DISTRICT GROUND WATER INFORMATION BOOKLET

JABALPUR DISTRICT
MADHYA PRADESH

Ministry of Water

Central Ground Water Board
North Central Region

BHOPAL

2013

JABALPUR DISTRICT AT A GLANCE

S.No.	Items	Statistics	
1	**General Information**		
	i) Geographical Area	5655.34 Km^2	
	ii) Administrative Division Number of Tehsil Number of Panchayat/ Villages	 4/7 542/1458	
	iii) Population	2460714	
	iv) Average Annual Rainfall	1279.50 mm	
2.	**Geomorphology**		
	1. Major Physiographic Units	i) Vindhyan track ii) South eastern plateau iii) Bhitri Ganj range	
	2. Major Drainage	i) Narmada river and its tributaries ii) Chhoti Mahanadi & its tributary	
3.	**Land use ($Km^{2)}$**		
	a) Forest Area	777	
	b) Net area sown	2738	
	c) Gross croped area	3718	
4.	**Major Soil Types**	1. Loamy to sandy loamy 2. medium black and deep black	
5.	**Principal Crops**	Paddy,Maize,wheat,Mustard,Arhar etc.	
6.	**Irrigation By Different Sources**	**No.**	**Area irrigated Km^2**
	Dug Wells	8010	261
	Tube wells/Bore wells	8832	815
	Tanks/Ponds	36	1
	Canals	56	940
	Other sources	853	161
	Net Irrigation Area		1174
	Gross Irrigated Area		1332
7.	**Number of Ground Water Monitoring Wells of CGWB (As on 31.03.2013)**		
	Number of Dug Wells No. Piezometers	19 07	
8.	**Predominant Geological Formations**	Recent : Alluium, Gondwana, Vidhyan.	
9.	**Hydrogeology**		
	Major Water Bearing Formation Pre monsoon depth to water level during 2012 Post monsoon depth to water level during 2012 Long term water level trend in 10 years (2003-2013)	Alluvium joint & fractured Granite and Sand stone 0.37 to 10.20 mbgl 2.30 to 16.80 mbgl **Fall** 0.02-0.2 m/year (Pre-monsoon)	

		Rise 0.01-0.14 m/year (Pre-monsoon) 0.34-1.36 m/year (Post- monsoon)
10.	**Ground Water Exploration by CGWB (as on 31.03.2013)**	
	No.of wells drilled(EW, OW, Pz, SH, Total	34 EW + 25 Pz+15PZ,Total=74
11	**Ground Water Quality**	
	Ec,No3,F	Ec-505-1603,N03-8-81,F-0.02-2.35
12	**Dynamic Ground Water Resources (2009) in MCM**	
	Net Annual Ground Water availability Annual ground water Draft Stage of Ground Water Development Allocation forDomestic and Industrial water uses up to next 25yrs ie 2033	556.79 251.40 51% 48.94
13	**Awareness and Training Activities**	
	Mass Awareness Programme organized No. of Participants Water Management Training Programme No. of Participants	- - One on 29.12.2003 201
14	**Efforts of artificial Recharge and Rain Water Harvesting**	
	Projects completed by CGWB Projects under guidance of CGWB	Nil Nil
15	**Ground Water Control and Regulation**	
	No. of OE Blocks No. of Critical Blocks No. of Notified Blocks	Nil Nil Nil
16	**Major Ground Water Problems and Issues**	
	Issues:	Declining Water Level Trend by 10 cm /year in Southern and Western parts

1. INTRODUCTION

Jabalpur district is located almost in the central part of Madhya Pradesh and it is having 15% tribal population to the total population of the district. The deposits of tale around Bharaghat near the Marble rocks on the Narmda river, about 13 miles west of Jabalpur are the best known. The district lies between the North latitude 22°49' and 23°07' North and meridian of longitude 79°21' and 80°35' East. The district is bounded in the South east and east by Manda & Dindori districts, in the south by Seoni and in the south West Narsingpur district and in the west by Damoh district. The district falls in survey of India Top sheet Nos. 55m, 64A- and 55 N on 1:250,000 scale & occupies an over of 5655 sqkm.

The has been divided in to four Tehsils and seven development blocks. (Fig-1) there 1458 villages, 542 village Panchayats 07 Janpad Panchayats of administrative divisions of the district are given in Table-1

Table – 1 : Administrative division, Jabalpur district, (M.P.)

S.No.	Tehsil	Block	Area in sq. Km.	No of Villages	No. of Towns
1.	Sihora	Sihora Majhola	440.05 596.94	151 210	2
2.	Patan	Patan Shahpura	568.49 810.31	220 224	2
3.	Jabalpur	Panagar Jabalpur	421.43 751.00	208 242	2
4.	Kundam	Kundam	890.91	189	1
			5655.34	1458	

Drainage-

Jabalpur district lies at the Junction of the vindhyan and Satpura range and forms part of the great central watershed of India. The Narmada and its tributaries, the Hiran, Gaur drain the district. Chotimahanadi drains a very small area in the east, which is tributary of son river falling in the Ganga basin. The general slope of the Narmada valley is towards west & of Hiran towards south west. The drainage in the district is generally of dendrite type except in the valley of Narmada, along the right banks of Hiran below Katangi where it is of the straight trunk & trellis pattern. The total length of the Narmada river in the district is about 110 km.

