
# केंद्रीय भूमि जल बोर्ड

जल संसाधन, नदी विकास और गंगा संरक्षण मंत्रालय

भारत सरकार

# Central Ground Water Board

Ministry of Water Resources, River Development and Ganga Rejuvenation

Government of India

# AQUIFER MAPPING REPORT

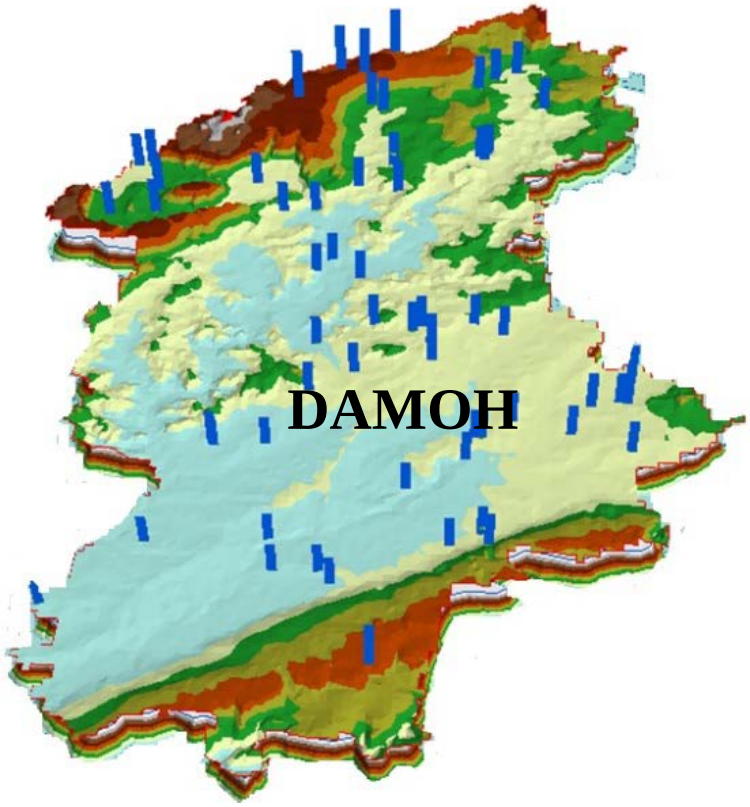
## Damoh District, Madhya Pradesh

उत्तरी मध्य क्षेत्र, भोपाल

North Central Region, Bhopal

**Government of India**
**Central Ground Water Board**
**Ministry of Water Resources, River Development & Ganga Rejuvenation**

# NATIONAL AQUIFER MAPPING PROGRAMME
# GROUND WATER MANAGEMENT PLAN OF DAMOH DISTRICT, MADHYA PRADESH




***By***
**Dr L.K.Mathur**
***Scientist "D"***

**NORTH CENTRAL REGION**
**BHOPAL**
**December-2017**

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# PREFACE

Aquifer mapping is as a multi-disciplinary scientific process, wherein a combination of geological, geophysical, hydrological and geochemical studies are applied to characterize the quantity, quality and sustainability of ground water. Systematic aquifer mapping is a procedure to improve our understanding of the hydrogeological framework of aquifer system.

Under the project on National Aquifer Mapping (NAQUIM) in XII & XIII Plan to formulate sustainable aquifer management plan, Central Ground Water Board (CGWB), North Central Region, Bhopal has taken up Damohr disrtict to prepare the 3-Dimensional Model and 2-Dimensional Aquifer Maps for the entire district and formulate Block-wise Aquifer Management Plan.

Damoh district occupies an area of 7306 sq km out of which the ground water recharge worthy area is 4749 sq. km. and the rest is covered by hilly and forest area. The major rivers flowing through the area includes the river Ken ,Bina, Sonar and Bamner. The major part of the district is covered by the by Vindhayan sandstones ,Shale& Limestone. On the basis of the 68 Exploratory borewells drilled by CGWB, NCR under its Exploratory/NAQUIM program, it has been observed that the yield varies from 3-6 $m^3$/hrshallow aquifer and 3 to 20$m^3$/hr in deep aquifer. As per the Dynamic Ground Water Resource Assessment Report (2013), the net ground water availability in the district **392.03**MCM and ground water draft for all uses is 250.75 MCM, resulting the stage of ground water development to be 63.96 % as a whole for district.

The Damoh district falls under safe category. After the implemented of project interventions in the report, the stage of development is expected to improve by 7.9 % i.e. from 63.96% to 56.06% for the Damoh district.

Damoh district comprises of seven blocks, namely Batiyagarh, Damoh, Hatta, Jabera, Patera, Patheriya &Tendukheda .As per the Management plan prepared under NAQUIM of all the Block of Damo District , a total number of 100 Percolation Tanks, 258 Recharge Shafts/Tube wells and 693 Nala Bunds/Check Dams/Cement Plugs have been proposed and financial expenditure is expected to be Rs 124.33 Crores in Damoh District for sustainable development and management of ground water resources.

Before finalization of this report a three tier evaluation mechanism is adopted ,presentations were made at Regional level & State level Coordination Committee ,then the revised presentation were made before the Member and finally it was presented to National Level Expert Committee , after all corrections this report is prepared. Results of these comprehensive studies will contribute significantly to ground water sustainable management tools. It will not only enhance the long-term aquifer monitoring networks and but would also help in building the conceptual and quantitative regional ground-water-flow models for planners, policy makers and other stakeholders.

I would like to place on record my appreciation for ***Dr. L.K. Mathur, Scientist 'D'*** who had compiled this report. I fondly hope that this report will serve as a valuable guide for sustainable development of ground water in the Damoh District, Madhya Pradesh.

**( Parvinder Singh)**
**Regional Director**

# CHAPTER-I
# INTRODUCTION

## 1.0 Location :

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, Damoh in the West, Narsimhapur and Jabalpur in the South and part of Jabalpur and Panna in the East.

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

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

| S.No. | Block | Geographical Area in Sq.km | Recharge Worthy Area Sq.Km | No. of Towns |
|---|---|---|---|---|
| 1. | Batiyagarh | 1225 | 891.82 | 2 |
| 2. | Damoh | 1304 | 849.00 | 1 |
| 3. | Hatta | 865 | 491.00 | -- |
| 4. | Jabera | 1262 | 634.00 | 1 |
| 5. | Patera | 723 | 577.00 | -- |
| 6. | Patheriya | 970 | 903.37 | 1 |
| 7. | Tendukheda | 957 | 400.00 | -- |
| 8. | Total | **7306** | **4746.19** | |

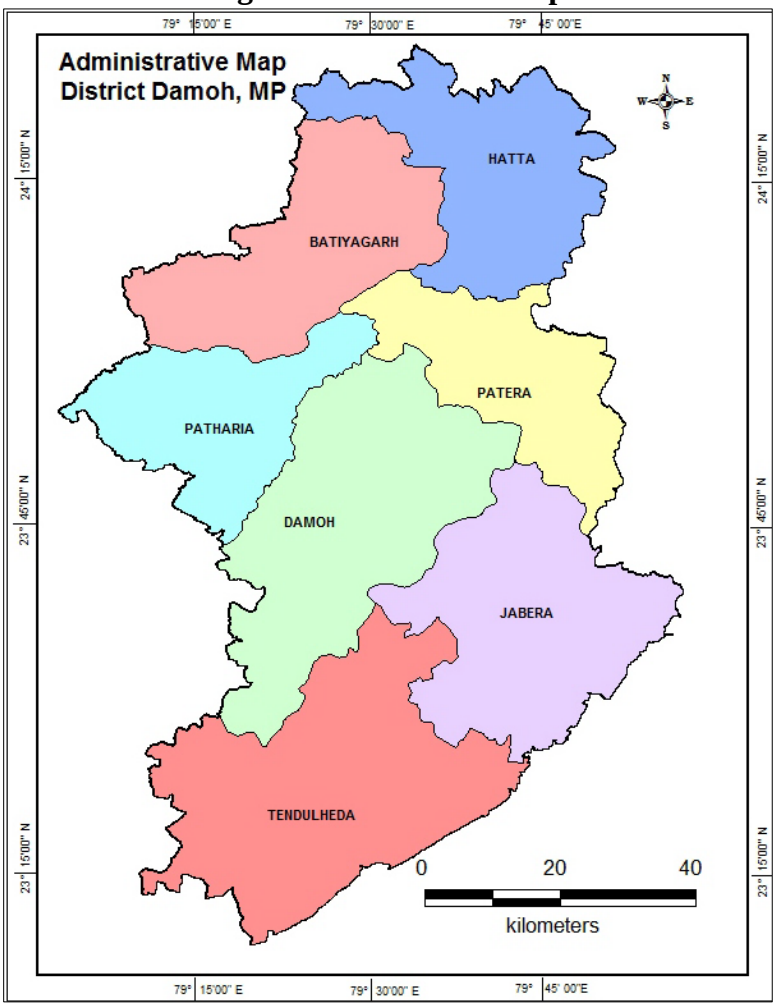
## 1.1 Objectives:

The aquifer mapping study primarily depends on the existing data that are assembled, analysed and interpreted from available sources. The data gaps analysis carried out helped to generate data from data-collection activities such as BDR of exploration drilling, water level measurements and groundwater quality analysis done by CGWB & State Department.

By analysing the existing data and the data generated, regional hydrogeological maps, thematic maps, water quality maps, cross-sections, 2-D and 3 –D aquifer dispositions and potentiometric maps were generated.

The objectives of the Management plan is to define the aquifer geometry, type of aquifers, ground water regime behaviors, hydraulic characteristics and geochemistry of Multi-layered aquifer systems on 1:50,000 scale .

**Fig:1 Administrative Map**




**1.2 Data Adequacy, Data Gap, Data Availability:**

Aquifer Mapping can be envisaged as follows :

1. Data Compilation & Data Gap Analysis:

One of the important aspect of the aquifer mapping programme was the synthesis of the large volume of data already collected during specific studies carried out by Central Ground Water Board and various Government organizations with a new data set generated that broadly describe an aquifer system. The data were assembled, analysed, examined, synthesized and interpreted from available sources. These sources were predominantly non computerized data, which was converted into computer based GIS data sets. On the basis of available data, Data Gaps were identified.

2. Data Generation: There was also a strong need for generating additional data to fill the data gaps to achieve the task of aquifer mapping.

3. Previous studies Prior to this study, the groundwater hydrogeology has been studied only in separate parts with many areas left untouched. As a result, there was no hydrogeologic framework developed so as to understand the regional effects of groundwater development in the area .

4. Preparation of Block wise ground water management plan of the Damoh district that will guide the planers to manage the ground water resources in judicious manner and improve the ground water scenario of the district.

## 1.3 Rainfall & Climate:

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.

The normal maximum temperature received during the month of May is 42.0°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 ( Table 2).

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.

**Table-2: NORMAL CLIMATOLOGICAL PARAMETERS FOR DAMOH DISTRICT**

| S. N. | 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 (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 |

## 1.4 Geomorphology:

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.

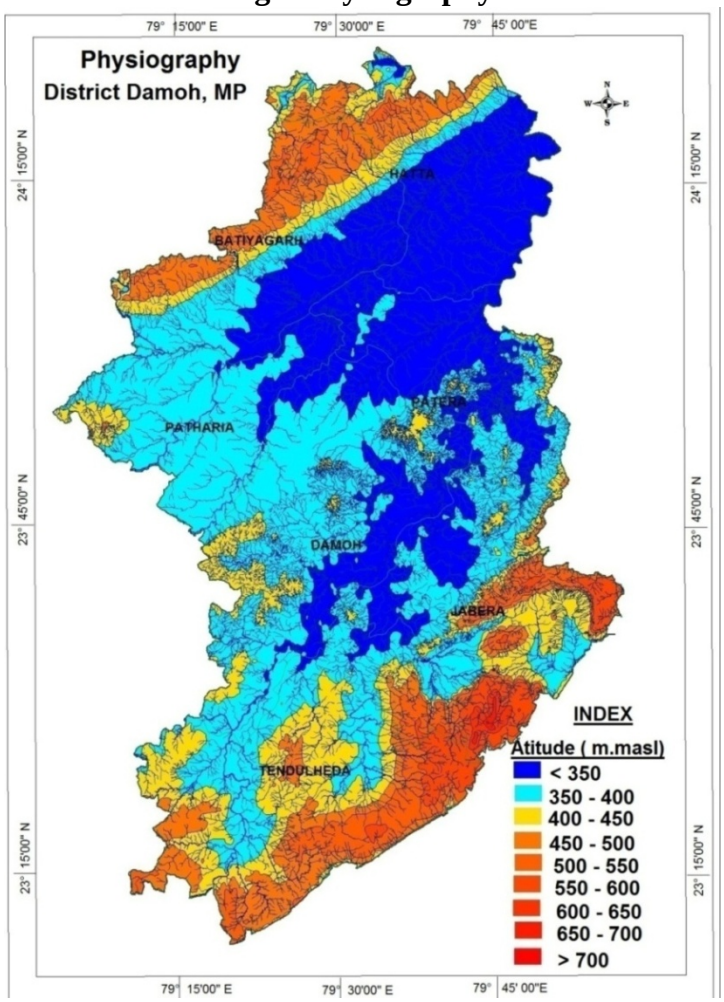
The Southern plateaus extend in a broad belt from Southwest to Northeast. It is centrally drained by the Bearma and is transversed by a number of spurns and ridges of Vindhyan range.

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.

In the Southwestern part of Jabera block isolated hill ranges are more than 600m and at places they are more than 700m. amsl.

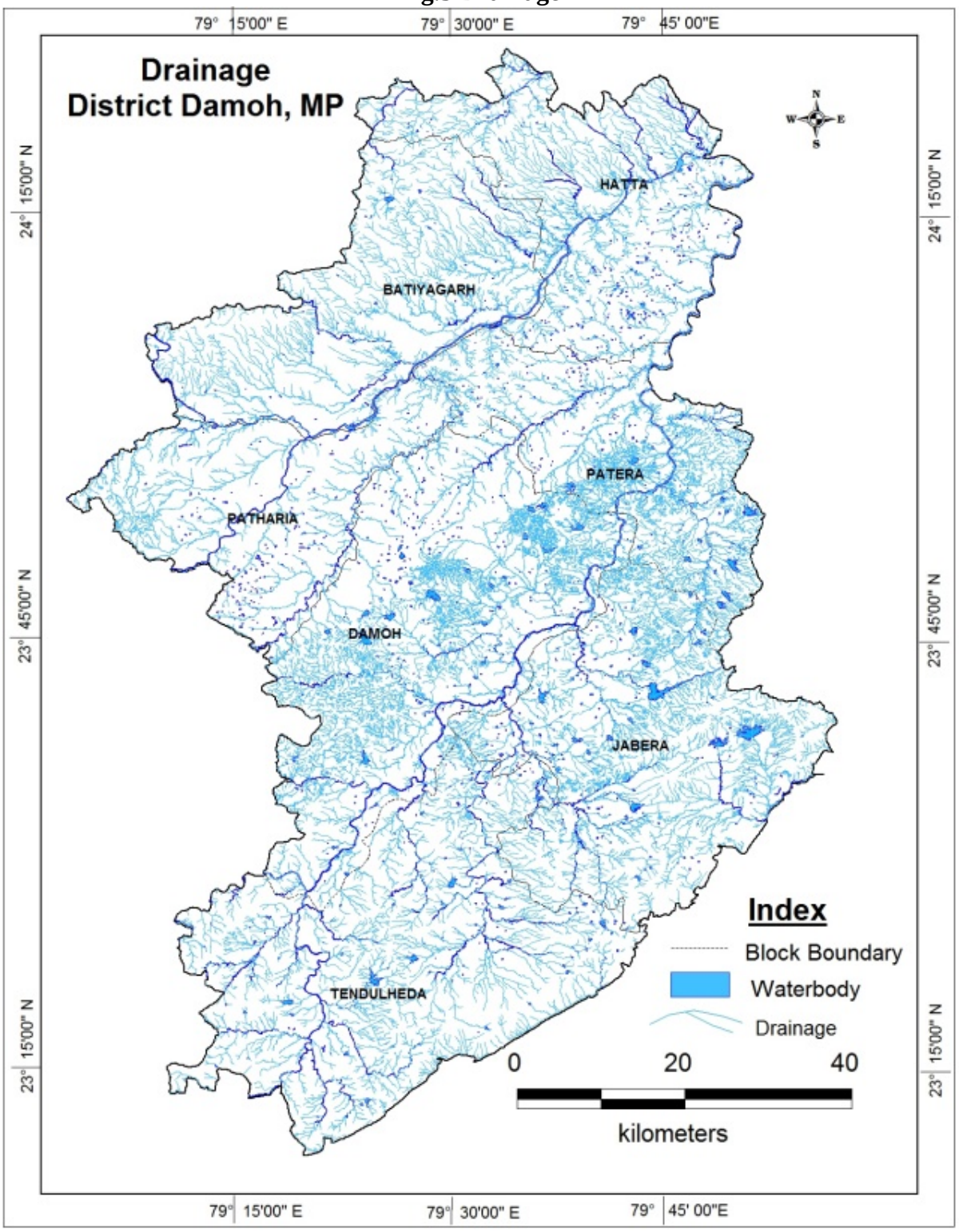
**Fig:2 Physiography**



## 1.5 Drainage:

The area is mainly drained by SonarRiver and the BearmaRiver, 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 KenRiver into Yamuna.

