depth range (m) Discharge (liters per second) Storativity (S) Transmissivity range[5] (m^2/ day)	 EW-11, OW-8, 83.78 to 200.00 0.5 to 57.00 $0.16X10^{-3}$ to $9.5X10^{-5}$ 470 to 5465
11.	**GROUND WATER QUALITY**	
	Presence of Chemical constituent more than permissible limit	EC=550-2080 µS/cm NO_3=2.5mg/l -298mg/l Flouride-0.06-1.4
12.	**DYNAMIC GROUND WATER RESOURCES (YEAR-2009)**	
	Net Annual Ground Water Availability Existing Gross Ground Water Draft Projected Demand for Domestic and industrial Uses for next 25 years Stage of Ground water Development	64244 ham 27597 ham 6823 ham 43%
13.	**EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING**	---
14.	**GROUND WATER CONTROL AND REGULATION**	---
	Categoirization of Blocks	Non command area of Morena, kailaras and Sabalgarh blocks are semi-critical
15.	**MAJOR GROUND WATER PROBLEMS**	Decline of Ground Water levels and Salinity problem in deep aquifers

1.0 INTRODUCTION

Morena district is located in the northern part of the State, bordered by Rajasthan on the West and Uttar Pradesh on the north. The adjacent districts are Gwalior and Bhind in the east and Sheopuri kalan in the South. The district is bounded by North Latitudes,26^0 05'—26^0 42' and East Longitudes, 77^0 05' 00"—78^0 30' 00" and is covering an area of 4988 Sq.km which falls under the surevey of InidiaToposheet numbers 54 F,&J (Fig.1)



The population of the district is 1,965,137 (2001 census). The district comprises 6 Tahsils and 7 blocks. There are 782 villages in the district. The administrative units (blocks) are as given below.

Administrative units (blocks) of Morena District.

1. Porsa
2. Ambah
3. Morena
4. Joara
5. Pahargarh
6. Kelaras
7. Sabalgadh

Activities carried out by CGWB

1. Systematic Hydro geological Surveys were carried out by Shri. Muthukhannnan, Babu Nair, Saurabh Gupta &A.K Jain, (officers of CGWB, NCR office during F.S.P 1987-88.
2. Water Balance studies were carried out in Ambah and Porsa Blocks in Chambal-Kanwar Doabs area by Shri A.K Mishra, Junior Hydrogeologist, CGWB, NCR Bhopal.
3. Exploratory drilling operations were carried out during F.S.P 1984-85 and Shri Raman, Sr.Hydrogeologist, CGWB,NCR, Bhopal attended drilling operations.
4. Deposit wells were constructed by the CGWB, NCR, Bhopal for augmentation of Water supply during F.S.P 1987-88.

2.0 CLIMATE AND RAINFALL

The climate of Morena District, is characterized by a hot summer and general dryness except 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. There is no meteorological observatory in Morena District. The nearest observatory is Gwalior. Hence all climatoligical parameters of Gwalior is used except rainfall to describe the climate of Morena District.

The normal annual rainfall of Morena District is 753.7 mm. Morena District receive maximum rainfall during south west monsoon period i.e., June to September. About 91.8% of the annual rainfall received during monsoon season. Only, 8.2% 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 during the month of May is 42.10c and minimum during the month of January is 7.1^0C. The normal annual means maximum and minimum temperature of Morena District are 32.5^0C and 18.7^0C respectively.

During the south west monsoon season the relative humidity generally exceeds 83% (August month). In the rest of the year is drier. The driest part of the year is the summer season, when relative humidity is less than 26%. May 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 11.3km/hr observed during the month of June and minimum3.1 km/hr during the month of November. The average normal annual wind velocity of Morena District is 6.4 km/hr.

3.0 GEOMORPHOLOGY AND SOIL TYPES

Physiographically, the area is represented by north east – south west trending ridges and valleys (between 200 and 300 metres). The ridges are represented by sand stone and the valleys by shale. The minimum elevation 165 metres above m.s.l. with general slope towards North.

Chambal is the main river which is flowing from southwest to northeast. Its tributaries Kunwari and Asan rivers drain the area. The overall drainage pattern in the district is dendritic.

Laterite forms flat and slightly undulatory capping over the rocks of Vindhyan super group. It occurs at two elevations between altitudes of 425 meters to 530 meters above m. s. l. It is dark reddish brown and red in colour and mainly consists of Haematite, Goethite, Gibbsite, few opaque and Quartz. Quaternary alluvium consisting of unconsolidated to consolidated yellowish brown sand silt and clay with gravel and pebbles, forms the youngest formation exposed in the area. The thickness of the alluvium varies from a metre to more than 180 m.