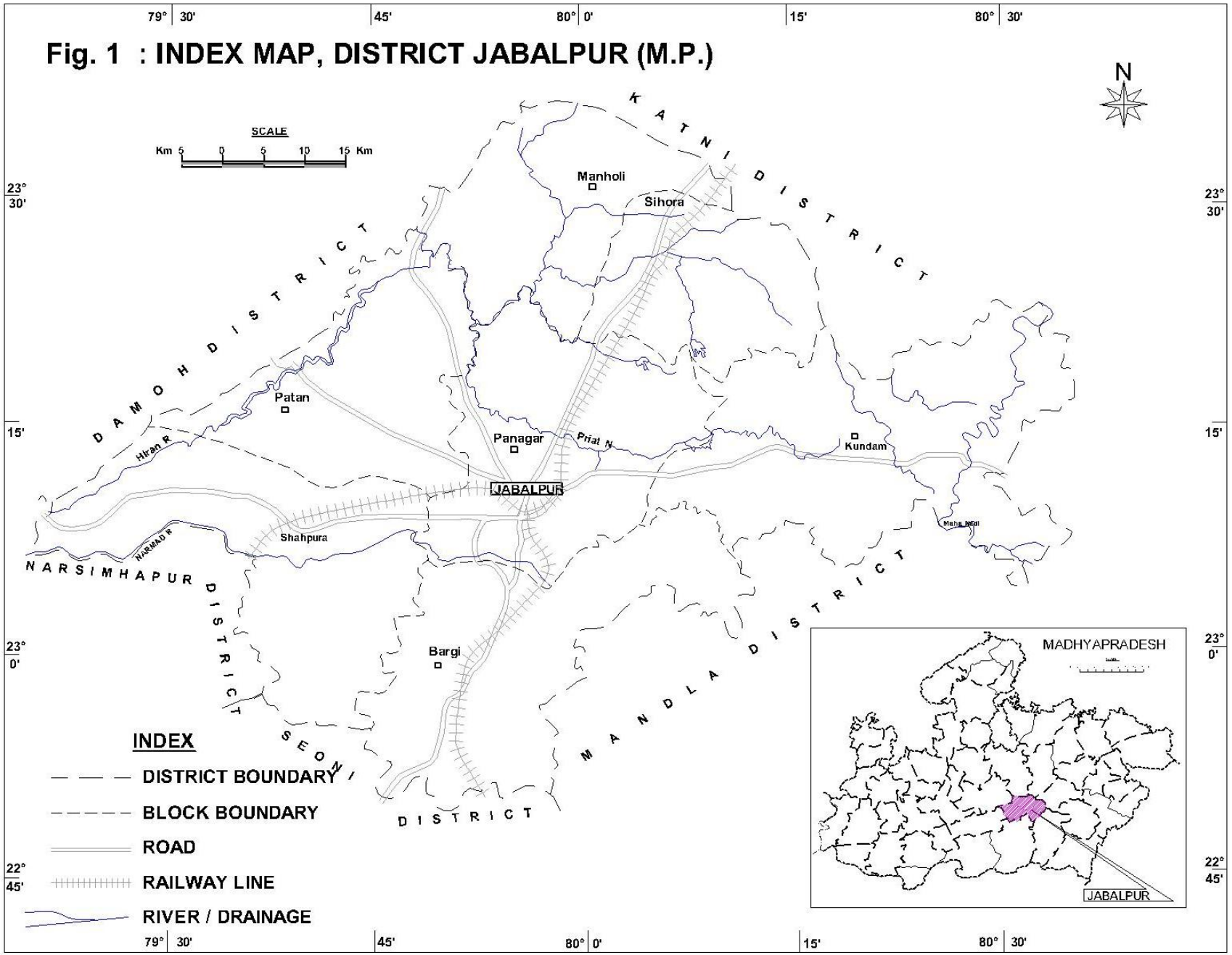
Irrigation-

The total area under irrigation by various sources is 1100.42 sqkm & Net sown area is 2726.60 sqkm which is 40.35% of net sown area in the district. The area irrigated by canals was 78.54 sqkm (2.88% of total area sown), by tube wells 739.11 sqkm (27.10%), by open wells 281.88 sqkm (8.92%) and by ponds (0.04%). There are 8832 tube wells and 8010 dug wells in the district for irrigation.

C.G.W.B. Activities-

The exploratory tube well organization (ETO) took up exploratory drilling in the district way back in 1956 at Shahpura. ETO carried out exploration at eight sites up to the year 1963. There after, CGWB under Narmada project undertook detailed hydrogeological studies between the years 1971-1975. Under this project, 4302 sq km of Jabalpur district was covered. Systematic Hydrogeological Surveys were taken up in 1976-77 and 1977-78 by shri M.A. Haseeb and by Shri K.M. Vishwanath in 1989-90. S/Shri Babu Nair, G.B. Rao and S.K. Verma took up Reappraisal hygrogeological surveys in 1996-97 C.G.W.B. under its normal exploratory drilling program under took trilling at 13 locations between 1995-1999.

Fig. 1 : INDEX MAP, DISTRICT JABALPUR (M.P.)



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2.0 RAINFALL AND CLIMATE

The climate of Jabalpur District M.P. characterized by a hot summer and general dryness except during the south west monsoon. The year may 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 the middle of June to September is the south west monsoon season. October and November form the post monsoon or transition period.

The average annual rainfall of Jabalpur District is 1279.50mm. Jabalpur received maximum rainfall received during south west monsoon period i.e. June to September. About 90% of the annual rainfall received during monsoon season. Only 10% 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 December is 9^0C. The normal annual means maximum and minimum temperature of Jabalpur District is 32.1^0C & 18.3^0C respectively.

During the south west monsoon season the relative humidity generally exceeds 87% (August month). In the rest of the year is drier. The driest part of the year is the summer season. When relative humidity's are less 27%. 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 8.6 km/hr observed during the month of annual wind velocity of Jabalpur district is 5.3 km/hr. Normal climatologically parameter of Jabalpur district given in attached Annexure. Normal climatological parameters of Jabalpur district is given in Tabale-2

Table – 2 Normal Climatolocical Parameters For Jabalpur Distt.

	Jan	Feb	Mar.	April	May	June	July	Aug	Sep.	Oct.	Nov.	Dec.	Annual
Max. Temp.	26.2	29.4	34.5	39.3	42.0	38.0	31.1	29.8	31.4	32.3	29.9	26.	32.6
Min. Temp.	9.7	12.1	16.6	21.9	26.4	26.6	24.2	23.7	23.3	19.2	13.1	9.7	18.9
R.H. %	69	58	43	33	31	59	85	88	82	70	65	70	63
W. Speed in Km/hr.	3.2	3.7	4.3	5.0	6.3	8.2	7.2	6.9	5.4	3.5	2.7	2.6	4.9

3.0 GEOMORPHOLOGY AND SOIL TYPES

Gemorphology

Jabalpur district can broadly be divided in to three physiographic units.

1. The Vindhyan Tract
2. The South eastern plateaus of the Satpura
3. The Bhitright Range & the associated hill area.

The Bhander & Kaimur ranges of Vindhyan System attains & altitude of 530 mamsl & form the western boundary of the district. The Bhander range is in the form of ery abrupt & step scarp & at the foot of this escarpment flows the Hiran river.

The south eastern plateans of satpura are cut across by the Namada its south of Jabalpur & Deccan carps farming flat topped hills cover the whole area of satpuras in south east. The general height of table land is 460 mamgl south of Narmada & about 535 mamgl east of Jabalpur.

The Bhitrigarh range & associated hill area run across the northern part of the district from south west to north east. It consists of metamorphic rocks & meets the spur of satpuras at almost right angle. These have general elevation of 460 to 550 mamgl.

The range forms the watershed between the catchments of Hiran in the south & Katni in the north. Between the high lands of vindhyans in the west & Satpuras in east is low lying alluvial plain farmed due to Narmada & Hiran rivers & is called as the ‘Haveli’.

Soils

Jabalpur district is covered by three types of soils –

1. The loam to sandy loam confined to the river courses of the Narmada & Hiran falling in shahpura & Patan blocks.
2. Medium black soil covering Kundam, Bargi, eastern parts of Shahpura, Panagar & Sihora blocks.
3. Deep block soil covering Shahpura, Patan & Sihora blocks. In the Narmada valley, the block soil is composed mainly of clay & silt washed down by rivers.

4.0 GROUND WATER SCENARIO

Hydrogeology

District Jabalpur is a home of geology since formations ranging form lower proterozoic to Pleistocene age are exposed in the area different types of aquifers are formed by these rocks in the area main geological units of the area are Archaens, Gondwana, Lameta, Deccan Trap and Narmada alluvium. Occurrence & movement of ground water in hard rocks is mainly controlled by secondary porosity through Joints & fractures. Primary porosity in Gondwana sand stone & vesicular basalts in Deccan Traps play are important role in ground water movement. Lameta are also forming potential aquaifers made up of relatively loose & friable shale & sand stone. Ground water in general occurs under unconfined; Semi confined & confined conditions. The occurrence & movement of ground water in different geological formations in described below. Fig-2

Makoshal Group :

These formations consisting of quartzite's, shale, state and marble are hard, compact, re-crystallized and have no primary porosity. There form poor aquifers. However, limestone's at places have solution cavities, which give rise to very high secondary porosity & permeability. The limestone formation is encountered at Patan at depth of 55mbgl yielded 41 lps of water for 5.36 meters of draw down.

