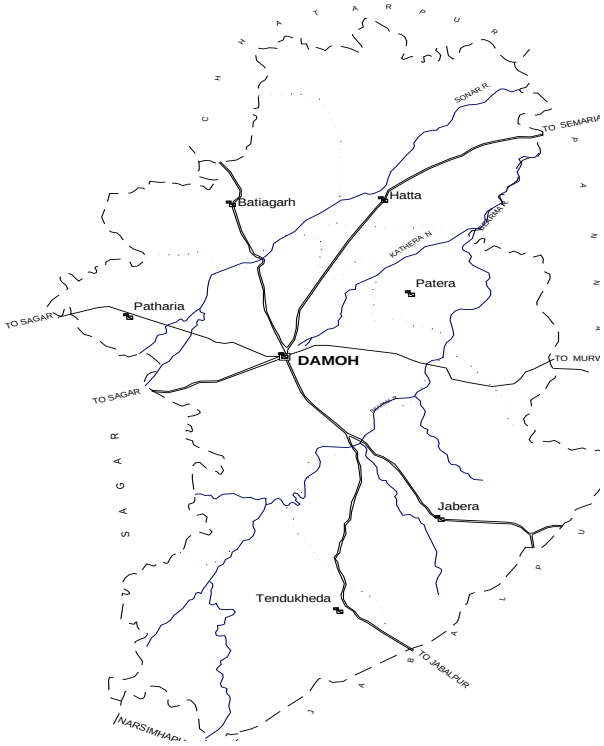
DISTRICT GROUND WATER INFORMATION BOOKLET

DAMOH DISTRICT

MADHYA PRADESH



Ministry of Water Resources

Central Ground Water Board

North Central Region

Government of India

2013

DAMOH DISTRICT AT A GLANCE

S. No.	ITEMS	STATISTICS
1	**GENERAL INFORMATION**	
	1) Geographical area	7306 Sq.km
	2) Administrative Divisions Number of Thesil/Blocks /Villages	 7/7 1225
	3) Population (Census 2011)	1263703
	4) Normal Rainfall (mm)	1170.4 mm
2	**GEOMORPHOLOGY**	
	Major Physiographic Units	1. The Southern Plateau 2. The Sonar Valley 3. The North West Hill Range
	Major Drainage	The area is mainly drained by the Sonar river and by the Bearma river.
3	**LAND USE (Sq. Km)**	
	1) Forest area	2671 Sq.Km.
	2) Net area sown	3114 Sq.Km.
	3) Cultivable area	4056 Sq.Km.
4	**MAJOR SOIL TYPES**	
		Soils are Medium black (Chromesterts), Shallow Black (ustochrepts) and Skeletal Soil (Lithic Enti soils).
5	**PRINCIPAL CROPS**	
		Wheat, Rice, Jowar, Maize etc. Gram, Tuwar, Urad etc Sugarcane
6	**IRRIGATION BY DIFFERENT SOURCES STRUCTURES**	
	Dug wells	15540 282.30(sq.km)
	Tube wells/ Bore wells	7372 298
	Tank/Ponds	47 8.0
	Canals	139 1440
	Other sources	476 453
	Net Irrigated area	--- 1158
	Gross irrigated area	--- 1186

7	***NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31.03.2013)***	No of Dug Wells **: 18** No of Piezometers **: 07**
8	***PREDOMINANT GEOLOGICAL FORMATIONS***	Limestone, Sandstones & Shales
9	***HYDROGEOLOGY*** Major Water bearing Formation Pre-Monsoon depth to water level during 2012 Post-Monsoon depth to water level during 2012	 Alluvium, Shale, Limestone and Sandstone 2.62 mbgl-25.00 mbgl 0.20 mbgl-8.55 mbgl
10	***GROUND WATER EXPLORATION BY CGWB (Under Contractual only) As on 31.03.2013*** No of wells drilled (EW,OW, Pz, SH)	EW-69,OW-08,PZ-32=109 Total**:109**
11	***GROUND WATER QUALITY*** Ec,NO3,F	Ec-166-2100,NO3-6-59,F-0.02-0.93
12	***DYNAMIC GROUND WATER RESOURCES (2009) IN MCM*** Net Annual Ground Water Availability Gross Annual Ground Water Draft Projected Demand for Domestic and Industrial Uses upto 2033 Stage of ground Water Development	 **363.85 MCM** **203.85 MCM** **27.00 MCM** **60%**
13	***EFFORTS OF ARTIFICIAL RECHARGE &RAIN WATER HARVESTING*** Projects completed by CGWB On going projects under technical guidance of CGWB	 NIL NIL

14	***GROUND WATER CONTROL AND REGULATION*** Number of OE Blocks Number of Critical Blocks Number of Notified Blocks	 NIL NIL NIL
15	***AWARENESS AND TRAINING ACTIVITY*** Mass Awareness Programmes organized Date Place No. of participants	 01 15 &16 December, 04 - 300

1.0 INTRODUCTION

Damoh District lies between 23°9′ and 24°27′ North latitude and between 79°3′ and 79°57′ East longitude in the Northern part of Jabalpur Division. The shape of the district is irregular and elongated from North to South with projection in the East and West.

The District is bounded by the district of Chhatarpur in the North and Northwest, Sagar in the West, Narsimhapur and Jabalpur in the South and part of Jabalpur and Panna in the East.

The District is divided into 7 Thesils and 7 development blocks (Fig:1). 1225 Villages and 5Towns in the District (Table-1).