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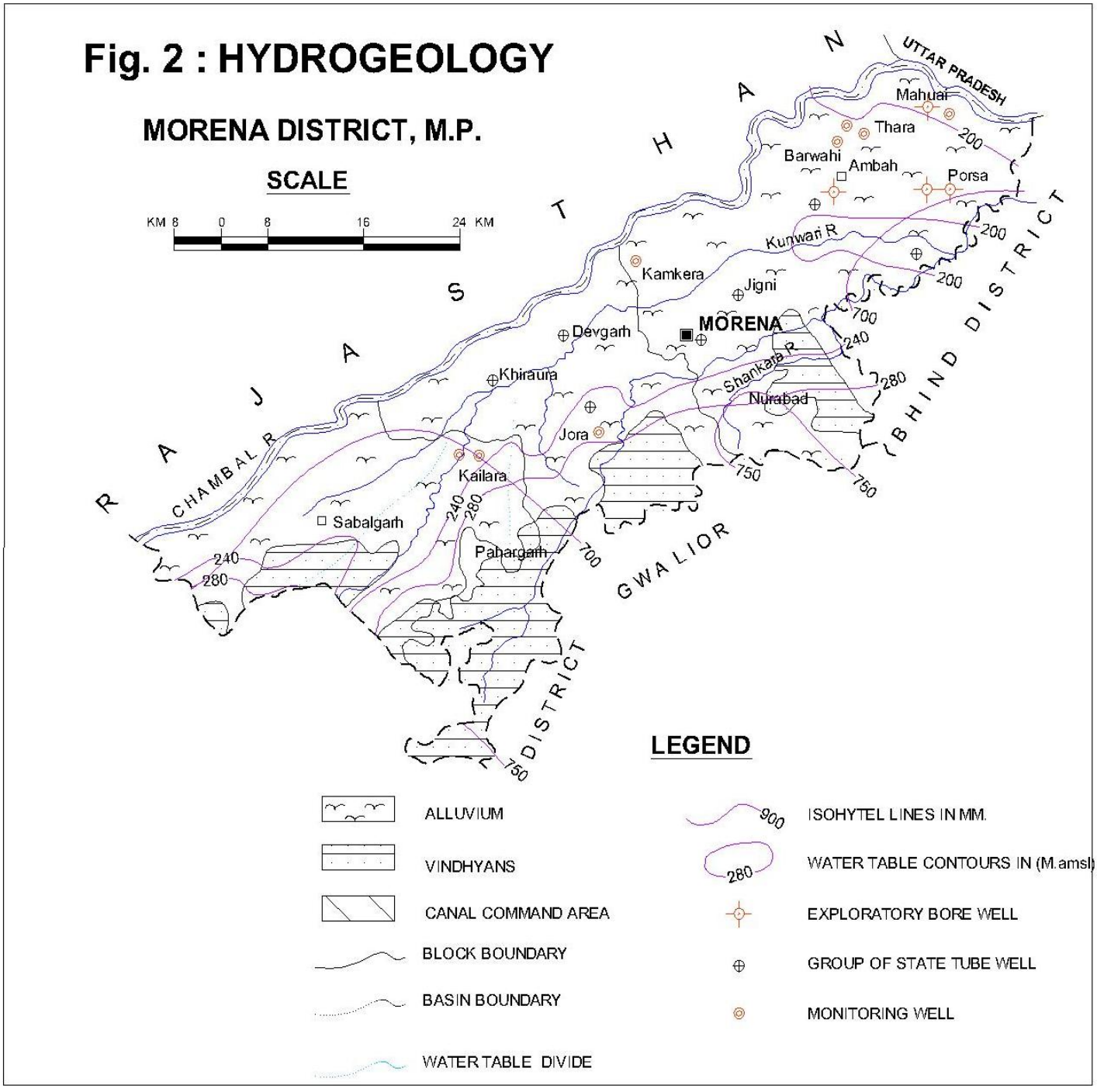
4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

The hydrogeological map of the district is presented as figure 2.



Vindhian super group of rocks, sand stones and shales, laterite and alluvium are the rock types exposed in the area.(Fig 2) The area exhibits good development of sedimentary structures viz., current bedding, ripple marks, rain prints, rib and furrow structures, ball and

pillow structures, mud cracks, clay balls, concretions, load and flute structures etc. The general strike of the bedding is North-South to NNE-SSW with varying dips of 4 to 10 degrees towards west and north. The deformational structures of the area are mainly represented by various sets of joints trending NW-SE, NE-SW, E-Wand NNE-SSW with vertical dips. (GSI)

The sandstones are hard and compact with siliceous matrix and as such are devoid of primary porosity and permeability. But wherever they are weathered and jointed secondary porosity and permeability is developed and made them water bearing. It is observed that sandstones in general are poorly and moderately weathered (2 to 4 metres) and at places they are jointed and do not posses sufficient ground water potential. Ground water occurs under water table condition and exists in weathered portions and in jointed zones.