Granites :

Granites and granitic gneisses exposed mostly in and around Jabalpur town. These formations are quite hard and generally devoid of primary porosity. However, due to weathering of the top mantle, secondary porosity and permeability has developed which supports dug-wells. The joints and fractures close down after a depth of 40 to 50 meters. Ground water occurs under water table conditions and the tube wells in this formation, though very few, can sustain a maximum discharge of about three lps for appreciable draw downs. The yield of open wells ranges between 20 to 100m3/day

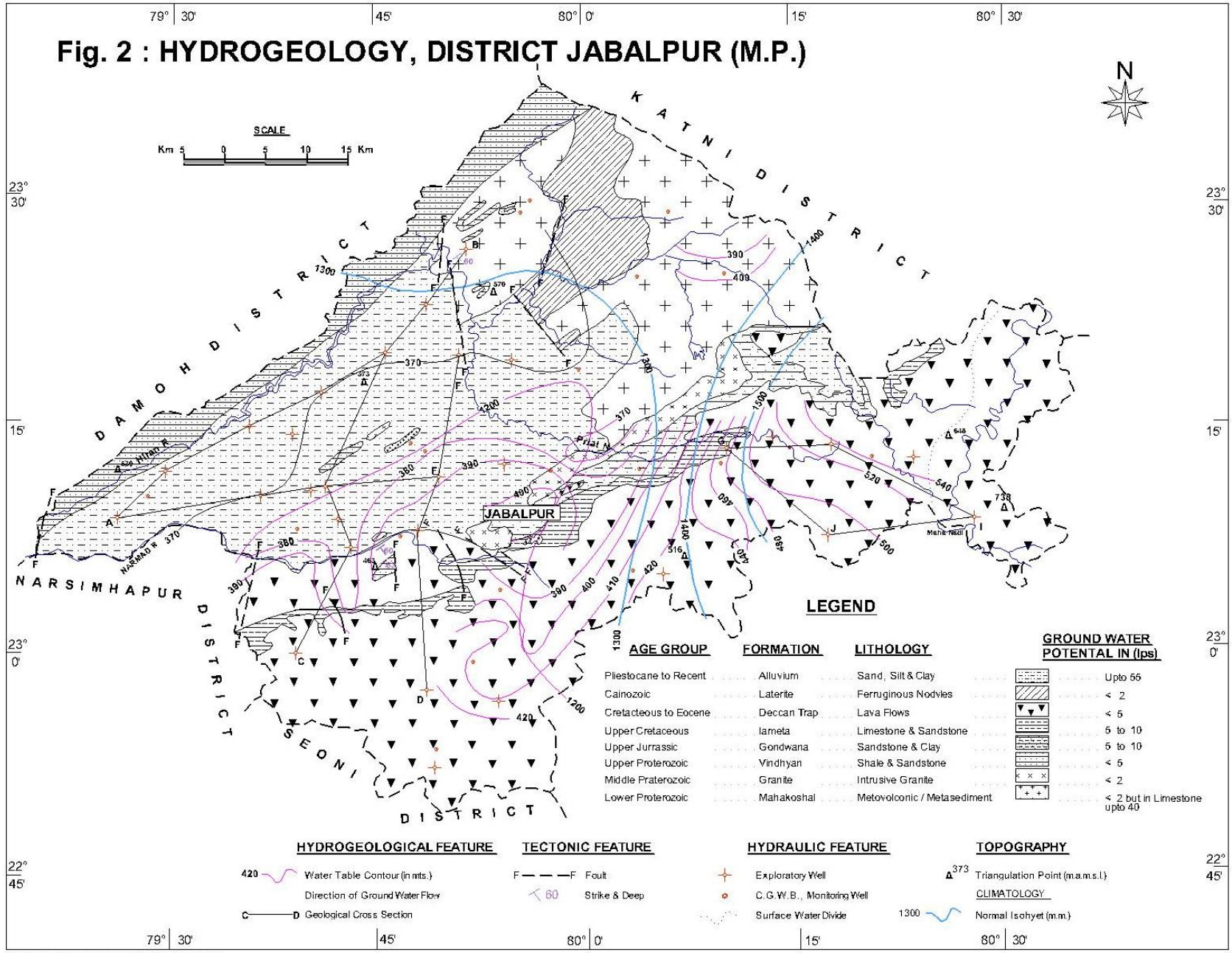
Vindhyans :

These are mostly sandstones belonging to the lower vindhyans and are devoid of any primary porosity. However, due to weathering, fracturing and jointing, the top portion of the formation behaves as a phreatic aquifer due to development of secondary porosity. These formations can thus support very low yielding open wells.

Gondwanas :

These are sedimentary formations and are rich in granular zones forming moderately potential aquifers. Gondwana sandstones support both tube wells and dug-wells capable of yielding up to ten LPS of water for moderate drawdowns. The exploratory well at Bijna Magarmuha tapping alluvium and Gondwana sandstone yielded 8.5 LPS of water for a drawdown of 6.5 meters. Verma (1998) has reported that there is a cluster of dug-cum-bore-wells near village Rithari ($23^0$14':$80^0$03') and that each well has a command area of 8 to 16 hectares. The depth of these wells is upto 35 meters. The discharge of wells near pariyat tank is about 150 m3/day.

Fig. 2 : HYDROGEOLOGY, DISTRICT JABALPUR (M.P.)



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Lametas :

These are infratrappean formations in which the top limestone, which is hard, compact and siliceous, is underlain by sandstone. The limestone are poor aquifers. However, the sandstones are semi-consolidated and have primary porosity also. However, these have a limited thickness of 8-10 meters and have poor to moderate permeability's. The Lametas overlying the Gondwanas and the Lameta-Gondwana contract can be explored for moderately potential aquifers.

Deccan Traps :

Deccan trap form the most important formation in the district due to their large aerial extent. The weathered, jointed, fractured, and vesicular units of basalt form moderately potential aquifers. The zeolitic basalt in weathered form also makes good aquifers. The red bole bed, which is predominantly clay, is non-productive. These formations have highly variable yields, being higher in dug-wells. The yields range between 10 and 75 m^3/day. It has been observed that the yield increases substantially when bores extending down to the lower vesicular zone are drilled at bottom of the dug-wells.

Alluvium :

The alluvial deposits are confined mostly to the Narmada-Hiran river area. The maximum thickness of alluvium is 129 meters at Beohari. Ground water in alluvium occurs under phreatic conditions. It is the most important formation for ground water development and has primary inter-granular porosity and permeability. It can support high discharge tube wells, the maximum being 55.5LPS for a drawdown of 7 meters at Udna. The thickness of granular zones varies from a minimum of 8.51 m at Sontalai to a maximum of 57.45 m at Umaria, with an average thickness of 30m for the entire area. In general, the thickness of the granular zones is maximum in mid-rib portion of the Hiran sub-area, which increases from the western to the central part of Umaria and then decreases towards cast towards Sontalai. Based on the studies carried out under Narmada Project. It has been interpreted that the Hiran sub-area has a confined aquifer separated from the phreatic aquifer. The phreatic zone occurs within a depth range of 16 to 27 mbgl with its thickness varying from 5 to 23 meters. It consists mostly of fine mixed with clay. Silt and 'Kankar'.

The confined aquifer commences from 21 to 51 mbgl with its thickness varying from 9 to 27 meters. It comprises mostly of sand; gavel and 'kankar' intercalated occasionally with silt and clay lenses.

The grain size analysis of formation samples suggests the value of the median diameter is very small medicating that the formation material is finer in size and have a distinct provenance. Further, the values of the median diameter are also not uniform with depth in the same borehole. This suggests the sedimentation had taken place under changing environmental conditions. This is also revealed by alternating bands of clay and silt. The value of sorting co-efficient. In general, is less than 2.5, confirming that the sediments are well sorted.