TABLE – 1: Administrative Divisions, District DAMOH, (M.P).

S.NO	BLOCK	Area Sq.Km	No. of Towns
1.	DAMOH	862.49	2
2.	PATHARIYA	677.77	1
3.	JABERA	907.79	--
4.	TENDUKHERA	676.17	1
5.	BATIYAGARH	653.80	--
6.	HATTA	704.96	1
7.	PATERA	647.25	--

SOIL:

The Soils in the district are mainly of three types: -

(1) Medium Black Soil:

This Soil is formed due to weathering of green and black shales. It is very fine grained and clayey in nature. All the agriculture fields located over shales are covered by this type of soil. It varies in thickness from place to place which ranges from 1 to 4 m.

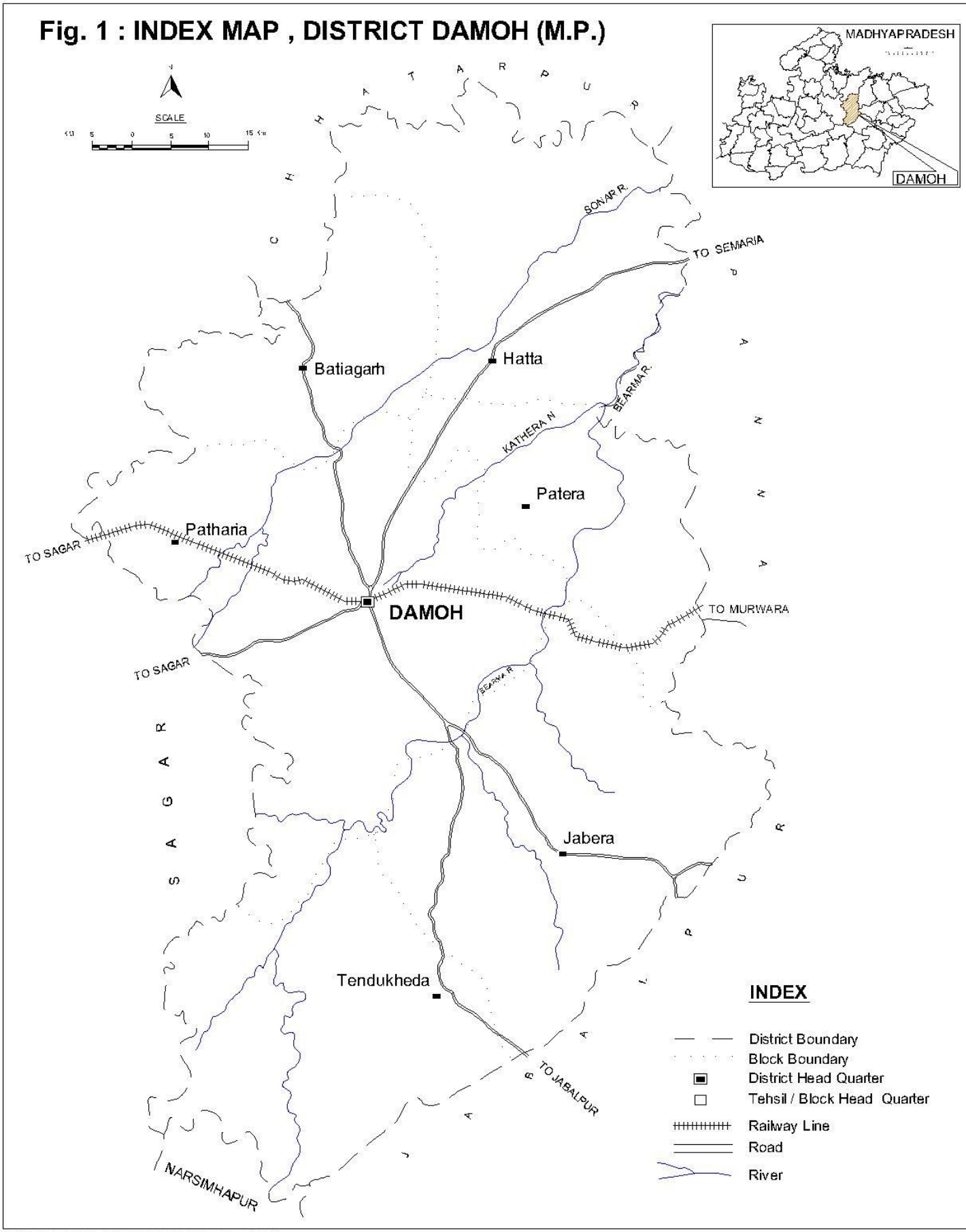
(2) Shallow Black Soil:

This is alluvial type of soil occurring on the banks of Sonar and Bearma rivers. It is grey to black in colour, pebbly sandy to clayey in nature.

(3) Skeletal Soil:

This soil is formed due to the weathering of sandstone. This type of soil is observed near the foothills of quartzitic sandstone in the Southern part of the district.

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



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DRAINAGE:

The area is mainly drained by Sonar River and the Bearma River, which flow in the general slope of the country and flow a tributary of the Narmada, the entire district is drained by Sonar, Bearma and through the tributaries and feeders of the Ken River into Yamuna.

IRRIGATION:

The district is irrigated mainly by Dug wells & Tube wells and also through Canals and Ponds.