**Fig.3 Drainage**



**1.6 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.

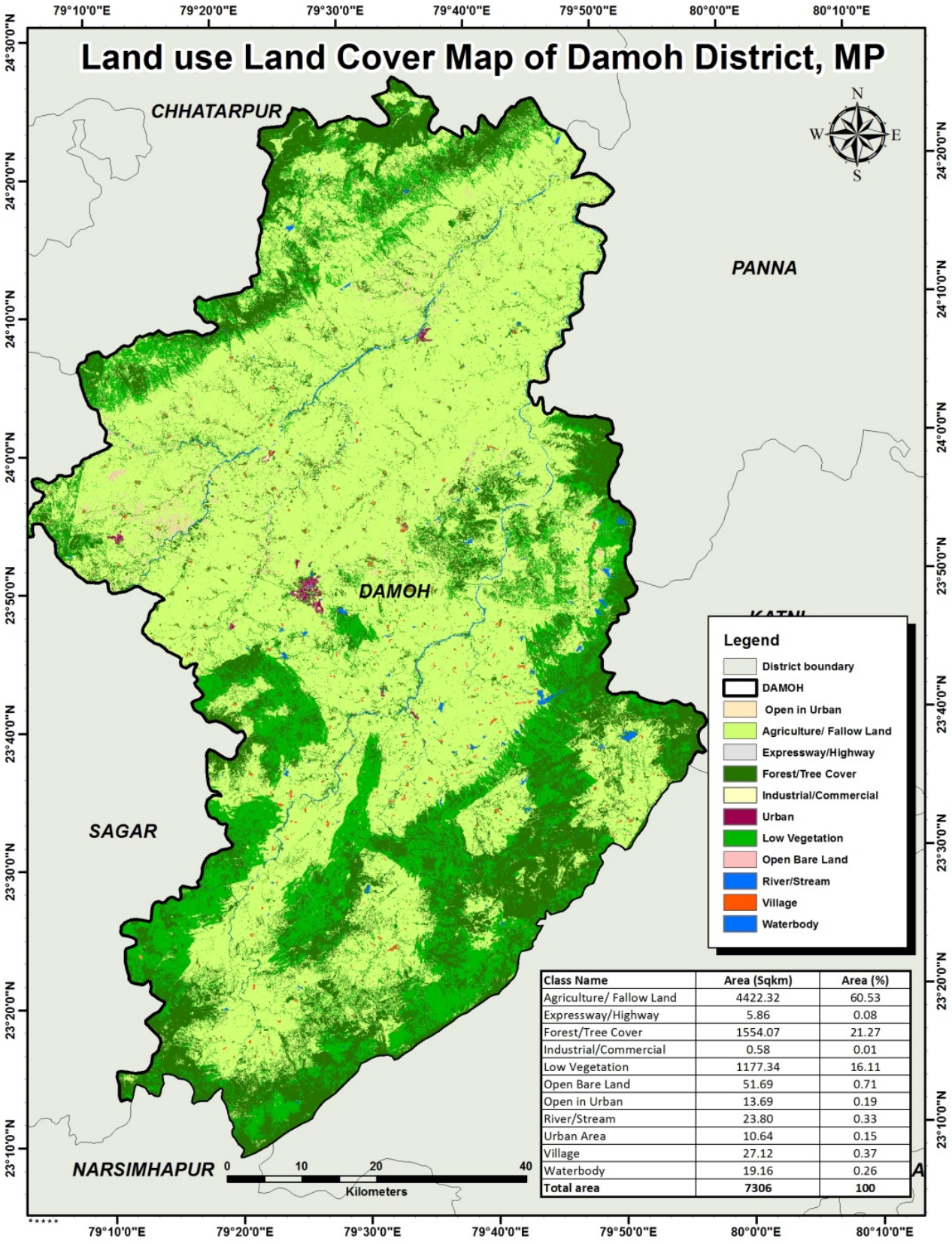
**1.7 Landuse:**

Damoh district landuse map prepared by using LISS- IV Image data about 60% of the area is covered by Agriculture/Fallow land ie. about 4422 Sq.Km and other part of the area is covered by Forest/Tree cover and low vegetation , aerial distribution of the landuse cover of the district is given in table No 3

**Table No :3 Landuse /Land cover**

| Class Name | Area (Sqkm) | Area (%) |
|---|---|---|
| Agriculture/ Fallow Land | 4422.32 | 60.53 |
| Expressway/Highway | 5.86 | 0.08 |
| Forest/Tree Cover | 1554.07 | 21.27 |
| Industrial/Commercial | 0.58 | 0.01 |
| Low Vegetation | 1177.34 | 16.11 |
| Open Bare Land | 51.69 | 0.71 |
| Open in Urban | 13.69 | 0.19 |
| River/Stream | 23.80 | 0.33 |
| Urban Area | 10.64 | 0.15 |
| Village | 27.12 | 0.37 |
| Waterbody | 19.16 | 0.26 |
| **Total area** | **7306** | **100** |

**Fig No 4: Landuse/Landcover**

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| Open in Urban | 13.69 | 0.19 |
| River/Stream | 23.80 | 0.33 |
| Urban Area | 10.64 | 0.15 |
| Village | 27.12 | 0.37 |
| Waterbody | 19.16 | 0.26 |
| **Total area** | **7306** | **100** |

## 1.8 Agriculture/Irrigation/Cropping pattern

As shown in table No 4 , Gross sown area of Damoh district is 202341 ha .

**Table No. 4: Gross Sown Area of DamohDistrict**

| Area | Type of soil | Gross Area sown (ha) (2014-15) | Area irrigated by surface water (ha) (2014-15) | Area Irrigated by GW (ha) (2013-14) |
|---|---|---|---|---|
| Damoh District | Black Cotton soil, mixed soil, gravelly sandy soil and Red Loamy soil | 317723 | 33453 | 84702 |

**Table No.5: Area Irrigated (Ha) by Different Source In Damoh District.**

| Block | Ground Water Irrigated Area | | | Surface Water Irrigated Area | | |
|---|---|---|---|---|---|---|
| | Area Irrigated by Dug Well | Area Irrigated by Tube Well | Total Area Irrigated by Ground Water Area in Ha | Area Irrigated by Balram Talab | Area Irrigated by Canals | Total Area Irrigated by Surface Water Area in Ha |
| **DAMOH** | 11940 | 4959 | 16899 | 3076 | 887 | 3963 |
| **PATHARIYA** | 7088 | 7547 | 14635 | 3365 | 5517 | 8882 |
| **JABERA** | 4810 | 3220 | 8030 | 1566 | 529 | 2095 |
| **TENDUKHERA** | 5389 | 1985 | 7374 | 520 | 632 | 1152 |
| **BATIYAGARH** | 6742 | 14792 | 21534 | 150 | 3952 | 4102 |
| **HATTA** | 3492 | 6341 | 9833 | 1008 | 1333 | 2341 |
| **PATERA** | 4579 | 1782 | 6361 | 124 | 408 | 532 |
| **Total** | **44040** | **40626** | **84666** | **9809** | **13258** | **23067** |

## 1.9 Prevailing Recharge practices

**Artificial Recharge Studies by CGWB :**

The Central Ground Water Board, under the Central Sector Scheme, has been extending technical and financial support to the State Government for implementing practices in rural and urban areas of the district. In Damoh district no such project has been taken up by CGWB ,however technical guidance for preparing DPR and other recharging has been guided to PHED and other state departments.

# CHAPTER-II
# DATA COLLECTION AND GENERATION

## 2.0 GROUND WATER SCENARIO :

### 2.1 Hydrogeology - Aquifer System and Aquifer Parameters

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

**Hydrogeological units :**

**Alluvium:**

Sonar and Bearma river forms alluvial tracts along the banks. The alluvial and soil covers in the area are unconsolidated formation having very high porosity. The alluvium has good water yielding capacity of the order of 50-60 m3 / day. The depth of the wells in this formation ranges from 8 to 14 m. bgl. The depth to water level ranges from 2 to 6 m. bgl.

**Shale:**

The shales are clayey in nature and have very high porosity & less permeability. In this unit water moves by capillary action. In the district shale formation area forms a fine dendritic drainage and rain water goes away as run- off. In shales due to secondary opening such as bedding planes and joints water is transmitted fast.

The shallow dug wells in the depth ranges between 6-13m. tapping shales , surprisingly, have water yielding capacity of 70-200 $m^3$ day.

The general range of water level in this formation is 4-12m. bgl. Number of bore wells drilled in shale formation are not in operation due to meager discharge as deeper aquifers are not productive. In summer dug wells run at the most for two hours and recoup in one or two days. Some shallow dug wells dry up in summer.

**Sandstone:**

Sand stone are very hard compact in nature, fine to medium in grain size and pinkish to reddish in colour, Sandstone is well cemented by silicious material and has very low porosity but their structural characters do give rise to a few large opening through which water is transmitted fast. These openings are bedding planes, current bedded layers, ripple marks and three prominent sets of joints. The volume of such opening, as

**Limestone:**

The limestone is very hard and compact in nature and has very poor primary opening and are characterized by secondary opening such as bedding planes, joint planes, solution channels and cavernous opening. The limestones are affected greatly by Chemical Weathering. Due to chemical reaction the joint planes are widened resulting in solution channels or caverns and sink holes. Due to Karstification , the limestone formations are suitable both for dugwell and tube wells. This type of karstification is observed in the Sonar river bed at Jamunia Khain village in Patera block. Test bore wells were drilled in Futera and Bakargarh village in Batiyagarh Block, Banjari and garish village in Hatta Block. Depth of bore holes are 60 m. bgl. and the yield is of the order of 70-200 $m^3$ day. The depth of dug wells in this formation ranges from 8-12 mgl. The depth of water level ranges from 4 to 10m. bgl. The yield of shallow dug wells is of the order of 40-50 $m^3$/ day.

**Sub- Surface Geology and Yield Potential of Aquifers:**

To meet the drinking water requirements of the rural population of the district, the Public Health Engineering Department of M.P. Govt. has drilled tubewells in almost all the villages.

From the perusal of Geological Cross-Section based on dug wells sections, bore hole logs and exposures in river section, some generalization have been made. The Vindhyan sandstone , Shales and limestone are the main litho logical units. The main aquifers are formed by shales and L.st.

The Patharia block around villages Sukha, Magardha, Sumera Lodhi, kisanganj, Narsinghgarh etc. Overburden thickness ranges from 6 to 9 m. and underlying formation is mainly Limestone , sandstone and shales. Limestone of this area is compact.

The bedding planes, joints cracks generally allow movement of groundwater due to widening of joints, fissure etc. by solution action. In Tendukheda block rate of success of dug well is about 70 with a discharges if 0.5$m^3$/hr to 1.60 $m^3$/hr. Thus, chances of storage of groundwater occurs in weathered pockets, cracks & fissures. The average yield of wells in shales is 16 $m^3$/ day to 30 $m^3$/day. Vindhyan sandstone is compact, hard and groundwater Occurrencein this formation seems to be insignificant. The yield of dug well is 15 $m^3$/day to 40 $m^3$/day. In Damoh block, major part of the area is covered by medium black soil underlain by clays mixed with kankar. The thickness of clay varies from 3 to 10m. The depth of shales ranges from 5 to 12 m. Limestone occurs in between shales.

Consolidated of aquifers formed by shales , jointed sandstone of Vindhyan are moderate in ground water potential Limestone is moderate to good. Shallow and deep aquifers occur between 20-25m. bgl and 60-120m. bgl. depth. These aquifers are of limited width and extension and get recharged by the base flow leakages of Sonar, Bearma and their tributaries.

The general geological formation of the area is Sandstone ,Shale& Limestone as shown in Fig:5.

**Fig:5 Geology**

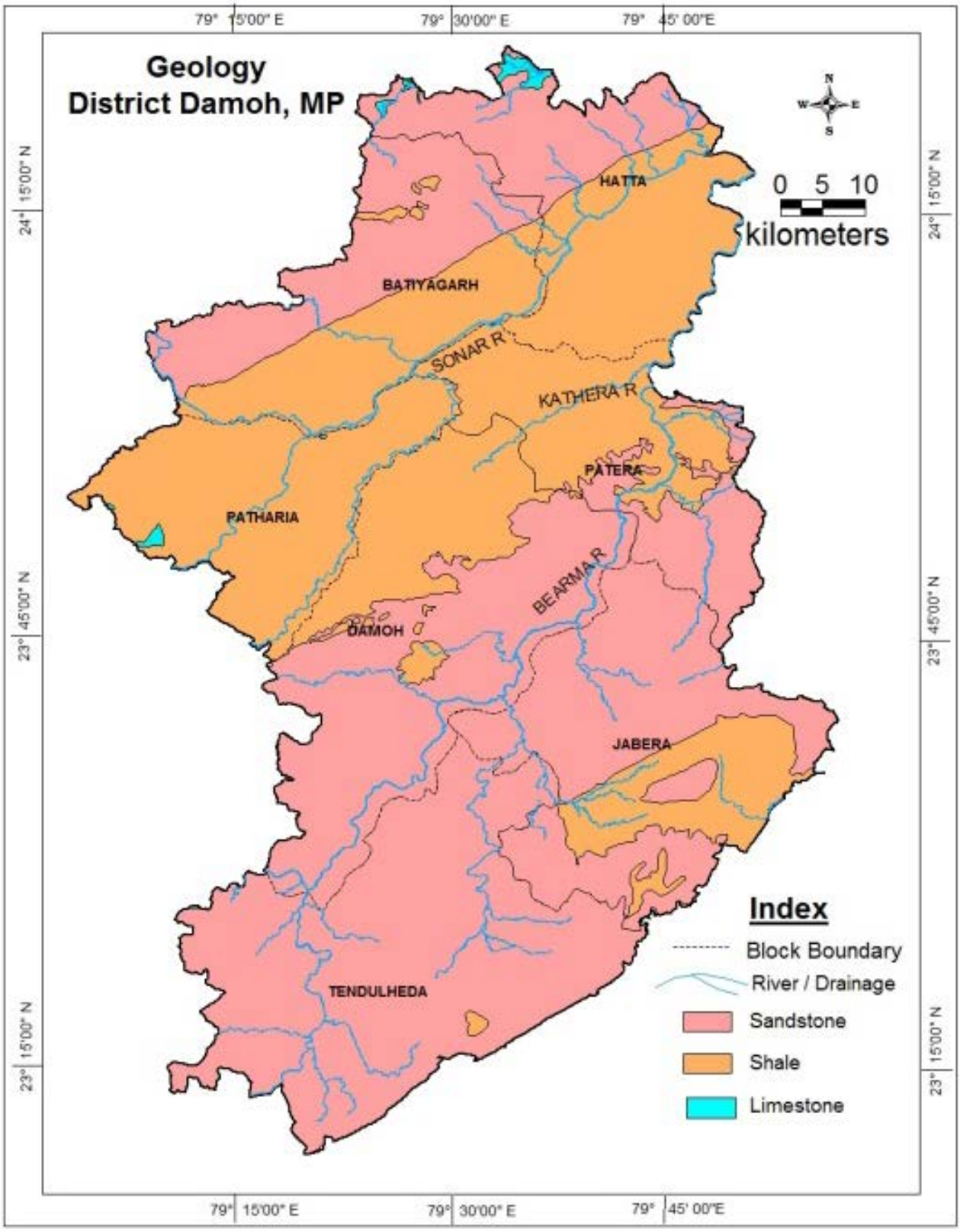
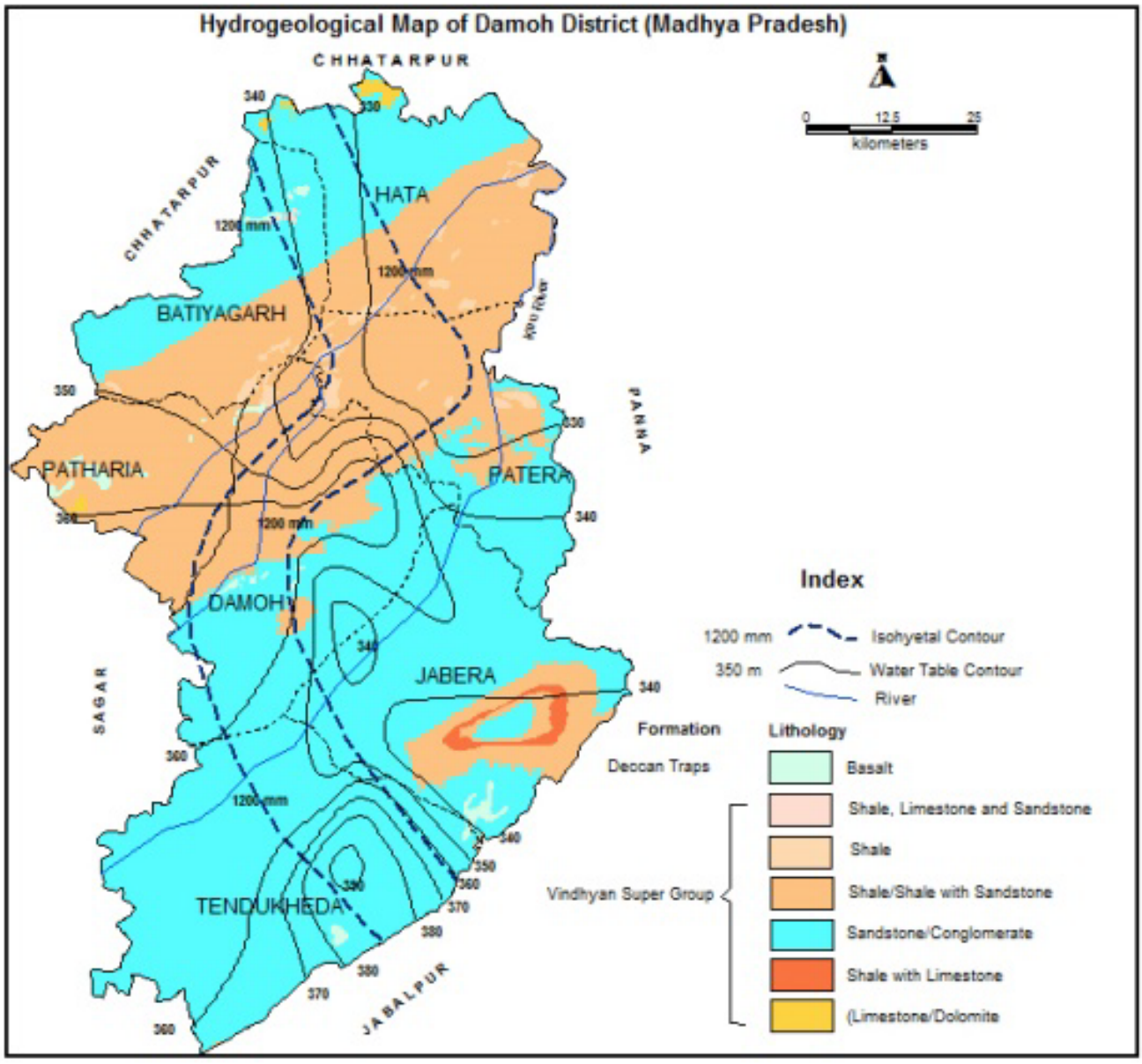