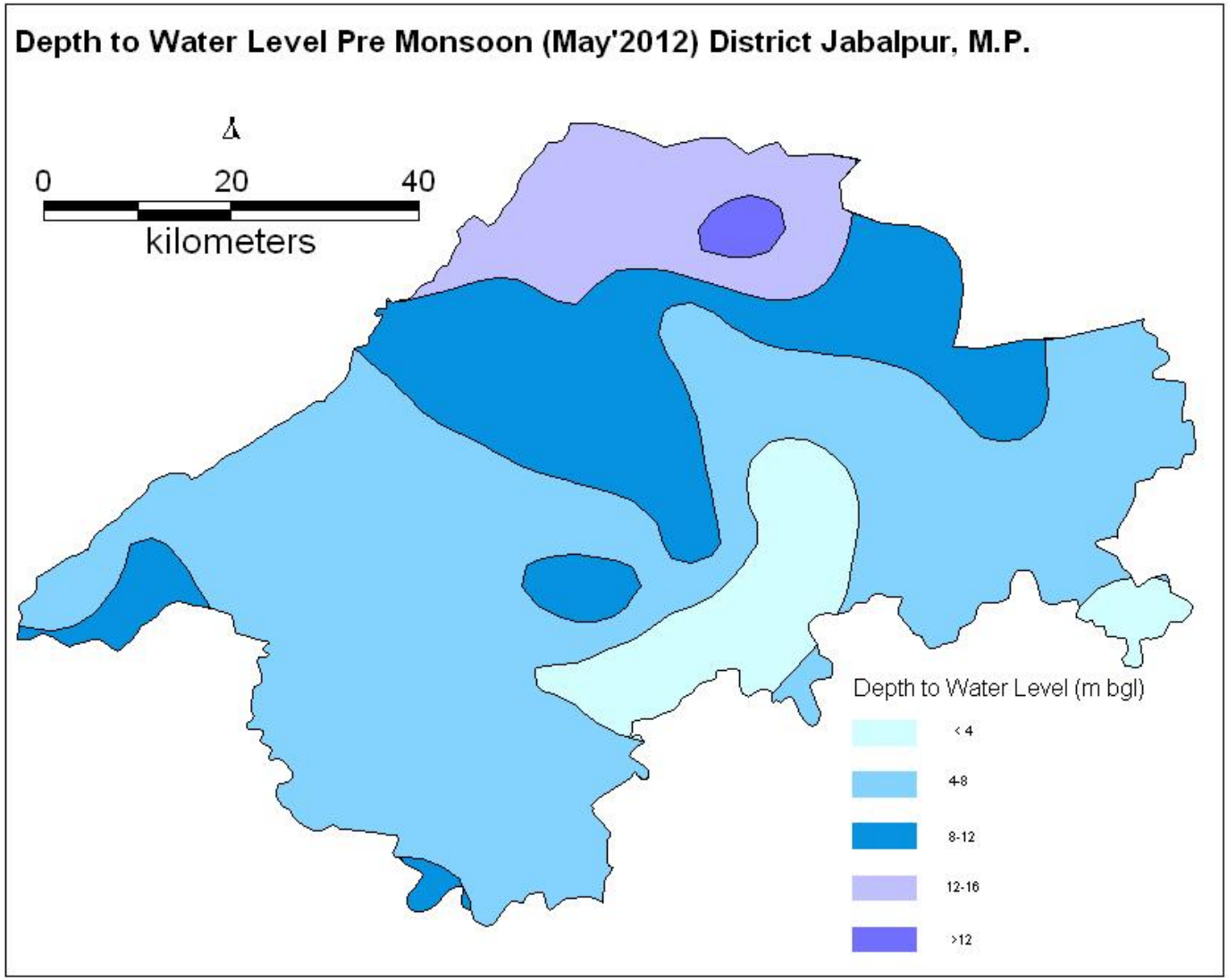
Depth to Water Level :

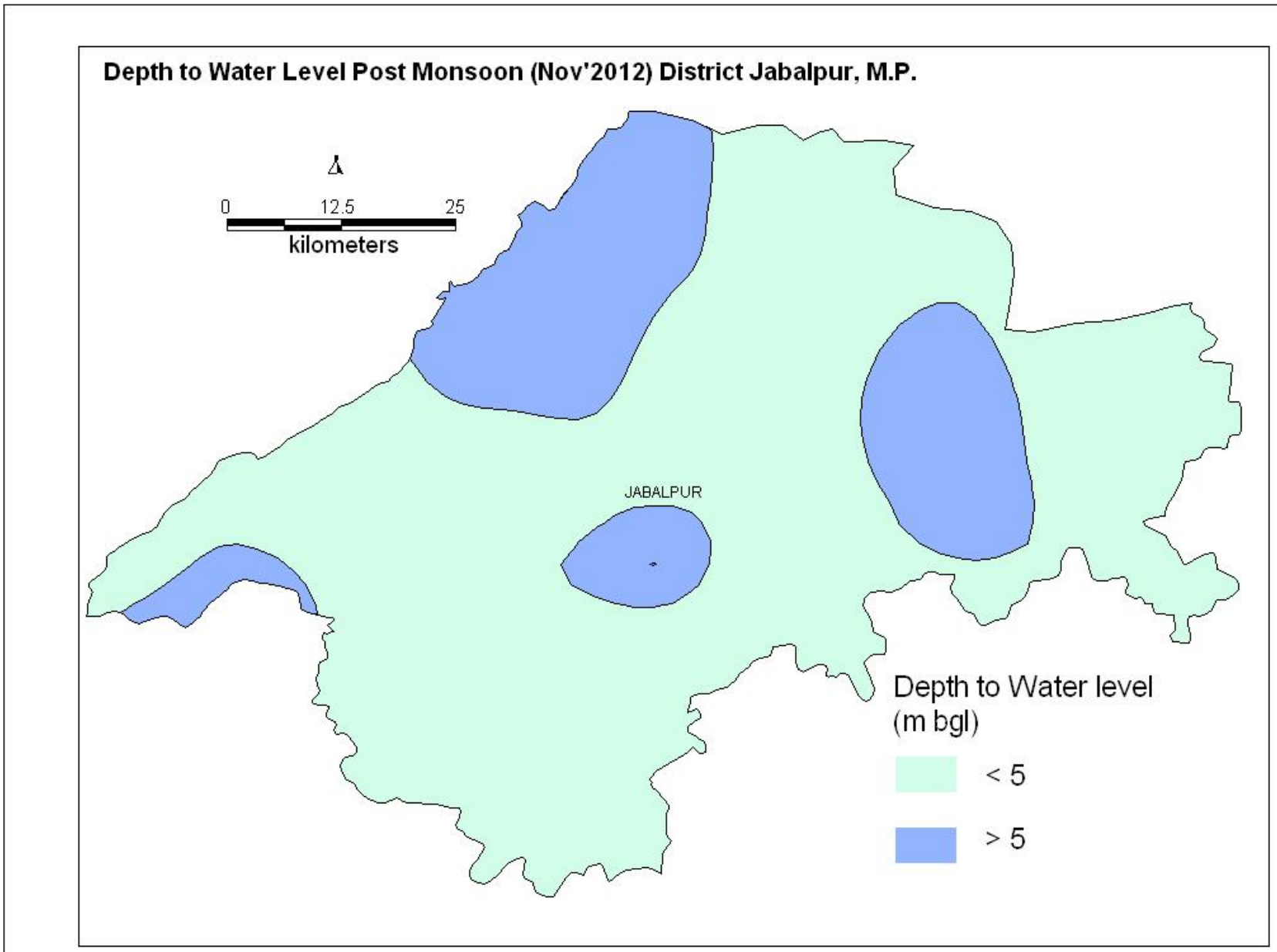
Central ground water board has been carrying out water level monitoring of 26 no. of ground water monitoring wells in the district. Water level of these monitoring wells are being monitored four times in a year during the month of January, May, August & November. A hydro geological map (Fig.-2) of Jabalpur district has been prepared on the basis of available data. To study ground water regime of the area, pre monsoon & post monsoon depth to water level maps of the district has been prepared. Eastern past of the district is highly undulating & forested.