The shales are fine grinded and compact and are porous but are not permeable. At most places in most of the area shales are devoid of ground water but near river beds they form water bearing due to the presence of bedding planes and joints. Ground water occurs under water table conditions.

The water holding capacity in alluvium mainly depends upon the thickness and the aerial extent. It is found that along the banks of Chambal and Kanwari rivers, gully erosion is very common and spread over 1 to 2 Km away from the banks. It is more clayey and silty and as such has poor to moderate water bearing capacity. One or two aquifers are present in the formation and ground water is found to be under phreatic as well as semi confined to confined conditions.

Central Ground Water Board had constructed 11 exploratory wells and 8 observation wells in the area. The details of aquifer zones, discharge, water levels and aquifer parameters etc., are given in Table 1. It is observed that Alluvium forms prolific aquifer whereas Vindhyans forms poor aquifer in the district.

Table 1. Hydrogeological details of CGWB exploratory tube wells.

S.N	Location	Latitude/ Longitude	Year of Co nstruction	Depth Drilled (mbgl)	Depth of Construction mbgl)	Major Lithology encountered	Zones Tapped	Static Water Level (mbgl)	Discharge (Lps)	Draw down (m)	T (m^2/ day)	S
1	Porsa-I	26º 42' 00" 78º 21' 55"	1984-85	107.43		Alluvium	52-69 94-106	18.32	33.70	4.47	2580	$2.8X10^{-5}$
2	Porsa-II	26º 40' 05" 78º 22' 30"	1984-85	117	114	Alluvium	42.50-75.00	17.98	30.83	4.56	5050	$9.5X10^{-5}$
3	Ambah	26º 42' 00" 78º 13' 00"	1984-85	122.5		Alluvium	27-30 42-48 50-56 89-80 88-99 100-107	16.13	11.80	1.35	1765	$7.47X10^{-4}$
4	Mahua	26º 45' 30" 78º 22' 00"	1984-85	164.75	168.5	Alluvium	0-163.75 Alluvium V.Sst. At 163.75	23.04	8.38	2.36	825	$2.5X10^{-4}$

5	Jigni	26º 32' 15" 78º 04' 00"	1984-85	83.78	82	Alluvium	-	13.07	57.20	4.17	5465	$0.16X10^{-3}$
6	Piprai	26º 36' 30" 77º 56' 00"	1984-85	87	80	Alluvium	-	25.29	16.02	11.28	470	$0.33X10^{-4}$
7	Pahadgarh	-	2001	115.85	-	Sst shale	101.14-114	-	.5	-	-	-
8	Kanhar	-	2001	160.43	-	-		64-66 124-129	2.5	-	-	-
9	Mara	-	2001	91.46	-	-		7.45-12.02 37.18-36.44	1.0	-	-	-
10	Dhonda	-	-	2001	200	-	Dry	-	-	-	-	-
11	Areti	-	-	2001	171.97	-	-	17-18.5 110-115	1.85	-	-	-