**Fig:6 Hydrogeology**



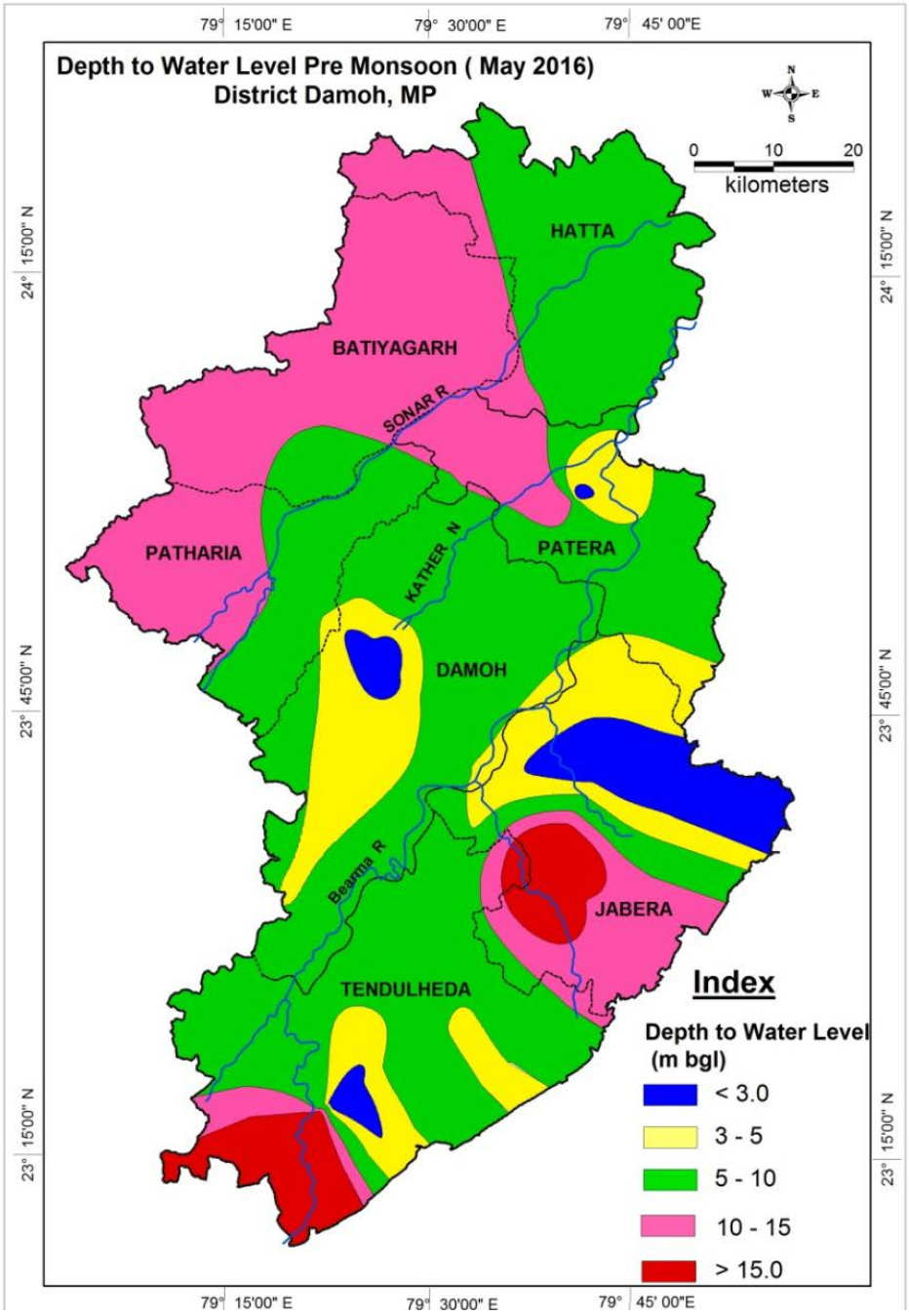

## 2.2 WATER LEVELS

Ground water levels form a very important parameter of the ground water system, as these 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 25 National Hydrograph Stations (NHS) and 08 Peizometers in Damohdistrict. Due to large-scale ground water development the dug wells are drying up.

**Pre-monsoon (May 2015)**

Depth to water level during pre-monsoon, 2015 yr ranged between1.5 m bgl at Patera and 24.47m bgl at Bhonrasa. Water levels, in general fall between 5 - 20 m bgl. Shallow water levels of less than 3 m bgl occur in a patch in the south-western part of the district falling in Tendukheda block , eastern & central part of Jabera block and central part of Patera block. Maximum part of the district lies between 3-10 mbgl. Deeper water levels, more than 15 m occur in western part of Patharia block. In Batiyagarh , Patharia and Jabera blocks wells are fast drying up perhaps due to higher ground water development. During May 2015, pre-monsoon the depth to water level in Damohdistrict as shown in Fig 5

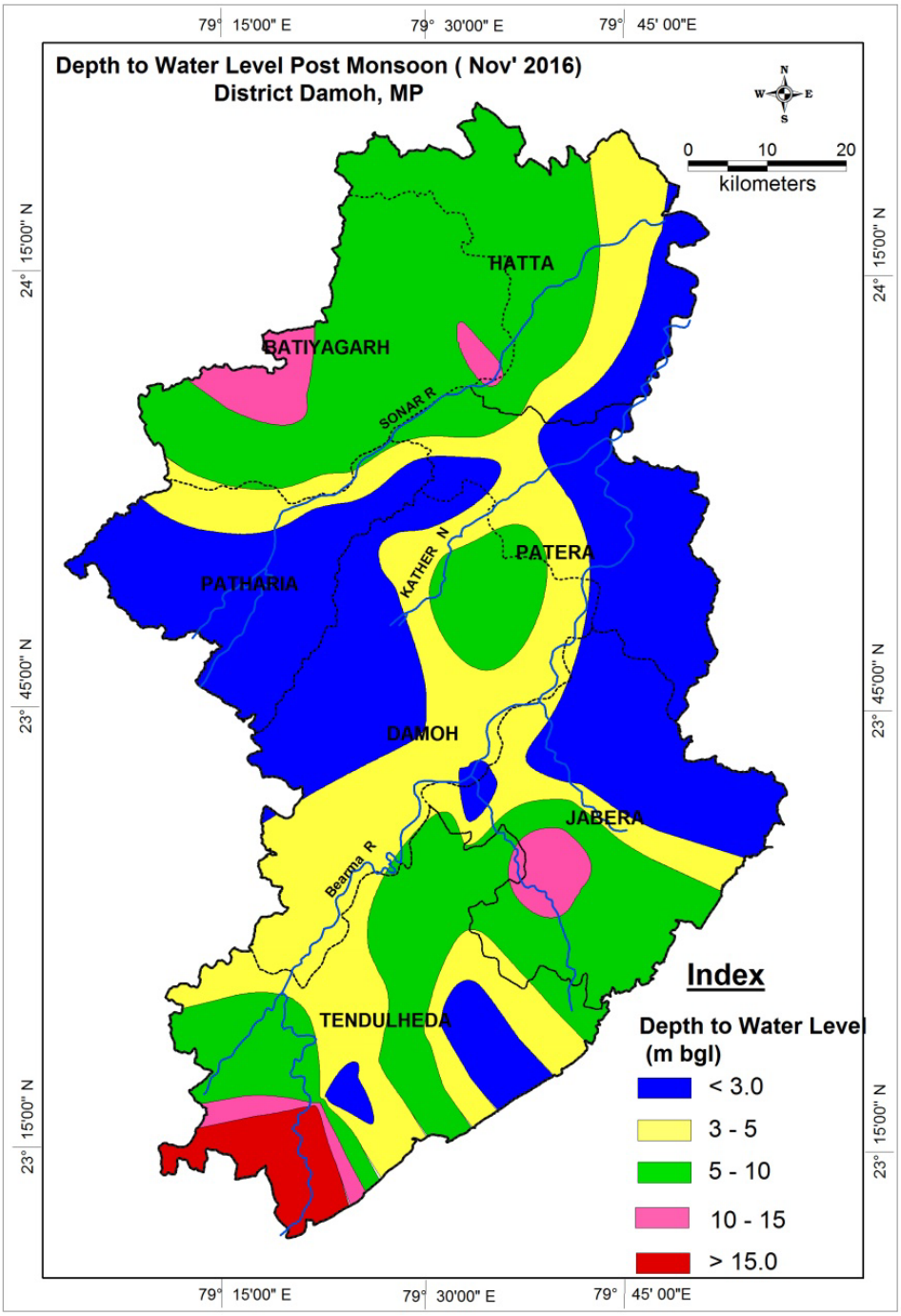
**Fig 5.Pre -Monsoon Depth to Water Level (2015)**



**Post-monsoon (November 2015)**

During post-monsoon period of the same year, November 2015, the water levels varied from 0.06m bgl at Dhayali to 15.19m bgl at Bhonrasa. The water level, in general lies between 2 to 10 m bgl during this period. Shallow water levels, less than 3 m bgl occur in a small part of the district covering parts of Hatta, Patharia,Patera,Jabera & Tendukheda blocks. Deep water levels above 10 m bgl occur in the northeastern part in Patta, and south western part of Jabera blocks as shown in Fig 6.

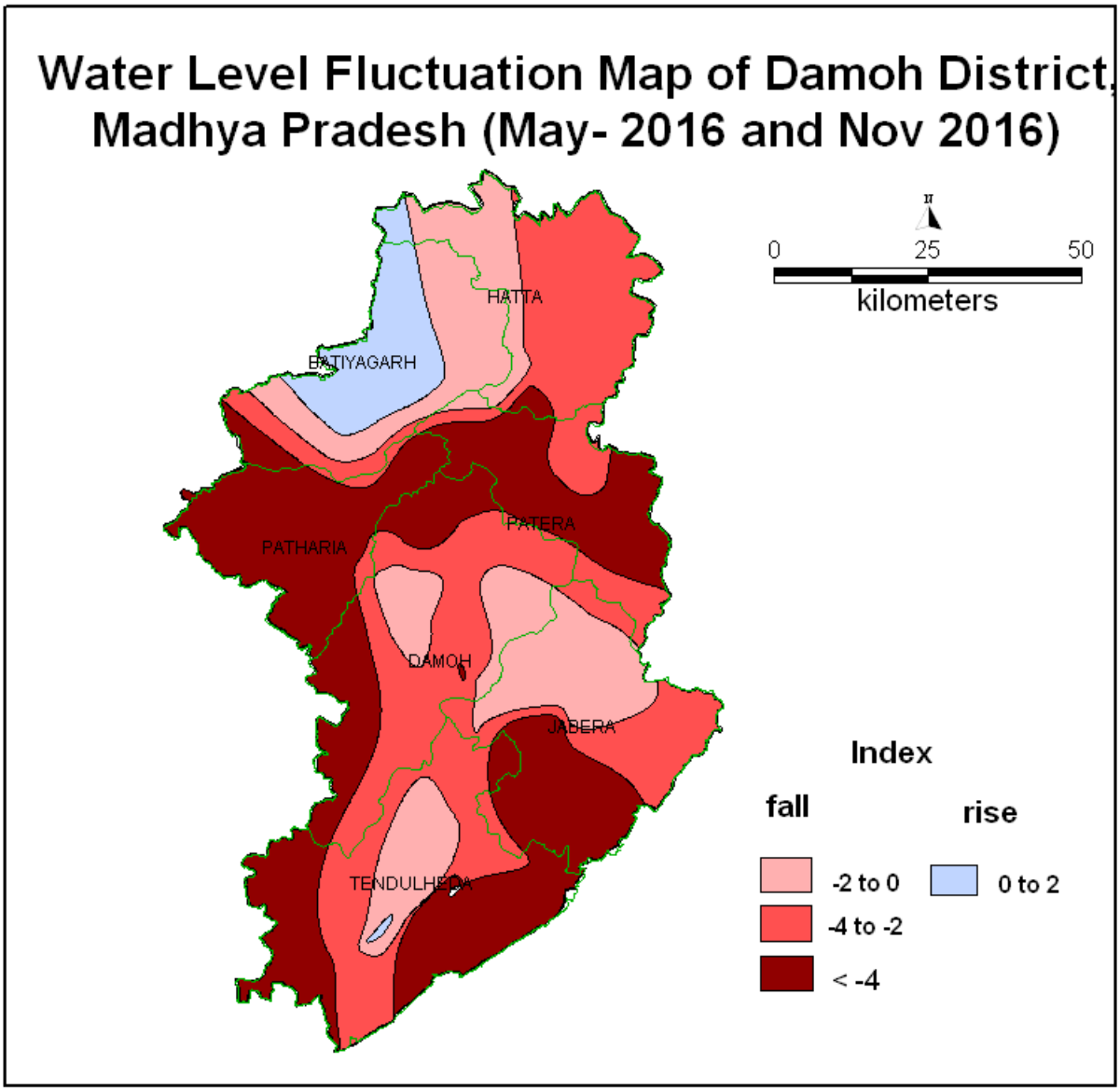
**Fig 6. Post -Monsoon Depth to Water Level (2015)**



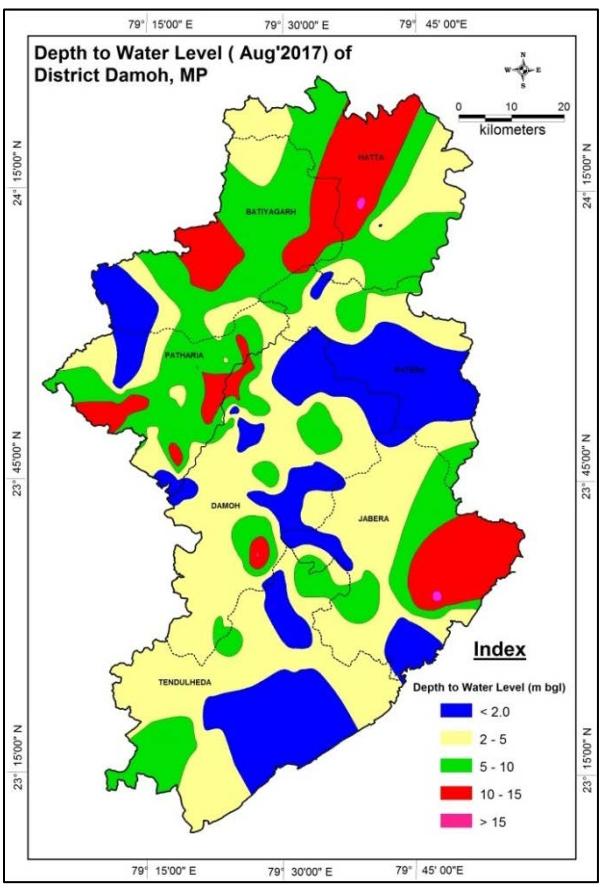
**Water level Fluctuation ( May 2016-Nov 2016) :**

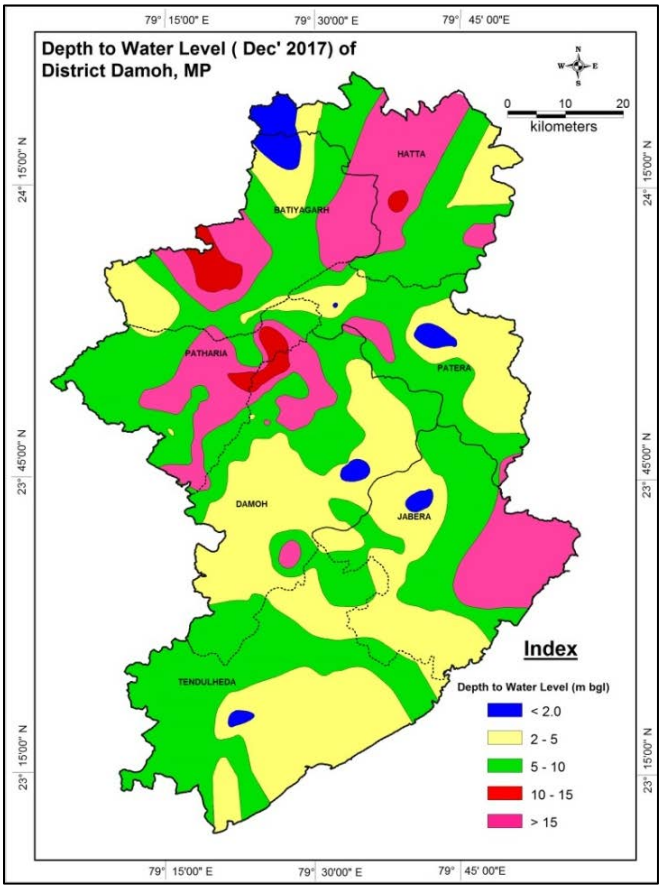
Major part of the district shows seasonal fluctuation rise more from 3-10m and in small parts of block Hatta, Patera Cetral part of Damoh, Jabera & Tendukeda blocks shows fluctuation fall from >3to >10m as shown in Fig 7.

**Fig: 7 Water level Fluctuation ( May 2016-Nov 2016)**




**Data Generation:** During the month of August 2017, 126 Key observation wells were established. The water level monitoring was conducted in the month of Aug & Dec, 2017
and ground water sample collection was done in the month of Aug, 2017. The depth to water level maps have been prepared and shown in figure 8 & 9.




**Water level Aug' 2017**

The minimum depth to water level of 0.5 mbgl was recorded in the Tindni village of Damoh block whereas the maximum depth to water level of 15.25 mbgl was recorded in the Kanti village of Hatta block. As per the depth to water level map it can be observed that shallow water levels of < 2m bgl occurs in patches dominantly in Patera block and small pockets all over the central and southern part of district. The major part of the district has depth to water level within the range from 2-10 m bgl. The deeper water levels of >10 mbgl are encountered in small pockets in the northern and south eastern part of Damoh district.