Pre-monsoon (May, 2012) :
In general depth to water level in the district, ranges between 0.37m-14.20mbgl

Post-monsoon (November, 2012) :
In general depth to water level in the district, ranges between 2.30m-16.80mbgl

Long Term Water level trend in last 10 years (2003-2013) –
Fall -0.02-0.2 m/year and Rise of 0.01-0.14 m/year during Pre-monsoon.


Depth to Water Level Pre Monsoon (May'2012) District Jabalpur, M.P.
0
20
40
kilometers
Depth to Water Level (m bgl)
< 4
4-8
8-12
12-16
>12


Depth to Water Level Post Monsoon (Nov'2012) District Jabalpur, M.P.
0
12.5
25
kilometers
JABALPUR
Depth to Water level
(m bgl)
< 5
> 5

Aquifer Parameters :

C.G.W.B. has drilled 74 exploratory wells in the district. Hydro geological data of exploratory wells in the district is given in Table-4.

Perusal of above table reveals that, yield of alluvial formations vary from 3 to 55 lps & draw down ranges between 0.89m to 11.40m. yield of Deccan Trap basalts was recorded between 1lps to 9 lps & draw down was observed between 3 to 26m. Analysis of aquifer performance test results reveals that regional transmitssivity of Alluvial sediment ranges from 300 to 3000m2/day which the hydraulic conductivity is 6 to 204m/day.

Table- 4 Hydrogeological details of some CGWB exploratory wells drilled in Jabalpur district.

S.N.	Location	Block	Co-ordinates	Topo Sheet	Year	RL of GL of EW (mamsl)	Depth Drilled (m)
1	2	3	4	5	6	7	8
1.	BHERAGHAT	PANAGAR	230^{0}9’50”.79^{0}45’55”	55M/16	1956	383.2	72.24
2.	SHAHPURA	SHAHPURA	230^{0}9’00”.79^{0}39’00”	55M/12	1956		
3.	BHERAGHAT	PANAGAR	23^{0}08’50”.79^{0}48’00”	55M/16	1962		58.52
4.	DIGORI	SHAHPURA	23^{0}09’50”.79^{0}42’00”	55M/12	1962	375.51	52.7
5.	KIRKAKHERA	SHAHPURA	23^{0}08’45”.79^{0}43’00”	55M/12	1962	378.26	61.26
6.	PATAN	PATAN	23^{0}08’16'7.9^{0}42’00”	55M/11	1963	357.18	69.2
7.	UDNA	PATAN	23^{0}14’00”.79^{0}39’00”	55M/12	1963	372.16	112.47
8.	UMARIA	SHAHPURA	23^{0}10’45”.79^{0}36’05”	55M/12	1975	371.86	103.17
9.	ARCHHO	PATAN	23^{0}11’45”.79^{0}50’00”	55M/16	1976	382.51	121.7
10.	BAMHNODI	PANAGAR	23^{0}19’30”.79^{0}54’45”	55M/15	1976	375.02	91.74
11.	BEOHARI	PATAN	23^{0}19’30”.79^{0}46’00”	55M/15	1976	378	129.361
12.	GHUNSOR	SHAHPURA	23^{0}11’00”.79^{0}43’00”	55M/12	1976	376.25	58.82
13.	KANKERKHERA	PATAN	23^{0}19’30”.79^{0}51’45”	55M/15	1976	374.25	65.1
14.	KUARPUR	PATAN	23^{0}15’00”.79^{0}36’20”	55M/12	1976	366.12	76.2
15.	KUSLI	PATAN	23^{0}23’23”.79^{0}49’15”	55M/15	1976	366.53	76.2
16.	MAGARMUHA	SHAHPURA	23^{0}08’00”.79^{0}43’00”	55M/12	1976		
17.	MANKENRI	SHAHPURA	23^{0}11’00”.79^{0}31’00”	55M/12	1976	365.63	91.44
18.	MAROTAL	PANAGAR	23^{0}12’00”.79^{0}55’00”	55M/16	1976	389.75	61.87
19	MATANPUR	SHAHPURA	23^{0}08’45”.79^{0}27’30”	55M/8	1976	376.86	78.8
20.	SEHAJPUR	SHAHPURA	23^{0}09’30”.79^{0}44’45”	55M/12	1976	381	59.51
21.	SONTALAI	PATAN	23^{0}14’00”.79^{0}49’00”	55M/16	1976	381	113.06
22.	.HARDULIKALAN	KUNDAM	23^{0}09’20”.80^{0}29’00”	64A/8	1995	591.07	189.1
23.	BAIRAGI.	KUNDAM	23^{0}13’30”.80^{0}17’00”	64A/8	1996	552.11	189.5
24.	BIJNA.	SHAHPURA	22^{0}59’30”.79^{0}39’30”	55A/9	1996	386.28	113
25.	BIJNA.	SHAHPURA	23^{0}07’04”.79^{0}44’04”	55M/15	1996	378.04	58.4
26.	DEHRI KALAN.	KUNDUM	23^{0}13’05”.80^{0}10’50”	64A/4	1996	518.63	157.75
27	MAHAGAWAN	KUNDUM	23^{0}12’5”.80^{0}23’15”	64A/8	1996	538.93	175.9
28	PIPARIA.	MAJHOLI	23^{0}26’10”.79^{0}54’40”	55M/15	1996	369.54	76.81
29.	KASTRA	KUNDUM	23^{0}07’30”.80^{0}18’15”	64A/8	1997	475?	148.5
30.	PURWA	BARGI	23^{0}05’30”.80^{0}05’50”	64A/4	1998		135.7
31.	TILSANI.	KUNDUM	23^{0}59’05”.80^{0}13’50”	64A/4	1998		181.96
32.	BARGI NAGAR.	BARGI	22^{0}55’45”.79^{0}54’30”	55N/13	1999		115.9
33.	HINOTA	BARGI	22^{0}56’40”.79^{0}50’15”	55N/13	1999		183
34.	KALAN DEI	BARGI	22^{0}52’30”.79^{0}50’10”	55N/13	1999		176.9

Data Collected During Exploration, Jabalpur District, M.P.