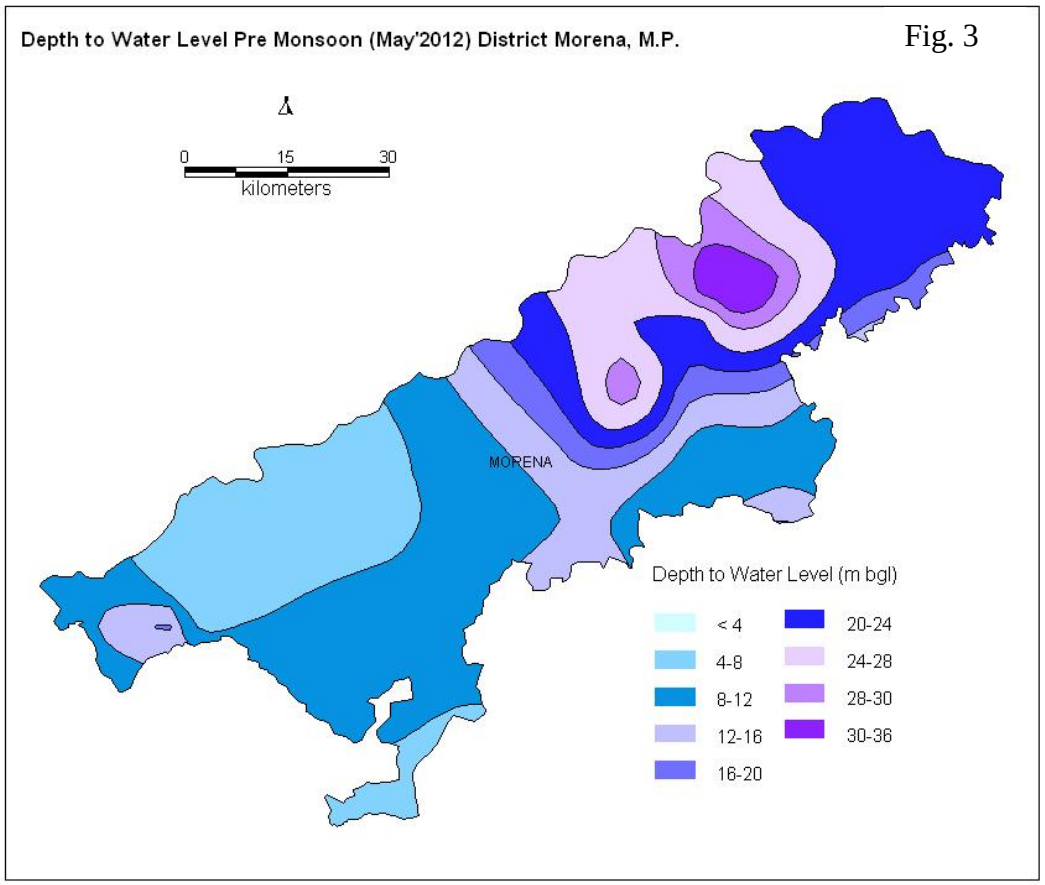
4.1.1 Water levels

Water level data, including historical data, are essential not only to know the present ground water conditions but also for forecasting future trends in response to ground water reservoir operations. CGWB is monitoring 17 NHS wells in the district. Pre and Post monsoon depth to water level maps are prepared and presented (Fig 3 &4)

4.1.1.1 Pre- monsoon (May, 2012)

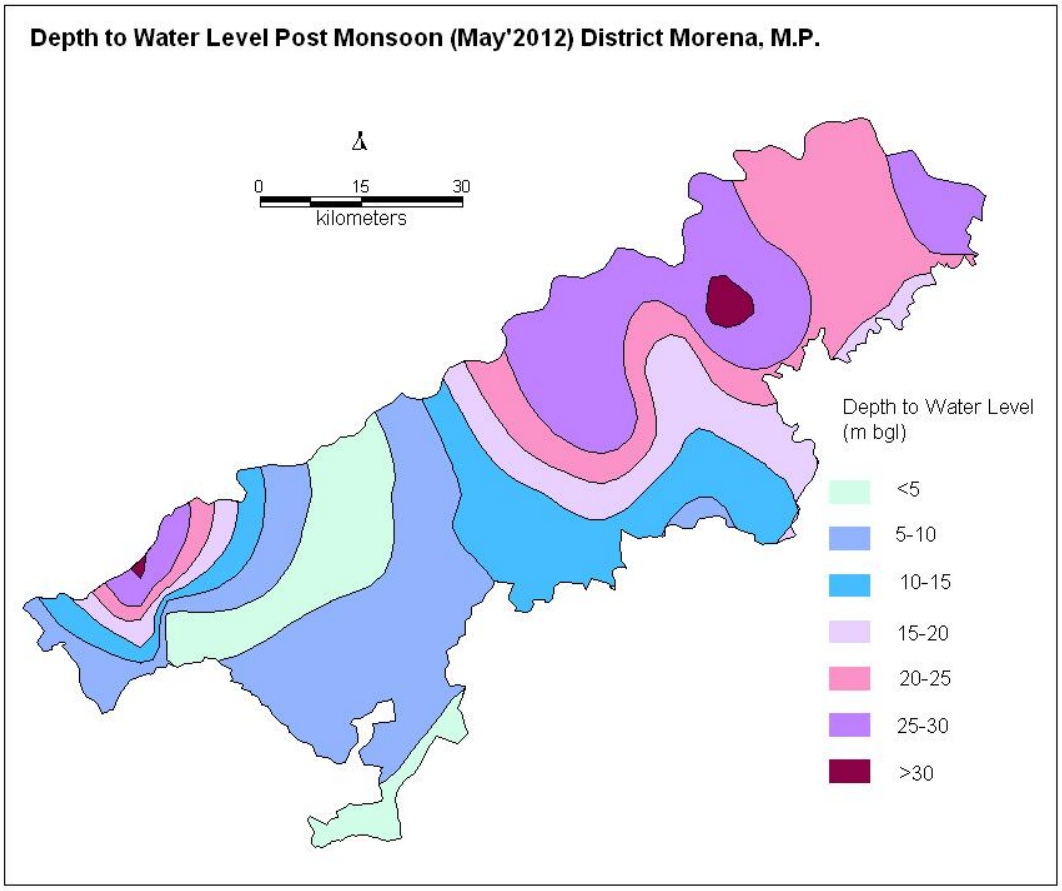
Pre monsoon depth to water levels map is presented as figure 3. A perusal of map reveals that the depth to water level ranges from less than 5.6mbgl to 31.78 mbgl in the district. However, in major part the DTW is less than 28 mbgl. DTW of more than 30 mbgl was observed in an isolated patch in north eastern part.