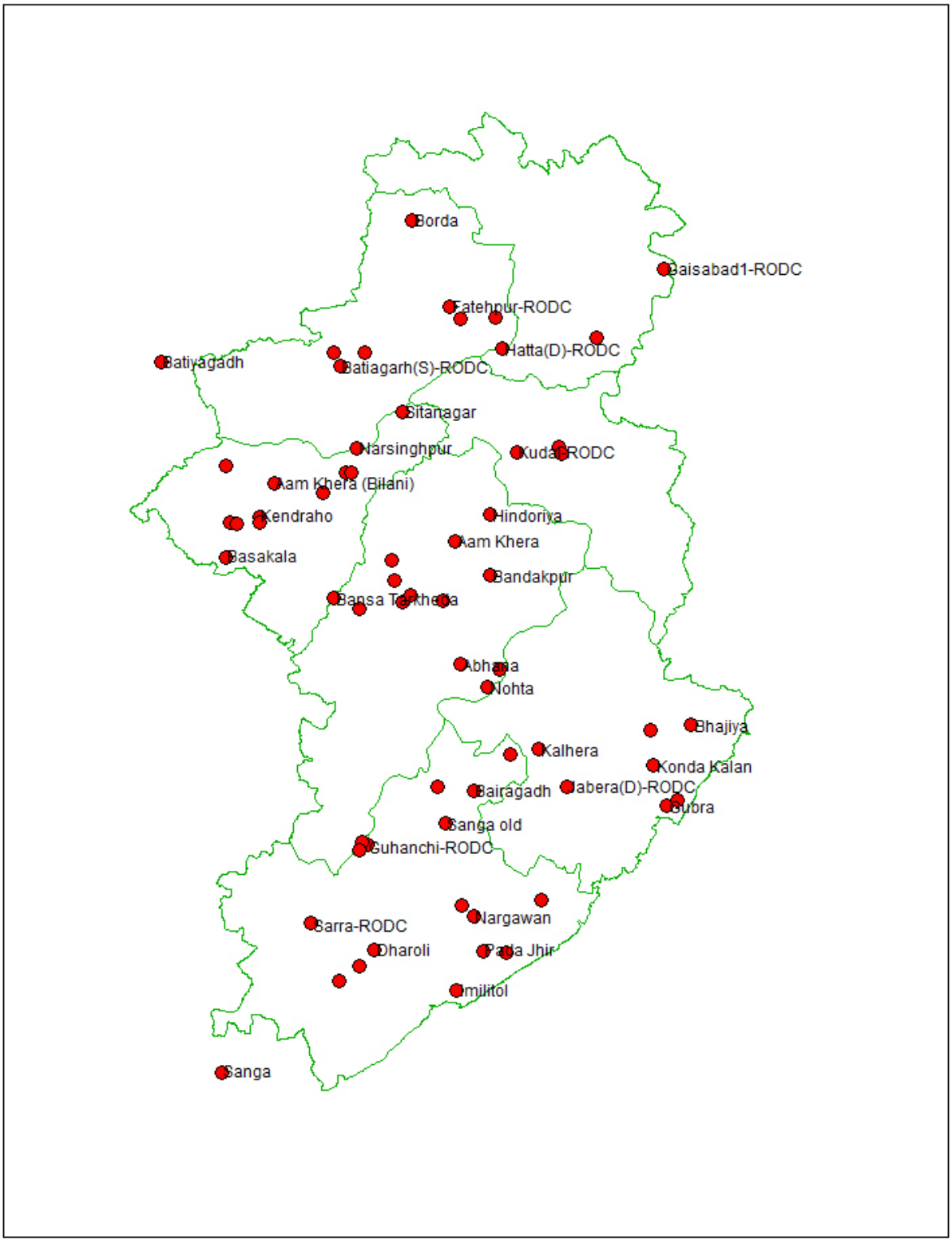
**Water level Dec' 2017**

The minimum depth to water level of 0.88 mbgl was recorded in the Jangpur village of Hatta block whereas the maximum depth to water level of 18.67 mbgl was recorded in the Dhingsar village of Damoh block. As per the depth to water level map it can be observed that shallow water levels of < 2m bgl occurs in very small pocketsin the northern, central and southern part of district. The major part of the district has depth to water level within the range from 2-10 m bgl. The deeper water levels of >10 mbgl are encountered predominantly in the north western and south eastern part of Damoh district.

## 2.3 Exploratory Drilling:

CGWB under its exploration programme drilled 35 borewells and 11 Piezometers on the basis of litholog and aquifer perimeter sub surface lithology of the area is inferred and 3-D , Section and Fence of the district has been prepared .and the salient detail of these drilled bore wells is given in Table No2.

**Fig 8: Location of Exploratory Wells , Damoh District**



# Digital Elevation Model of Damoh District

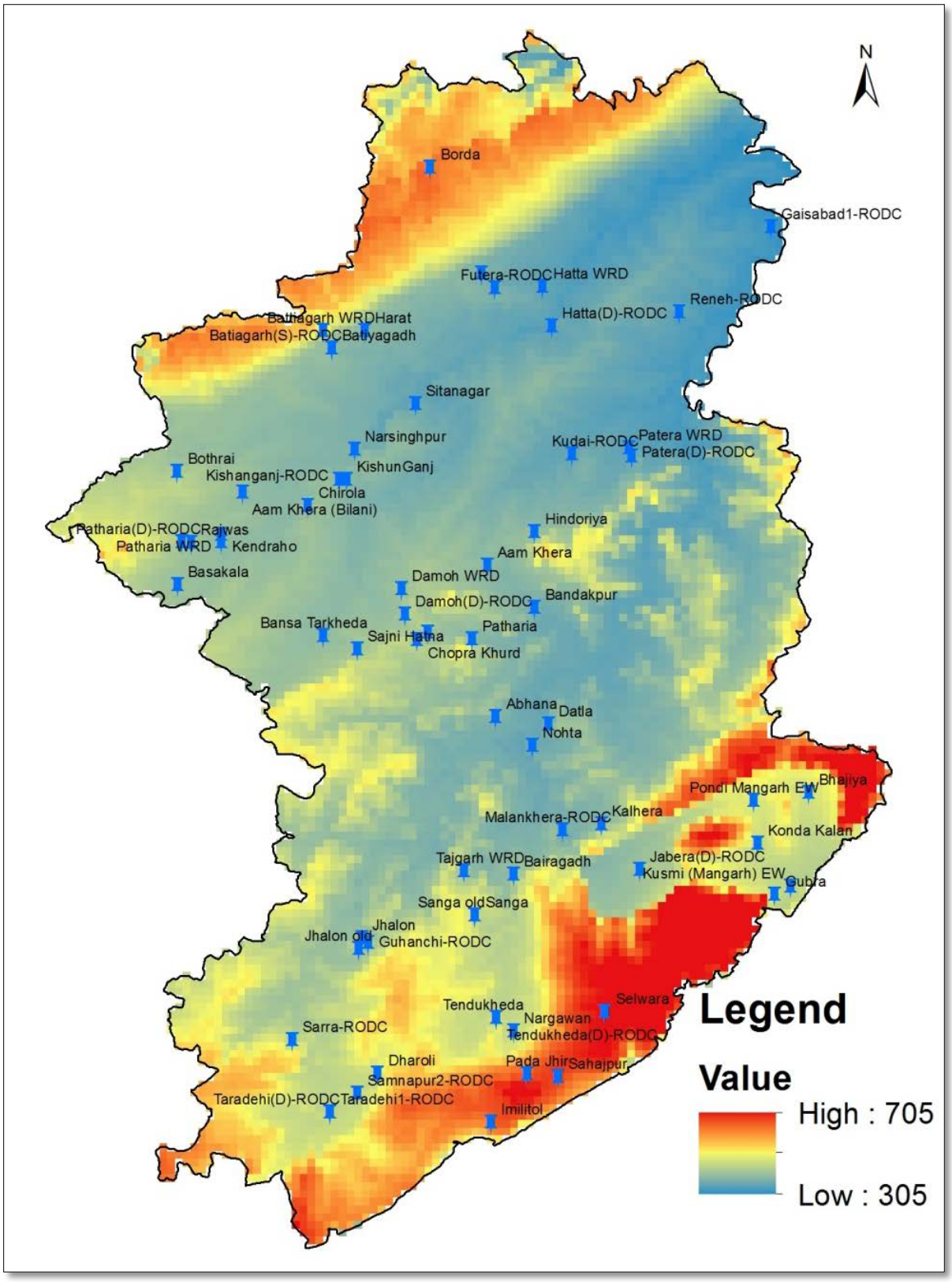


**Table-6: Salient Features of Exploratory Boreholes Drilled in DamohDistrict**

| S.N. | Name of site | Type of Well | Depth drilled in mbgl | Zones tapped | SWL | Discharge | Drawdown | Formation |
|---|---|---|---|---|---|---|---|---|
| | | | | | (mbgl) | (lps) | (m) | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| **DAMOH DISTRICT** | | | | | | | | |
| 1 | Abhana | EW | 300 | | - | 1 | | Shale |
| 2 | Abhana, | PZ | 106.7 | - | 5.5 | 7.5 | | Shale |
| 3 | Aamchopda, | EW | 268.4 | - | - | - | | Shale |
| 4 | Aamkheda, | EW | 262 | - | - | - | | Shale |
| 5 | Bandakpur, | EW | 250 | - | - | 0.2 | | Shale |
| 6 | Bansa Tar Khera | EW | 305 | | 30.37 | 0.2 | | Shale |
| 7 | Bansa Tar Khera, | PZ | 66.75 | | 8.43 | 0.25 | | Shale |
| 8 | Bataria, | EW | 303.5 | - | 60 | 1.5 | | Shale |
| 9 | Batiagarh | PZ | 153 | | 70 | | | Shale |
| 10 | Bhilani, | EW | 231 | - | - | - | | Shale |
| 11 | Bothrai, | EW | 134.2 | - | 4.5 | 3.4 | | Shale |
| 12 | Bothrai, | OW | 134.2 | - | 4.5 | 2.5 | | Shale |
| 13 | Chirola, | EW | 215 | - | 15 | 12.86 | | Shale, lime stone |
| 14 | Chirola, | OW | 93.18 | - | 21.5 | 1.13 | | Shale, lime stone |
| 15 | Damoh, Collectorate, | EW | 300.25 | - | 50 | 0.2 | | Shale |
| 16 | Hindoria | EW | 276 | Abandoned | | | | Shale |
| 17 | Kendraho | EW | 103.7 | 24-30, 68-74 | 12.6 | 10 | | Fractured shale |
| 18 | Kendraho | OW | 103.7 | 24-30 | 12.95 | 2.75 | | Fractured lime stone |
| 19 | Kendraho | OW | 103.7 | 24-30, 68-74 | 12.81 | 6 | | Fractured shale |
| 20 | Khejra Kher, | EW | 262.3 | - | - | - | | Shale, lime stone |
| 21 | Kisanganj | EW | 268 | | 15 | 1 | | Shale |
| 22 | Kisanganj | PZ | 81.7 | | 12 | 1 | | Shale |
| 23 | Narsinghgarh | EW | 305 | | 90 m | | | Shale |
| 24 | Nohta | PZ | 152.5 | - | - | - | | Shale |
| 25 | Nohta | PZ | 61 | - | - | - | | Shale |
| 26 | Pandajhiri, | EW | 145 | - | - | 0.5 | | Shale |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 27 | Pathariya (Karasdev), | EW | 54.9 | - | 15 | 12 | | Shale |
| 28 | Pathariya, (Karasdev) | OW | 67.9 | - | 15 | 5.5 | | Shale |
| 29 | Polytechnic | EW | 305 | | 60.2 | Negligible | | |
| 30 | Sahajpur, | EW | 233.34 | - | 13 | 0.25 | | Shale |
| 31 | Sailwara, | EW | 298.6 | - | - | Dry | | Shale |
| 32 | Sailwara, | PZ | 97.25 | - | 47 | - | | Shale |
| 33 | Sanga, | EW | 281 | - | | 0.5 | | Shale |
| 34 | Sangrampur, | EW | 157 | - | - | meager | | Shale |
| 35 | Sangrampur, | PZ | 73.3 | - | - | 2 | | Shale |
| 36 | Sangrampur, | PZ | 19.3 | - | 9.8 | 0.25 | | Shale |
| 37 | Sitanagar | EW | 277 | | 15 | 0.5 | | Shale |
| 38 | Sitanagar | OW | 79 | | 3.03 | 0.5 | | Shale |
| 39 | Nargawan, | EW | 270 | - | 4 | | 1 | Lime-stone |
| 40 | Nargawan, | PZ | 92.37 | - | 17 | | 0.1 | Lime-stone |
| 41 | Hardua, | EW | 303.5 | - | - | | Meagre | - |
| 42 | Gubra- | EW | 233.35 | - | 12 | | 0.2 | Sand S./ Shale |
| 43 | Gubra- | PZ | 91 | - | 12.1 | | 0.1 | Sand S./ Shale |
| 44 | Kusmi- | EW | 245.53 | - | 9.5 | | 5.5 | Sand S./ Shale |
| 45 | Kusmi- | OW | 265.8 | - | 8 | | 3 | Shale |
| 47 | Kusmi- | PZ | 61.7 | - | 9.5 | | 5.5 | Shale |
| 48 | Hinoti Khet Singh | EW | 287 | | 23 | | 0.2 | Sand S./ Shale |
| 49 | Magron | EW | 125.77 | 84-87 | 8.64 | 3 | 1.97 | Shale |
| 50 | Guhachi | EW | 162.75 | 30-32, 73.5-74.5, 94.5-96.25 | 10.5 | :- | :- | Shale |
| 51 | Singrampur | EW | 200 | 37-42, 47-50, 73.5-75 | 12.44 | 2.1 | 4.06 | Shale |
| 52 | Hardeshpur | EW | 200 | | | Dry | | Shale |
| 53 | Kishanganj | EW | 200 | | | Dry | | Shale |
| 54 | Lohari | EW | 200 | 25-26 | 20 | :- | :- | Shale |
| 55 | Patera | EW | 200 | | | Dry | | Shale |
| 56 | Kudai | EW | 196.5 | 25-27 | 5.72 | 1.2 | 16.28 | Shale |
| 57 | Raneh | EW | 200 | | | Dry | | Shale |
| 58 | Gaisabad | EW | 200 | 84-87, 105-109, 131-134 | 8.41 | 1.9 | 4.97 | Shale |

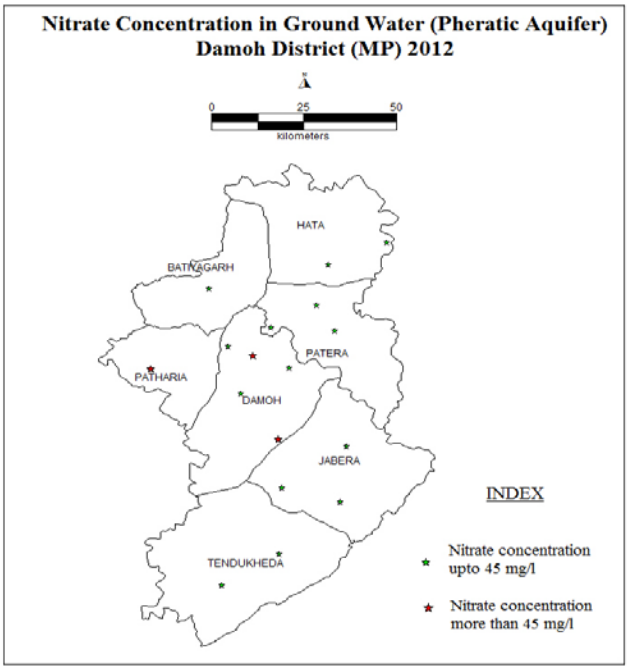
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 59 | Fatehpur | EW | 134.5 | 77-79, 83-91 | | | | Shale |
| 60 | Futera | EW | 196.75 | 109-112.25 | 24.69 | 3 | 4.68 | Shale |
| 61 | Samnapur | EW | 184.12 | 103-105 | 8.26 | Dry | | Shale |
| 62 | Taradehi | EW | 200 | | | Dry | | Shale |
| 63 | Sarra | EW | 182 | 136-138, 146-148 | 7.36 | 3 | 3.41 | Shale |
| 64 | Malankhera | EW | 200 | | | Dry | | Shale |
| 65 | Nandrai | EW | 200 | 27-28 | 6.45 | : | : | Shale |
| 66 | Gugrakalan | EW | 175 | 100-105, 140-152, 169-171 | 5.36 | 3 | 3.03 | Shale |
| 67 | Khaderi | EW | 200 | | | Dry | | Shale |
| 68 | Kerwana | EW | 112.75 | 55-60.25, 108-111 | 4.41 | 3 | 1.63 | Shale |

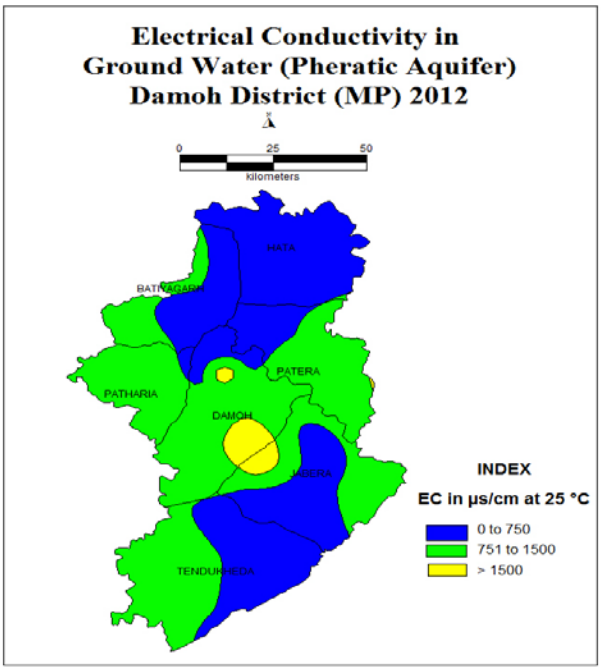
## 2.4 Ground Water Quality

The electrical conductivity of ground water in Damoh district ranges between 417 to 2370 µS/cm at 25°C. In most parts of the district the EC is less than 1500 µS/cm 25°C. The EC of less than 750 µS/cm 25°C is observed in northern part and in south. In north EC values of less than 750 µS/cm 25°C are observed in an considerable area comprising Hatta, major parts of Batiagarh and adjoining areas of Patera and Damoh blocks, whereas, in south EC of less than 750 µS/cm 25°C is observed in major part of Jabera and eastern half of Tendukheda blocks. EC of more than 1500 µS/cm 25°C is observed in two small isolated patches in central part. The EC value less than 750 µS/cm 25°C was recorded at 10 locations constituting about 60%, and at 7 locations i.e. 40% has recorded between 750 to 3000 µS/cm 25°C. The highest EC value recorded in Abhana dug well of Damoh district i.e. 2370 µS/cm at 25°C.

The fluoride concentration ranges between 0.14 to 1.20 mg/l.The fluoride concentration reveals that all the ground water samples of Damoh district are within maximum permissible limit as recommended by BIS i.e. 1.50 mg/l. Maximum concentration of fluoride (1.20 mg/l) recorded at dug well of Bamori.

The nitrate concentration in the ground water samples ranges between 7 to 145 mg/l. In major part the concentration of nitrate is within acceptable limit recommended by BIS i.e 45 mg/l for drinking purpose, the concentration of nitrate beyond permissible limit was observed mainly in Damoh and Patharia blocks. The nitrate concentration within permissible limits (<45 mg/l) was recorded at 14 samples, whereas, at 3 locations the concentration of nitrate was more than 45 mg/l. The highest concentration of nitrate (145 mg/l) is recorded in ground water of dug well at Abhana.