S.N.	Location	Basement Struck at mbgl	Basement Rock	No of OW	Rig Type	Remarks
1.	BHERAGHAT	70.7	BASALT	0	Rotary	ETO Slim Hole
2.	SHAHPURA		QUARTZITE		Rotary	ETO
3.	BHERAGHAT	57.9	BASALT		Rotary	ETO
4.	DIGORI	49.1	CONGLOMERATE		Rotary	ETO
5.	KIRKAKHERA	61.3	CONGLOMERATE		Rotary	Deposit Well. ETO
6.	PATAN	55.8	LIMESTONE		Rotary	ETO
7.	UDANA	103.3	SLATE		Rotary	ETO
8.	UMARIA	102.6	CHLORITE MICA SCHIST	0	Rotary	ETO
9.	ARCHHO	98.0	SHLE	2	Rotary	Narmada Project
10.	BAMHNODI	112.6	QUARTZIE	1	Rotary	Narmada Project
11.	BEOHARI	128.7	GRANTIE		Rotary	Narmada Project
12.	GHUNSOR	57.9	CONGLOMERATE		Rotary	Narmada Project
13.	KANKERKHERA	64.0	QUARTZIE	1	Rotary	Narmada Project
14.	KUARPUR	76.0	QUARTZIE	0	Rotary	Narmada Project
15.	KUSLI	73.5	GRANITE		Rotary	Narmada Project
16.	MAGARMUHA		SANDSTONE		Rotary	Narmada Project
17.	MANKENRI	84.7	QUARTZIE		DTH	Narmada Project
18.	MAROTAL	61.9	GRANITE		Rotary	Narmada Project
19	MATANPUR	78.0	QUARTZIE		Rotary	Narmada Project
20.	SEHAJPUR	53.6	CONGLOMERATE		Rotary	Narmada Project
21.	SONTALAI	111.5	DOLOMITE		Rotary	Narmada Project
22.	HARDULI KALAN	1.0	BASLAT	1	DTH	*PYT Results
23.	BAIRAGI	1.0	BASLAT	1	DTH	*PYT Results
24.	BIJNA (CHARGAWAN)	3.0	BASLAT	1	DTH	*PYT Results
25.	BIJNA.	41.0	SANDSTONE	0	Rotary	
26.	DEHRI KALAN.	6.0	BASLAT	1	DTH	*PYT Results
27.	MAHAGAWAN	2.0	BASLAT	1	DTH	
28.	PIPARIA.	30.0	QUARTZITE SHALE	0	Rotary	*PYT Results
29.	KASTRA	3.0	BASLAT	1	DTH	
30	PURWA	2.0	BASLAT		DTH	*PYT Results
31	TILSANI.	2.0	BASLAT		DTH	*PYT Results
32	BARGI NAGAR.	6.0	BASLAT	3	DTH	
33	HINOTA	3.0	BASLAT		DTH	Abandoned
34	KALAN DEI	1.0	BASLAT		DTH	Abandoned

Data Collected During Exploration, Jabalpur District, M.P.

S.N	Location	Static Water Level (mbgl)	Discharge (lps)	Draw Down (m)	Transmissivity (m2/day)	Hydraulic Conductivity 'K' m/day	Storat-ivity	Quality
1.	BHERAGHAT							
2.	SHAHPURA	4.61	47.2	4.43	1200.0	45.0		
3.	BHERAGHAT	7.77	40.0	3.80	3000.0	150.0		
4.	DIGORI	6.24	42.3	7.98	564.0	21.7		TDS 4.36
5.	KIRKAKHERA	8.00	42.0	3.23	2162.0	170.0		TDS-270
6.	PATAN	6.83	41.0	5.36	2381.0	223.4		TDS-330
7.	UDANA	6.24	55.5	7.05	671.0	22.96		TDS-363
8.	UMARIA	10.13	19.0	6.80	368.0	12.6		TDS-366
9.	ARCHHO	5.12	14.0	7.17	400.0	25.0	$1.013*10^{3}$	EC-584,TDS-350
10.	BAMHNODI	5.30	14.8	7.17	343.0	13.0	$6.06*10^{-14}$	EC-438,TDS-274
11.	BEOHARI	6.39	3.0	11.52	17.0	1.2		EC-1004, TDS-360
12.	GHUNSOR	2.62	35.0	11.40	360.0	20.0		
13.	KANKERKHERA	8.07	42.4	9.18	1381.0	66.0	1.69*10-4	EC-725,TDS-448
14.	KUARPUR	16.90	14.8	0.90	3060.0	204.0		EC-670,TDS-410
15.	KUSLI	10.90	8.7	7.71	1428.0	6.0		EC-696,TDS-410
16.	MAGARMUHA							
17.	MANKENRI	16.90	14.8	0.89	3060.0	82.0		
18.	MAROTAL							
19.	MATANPUR	16.44	21.8	10.42	300.0	14.0	5.85*10-4	EC-721,TDS-434
20.	SEHAJPUR		SLIM HOLE					
21.	SONTALAI		SLIM HOLE					
22.	HARDULI KALAN							
23.	BAIRAGI	114.72*	2*	>3	-	-	-	-
24.	BIJNA (CHARGAWAN)	21.00	8.8	17.43	63.5	3.2	1.29*10-4	EC-632
25.	BIJNA.	24.74	8.5	6.49	136.0	13.6		EC-1060
26.	DEHRI KALAN.	93.8-	2.62*	0.26*	-	-	-	
27.	MAHAGAWAN							
28.	PIPARIA.	16.83*	1.1*	10.2*				EC-612
29.	KASTRA	27.48	4.7	25.90	52.0		0.18	
30.	PURWA	110.4*	1.1*	ABANDONED				
31.	TILSANI.	107*	1.5*	ABANDONED				
32.	BARGI NAGAR.	9.44	1.5	29.90	2.0			
33.	HINOTA	44.65	Negligible		-	-	-	
34.	KALAN DEI	11.10	Negligible		-	-	-	

Data Collected During Exploration, Jabalpur District, M.P.

S.N	Location	Depth of Construction (m)	Zones Tapped (mbgl)	Aquifer
1.	BHERAGHAT	Slim Hole		SAND & GRAVEL
2.	SHAHPURA	90.68	22.71-27.89, 28.65-34.44, 40.-84-46.94,52.58-58.83, 81.53-90.68	ALLUVIUM
3.	BHERAGHAT	56.22	24-30.3, 42.5-56.22	ALLUVIUM
4.	DIGORI	52.7	25.46-51.32	ALLUVIUM
5.	KIRKAKHERA	44.37	30-42.7	ALLUVIUM
6.	PATAN	67.9	55.1-66.6	ALLUVIUM
7.	UDANA	44.45	15.13-44.45	ALLUVIUM
8.	UMARIA	103	73.82-103	ALLUVIUM
9.	ARCHHO	49	24-26 28-30 32-14, 35.5-42.5, 43.5-46	ALLUVIUM
10.	BAMHNODI	85	27.25-31.50, 36.5-36.5, 41-45.5, 58.5-62.5, 68-72, 74-81	ALLUVIUM
11.	BEOHARI	90	45-50, 52-58, 60-64, 66-69, 81-88	ALLUVIUM
12.	GHUNSOR	53.04	34.75-53.04	ALLUVIUM
13.	KANKERKHERA	60	30-33, 35-49, 56-60	ALLUVIUM
14.	KUARPUR	66	25-31, 41.5-46.5, 60-64	ALLUVIUM
15.	KUSLI	72	21-23, 24-25.5, 27-28, 33-39, 47-57, 62-70	ALLUVIUM
16.	MAGARMUHA	84.58		ALLUVIUM
17.	MANKENRI	84.58	34.35-46.18, 58.97-84.58	ALLUVIUM
18.	MAROTAL	-		ALLUVIUM
19.	MATANPUR	75	39.5-42.47-52, 53.5-55, 57-63, 65-69.5, 71-73	ALLUVIUM
20.	SEHAJPUR	-	SLIM HOLE	ALLUVIUM
21.	SONTALAI	-	SLIM HOLE	ALLUVIUM
22.	HARDULI KALAN	189.1	121-139, 143.-168.5	BASAL
23.	BAIRAGI	183	146-149, 152-155, 171-184	BASALT& LAMETA SST.
24.	BIJNA (CHARGAWAN)	112	88-91, 95-112	BASALT& LAMETA SST
25.	BIJNA.	53	31-34, 41-43, 48-53	ALLUVIUM & SST.
26.	DEHRI KALAN.	147	107-113, 120-123, 132-144	GONDWANA SST.
27.	MAHAGAWAN	175.5	166-175.5	BASAL SHALES
28.	PIPARIA.	47	32-44	BASALT&LAMETA SST.
29.	KASTRA	1148.5	23.5-102, 142.5-148	BASALT& LAMETA SST
30.	PURWA	135.7	129-135	BASALT& LAMETA SST
31.	TILSANI.	180	78-80, 82-84, 54-57, 73-85, 100-106, 109-112	BASALT& LAMETA SST
32.	BARGI NAGAR.	115.9	18-24, 36-48, 54-57, 73-85, 100-106, 109-112	BASALT
33.	HINOTA		Well Abandoned	BASALT
34.	KALAN DEI		Well Abandoned	BASALT