Fig. 3



4.1.1.2 Post- monsoon (Nov. 2012*)*

Post monsoon depth to water level map is presented as figure 4. during post monsoon period, water levels ranges from 1.60 mbgl to 31.78 mbgl. However, in major part the depth to water level is less than 30 mbgl. Deeper water level of more than 30 mbgl is observed in two small isolated patches one each in western part and in north easten part.



Long term water level trend for 10 years (2003-10) shows that there is overall decline in the area. The decline ranges from 0.61 cm/year to 106 cm/year.

4.2 Ground Water Resources (2009)

Morena district is characterized by alluvial formation, Vindhyan Formation and Gwalior Series. Dynamic ground water resources of the district have been estimated for base year -2008/09 on block-wise basis (Table 2). There are seven assessment units (block) in the district which fall under command (48 %) and non-command (52 %) sub units. Non command areas of Kailaras , Morena and Sabalgarh blocks of the district are categorized as semi critical . The highest stage of ground water development is computed as 74 % in Morena block. The net ground water availability in the district 64,244 ham and ground water draft for all uses is 27,597 ham, making stage of ground water development 43% 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 34,232 ham.

Table-2 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	Ambah	Command	7163	3825	740	4565	803	2535	64	Safe
		Non-Command								
		Block Total	**7163**	**3825**	**740**	**4565**	**803**	**2535**	**64**	**Safe**
2	Joura	Command	5786	1250	290	1541	559	3977	27	**Safe**
		Non-Command	2711	1260	355	1615	683	769	60	**Safe**
		Block Total	**8498**	**2510**	**645**	**3155**	**1241**	**4746**	**37**	**Safe**
3	Kailaras	Command	4941	895	203	1098	363	3683	22	**Safe**
		Non-Command	2116	1343	203	1545	363	410	73	**Semi Critical**
		Block Total	**7057**	**2238**	**405**	**2643**	**726**	**4093**	**37**	
4	Morena	Command	9712	1513	515	2029	750	7448	21	**Safe**
		Non-Command	4861	2827	773	3600	1126	908	74	**Semi Critical**
		Block Total	**14572**	**4340**	**1289**	**5629**	**1876**	**8356**	**39**	
5	Pahadgarh	Command	4316	488	103	591	169	3659	14	**Safe**
		Non-Command	3845	2222	240	2462	394	1229	64	**Safe**
		Block Total	**8161**	**2711**	**343**	**3053**	**562**	**4888**	**37**	**Safe**
6	Porsa	Command	4750	1326	265	1591	392	3032	33	**Safe**
		Non-Command	3408	2022	250	2273	392	994	67	**Safe**
		Block Total	**8159**	**3348**	**515**	**3863**	**785**	**4026**	**47**	**Safe**
7	Sabalgarh	Command	5755	1065	142	1207	249	4441	21	**Safe**
		Non-Command	4879	3152	331	3482	580	1147	71	**Semi Critical**
		Block Total	**10634**	**4217**	**473**	**4689**	**829**	**5588**	**44**	
		District Total	**64244**	**23189**	**4409**	**27597**	**6823**	**34232**	**43**	

4.3 Ground Water Quality

Ground water quality in Morena district is assessed annually by CGWB on the basis of analysis of ground water samples collected from hydrograph stations located in the district. The Electrical conductivity ranges from 550 to 2080 µS/ cm at 25°C. The Fluoride is within permissible limits and ranges from 0.06 mg/l to 1.4 mg/l. The Nitrate ranges from 2.5 mg/l to 298 mg/l.