# CHAPTER-III
# DATA INTERPRETATION/PREPARATION OF AQUIFER MAP

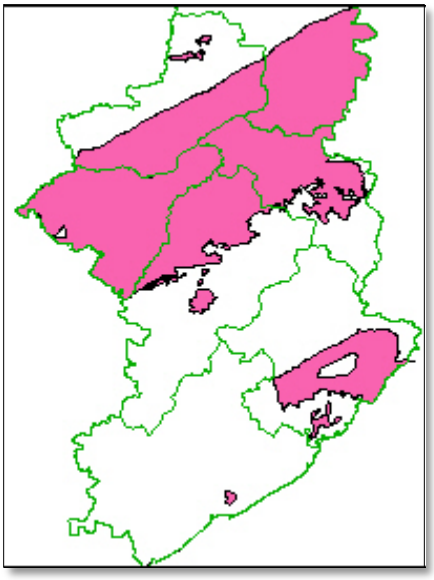
## 3.1 Data Interpretation:

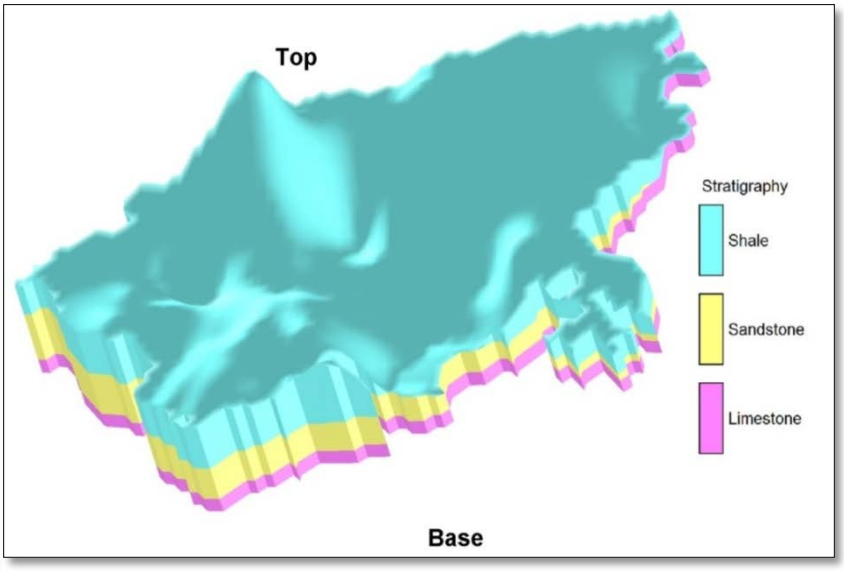
Lithological data collected from CGWB bore wells, Piezometers,State ground water Piezometers etc. were studied and aquifer geometry and properties interpreted . Detail Lithologs of boreholes were studied and compressed datain form of Rockworks data sheet.

## 3.2 Lithological Model :

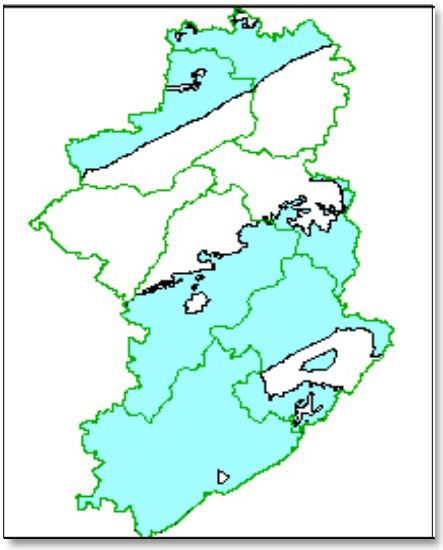
Three formations Sirbu shale ,Lower vindhyan sandstone and Limestone

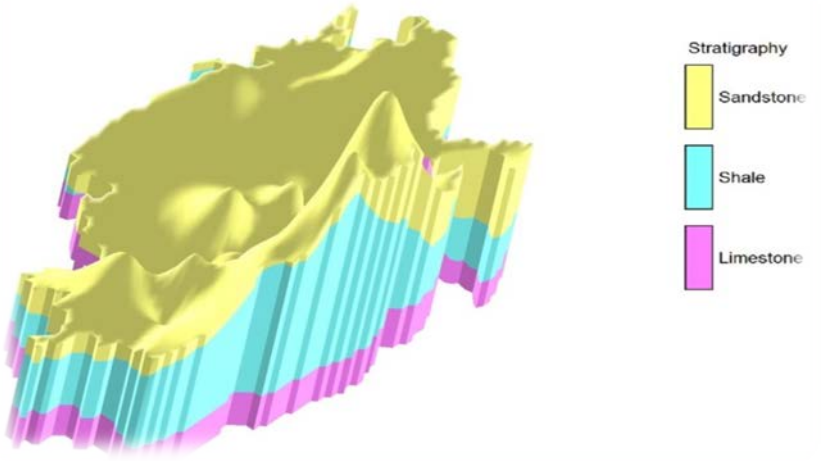
### 3.2.1 Shale - Lithological Model



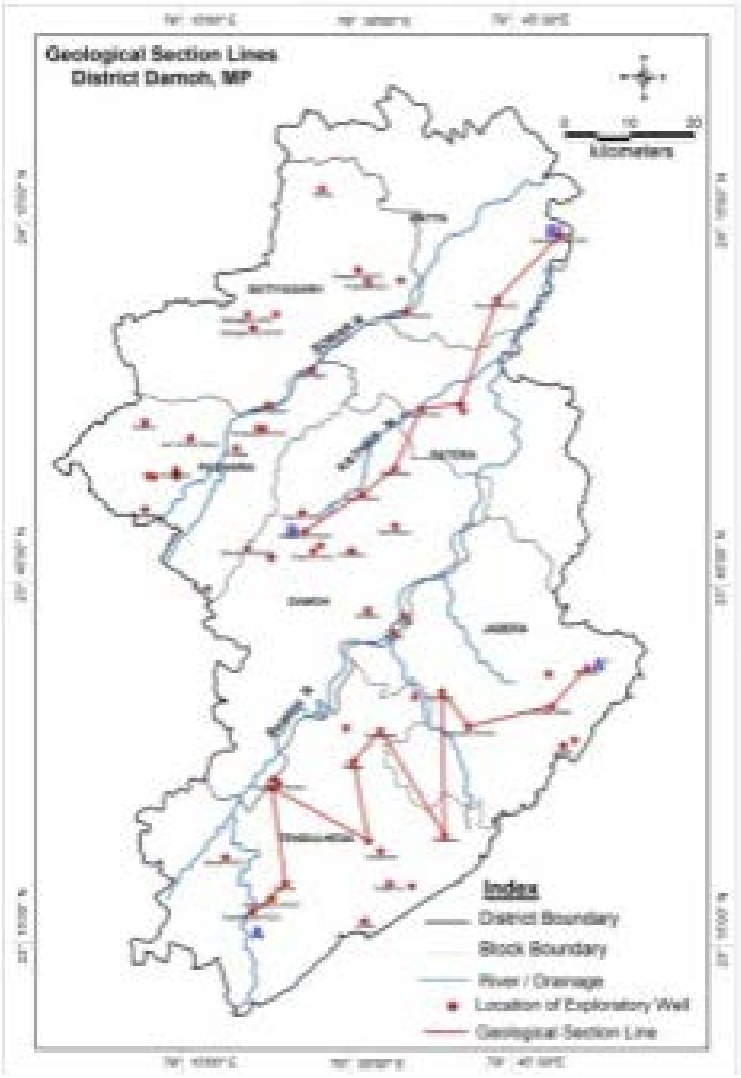


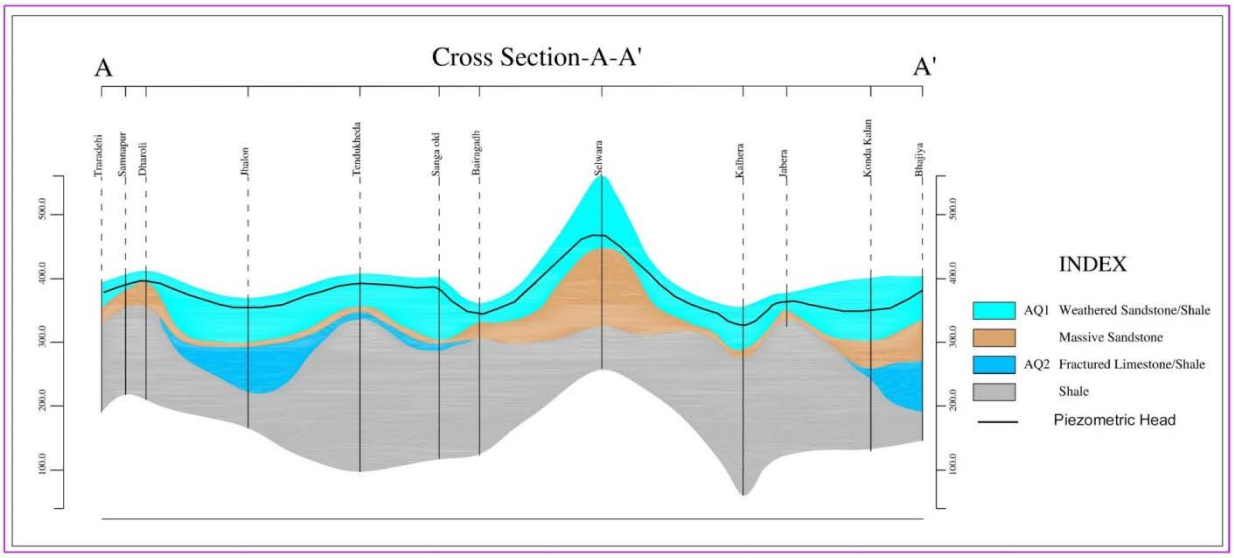

### 3.2.2 Sand stone - Lithological Model





## 3.3 Lithological Cross section



### 3.4 Fence Diagram: 3- Disposition of Lithology

3-D interpretation of lithologs reveals that shallower and deeper weathered /fractured Sand stone, Shale and Limestone is separated by red bole and massive basalt in the district. Water levels are observed at different depth of shallower as well as deeper fractured formation. The deeper fracture rechargesfrom the leaky upper formations also.Table No 7.shows that shallow Piezometer/ Dug wells and deeper Piezometer water level.

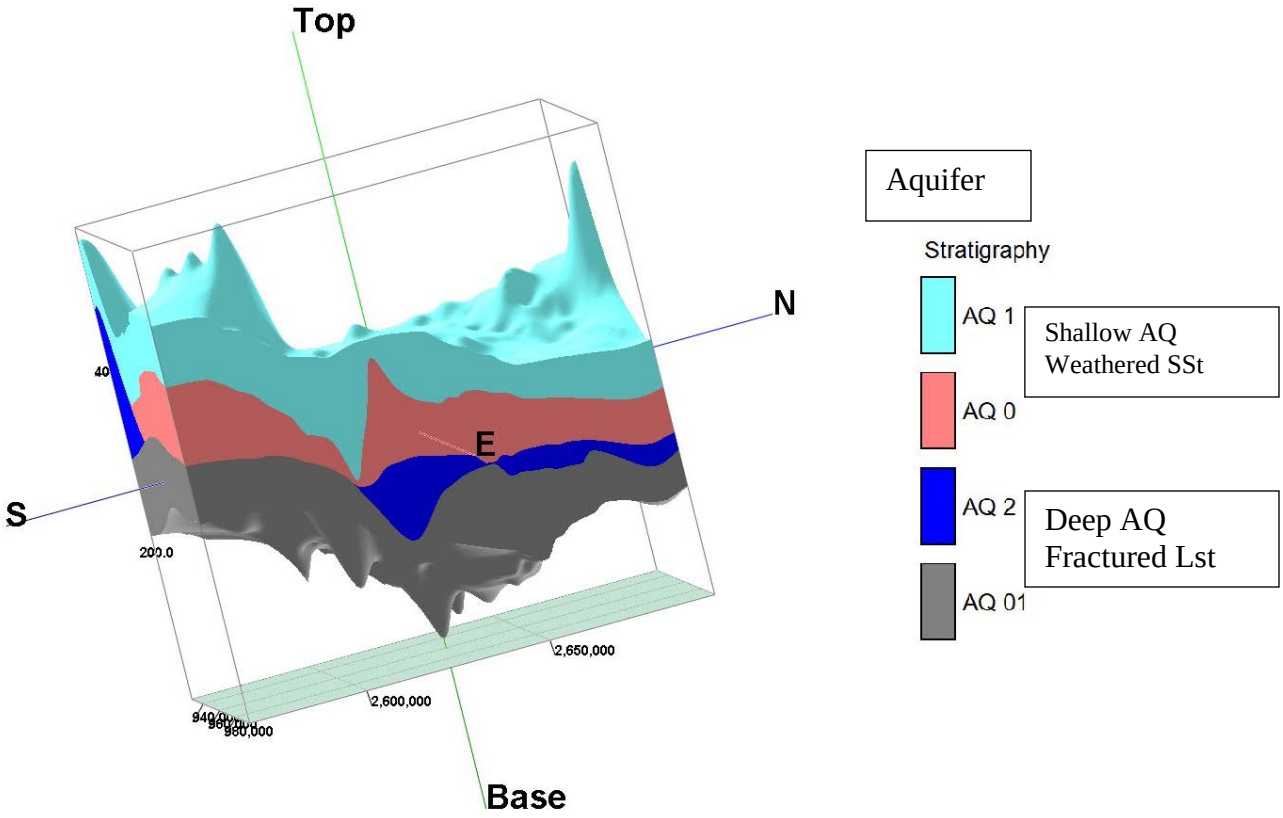


**Table No 7. Shallow Piezometer (S)/ Dug wells and Deeper Piezometer (D) water level.**

| Sr.No | BLOCK_NAME | Location | Longitude | latitude | PRE 2015 | Post 2015 |
|---|---|---|---|---|---|---|
| 1 | DAMOH | Piparia Champat | 79.404444 | 23.955 | 4.35 | 1.8 |
| 2 | JABERA | Jabera1 | 79.701389 | 23.5375 | 14.25 | 1.3 |
| 3 | PATERA | Patera2 | 79.688611 | 23.99722 | 1.5 | 2.35 |
| 4 | JABERA | Tejgarh | 79.546389 | 23.575 | 8.25 | 11.44 |
| 5 | BATIAGARH | *Batiagarh(S) | 79.358889 | 24.10667 | 17.04 | 2.23 |
| 6 | BATIAGARH | Batiagarh1 | 79.353056 | 24.11056 | 11.05 | 9.55 |
| 7 | DAMOH | Abhana | 79.536667 | 23.705 | 3.01 | 5.45 |
| 8 | DAMOH | Damoh(D) | 79.436667 | 23.82278 | 1.93 | 0.15 |
| 9 | DAMOH | Damoh2 | 79.436111 | 23.82833 | 3.05 | 3.01 |
| 10 | DAMOH | Hindoria | 79.566667 | 23.89722 | 8.3 | 7.25 |
| 11 | DAMOH | Palar | 79.469444 | 23.92917 | 8.5 | 4.03 |
| 12 | DAMOH | Piparia Champat | 79.404444 | 23.955 | 3.61 | 5.21 |
| 13 | HATTA | Gaisabad | 79.826944 | 24.25556 | 5.15 | 15.43 |
| 14 | HATTA | Hardua | 79.670833 | 24.175 | 8.4 | 1.19 |
| 15 | HATTA | Hatta(D) | 79.593056 | 24.12972 | 11.37 | 4.22 |
| 16 | JABERA | Bamhori | 79.718889 | 23.7 | 2.4 | 0.87 |
| 17 | JABERA | Jabera(D) | 79.686667 | 23.56389 | 23.46 | 2.84 |
| 18 | JABERA | Jabera1 | 79.701389 | 23.5375 | 14.32 | 20.18 |
| 19 | JABERA | Khamaria | 79.559167 | 23.65 | 3.42 | 40.43 |
| 20 | JABERA | Nohta | 79.573611 | 23.67833 | 3.25 | 10.25 |
| 21 | JABERA | Tejgarh | 79.546389 | 23.575 | 8.25 | 3.12 |
| 22 | PATERA | Bangaon | 79.5175 | 24.00556 | 5.58 | 4.9 |
| 23 | PATERA | Kumhari | 79.815 | 23.92556 | 4.9 | 3.17 |
| 24 | PATERA | Majhgawa | 79.639722 | 24.06556 | 10.1 | 2.37 |
| 25 | PATERA | Patera(D) | 79.678333 | 23.99139 | 6.5 | 3.53 |
| 26 | PATERA | Patera2 | 79.688611 | 23.99722 | 1.65 | 3.09 |
| 27 | PATERA | Bangaon New | 79.516944 | 24.00667 | 7.37 | 3.5 |
| 28 | PATHARIA | Pathria | 79.195833 | 23.89472 | 15 | 2.57 |
| 29 | TENDUKHEDA | Dhangor | 79.477222 | 23.37667 | 6.75 | 0.92 |
| 30 | TENDUKHEDA | Samnapur | 79.386111 | 23.3125 | 1.52 | 4.76 |
| 31 | TENDUKHEDA | Taradehi(D) | 79.357222 | 23.29306 | 20.05 | 10.12 |
| 32 | TENDUKHEDA | Tendukheda(D) | 79.534167 | 23.39306 | 49.4 | 40.5 |
| 33 | TENDUKHEDA | Tendukheda2 | 79.538889 | 23.39639 | 5.95 | 3.25 |

# CHAPTER-IV
# GROUND WATER RESOURCES

## 4.1 Dynamic Ground Water Resource & Draft :

The dynamic ground water resources of the Madhya Pradesh State assessed jointly by the CGWB and State Ground Water Departments under the supervision of the State level Committees. The base year of computation of the resources is 2012-13.

The dynamic ground water resources are also known as Annual Replenishable Ground Water Resources since it gets replenished/ recharged every year. The Annual Replenishable Ground Water Resource for the DamohDistrict has been assessed as 78407.46ham. The major source of ground water recharge is the monsoon rainfall. Block - wise Ground Water Resources of DamohDistrict as on March, 2013 is given in Table No 8 and the presents the over-all scenario of ground water resource utilization and availability of the District. The contribution from other sources such as canal seepage , return flow from irrigation, seepage from water bodies etc in Annual Replenishable Ground Water Resource is more than of 33% in the states.

The assessment of ground water draft is carried out based on the Minor Irrigation Census data and sample surveys carried out by the State Ground Water Departments. The Annual Ground Water Draft of the entire district for 2012-13 has been estimated as 50149.58ham. Agriculture sector remained the predominant consumer of ground water resources. About 90% of total annual ground water draft i.e. 45546.8 ham is for irrigation use. Only 4602.78 ham is for Domestic & Industrial use which is about 10% of the total draft. An analysis of ground water draft figures indicates that in the district 63.96 % is stage of ground water development.