Ground Water Resources :

Jabalpur district is underlain by Alluvium, Archaean granite, Basaltic lava flows of Deccan trap Bijawar and Vindhyan sandstone. Dynamic ground water resources of the district have been estimated for base year -2008/09 on block-wise basis. Out of 5,26,693 ha of geographical area, 4,43,866 ha (84 %) is ground water recharge worthy area and 82,827 ha (16%) is hilly area. There are seven number of assessment units (block) in the district which fall under non-command (86 %- Kundam and Majholi) and command (14.%) sub units. All the blocks except, Patan is categorized as safe. Non command area of Patan block of the district is categorized as semi critical (safe in 2003/04). The highest stage of ground water development is computed as 64% in Shahpur block. The net ground water availability in the district is 55,679 ham and ground water draft for all uses is 28,184 ham, making stage of ground water development 51 % (42 % 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 25,645 ham.

Table -5 Block wise Ground water Resource Estimation Data of Jabalpur District (Base Year 2009)

ASSESSMENT OF DYNAMIC GROUND WATER RESOURCES OF MADHYA PRADESH **Type of Assessment Unit : Block (As on March, 2009)**									
S. No.	**District/ 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 (11+12) (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 {(13/10)*100} (%)**
22	**Jabalpur**								
	Bargi	Command	362	80	32	112	67	215	31
		Non-Command	4225	2236	430	2666	891	1097	63
		Block Total	**4587**	**2316**	**462**	**2778**	**958**	**1313**	**61**
	Kundam	Command							
		Non-Command	4871	569	356	925	456	3846	19
		Block Total	**4871**	**569**	**356**	**925**	**456**	**3846**	**19**
	Majholi	Command							
		Non-Command	6866	3212	427	3640	708	2945	53
		Block Total	**6866**	**3212**	**427**	**3640**	**708**	**2945**	**53**
	Panagar	Command	930	161	135	297	140	629	32
		Non-Command	11431	5123	430	5553	629	5679	49
		Block Total	**12362**	**5284**	**565**	**5850**	**769**	**6308**	47
	Patan	Command	6546	2053	113	2166	185	4308	33
		Non-Command	6136	3823	262	4084	430	1883	67
		Block Total	**12681**	**5875**	**375**	**6250**	**615**	**6191**	**49**
	Shahpur	Command	3333	1453	162	1615	273	1607	48
		Non-Command	6181	4187	302	4489	507	1487	73
		Block Total	**9513**	**5641**	**464**	**6104**	**780**	**3093**	**64**
	Sihora	Command	1066	122	46	169	65	879	16
		Non-Command	3733	2119	349	2468	543	1071	66
		Block Total	**4799**	**2241**	**395**	**2637**	**608**	**1950**	**55**
		District Total	**55679**	**25140**	**3045**	**28184**	**4894**	**25645**	**51**

Ground Water Quality Of Jabalpur District Resources :

Quality of Ground Water for Drinking :

The EC value ranges from 505-1603,NO3 value ranges from 8-81,Fluoride value ranges from 0.02-2.35. The total hardness of the groundwater in the district is under safe limit as per BIS standards.

Quality of Water for Irrigation :

High SAR is not good for irrigation as it leads to sodium hazard. Water samples in the district generally fall in C1S1 and C3S1 classes of US Salinity diagram. However ground water in the district general is safe for irrigation but proper drainage system is required where EC is more than 1500 us cm^{-1}.

Status of Ground Water Development :

Ground water is main source for drinking and Irrigation in the Jabalpur district. About 37.44% of irrigation in the district is from ground water sources. The level of irrigation in the district is 40% with the net sown area. There are 8832 tube wells and 8010 dug wells for irrigation in the district. Depth of dug wells in the district ranges from 5 to 20m. Yield of bore wells vary from 19.3 to 76.4 cu m/hour depending upon the hydrogological situations in the area. High yielding tube wells have been encountered which were drilled in the alluvium, Lameta & Gondwana sand stone and their highest discharge was observed 33.30 lpm at Udna (alluvium) 528 lpm at Bijna. Apart from private sources, hand pumps are main source of rural water supply in the district.

5.0 GROUND WATER MANAGEMENT STRATEGY

Resource Estimation

As per Ground water resource estimation of Jabalpur district for the year 2008/09, the available ground water resources & gross ground water drafts are 556.79 MCM & 251.40 MCM respectively, making stage of ground water development 51% as a whole for the district. Thus there is arable scope for future development of ground water resources in the district. All the seven blocks namely, Bargi, Kundam, Sihora, Panagar, Majholi, Shahpur & Patan are falling under safe categories. Decadal water level trend analysis reveals mixed of water level during pre & post monsoon reasons.

After making allocation for future domestic & Industrial supply up to next 25 years, balance available ground water is 48.94 MCM. If 70% of balance available ground water & 30% through tube wells, then at suitable hy radiological locations tentatively 12775 new dug wells & 2737 new tube wells for irrigation can be constructed in the district, considering unit draft of dug wells & tube Wells 1.5 & 3.0 ham respectively.

Area recommended for future development is given in fig 6. Dug wells are feasible structures for granites & basaltic area, where as the shallow tube wells are recommended in weathered/Jointed Achaeans & basaltic formations.

Deep tube wells with proper well assembly are suitable in Gondwana & alluvial formations in the district. In the basalts, overlying lamata beds drilling may be talcum up with DTH Rigs, but further down drilling in Lameta formations becomes difficult, due to its loose & friable nature, if these rocks

are occurring below a depth of 100m, drilling technology is to be developed to negotiate the formations at proper level.

Water Conservation & Artificial Recharge :

Considering hydrogeology situation of the area, there is tremendous scope for artificial recharge work, especially, in ground water depleting areas of Shahpura, Patan Shihora, Majholi & Bargi blocks. At present stage of ground water development in the district is only 32% in command area and 55.71 in non-command area.

The declining trend of water levels is also observed in small Catcher. However, with ever increasing demand for ground water, it is important to not mly safeguard it also.

Hydrogeologically, the district has been broadly grounded in to hard rock area & falling mostly in panager, Jabalpur, Kundan, Sihora & Majholi blocks & the alluvial areas falling in Patan & Shahpura blocks. In hilly & hard rock areas plan may be adopted using hill to valley approach in a watershed at origin of streams structure like gully plugs & contour trenches may be constructed to arrest surface water runoff.

Gabion structures may be constricted at down streams of these structures, across the stream using local boulders & wire mesh to check the velocity of flowing water & to store water in up stream side of there strictures. Percolation tanks are most important structures from ground water recharge point of view.

Percolation tanks are recommended in second & third order streams on porous & permeable formations.

Foundation of these structures should not rest on hard & compact or on impermeable formations & water should be allowed to seep below stream bed to recharge ground water body at sub-surface. It is quite possible that in due course of time infiltration of water from percolation tank is reduced due to silt deposition in side the structures to over-come this problem, recharge shaft may be constricted inside percolation tanks to allow continuous Seepage of water from the structure to ground water system of the area.