CROPPING PATTERN:

Wheat, Jowar, Gram are the main crops of the Rabi season whereas Paddy and Soya bean are the principal crops sown during Kharif season.

CGWB ACTIVITIES:

1) Systematic Hydrogeological Survey, parts of Damoh District, M.P. field season- 1989-1990.
2) Hydrogeological framework, ground water potential and Development of Damoh District- 1997.
3) Exploratory Drilling through outsourcing (Contract Basis)- 2002.

2.0 CLIMATE AND RAINFALL

The Climate of Damoh district, M.P. characterized by a hot summer and general dryness except during the southwest monsoon season. 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 from the middle of June to September is the southwest monsoon. October and November form the post monsoon or transition period. The nearest observatory is Jabalpur. The meteorological parameters of Jabalpur plateau are used except rainfall.

The average annual rainfall of Damoh district is 1173.0 mm. Damoh district received maximum rainfall during southwest monsoon period i.e. June to September. About 90.4% of the annual rainfall received during monsoon season. Only 9.6% of the annual rainfall takes place between October to May period. Thus, surplus water for ground water recharge is available only during the southwest monsoon period. mm.

The normal maximum temperature received during the month of May is42.0° C and minimum during the month of December/January is 9.7°C. The normal annual means maximum and minimum temperatures of Damoh district is 32.6° and 18.9°C respectively.

During the southwest monsoon season the relative humidity generally exceeds 88% (August month). In the rest of the year it is drier. The driest part of the year is the summer season, when relative humidity is less than 31%. 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 8.2 km/hr observed during the month of June and minimum 2.6 km/hr during the month of December. The average normal annual wind velocity of Damoh district is 4.9 km/hr. Normal climatologically parameter of Damoh district is given in Table-2.

Table-2: NORMAL CLIMATOLOGICAL PARAMETERS FOR DAMOH DISTRICT

S.No.	Parameter	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
1	Maximum Temp (°C)	26.2	29.4	34.5	39.3	42.0	38.0	31.1	29.8	31.4	32.3	29.9	26.7	32.6
2	Minimum Temp (°C)	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
3	Relative Humidity (%)	69	58	43	33	31	59	85	88	82	70	65	70	63
4	Wind Velocity (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

The district is divided into three physiographic sub-divisions, namely Vindhyan range, Vindhyan Scraps and Bundelkhand uplands. The Vindhyan Scrap covers the entire Sonar Valley and the southern plateau excluding the main line of hills belonging to Vindhyan range. The Sonar Valley can be considered to be separate divisions and the Vindhyan range may be grouped with the rest of the Southern hills. Thus, there are three distinct divisions in the district: -

1. The Southern Plateau
   (a) The Vindhyan range and the Southern precipice.
   (b) The broad Southern Plateaus.

2. The Sonar Valley.
3. The Northwest hill range.

In Damoh the Southern part of Vindhyan range up to Katangi is called the Bharner range. Beyond this point, the escarpment enclosing the land- lock valley of Singrampur and the hill range in continuation is called Kaimur range. The Southern edge of the plateau and the hills scrap steeply to the South facing the Narmada Valley and the Valley of the Hiran.

The greatest height in this range is that of the Kulumar hill 751 mamsl. On the Northeast of Singrampur Kheri 586.7 mamsl is the highest peak. Elsewhere the hills range from 550 to 580 meters high. North and Northwest of Bharner range and Northwest Kaimur range, the great tableland slopes towards the Northeast. The drainage lines of the Sonar valley and the Kopra lies into a broad belt of the low alluvial country between the line dissected hills on the Southwest and the scraps of the Northwestern plateau. Thus, the plateau region has been separated from the Northwestern hill range.

The Southern plateaus extend in a broad belt from Southwest to Northeast. It is centrally drained by the Bearma and is transversed by a number of spurns and ridges of Vindhyan range.

The Sonar Valley (Haveli) extends in a belt across the North Central part of the district. It is about 80 Km long from Southwest to Northeast and 32 to 43 Km wide between the Scraps of the Southern and Northern plateau of the Vindhyans, which also forms the local watershed between the Sonar and the Bearma Nala to the Northwest. It lies at an elevation of 335 mamsl. The Bewas, the Kopra and the Bearma are the important tributaries of the Sonar going it at Damoh and flowing through the valley. The valley lying in the center of the district is composed of fertile soil formed from the detritus of volcanic rocks.

The Northwestern plateau rises about 120 m like a wall from the Sonar valley, locally known as Barana hills, the Central ridge (460 to 520 m) is marked by several flat topped hills and runs from Southwest to Northeast.