The status of ground water development is high in the two blocks i.e Hatta and Pathariya where the Stage of Ground Water Development is more than 80 %, which implies that in the block the annual ground water consumption is more .The stage of ground water development is 80% and above. In rest of the block the stage of ground water development is below 70%. The ground water development activities have increased generally in the areas where future scope for ground water development existed. This has resulted in increase in stage of ground water development . List of categorization of Blocks / Districts is given in Table No 8

## Table No 8. Dynamic Ground Water Resource -2013, Damoh District ( Zone of Fluctuation) ( MCM)

| Assessment Unit / Block | Command / Non Command | Net Ground Water Availability in Ham | Existing Gross Ground Water Draft for Irrigation in Ham | Existing Gross Ground Water Draft for Domestic & Industrial Water Supply in Ham | Existing Gross Ground Water Draft for All Uses in Ham | Allocation For Domestic & Industrial Water Supply in Ham | Net Ground Water Availability for Future Irrigation Development in Ham | Stage of Ground Water Development in % | Category |
|---|---|---|---|---|---|---|---|---|---|
| Batiyagarh | Non Command | 5441.1 | 4035.42 | 309.9 | 4345.32 | 474 | 931.68 | 79.86 | Safe |
| | Block Total | 5441.1 | 4035.42 | 309.9 | 4345.32 | 474 | 931.68 | 79.86 | |
| Damoh | Command | 1466.42 | 173.21 | 36.16 | 209.37 | 45 | 1248.21 | 14.28 | safe |
| | Non Command | 6218.12 | 3701.7 | 411.17 | 4112.87 | 545.51 | 1970.91 | 66.14 | Safe |
| | Block Total | 7684.54 | 3874.91 | 447.33 | 4322.24 | 590.51 | 3219.12 | 56.25 | |
| Hatta | Non Command | 3819.24 | 2794.66 | 273.28 | 3067.94 | 276 | 748.58 | 80.33 | Semi critical |
| | Block Total | 3819.24 | 2794.66 | 273.28 | 3067.94 | 276 | 748.58 | 80.33 | |
| Jabera | Command | 2686.7 | 206.77 | 152.77 | 359.54 | 238.07 | 2241.86 | 13.38 | Safe |
| | Non Command | 3916.41 | 2163.62 | 198.73 | 2362.35 | 339.93 | 1412.86 | 60.32 | Safe |
| | Block Total | 6603.11 | 2370.39 | 351.5 | 2721.89 | 578 | 3654.72 | 41.22 | |
| Patera | Command | 204.24 | 38.02 | 37.48 | 75.5 | 59.9 | 106.32 | 36.97 | Safe |
| | Non Command | 3805.74 | 1527.23 | 239.15 | 1766.38 | 389.1 | 1889.41 | 46.41 | Safe |
| | Block Total | 4009.98 | 1565.25 | 276.63 | 1841.88 | 449 | 1995.73 | 45.93 | |
| Patheriya | Non Command | 8282.01 | 6674.66 | 333.35 | 7008.01 | 396 | 1211.35 | 84.62 | Semi critical |
| | Block Total | 8282.01 | 6674.66 | 333.35 | 7008.01 | 396 | 1211.35 | 84.62 | |
| Tendukhera | Command | 965.7 | 196.13 | 71.93 | 268.06 | 114.93 | 654.64 | 27.76 | Safe |
| | Non Command | 2398.05 | 1261.98 | 237.47 | 1499.45 | 376.07 | 760 | 62.53 | Safe |
| | Block Total | 3363.75 | 1458.11 | 309.4 | 1767.51 | 491 | 1414.64 | 52.55 | |
| | District Total | 39203.73 | 45546.8 | 4602.78 | 25074.14 | 6509.02 | 26351.64 | 63.96 | Safe |

**Table No 9. Ground Water Resource &Draft (in MCM) -NAQUIM:**

| | **Batiagarh** | **Damoh** | **Hatta** | **Jabera** | **Patera** | **Patharia** | **Tendukheda** | **Total** |
|---|---|---|---|---|---|---|---|---|
| Shallow Aquifer | | | | | | | | |
| **Dynamic Resources (MCM)** | 54.411 | 76.8454 | 38.1924 | 66.0311 | 40.0998 | 82.8201 | 33.6375 | 392.037 |
| **In storage (MCM)** | 29.430 | 22.923 | 27.030 | 28.530 | 21.378 | 34.012 | 30.120 | 193.422 |
| Total Resources (MCM) | **83.841** | **99.768** | **65.222** | **94.561** | **61.478** | **116.832** | **63.758** | **585.460** |
| ***Irrigation*** | 15.739 | 30.714 | 13.626 | 14.894 | 10.185 | 21.464 | 10.196 | 116.819 |
| ***Domestic+Industries*** | 3.090 | 4.470 | 2.730 | 3.510 | 2.76 | 3.330 | 3.090 | 22.980 |
| GW Draft (MCM) | 18.829 | 35.184 | 16.356 | 18.404 | 12.945 | 24.794 | 13.286 | 139.799 |
| | | | | | | | | |
| Deeper Aquifer | | | | | | | | |
| **Static Resources (MCM)** | **33.443** | **16.980** | 19.149 | **19.020** | 19.907 | 48.782 | 14.400 | 242.056 |
| **GW Draft (MCM** | 24.61536 | 8.0352 | 14.3208 | **8.80956** | 5.46696 | 45.28224 | 4.3848 | 110.91492 |
| Total GW Resources (MCM) | 117.284 | 116.748 | 84.371 | 113.581 | 81.384 | 165.614 | 78.158 | 827.515 |
| Gross Ground Water Draft (MCM) | 43.444 | 43.219 | 30.677 | 27.214 | 18.412 | 70.077 | 17.671 | 250.714 |
| Stage of Ground Water Development (%) | **79.84** | **56.24** | **80.32** | **41.21** | **45.92** | **84.61** | **52.53** | **63.95** |
| **Category** | **Semi critical** | **safe** | **Semi critical** | **safe** | **safe** | **Semi critical** | **safe** | **safe** |

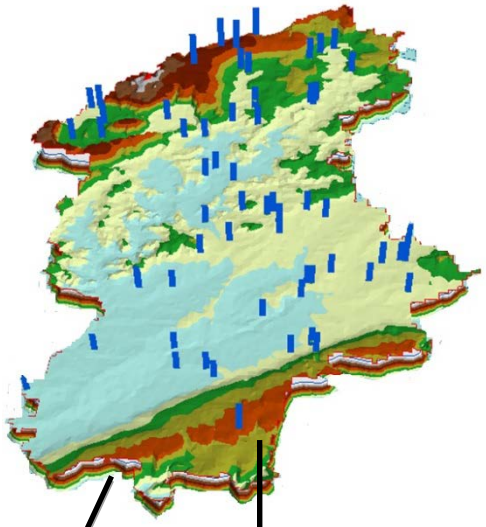
.

**4.2 In storage and Static Ground Water Resource &Draft :**

Ground Water Resource of Weathered /fractured formation below zone of fluctuation upto 30m depth is **19342.2 ham** and 30-200 m bgl depth is computed **24205.6 ham .Total In storage Ground water resources of the district is 43547.8 ham** and draft of bore well /tube well is also calculated separately **13979.9 ham** and **11091.99 ham** given in table no 9.

**4.3 Conceptualisation of Aquifer system, DamohDistrict**

**3-D Model Conceptual Model**



**I - (Shallow aquifer -weathered/fractured gl to 30 m.bgl)**

**II - ( Deeper aquifer - Fractured 30-200 m.bgl )**

| First Aquifer | *Total* |
|---|---|
| **Dynamic Resources (MCM)** | 392.037 |
| **In storage (MCM)** | 193.422 |
| Total Resources (MCM) | **585.460** |
| ***Irrigation*** | 116.819 |
| ***Domestic+Industries*** | 22.980 |
| GW Draft (MCM) | 139.799 |

| Second Aquifer | *Total* |
|---|---|
| **Static Resources (MCM)** | 242.056 |
| **GW Draft (MCM** | 110.91492 |

| | |
|---|---|
| **Total GW Resources (MCM)** | **827.515** |
| **Gross Ground Water Draft (MCM)** | **250.714** |
| **Stage of Ground Water Development (%), category.** | **63.95, safe** |

# CHAPTER-V
# GROUND WATER RELATED ISSUES

## 5.1 Ground Water Depletion

In last two decade Damohdistrict has shown growth in Industry as well as in Agriculture sector , resultant is pressure came on ground water utilization ,Groundwater is the only source of irrigation in 90 % of the part of Jabera, Patera and Tendukhedablocks, where canal irrigation exists. Farmers solely depend on groundwater for irrigation. Every year number and depth of bore wells are increasing. The yield of the dug wells in shallow aquifer (0-30 mbgl) is reduced due to over development of deep fractured aquifer by bore wells. The phreatic aquifer is recharged during monsoon and the dug wells sustains for 3 to 4 months only The dug wells sustain only for 2 to 3 hours of pumping with a drawdown of 2 to 5 m. Decline in groundwater level is observed in last decade is 0.05m in Batiyagarh to maximum 2.26m in Pathariya blockand overall decline in last ten years in Damoh district is about 0.98m. The saturated thickness of the shallow aquifer in pre monsoon is 3.8 to 10 m. and post-monsoon : 1.16 to 12 m. In the year 2012-13, Ground water resource of District was computed and data reveals that Damoh, Jabera, Patera & Tendukhedablocks having stage of ground water development,66.14%,41.22%,45.93%,64.62,&52.55 %,respectively and they were categorized safe . In three blocks Batiyagarh , Hatta &Pathariya having stage of ground water development79.86%, 80.33% & 84.22% respectively and they were categorizedSemi Critical .

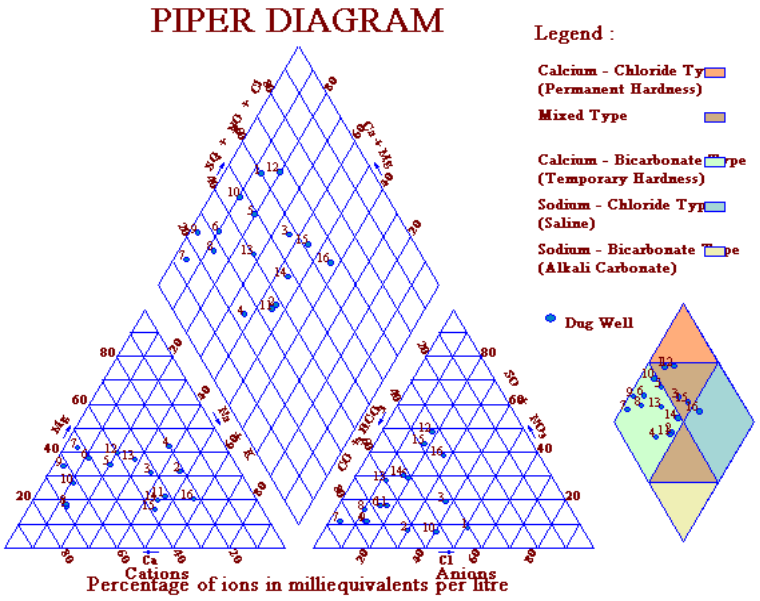
## 5.2 Ground Water Quality :

The water samples were collected from National Hydrograph Stations 16 different locations of Damoh district during May 2015

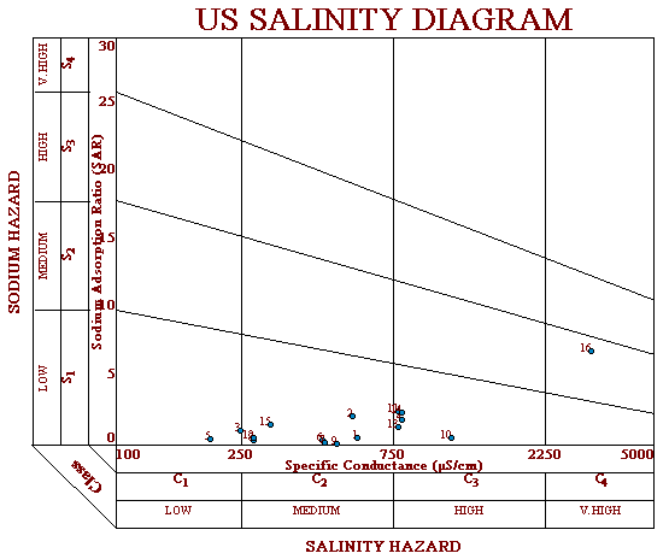
The pH of ground water of Damoh district ranged in between 7.50 to 9.08. As per BIS recommendation, all water samples recorded within the permissible limit of 6.5 to 8.5. In the Damoh district, pH has been observed more than 8.5 in the dug well of Bamori (8.58), Samnapur (9.00) and Piparia Champat (9.08). The ground water of the study area can be assessed as neutral to slightly alkaline in nature. The electrical conductivity of ground water in Damoh districtranged between 200 to 3160 µS/cm at 25°C. The EC values more than the 3000 µS/cm 25°C were recorded only at Abhana i.e. 3160 µS/cm at 25°C. The electrical conductivity shows that the ground water in Damoh districtis good to slightly saline in nature.

The fluoride concentration in Damoh districtranged in between 0.28 to 0.89 mg/l. The BIS has set the maximum concentration of fluoride in drinking water is 1.5 mg/l as permissible limit. In the district has not been observed fluoride concentration more than 1.5 mg/l and the maximum concentration of fluoride has been recorded in the dug well of Damoh i.e. 0.89 mg/l.In the district, nitrate concentration in ground water ranged in between 10 to 154 mg/l.The 81% ground water recorded nitrate concentration within the acceptable limit of 45 mg/l and 19% water samples recorded more than 45 mg/l as BIS recommendation.The highest concentration of nitrate has been detected in ground water of Abhana (154 mg/l), Bangaon (54 mg/l) and Palar (47 mg/l). High nitrate in ground water appears may be due to anthropogenic activities or excessive use of fertilizers etc.Total hardness of ground water in the study area ranged in between 80 to 675 mg/l. The maximum concentration has been observed in the dug well of Abhana (675 mg/l).

In the district water is Mixed type, Sodium Chloride (saline), Calcium Bi-carbonate (temporary hardness) types of water. The US Salinity Diagram of Damoh districtshows the ground water is low to high salinity classes i.e. $C_1S_1$, $C_2S_1$, $C_3S_1$, and $C_4S_2$. $C_3$ and $C_4$ classes of water should not be used for irrigation purpose unless proper soil management.




1. Tejgarh
2. Samnapur
3. Piparia Champat
4. Palar
5. Nohta
6. Majhgawa
7. Jabera1
8. Hindoria
9. Hardua
10. Gaisabad
11. Dhangor
12. Damoh2
13. Batiagarh
14. *Bangaon
15. Bamhori
16. Abhana




1. Tejgarh
2. Samnapur
3. Piparia Champat
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6. Majhgawa
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9. Hardua
10. Gaisabad
11. Dhangor
12. Damoh2
13. Batiagarh
14. *Bangaon
15. Bamhori
16. Abhana

# CHAPTER-VI
# GROUND WATER MANAGEMENT STRATEGIES

## 6.1 District Ground Water Management Plan

The demand of fresh water for agriculture, drinking and industrial uses etc. has significantly increased due to population growth and socio-economic development. As surface water resources in the district are in-adequate, the dependability on ground water resources has increased substantially. This has resulted in rapid exploitation of ground water resources vis a vis depletion of ground water levels in various parts of the State.

The **District Damoh** is one of the under stress, rapid exploitation of ground water resources in the district , ground water resources in the area are under continuous depletion. Thus there is urgent need for taking up suitable water management interventions based on integrated approach, which on one hand includes augmentation of ground water resources through appropriate techniques, and on the other hand requires the adoption of suitable water conservation measures, such as ensuring water use efficiency through creation of additional water storage facility, maintenance/ renovation of existing water bodies etc. Water awareness and capacity building of the stakeholders are also the important attributes of water management interventions as envisaged in the National Water Policy.

Artificial recharge to ground water is one of the most efficient, scientifically proven and cost effective technology to mitigate the problems of over exploitation of ground water resources. The technology serves as a means for restoring the depleted ground water storage, ameliorate the ground water quality problems and also enhance the sustainability of wells in the affected areas. A detailed knowledge of geology, hydrogeology, land use pattern, geomorphology and hydro-meteorological features are however, essential for selection of appropriate artificial recharge techniques as well as design and sites of ground water recharge structures.