Recharge shafts can be constructed using Hume pipes of the diameter from 1 to 3 m structures. Recharge shafts can also be contracted in those places where impervious formations are occurring of surface & at shallow. Depths porous & permeable rocks are found. Properly designed tube wells also act as recharge shorts to recharge deeper aquifers.

Sub-surface dykes are water conservation structures constructed at suitable hydrogological locations across the river beds at end of water shed to check sub-surface flow of water along stream beds.

Dug wells recharge is also applicable in rural areas. In this system water from fields is diverted in to recharge well passing through de-salutation chamber & filter media. In alluvial areas, recharge shafts are appropriate. Other structures like contour trenches, gabion structures & nalla bunds etc can be constructed in the entire area.

6. GROUND WATER RELATED ISSUES & PROBLEMS

These are no venerable areas in the districts. There are no water logged & polluted areas as per the available data. Long term water level trend analysis shows mixed results. Depletion in ground water levels is observed during both pre & Post monsoon seasons in few ground water monitoring wells.

Drilling problem may be encountered in Kundam block in the district due to caving the basaltic formation Lameta beds of sedimentary origin are occurring which may be loose & friable in nature & forming potential aquifers in the area by deploying available drilling rigs (DTH- Rotary combination) drilling in Lameta beds occurring below basalts, more than 100 m.bgl has becomes different, because rotary system of these rigs are not operative below depth 100m. to drill his Lameta formation found below hard & compact basalts at deeper levels.

7. AWARENESS AND TRAINING ACTIVITY

Mass Awareness Programme (MAP) & water management Training Programme at Jawaharlal Nehru Krishi vishwa Vidyalaya on 29.12.2003. There were 201 participant from various orgnisations mainly agriculture scientist Engineers, Students, researchers & foramens etc.

Participation in Exhibition, Mala, fair etc. During the WMTP programme exhibition was installed in which various working models on ground water recharge posters etc were exhibited.

Presentation & lectures deliverer in public forum/Radio/T.V. etc. During the WMTP, Presentation of various artificial ground done by scientist of CGWB through slides, films etc in public forum.

8. AREAS NOTIFIED BY CA WA/SCWA

In Jabalpur district, no area is notified by CGWA/SGWB.

9. RECOMMENDATION

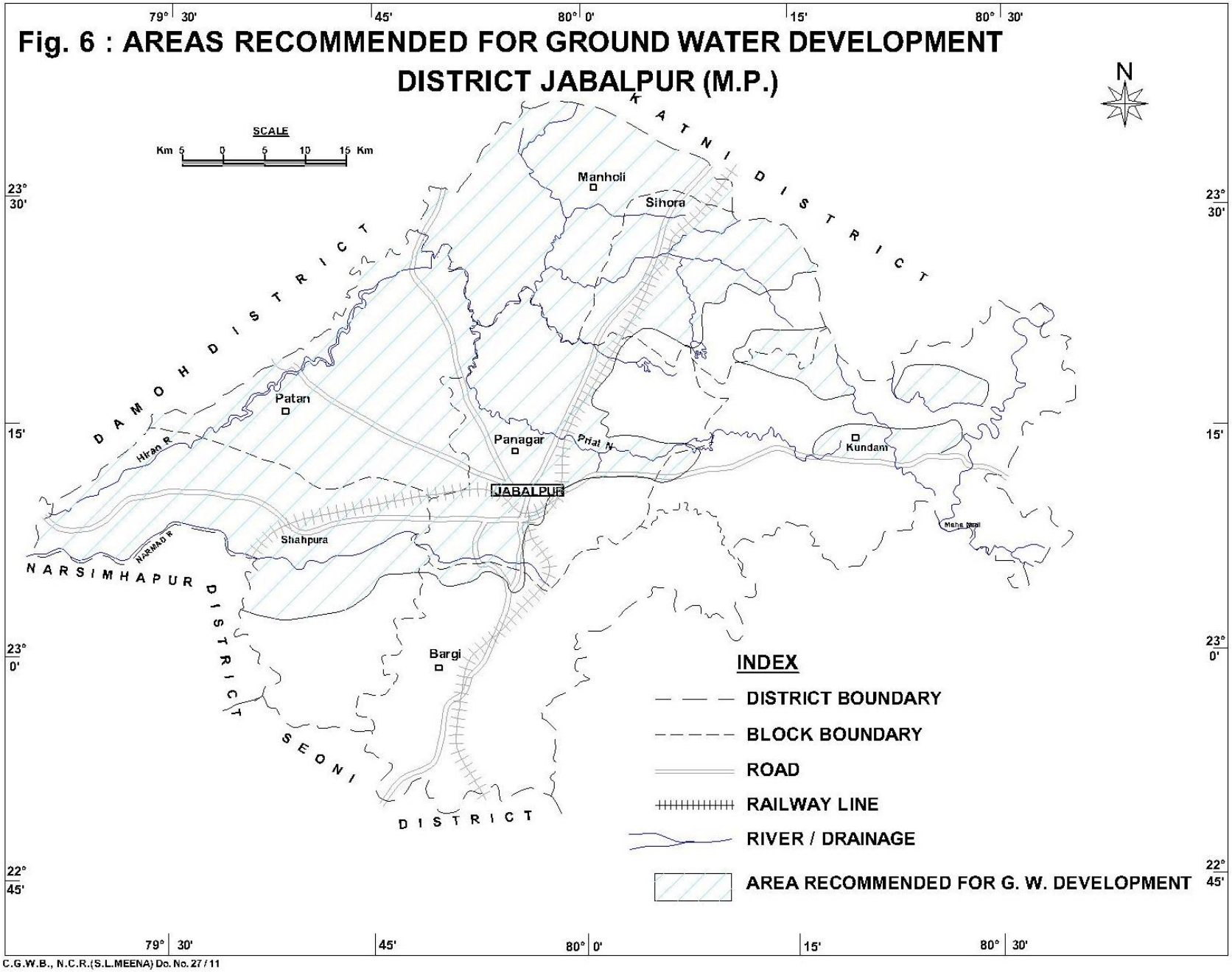
The stage of ground water development of Jabalpur district as a whole is 51% which reveals adequate scope for future development of ground water for irrigation.

After making allocation for future domestic & industrial water supply notice next 25 year in the district, balance available ground water is 256.45 MCM. If 70% of balance available ground water is to be developed through dug wells & 30% through tube wells/bore wells, then iteratively 12775 new dug wells & 2737 new tube wells can be constructed for irrigation.(Fig-6) –

- Depletion of ground water levels in observed in small patches. With the ever increasing demand for ground water, it in important to not only safe ground & conserve the ground water but to augment it also.

- Drilling problems in Kundam & Shahpura block may be encountered due to caving nature of inter trappean clays & below these basaltic formations Lameta beds of sedimentary origin may occur which may be loose & friable in nature & forming potential aquifers is the area. Drilling in Lameta after crossing basalts at depths becomes difficult. A proper drilling techniques is to be adopted to handle the caving nature of inter-trappean clay & and in first hand compact basalts then after in loose & friable Lameta formation at deeper levels.

Fig. 6 : AREAS RECOMMENDED FOR GROUND WATER DEVELOPMENT DISTRICT JABALPUR (M.P.)



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- Conjunctions use of surface & ground water is recommended in the command area.

- Fluoride in the district is below 1.5 mgl. except in the village Barela (I.61 mg/l) hewer ground water in the district is safe for drinking & agriculture propose.

- Rooftop rainwater harvesting project should be implemented in urban areas of Jabalpur district.

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