4.0 GROUND WATER SCENARIO

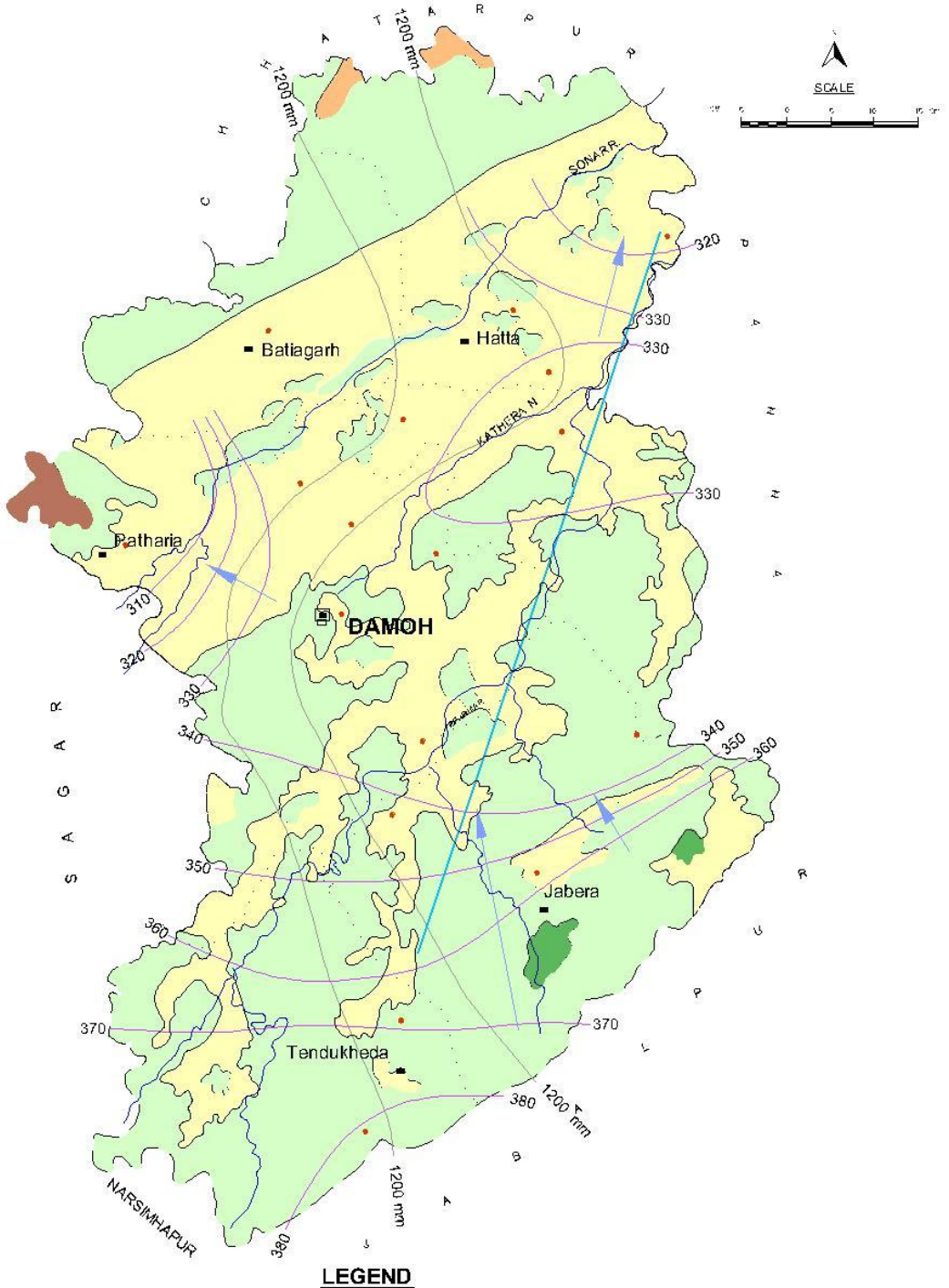
HYDROGEOLOGY:

The Groundwater in the district occurs under Phreatic, semi- confined and confined conditions. The ground water occurrence is mainly controlled by topography, drainage, lithology and disposition of fractures and joints specially in hard rocks. The very hard and compact sandstone because of fractures act as good repository of groundwater. Shales are clayey in nature and have medium porosity and movement of groundwater through these pore spaces takes place by capillary action. Limestone is also very hard and compact in nature and has very poor porosity opening. Due to secondary porosity, Limestone form good aquifers. Alluvial formations are unconsolidated sediments having high porosity.

The main water bearing formations identified within the area are as follows: -

1. Alluvium- Unconsolidated sediments.
2. Shale- Unconsolidated sediments.
3. Limestone- Consolidated (Hard Compact).
4. Sandstone- Consolidated (Hard Compact).

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



LEGEND

Age	Lithology	Potential (lps)
Recent	Recent	1 - 3
Upper cretaceous to Eocene	Deccan Trap	1 - 2
	Lametas	1 - 2
Pre-cambrian	Upper Vindhyan	
	Lower vindhyan	2 - 3

380 — Water Table Coutour (m.a.s.l.)

1200 mm — Isohyetal (m.m.)

C.G.W.B. Monitoring Well

Section Line

C.G.W.B.,N.C.R.(S.L.MEENA) Do No.132 /09

AQUIFER PARAMETERS:

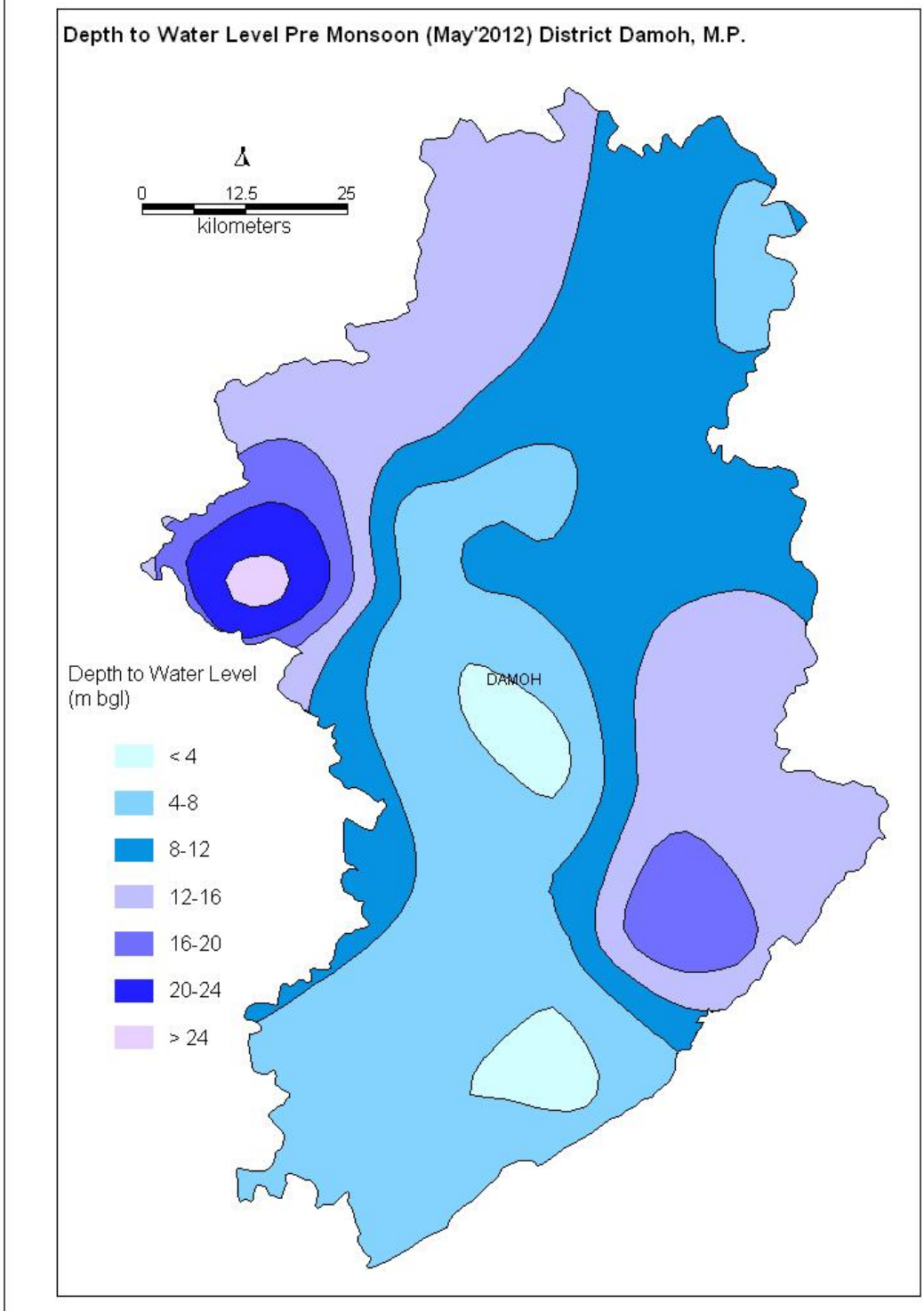
The exploratory drilling has been carried out in contractual drilling programme (2007) in Damoh district. The depth of bore wells ranges from 112.75 mbgl to 200 mbgl and yield ranges from meager to 3 lps.

DEPTH TO WATER LEVELS:

Groundwater levels form a very important parameter of ground water system, as there are its physical reflection. The groundwater balance expresses itself in the change in water levels, hence a continuous record is important and useful. CGWB has 18 National Hydrograph Stations (NHS) and 07 Piezometers in Dewas district. Due to large-scale ground water development the dug wells are drying up and the water level record is becoming erratic.