As per directions of Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India, preparation of Aquifer Management Plan for Damohdistrict in the State has been prepared block wise as shown in Table no12 and financial out lay plan is also shown in Table No13. Each Plan discusses the broad framework of ground water situation in the block, status of water availability (both surface and ground water), identification of feasible areas for

interventions, feasibility of artificial recharge and other water conservation structures, their design considerations, numbers and cost estimates. The expected outcomes of the proposed interventions have also been elucidated and given in table no 17. As Damohdistrict having **Stage Of Development 62.96%** after implementation of proposed intervention **Stage Of Development willbe 41.84%.**

**Table No 11: Dynamic Ground Water Resource**

| Assessment Unit / Block | Net Ground Water Availability in MCM | Existing Gross Ground Water Draft for Irrigation in MCM | Existing Gross Ground Water Draft for Domestic & Industrial Water Supply in MCM | Existing Gross Ground Water Draft for All Uses in MCM | Stage of Ground Water Development in % | Category |
|---|---|---|---|---|---|---|
| Batiyagarh | 54.41 | 40.35 | 3.10 | 43.45 | 79.86 | Safe |
| Damoh | 76.84 | 38.74 | 4.47 | 43.22 | 56.25 | Safe |
| Hatta | 38.19 | 27.94 | 2.73 | 30.67 | 80.33 | Semi-Critical |
| Jabera | 66.03 | 23.70 | 3.52 | 27.21 | 41.22 | Safe |
| Patera | 40.09 | 15.65 | 2.77 | 18.41 | 45.93 | Safe |
| Patheriya | 82.82 | 66.74 | 3.33 | 70.08 | 84.62 | Semi-Critical |
| Tendukhera | 33.63 | 14.58 | 3.09 | 17.67 | 52.55 | Safe |
| **District Total** | **392.03** | **227.73** | **23.01** | **250.74** | **62.96** | **Safe** |

**Table No 12:DamohDistrict , Block Wise Management Plan- NAQUIM**
**(Source Water for Artificial Recharge and number of Recharge Structure)**

| Block | Rainfall (m) | Area (Sq Km) | Area suitable for recharge (Sq Km) | Average post-monsoon water level (m) | Unsaturated zone (m) | Average SP Yield (%) | Sub-surface storage (mcm) | Surface water required (mcm) | Surface water (Run-off) available (mcm) | Non-committed Run-off (mcm) | Percolation tank | Recharge shaft/ Tube well | NB/ CD/ CP | No of Villages |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Batiagarh** | 1.173 | 1225 | 891.82 | 5.28 | 2.28 | 0.015 | 30.500 | 40.57 | 330.75 | 99.23 | 41 | 142 | 284 | 177 |
| **Damoh** | 1.173 | 1304 | 849 | 3.841 | 0.841 | 0.015 | 10.710 | 14.24 | 352.08 | 105.62 | 14 | 28 | 100 | 221 |
| **Hatta** | 1.173 | 865 | 491 | 3.78 | 0.78 | 0.015 | 5.745 | 7.64 | 233.55 | 70.07 | 8 | 15 | 53 | 57 |
| **Jabera** | 1.173 | 1262 | 634 | 3.35 | 0.35 | 0.015 | 3.329 | 4.43 | 340.74 | 102.22 | 4 | 9 | 31 | 179 |
| **Patera** | 1.173 | 723 | 577 | 3.49 | 0.49 | 0.015 | 4.241 | 5.64 | 195.21 | 58.56 | 6 | 11 | 39 | 156 |
| **Patharia** | 1.173 | 970 | 903.37 | 4.28 | 1.28 | 0.015 | 17.345 | 23.07 | 261.90 | 78.57 | 23 | 46 | 161 | 132 |
| **Tendukheda** | 1.173 | 957 | 400 | 3.44 | 0.44 | 0.015 | 2.64 | 3.51 | 258.39 | 77.52 | 4 | 7 | 25 | 181 |
| **TOTAL** | | **7306** | **4746.19** | | | | **74.509** | **99.10** | **1972.62** | **591.79** | **99** | **198** | **693** | **1103** |

**Table No13:Financial Outlay Plan**

| Block | Area Suitable for AR | Volume of Surface Water available for AR | Volume of Water required for recharge | Proportionate Surface water for planning AR | Percolation Tanks | | NB/ CD/ CP | | Recharge shaft/ Tube well | | Renovation of Village Ponds | | Total Cost of RS in crores |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sq.Km | (MCM) | (MCM) | (MCM) | structure | cost | structure | cost | structure | cost | structure | cost | |
| | | | | | Nos | (crores) | Nos | (crores) | Nos | (crores) | Nos | (crores) | |
| **Batiagarh** | 891.82 | 330.75 | 40.56 | 99.225 | 41 | 8.2 | 283.95 | 28.39 | 142 | 7.1 | 177 | 3.54 | 47.24 |
| **Damoh** | 849 | 352.08 | 14.24 | 105.624 | 14 | 2.8 | 99.71 | 9.97 | 28 | 1.4 | 221 | 4.42 | 18.59 |
| **Hatta** | 491 | 233.55 | 7.640 | 70.065 | 8 | 1.6 | 53.48 | 5.34 | 15 | 0.75 | 57 | 1.14 | 8.84 |
| **Jabera** | 634 | 340.74 | 4.42 | 102.222 | 4 | 0.8 | 30.98 | 3.09 | 9 | 0.45 | 179 | 3.58 | 7.93 |
| **Patera** | 577 | 195.21 | 5.64 | 58.563 | 6 | 1.2 | 39.48 | 3.94 | 11 | 0.55 | 156 | 3.12 | 8.82 |
| **Patharia** | 903.37 | 261.9 | 23.06 | 78.57 | 23 | 4.6 | 161.47 | 16.14 | 46 | 2.3 | 132 | 2.64 | 25.69 |
| **Tendukheda** | 400 | 258.39 | 3.51 | 77.517 | 4 | 0.8 | 24.57 | 2.45 | 7 | 0.35 | 181 | 3.62 | 7.23 |
| **TOTAL** | **4746.19** | **1972.62** | **99.09728** | **591.786** | **100** | **20** | **693.68** | **69.36** | **258** | **12.9** | **1103** | **22.06** | **124.33** |

## 6.2 Intervention of Technology

### 6.2.1 The drip irrigation technology

Rising demand for irrigation water amid concerns of growing water scarcity has brought into renewed focus the need for improving water use efficiency and raising crop water productivity. Great emphasis is being made on achieving water conservation through various demand side management interventions encompassing technological options and policy measures. Given the difficulties and political concerns associated with bringing about effective policy reforms to achieve the objective of water conservation, this emphasis has generally focused on technological solutions backed by soft policy interventions to aid and facilitate adoption of technological solutions by farmers.

Micro irrigation technologies such *drip and sprinkler* systems are being increasingly promoted as technological solutions for achieving water conservation. Of the two technologies, drip irrigation, its various forms, has been a relatively more important mode of micro irrigation in India. Enough empirical evidence is available from different parts of the country to suggest that drip technology saves water and is cost effective and has significant economic and social benefits. Drip irrigation saves water and electricity for pumping water, uses less labor and leads to higher crop productivity.

Farmers in India generally practice flood irrigation resulting in low water application and use efficiency. The estimated surface irrigation water use efficiency in India is 35-40%.With deteriorating surface water infrastructure and rapid declines in ground water tables in large parts of the country, and in the face of increasing demand for water from all sectors of the economy, there is a widespread concern for using the available water more efficiently. Micro irrigation systems, comprised of drip and sprinkler technologies, have emerged as an effective tool for water conservation and improving water use efficiency. While drip irrigation is ideally suited for horticulture crops such as pomegranates, grapes, mangoes, bananas, guava, coconuts, *amla*, and cash crops such as sugarcane, it is being used for cultivationofothercropsaswell.Sprinklersaregenerallyusefulinundulatinglandplanted with cereal crops. Despite substantial efforts in promoting demand side management technologies, in practice, drip and sprinkler technologies have been slow to be accepted by farmers. Of the two, drip irrigation is the more preferred technology.

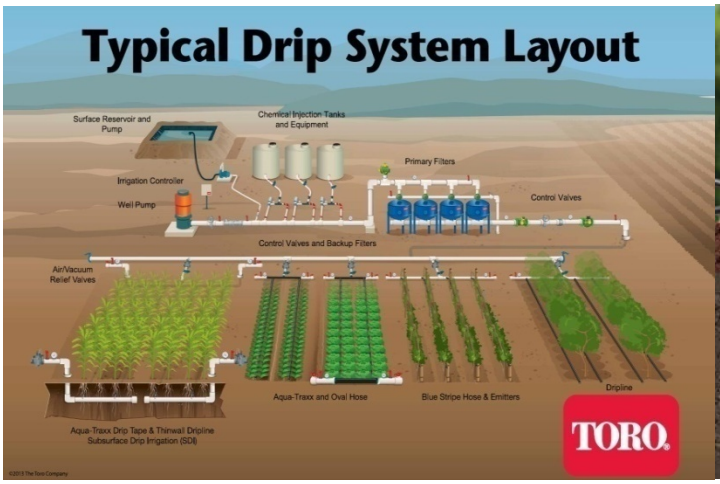
Drip irrigation is an irrigation method which enables saving water by allowing water to drip slowly to the roots of plants, either on the soil surface or directly into the root zone. Drip irrigation methods range from simple bucket kit systems for small farms to automated systems linking release of water to soil moisture conditions measured continuously by tensio-meters. Drip Irrigation technologies can be categorized into two groups based on their technical, economic and social attributes. These are low cost drip irrigation technologies and pressurisedsystems.Thelowcostdripirrigationtechnologiesincludethe“pepsee[3],”easydrip, various kinds of affordable drip irrigation systems designed by IDE, and micro tube drip systems.

***Drip Irrigation in India: current status and potential application***

It is now possible to use drip and sprinkler irrigation to a wide variety of crops. Various estimates of potential and actual are a under micro irrigation technologies have been made available by different researchers and institutions.

**Table No14:Selectedareacovered(in hectares)under micro irrigation in Madhya Pradesh**

| State | Drip | Sprinkler | Total |
|---|---|---|---|
| | Area In Ha | | |
| Madhya Pradesh | 20,432 | 117,685 | 138,117 |




### 6.2.2 Sprinkler Irrigation System

To reduce the ground water draft in Damoh district it is proposed that total irrigated Area 184919 ha which is irrigated by ground water , if 50% of this area i.e 92460 ha is to be irrigate by using sprinkler then total ground water save in one year is about 33.87 MCM. The block wise area proposed for irrigation through sprinkles is given in table no15.

**Table No 15:Irrigated Area (ha) proposed for irrigation through SprinklerSystem ,Damoh District**

| Block | Irrigated Area (ha) | 50% Irrigated Area (ha) proposed for irrigation through sprinkler | No. of Sprinklers proposed/ ha | Saving by Sprinkler in MCM |
|---|---|---|---|---|
| DAMOH | 16899 | 8449.5 | 25 | 6.76 |
| PATHARIYA | 14635 | 7317.5 | 25 | 5.85 |
| JABERA | 8030 | 4015 | 25 | 3.21 |
| TENDUKHERA | 7374 | 3687 | 25 | 2.95 |
| BATIYAGARH | 21534 | 10767 | 25 | 8.61 |
| HATTA | 9833 | 4916.5 | 25 | 3.93 |
| PATERA | **6361** | 3180.5 | 25 | 2.54 |
| Total | 84666 | 42333 | | 33.87 |

**Table No 16:DamohDistrict , Management Plan after Intervention**

| Block | Net GW Availability MCM | Gross Draft in MCM | Stage of Development % | Water Saving by sprinkler in mcm @0.08 m | Additional GW created by AR str.in MCM | Net GW Availability after construction AR str. MCM | After intervention of AR Structure & utilization of 60% of additional GW created. in MCM | Draft after sprinkler & additional GW created for agriculture in MCM | Stage of Development(%) after management plan implementation | Additional area Irrigated by GW after Intervention in Ha |
|---|---|---|---|---|---|---|---|---|---|---|
| Batiyagarh | 54.41 | 43.45 | **79.86** | 6.76 | 30.5 | 84.91 | 18.3 | 54.99 | **64.76** | 4575 |
| Damoh | 76.84 | 43.22 | **56.25** | 5.85 | 10.71 | 87.55 | 6.426 | 43.796 | **50.02** | 1606.5 |
| Hatta | 38.19 | 30.67 | **80.33** | 3.21 | 5.745 | 43.935 | 3.447 | 30.907 | **70.34** | 861.75 |
| Jabera | 66.03 | 27.21 | **41.22** | 2.95 | 3.329 | 69.359 | 1.9974 | 26.2574 | **37.85** | 499.35 |
| Patera | 40.09 | 18.41 | **45.93** | 8.61 | 4.241 | 44.331 | 2.5446 | 12.3446 | **27.84** | 636.15 |
| Patheriya | 82.82 | 70.08 | **84.62** | 3.93 | 17.345 | 100.165 | 10.407 | 76.557 | **76.43** | 2601.75 |
| Tendukhera | 33.63 | 17.67 | **52.55** | 2.54 | 2.64 | 36.27 | 1.584 | 16.714 | **46.08** | 396 |
| Total | 392.01 | 250.71 | **62.96** | 33.87 | 74.51 | 466.52 | 44.706 | 261.566 | **56.06** | 11176.5 |

# VII CONCLUSIONS AND RECOMMENDATIONS

- Damoh District occupies an area of 7306 Sq.Km and recharge worthy area is 4749sq. km. and the rest is covered by hilly and forest area.
- The major rivers flowing through the area includes the river **Ken, Bewas, Sonar and Bamner.**
- The major part of the district is covered by Vindhayan sandstones ,Shale and limestone.
- Damoh district comprises of seven blocks, namely Batiyagarh, Damoh, Hatta, Jabera, Patera, Patheriya& Tendukheda.
- The phreatic aquifer is recharged during monsoon and sustains for 3 to 4 months.
- More stress on Groundwater, 93.43 % of irrigation carried out by Ground water and 6.57% of irrigation by surface water.
- Groundwater decline more than 0.20 m/year. More decline in Jabera& Tendukheda Block.
- Isolated pockets of high concentration of Nitrate in parts of Damoh & Hatta Blocks ($NO^3$> 45 mg/l)
- On the basis of the 63 Exploratory borewells drilled by CGWB, NCR under its Exploratory and 5 Exploratory borewells drilled under NAQUIM program, it has been observed that the yield varies from 3-6 $m^3$/hrshallow aquifer and 3 to 20$m^3$/hr in deep aquifer.
- As per the Dynamic Ground Water Resource Assessment Report (2013), the net ground water availability in the district is **392.03**MCM and ground water draft for all uses is 250.75 MCM, resulting the stage of ground water development to be 63.96 % as a whole for district. The Damoh district falls under safe category.
- 2 (semi critical) Hatta & Pathariya out of 7Blocks
- After the interventions suggested in the report, the stage of development is expected to improve by 7.9 % i.e. from 63.96% to 56.06% for the Damoh district.
- As per the Management plan prepared under NAQUIM of all the Block of Damoh District, a total number of 100 Percolation Tanks, 258 Recharge Shafts/Tube wells and 693 Nala Bunds/Check Dams/Cement Plugs have been proposed .
- Financial expenditure is expected to be Rs 124.33 Cores in Damoh District for sustainable development and management of ground water resources.

- The number of artificial recharge structure and financial estimation has been proposed based on the CGWB Master plan 2013. It may be differ from the field condition as well as Changes in dynamic Ground water recourses.

- It is also recommended implementation intervention would be in Two Phases, First Phase should be in those blocks where stage of Development is more than 80 %.

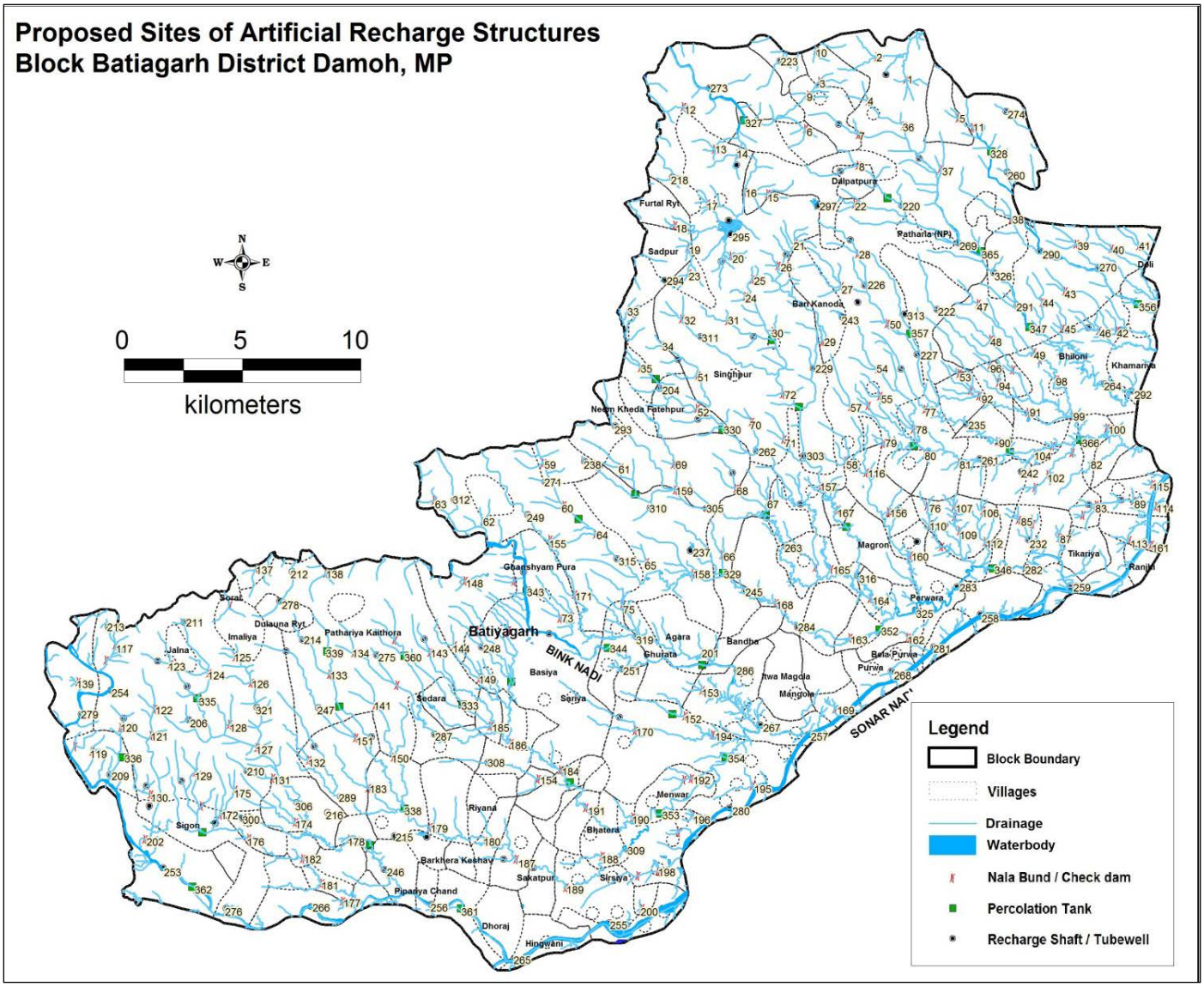
# VIII BLOCK WISE MANGEMENT PLAN

## 8.1 BLOCK BATIAGARH MANGEMENT PLAN

| Type of Structure | Number | Cost INR in Crores |
|---|---|---|
| **Percolation Tanks** | 41 | 8.2 (Rs 20 Lakh Per Stucture) |
| **NB/CD/CP** | 284 | 28.39 (Rs Five Lakh Per Stucture) |
| **Recharge Shaft/ Tube Wells** | 142 | 7.10 (Rs 10 Lakh Per Stucture) |
| Renovation of Village Ponds | 177 | 3.54 (Rs two Lakh Per Stucture) |
| **Total Cost** | | **47.24** |

### IMPACT

| Block | Net GW Availability MCM | Gross Draft in MCM | Stage of Development % | Water Saving by sprinkler in mcm @0.08 m | Additional GW created by AR str.in MCM | Net GW Availability after construction AR str. MCM | After intervention of AR Structure & utilization of 60% of additional GW created. in MCM | Draft after sprinkler & additional GW created for agriculture in MCM | Stage of Development( %) after management plan implementation | Additional area Irrigated by GW after Intervention in Ha |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batiyagarh** | **54.41** | **43.45** | **79.86** | **6.76** | **30.5** | **84.91** | **18.3** | **54.99** | **64.76** | **4575** |