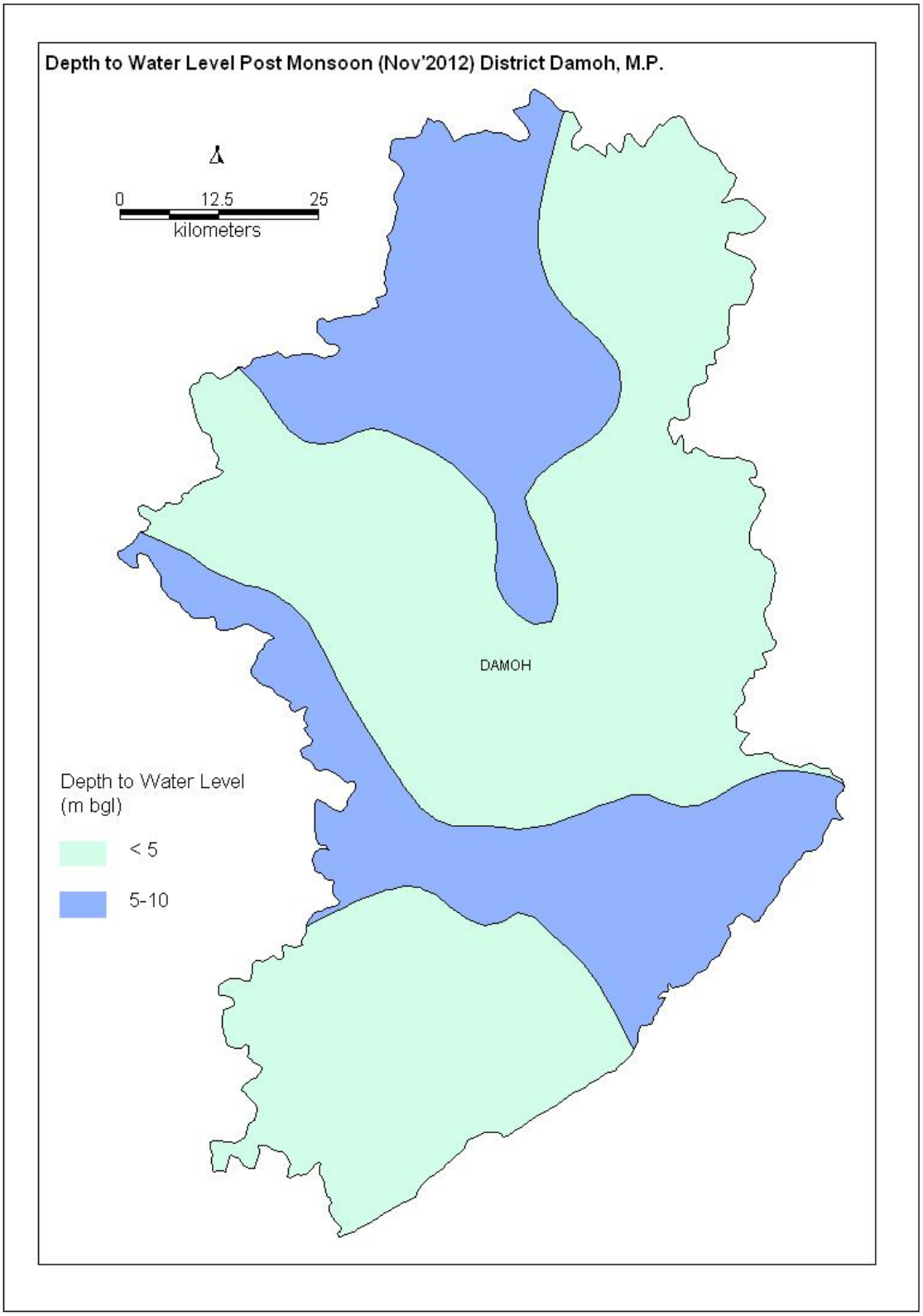
Pre-monsoon (May, 2012) :

In general depth to water level in the district, ranges between2.62mbgl-25.00mbgl


Depth to Water Level Pre Monsoon (May'2012) District Damoh, M.P.
0
12.5
25
kilometers
DAMOH
Depth to Water Level
(m bgl)
< 4
4-8
8-12
12-16
16-20
20-24
> 24

Post-monsoon (November, 2012) :

In general depth to water level in the district, ranges between 0.20m-10mbgl



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.

GROUND WATER RESOURCES:

Damoh district is underlain mainly by Vindhyan Shale, Limestone and Sandstone. Dynamic ground water resources of the district have been estimated for base year - 2008/09 on block-wise basis. Out of 7,30,600 ha of geographical area, 5,3,7419 ha (74%) is ground water recharge worthy area and 193181ha (26 %) is hilly area. There are seven number of assessment units (block) in the district which fall under non-command (99 %) and command (1.% Damoh, Jabera and Tedukheda) sub units. Batiyagarh, Damoh, Jabera, Patera and Tedukheda blocks of the district are categorized as safe blocks, Hatta and Pathariya as semi critical (all safe in 2003/04). The highest stage of ground water development is computed as 82.0 % in Patheria block. The net ground water availability in the district is 36,385 ham and ground water draft for all uses is 22,000 ham, making stage of ground water development 60 % (52 % 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 13,305 ham.

GROUND WATER EXPLOARTION BY CGWB:

Ground Water exploration under accelerated exploratory drilling was carried out by Contractual drilling under Drought Assistance in the year 2002 in Damoh District.

In Damoh district 20 No of boreholes were drilled in Vindhyan sandstones and Shales, borehole depth ranges from 112.74 mbgl (Karbana) to 200 mbgl. Ten bore holes had meager discharge and were abandoned. Yiled potential ranges from 1.2 lps (Kudai) to 22 lps Static Water level of bore hole ranges from 4.41 mbgl (Karbana) to 24.69 mbgl (Futera) draw down value ranges from 1.63 m (Kermana) -5.72 m (Kudai) and quality of ground water explored is good.

DETAILS OF SOME EXPLORATORY WELLS (DAMOH)

S.NO	LOCATION	DEPTH DRILLED	GEOLOGY	S.W.L (mbgl)	TESTED DISCHARGE (lps)	DRAW DOWN	QUALITY
1.	GUHACHI	163.35	SHALE	10.50	1.5	---	GOOD
2.	GAISABAD	200	SHALE	8.41	1.9	4.97	GOOD
3.	SANGRAMPUR	200	SHALE	12.44	2.1	4.06	GOOD
4.	HARDESHPUR	200	SHALE	---	DRY	---	---
5.	KISHANGANJ	200	SHALE	---	DRY	---	---
6.	LOHARI	200	SHALE	20.0	0.12	---	GOOD
7.	PATERA	200	SHALE	---	DRY	---	---
8.	KUDAI	200	SHALE	5.72	1.2	5.72	GOOD
9.	RANEH	200	SHALE	5.49	0.07	---	GOOD
10.	FATEHPUR	134.50	SHALE	9.14	3.0	2.94	GOOD
11.	FUTERA	196.75	SHALE	24.69	3.0	4.68	GOOD
12.	SAMNAPUR	184.10	SHALE	8.26	0.1	---	GOOD
13.	TARADEHI	200	SHALE	---	DRY	---	---
14.	SARRA	182	SHALE	7.36	3.0	3.41	GOOD
15.	MALANKHEDA	200	SHALE	---	DRY	---	---
16.	NANDRAJ	200	SHALE	6.45	0.13	---	GOOD
17.	KARWANA	112.75	SHALE	4.41	3.0	1.63	GOOD
18.	GUGRAKALAN	175.00	SHALE	5.76	3.0	3.03	GOOD
19.	KHADERI	200	SHALE	---	DRY	---	---
20.	MOGRON	125.77	SHALE	8.64	3.0	1.96	GOOD

GROUND WATER QUALITY OF DAMOH DISTRICT:

Quality of ground water for drinking:

The EC value ranges from 166-2100,NO3 value ranges from 6-59,Fluoride value ranges from 0.02-0.93. 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 $C_2S_1$and C_3S_1 to classes of US Salinity diagram. Ground water in general is safe for drinking.

Geogenic Problems:

Fluoride in the district is found with in the safe limit.

STATUS OF GROUND WATER DEVELOPMENT:

Damoh district is underlain mainly by Vindhyan Shale, Limestone and Sandstone. Dynamic ground water resources of the district have been estimated for base year - 2008/09 on block-wise basis. Out of 7,30,600 ha of geographical area, 5,3,7419 ha (74%) is ground water recharge worthy area and 193181ha (26 %) is hilly area. There are seven number of assessment units (block) in the district which fall under non-command (99 %) and command (1.% Damoh, Jabera and Tedukheda) sub units. Batiyagarh, Damoh, Jabera, Patera and Tedukheda blocks of the district are categorized as safe blocks, Hatta and Pathariya as semi critical (all safe in 2003/04). The highest stage of ground water development is computed as 82.0 % in Patheria block. The net ground water availability in the district is 36,385 ham and ground water draft for all uses is 22,000 ham, making stage of ground water development 60 % (52 % 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 13,305 ham.

Annexure III D - (cont.) 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} (%)
13	**Damoh**								
	Batiyagarh	Command							
		Non-Command	5521	3723	72	3795	50	1748	69
		Block Total	**5521**	**3723**	**72**	**3795**	**50**	**1748**	**69**
	Damoh	Command	1331	127	21	148	43	1161	11
		Non-Command	6455	3400	435	3835	914	2141	59
		Block Total	**7786**	**3527**	**457**	**3983**	**957**	**3302**	**51**
	Hatta	Command							
		Non-Command	3296	2446	114	2561	114	735	78
		Block Total	**3296**	**2446**	**114**	**2561**	**114**	**735**	**78**
	Jabera	Command	2258	209	36	245	56	1993	11
		Non-Command	4030	1685	321	2006	500	1845	50
		Block Total	**6289**	**1895**	**357**	**2251**	**556**	**3838**	**36**
	Patera	Command							
		Non-Command	3804	2064	251	2315	428	1311	61
		Block Total	**3804**	**2064**	**251**	**2315**	**428**	**1311**	**61**
	Patheriya	Command							
		Non-Command	6621	5311	123	5434	123	1187	82
		Block Total	**6621**	**5311**	**123**	**5434**	**123**	**1187**	**82**
	Tendukhera	Command	852	203	24	227	47	602	27
		Non-Command	2216	1211	221	1433	424	580	65
		Block Total	**3068**	**1414**	**246**	**1660**	**472**	**1182**	**54**
		District Total	**36385**	**20380**	**1620**	**22000**	**2700**	**13305**	**60**

5.0 GROUND WATER MANAGEMENT STRATEGY:

5.1 GROUND WATER DEVELOPMENT:

It is proposed that number of 10,493 tube wells and 52,470 dug wells may be constructed for achieving 100% level of ground water development. Creation of these structures would help to irrigate 1,26,436 hectares which is the ultimate utilized potential in Damoh district. The proposed number of tube wells and dug wells has been estimated on the basis of existing working ratio of ground water structures. It is assumed that a dug well would be able to irrigate 1.2 hectares and a tube well 6 hectare. Damoh district is enclosed with multi aquifer system comprising of Shale, Sandstone and Lime stone formation down to 60 m and beyond. Exploitation of these aquifers would ensure the maximum development.

5.2 WATER CONSERVATION AND ARTIFICIAL RECHARGE:

5.3 Artificial Recharge studies by CGWB

The Central Ground Water Board, till date has not taken any scheme of Artificial recharge in the district.

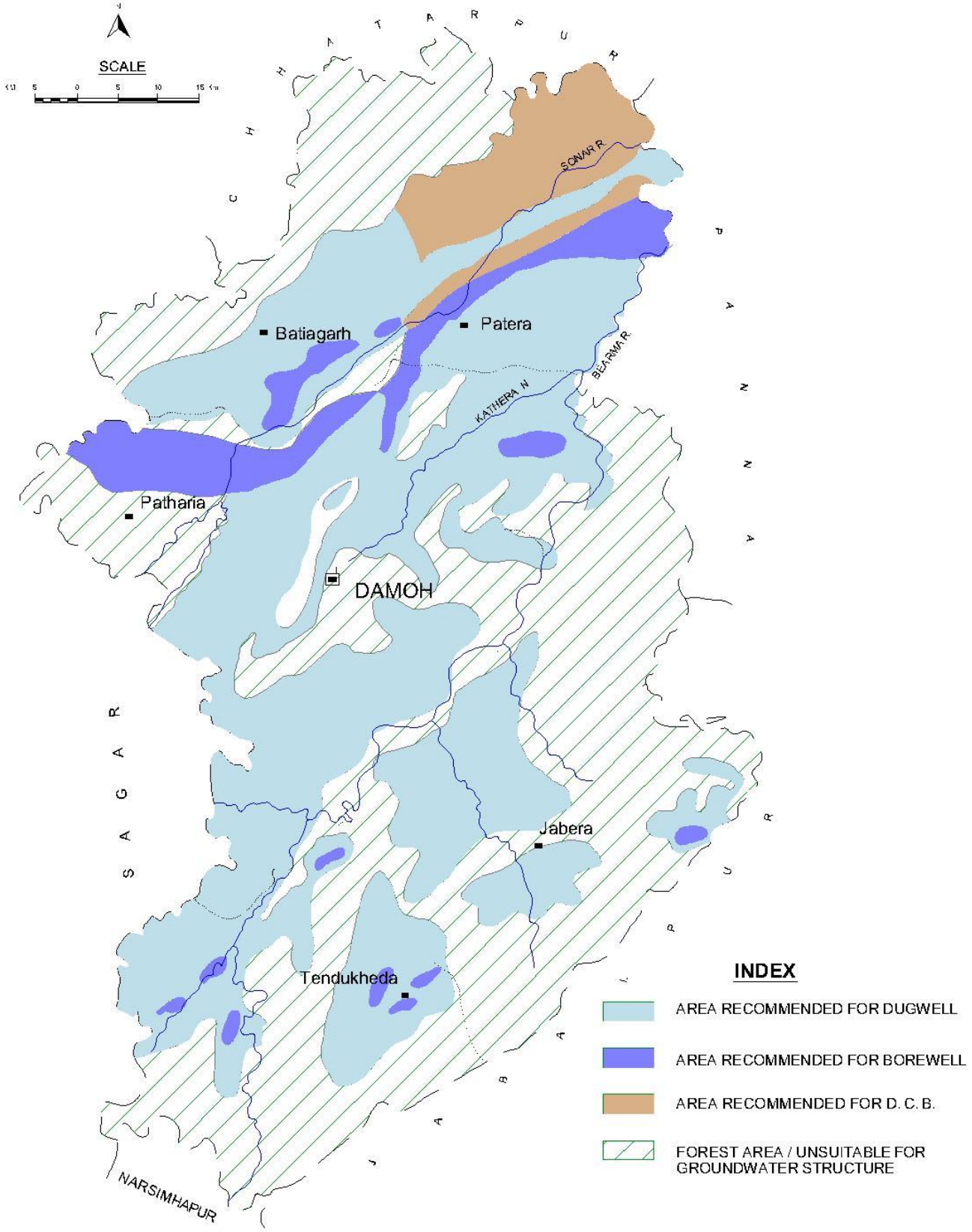
6.0 GROUND WATER ISSUES AND PROBLEMS:

1. Groundwater quality in Damoh district is generally low to medium saline as electrical conductivity values varies between 325 to 1523 μcm^{-1}. High EC were found in the dug wells of Pathria (1523 μcm^{-1}) village. Nitrate more than 100 mg per liter was found in only Palar (114 mg per liter) village. High Nitrate in the village area may be due to excessive use of fertilizers and agricultural waste.

2. Except Hardva and Pathariya all ground waters are very hard. Very hard matters containing Mg^{+2} and So_4^{-2} laxative properties while very hard waters with high Calcium Concentration might lead to an increased incidence of Urolithiosis.

3. Based on Chloride contents all waters are entirely safe for irrigation except Patera and Tendukheda, which are of intermediate order under ordinary conditions of climate and soil even for the sensitive Crops and Plants.

Fig.6: AREA SUITABLE FOR GROUNDWATER DEVELOPMENT DISTRICT DAMOH (M.P.)



C.G.W.B.,N.C.R.(B.PRASAD & S.L.MEENA) Do No.136 / 09

7.0 RECOMMENDATIONS:

1. Based on the flow net analysis and field investigations the favourable areas for ground water developments have been demarcated. The area where the limestone is present at the surface is recommended to be developed through bore wells because the dug wells existing in the areas are mostly unsuccessful. The alluvium cover areas are found most successful for ground water development by dug well and dug-cum bore wells. I this belt (shallow dug wells and dug-cum bore wells) the structures should be dig up to the hard and compact bed rocks.

2. The area covered by Ganurgarh Shales should be developed by dug-cum bore wells to tap the ground water from deeper potential zones. Construction of Nallha bundings and stop dams across the streams and Nallah Courses in upstream areas would enhance the ground water recharge.

3. It also appears from the study that the major quality of ground water goes off as effluent seepage through rivers and Nallahs and some amounts infiltrate in lime stone and sandstone formalities through their joints and fractured and remain in the deeper zones. Possibilities of having tube wells in such areas may be explored through test bore holes and geophysical studies. It is also recommended to de-silt and deeper (adequately) the surface water storage tanks existing in the shaly and sandstone areas to supplement the domestic water supply, which in turn will facilitate the precaution of water down to the ground water reservoirs underneath.

4. Artificial Recharge practices in rural areas should be taken up earnestly to Improve the ground water situation.

5. Change in cropping pattern is another measure which will relieve the situation.

6. Roof Top Rain Water Harvesting should be made mandatory considering the water scarcity in urban areas. This would mitigate the situation and recharge the ground water system.