Proposed Sites of Artificial Recharge Structures
Block Batiagarh District Damoh, MP
N
W
E
S
0
5
10
kilometers
Batiyagarh
BINK NADI
SONAR NADI
Dilipatpura
Furtal Ryt
Patharia (NP)
Sadpur
Bari Kanoda
Singhpur
Neem Kheda Fatehpur
Bhiloni
Khamariya
Deli
Magron
Tikariya
Ranjhi
Perwara
Ghanshyam Pura
Agara
Bandha
Ghurata
Basiya
Soriya
Itwa Magda
Mangola
Bela Purwa
Purwa
Sedara
Dulauna Ryt
Pathariya Kaithora
Imaliya
Jalna
Sorai
Menwar
Riyana
Bhatera
Sigon
Barkhera Keshav
Sakatpur
Sirsiya
Pipadya Chand
Dhoraj
Hingwani
Legend
Block Boundary
Villages
Drainage
Waterbody
Nala Bund / Check dam
Percolation Tank
Recharge Shaft / Tubewell

## (i) Nala bund

| Sr no | Longitude | Latitude | Sr no | Longitude | Latitude | Sr no | Longitude | Latitude |
|---|---|---|---|---|---|---|---|---|
| 1 | 79.5053 | 24.3236 | 41 | 79.6023 | 24.2606 | 81 | 79.5274 | 24.1783 |
| 2 | 79.4932 | 24.3321 | 42 | 79.5934 | 24.2283 | 82 | 79.5828 | 24.1776 |
| 3 | 79.4693 | 24.3228 | 43 | 79.5715 | 24.2434 | 83 | 79.5845 | 24.1622 |
| 4 | 79.4896 | 24.3155 | 44 | 79.562 | 24.2391 | 84 | 79.5789 | 24.1585 |
| 5 | 79.5271 | 24.309 | 45 | 79.5703 | 24.2291 | 85 | 79.5521 | 24.1567 |
| 6 | 79.4634 | 24.3049 | 46 | 79.5855 | 24.2284 | 86 | 79.5581 | 24.1552 |
| 7 | 79.4856 | 24.3027 | 47 | 79.5354 | 24.2386 | 87 | 79.5691 | 24.15 |
| 8 | 79.4854 | 24.291 | 48 | 79.5406 | 24.2251 | 88 | 79.5736 | 24.1506 |
| 9 | 79.4647 | 24.3177 | 49 | 79.5584 | 24.2202 | 89 | 79.6 | 24.1638 |
| 10 | 79.468 | 24.3345 | 50 | 79.4975 | 24.231 | 90 | 79.5436 | 24.1863 |
| 11 | 79.533 | 24.3054 | 51 | 79.4187 | 24.2115 | 91 | 79.5561 | 24.1974 |
| 12 | 79.4127 | 24.3132 | 52 | 79.4184 | 24.1989 | 92 | 79.5357 | 24.2035 |
| 13 | 79.4256 | 24.2971 | 53 | 79.5274 | 24.2121 | 93 | 79.5323 | 24.2058 |
| 14 | 79.4353 | 24.2953 | 54 | 79.4935 | 24.2139 | 94 | 79.5438 | 24.2086 |
| 15 | 79.4477 | 24.2802 | 55 | 79.4944 | 24.2036 | 95 | 79.5498 | 24.2135 |
| 16 | 79.4381 | 24.2811 | 56 | 79.4896 | 24.2 | 96 | 79.5405 | 24.2154 |
| 17 | 79.4226 | 24.2766 | 57 | 79.4824 | 24.1994 | 97 | 79.5614 | 24.2175 |
| 18 | 79.409 | 24.2682 | 58 | 79.4803 | 24.1788 | 98 | 79.5679 | 24.2099 |
| 19 | 79.4148 | 24.2601 | 59 | 79.3543 | 24.1782 | 99 | 79.5749 | 24.1958 |
| 20 | 79.4326 | 24.2566 | 60 | 79.3628 | 24.162 | 100 | 79.5891 | 24.1915 |
| 21 | 79.4591 | 24.2615 | 61 | 79.3865 | 24.1764 | 101 | 79.5745 | 24.1821 |
| 22 | 79.4841 | 24.2763 | 62 | 79.3294 | 24.1558 | 102 | 79.5645 | 24.1737 |
| 23 | 79.4148 | 24.2501 | 63 | 79.3089 | 24.1639 | 103 | 79.5591 | 24.1689 |
| 24 | 79.4386 | 24.2413 | 64 | 79.3761 | 24.1512 | 104 | 79.5592 | 24.1819 |
| 25 | 79.4414 | 24.2478 | 65 | 79.3972 | 24.1406 | 105 | 79.5664 | 24.1847 |
| 26 | 79.4521 | 24.2529 | 66 | 79.4287 | 24.1435 | 106 | 79.5373 | 24.1602 |
| 27 | 79.4783 | 24.2452 | 67 | 79.448 | 24.1639 | 107 | 79.5253 | 24.1616 |
| 28 | 79.4853 | 24.2575 | 68 | 79.4346 | 24.1685 | 108 | 79.5255 | 24.1578 |
| 29 | 79.4705 | 24.2242 | 69 | 79.4084 | 24.1777 | 109 | 79.5277 | 24.1524 |
| 30 | 79.45 | 24.228 | 70 | 79.441 | 24.1938 | 110 | 79.5154 | 24.1551 |
| 31 | 79.4312 | 24.2322 | 71 | 79.4545 | 24.1871 | 111 | 79.5202 | 24.1464 |
| 32 | 79.412 | 24.2327 | 72 | 79.4539 | 24.2044 | 112 | 79.5383 | 24.1484 |
| 33 | 79.3899 | 24.2358 | 73 | 79.3612 | 24.1194 | 113 | 79.5981 | 24.149 |
| 34 | 79.4046 | 24.2227 | 74 | 79.3661 | 24.12 | 114 | 79.6096 | 24.1618 |
| 35 | 79.3949 | 24.2143 | 75 | 79.3872 | 24.1242 | 115 | 79.608 | 24.1702 |
| 36 | 79.5044 | 24.306 | 76 | 79.5141 | 24.1619 | 116 | 79.4887 | 24.1745 |
| 37 | 79.5197 | 24.2897 | 77 | 79.5133 | 24.1986 | 117 | 79.1761 | 24.1092 |
| 38 | 79.5493 | 24.2706 | 78 | 79.5084 | 24.191 | 118 | 79.1723 | 24.1034 |
| 39 | 79.5763 | 24.2611 | 79 | 79.4958 | 24.1857 | 119 | 79.1664 | 24.0688 |
| 40 | 79.5907 | 24.2595 | 80 | 79.5132 | 24.1812 | 120 | 79.1784 | 24.0778 |

| Sr no | Longitude | Latitude | Sr no | Longitude | Latitude |
|---|---|---|---|---|---|
| 121 | 79.191 | 24.0749 | 161 | 79.6076 | 24.1473 |
| 122 | 79.1923 | 24.0849 | 162 | 79.5061 | 24.1121 |
| 123 | 79.1991 | 24.1019 | 163 | 79.482 | 24.1119 |
| 124 | 79.215 | 24.0985 | 164 | 79.4905 | 24.1268 |
| 125 | 79.226 | 24.1046 | 165 | 79.4741 | 24.138 |
| 126 | 79.2327 | 24.0948 | 166 | 79.4676 | 24.1386 |
| 127 | 79.2351 | 24.0703 | 167 | 79.4769 | 24.1604 |
| 128 | 79.2237 | 24.0791 | 168 | 79.4512 | 24.125 |
| 129 | 79.2094 | 24.0609 | 169 | 79.4758 | 24.0849 |
| 130 | 79.1907 | 24.0526 | 170 | 79.3926 | 24.0767 |
| 131 | 79.2416 | 24.0588 | 171 | 79.3673 | 24.1283 |
| 132 | 79.2566 | 24.0655 | 172 | 79.2198 | 24.0448 |
| 133 | 79.2653 | 24.0981 | 173 | 79.2118 | 24.0482 |
| 134 | 79.2755 | 24.1062 | 174 | 79.2511 | 24.042 |
| 135 | 79.2925 | 24.1111 | 175 | 79.2258 | 24.0543 |
| 136 | 79.2236 | 24.1242 | 176 | 79.2315 | 24.0359 |
| 137 | 79.2347 | 24.1382 | 177 | 79.2706 | 24.012 |
| 138 | 79.2637 | 24.1363 | 178 | 79.2736 | 24.0356 |
| 139 | 79.1606 | 24.0952 | 179 | 79.3069 | 24.0402 |
| 140 | 79.1592 | 24.0707 | 180 | 79.3298 | 24.035 |
| 141 | 79.2844 | 24.0864 | 181 | 79.262 | 24.0188 |
| 142 | 79.2933 | 24.094 | 182 | 79.254 | 24.0282 |
| 143 | 79.3072 | 24.1064 | 183 | 79.2814 | 24.0549 |
| 144 | 79.3171 | 24.109 | 184 | 79.3615 | 24.0617 |
| 145 | 79.3264 | 24.1143 | 185 | 79.3322 | 24.0785 |
| 146 | 79.3398 | 24.1147 | 186 | 79.3409 | 24.072 |
| 147 | 79.3421 | 24.1334 | 187 | 79.3429 | 24.0279 |
| 148 | 79.3217 | 24.1336 | 188 | 79.3788 | 24.0291 |
| 149 | 79.3278 | 24.0965 | 189 | 79.3637 | 24.0172 |
| 150 | 79.2919 | 24.0666 | 190 | 79.3916 | 24.0439 |
| 151 | 79.2762 | 24.0741 | 191 | 79.372 | 24.0475 |
| 152 | 79.4133 | 24.0822 | 192 | 79.4159 | 24.0586 |
| 153 | 79.4205 | 24.0921 | 193 | 79.4128 | 24.0581 |
| 154 | 79.3521 | 24.0585 | 194 | 79.4248 | 24.0751 |
| 155 | 79.357 | 24.1491 | 195 | 79.4414 | 24.0558 |
| 156 | 79.4981 | 24.1596 | 196 | 79.4165 | 24.0445 |
| 157 | 79.4699 | 24.1693 | 197 | 79.4106 | 24.0383 |
| 158 | 79.4166 | 24.1362 | 198 | 79.402 | 24.0234 |
| 159 | 79.4093 | 24.1679 | 199 | 79.3936 | 24.0216 |
| 160 | 79.507 | 24.1431 | 200 | 79.3953 | 24.0093 |
| | | | 201 | 79.4206 | 24.1062 |
| | | | 202 | 79.1883 | 24.0355 |

## (ii) Recharge shaft

| Sr no | Longitude | Latitude | Sr no | Longitude | Latitude | Sr no | Longitude | Latitude |
|---|---|---|---|---|---|---|---|---|
| 203 | 79.4775 | 24.3066 | 243 | 79.4791 | 24.2334 | 284 | 79.4603 | 24.116 |
| 204 | 79.4031 | 24.2064 | 244 | 79.4854 | 24.239 | 285 | 79.3569 | 24.1135 |
| 205 | 79.218 | 24.0416 | 245 | 79.4385 | 24.1297 | 286 | 79.4351 | 24.0996 |
| 206 | 79.2069 | 24.0809 | 246 | 79.2883 | 24.024 | 287 | 79.3092 | 24.0753 |
| 207 | 79.1797 | 24.0815 | 247 | 79.2608 | 24.0854 | 288 | 79.3049 | 24.1114 |
| 208 | 79.1893 | 24.0558 | 248 | 79.3287 | 24.1085 | 289 | 79.27 | 24.0518 |
| 209 | 79.174 | 24.06 | 249 | 79.348 | 24.1586 | 290 | 79.5613 | 24.2584 |
| 210 | 79.231 | 24.0614 | 250 | 79.3861 | 24.0818 | 291 | 79.5518 | 24.238 |
| 211 | 79.2049 | 24.1177 | 251 | 79.3874 | 24.1 | 292 | 79.5994 | 24.2054 |
| 212 | 79.2499 | 24.137 | 252 | 79.3462 | 24.1369 | 293 | 79.3845 | 24.1922 |
| 213 | 79.1733 | 24.116 | 253 | 79.1962 | 24.0246 | 294 | 79.4053 | 24.2475 |
| 214 | 79.2543 | 24.1111 | 254 | 79.1746 | 24.0921 | 295 | 79.4324 | 24.265 |
| 215 | 79.2927 | 24.0368 | 255 | 79.3821 | 24.0038 | 296 | 79.4317 | 24.2702 |
| 216 | 79.2646 | 24.0457 | 256 | 79.3078 | 24.0108 | 297 | 79.4691 | 24.2757 |
| 217 | 79.3059 | 24.0363 | 257 | 79.4649 | 24.0751 | 298 | 79.435 | 24.2912 |
| 218 | 79.4083 | 24.2866 | 258 | 79.5364 | 24.1208 | 299 | 79.4972 | 24.3253 |
| 219 | 79.4782 | 24.2888 | 259 | 79.5739 | 24.131 | 300 | 79.2294 | 24.0435 |
| 220 | 79.5038 | 24.2759 | 260 | 79.5477 | 24.2885 | 301 | 79.1905 | 24.0481 |
| 221 | 79.4824 | 24.2628 | 261 | 79.5363 | 24.1797 | 302 | 79.2062 | 24.0934 |
| 222 | 79.5185 | 24.2364 | 262 | 79.4433 | 24.1828 | 303 | 79.463 | 24.1809 |
| 223 | 79.4531 | 24.3306 | 263 | 79.4552 | 24.1467 | 304 | 79.511 | 24.2936 |
| 224 | 79.4557 | 24.2572 | 264 | 79.5882 | 24.2081 | 305 | 79.4223 | 24.1608 |
| 225 | 79.4105 | 24.2174 | 265 | 79.3423 | 23.9901 | 306 | 79.2519 | 24.0494 |
| 226 | 79.4884 | 24.2455 | 266 | 79.2579 | 24.01 | 307 | 79.1939 | 24.1031 |
| 227 | 79.5102 | 24.2193 | 267 | 79.445 | 24.0787 | 308 | 79.3313 | 24.0645 |
| 228 | 79.4286 | 24.2545 | 268 | 79.4994 | 24.0993 | 309 | 79.3898 | 24.0315 |
| 229 | 79.4669 | 24.2141 | 269 | 79.5273 | 24.2616 | 310 | 79.399 | 24.1612 |
| 230 | 79.4421 | 24.2262 | 270 | 79.5857 | 24.2523 | 311 | 79.4201 | 24.2261 |
| 231 | 79.5814 | 24.2294 | 271 | 79.3552 | 24.1711 | 312 | 79.3173 | 24.1642 |
| 232 | 79.5565 | 24.1491 | 272 | 79.3504 | 24.0247 | 313 | 79.5049 | 24.2346 |
| 233 | 79.5816 | 24.1624 | 273 | 79.4237 | 24.3203 | 314 | 79.4332 | 24.1744 |
| 234 | 79.5951 | 24.1641 | 274 | 79.5472 | 24.3115 | 315 | 79.3851 | 24.1419 |
| 235 | 79.5308 | 24.193 | 275 | 79.2851 | 24.1054 | 316 | 79.4852 | 24.1355 |
| 236 | 79.4189 | 24.1947 | 276 | 79.2225 | 24.0093 | 317 | 79.5035 | 24.2139 |
| 237 | 79.4157 | 24.1449 | 277 | 79.2473 | 24.1068 | 318 | 79.4616 | 24.1626 |
| 238 | 79.3717 | 24.1788 | 278 | 79.2447 | 24.1258 | 319 | 79.3932 | 24.1122 |
| 239 | 79.5101 | 24.1483 | 279 | 79.1621 | 24.0829 | 320 | 79.2037 | 24.0576 |
| 240 | 79.5216 | 24.1547 | 280 | 79.432 | 24.0474 | 321 | 79.2352 | 24.0856 |
| 241 | 79.544 | 24.1482 | 281 | 79.517 | 24.1084 | 322 | 79.259 | 24.0708 |
| 242 | 79.5536 | 24.1748 | 282 | 79.5556 | 24.1386 | 323 | 79.2829 | 24.0743 |
| | | | 283 | 79.5267 | 24.1312 | 324 | 79.3379 | 24.0279 |
| | | | | | | 325 | 79.5094 | 24.1224 |
| | | | | | | 326 | 79.5421 | 24.2502 |

**(iii) Percolation tank**

| Sr no | Longitude | Latitude |
|---|---|---|
| 327 | 79.4378 | 24.3082 |
| 328 | 79.5409 | 24.2963 |
| 329 | 79.4293 | 24.1365 |
| 330 | 79.4291 | 24.1909 |
| 331 | 79.4471 | 24.1586 |
| 332 | 79.341 | 24.0954 |
| 333 | 79.3208 | 24.0867 |
| 334 | 79.2695 | 24.0859 |
| 335 | 79.2104 | 24.0891 |
| 336 | 79.1792 | 24.0667 |
| 337 | 79.2124 | 24.0383 |
| 338 | 79.2966 | 24.0472 |
| 339 | 79.2644 | 24.1068 |
| 340 | 79.2822 | 24.0334 |
| 341 | 79.4081 | 24.083 |
| 342 | 79.369 | 24.157 |
| 343 | 79.3474 | 24.1298 |
| 344 | 79.3813 | 24.1081 |
| 345 | 79.4206 | 24.1016 |
| 346 | 79.5416 | 24.1382 |
| 347 | 79.5569 | 24.2297 |
| 348 | 79.4608 | 24.1995 |
| 349 | 79.4013 | 24.2101 |
| 350 | 79.4496 | 24.2249 |
| 351 | 79.4977 | 24.2787 |
| 352 | 79.4944 | 24.115 |
| 353 | 79.4031 | 24.0454 |
| 354 | 79.4302 | 24.0666 |
| 355 | 79.5487 | 24.1825 |
| 356 | 79.602 | 24.2385 |
| 357 | 79.5073 | 24.2272 |
| 358 | 79.3928 | 24.1663 |
| 359 | 79.4806 | 24.1541 |
| 360 | 79.2966 | 24.1051 |
| 361 | 79.3202 | 24.0094 |
| 362 | 79.2083 | 24.0175 |
| 363 | 79.3654 | 24.0572 |
| 364 | 79.5088 | 24.1847 |
| 365 | 79.5364 | 24.2584 |
| 366 | 79.578 | 24.187 |

## 8.2 BLOCK DAMOH

| Type of Structure | Number | Cost INR in Crores |
|---|---|---|
| Percolation Tanks | 14 | 2.8 (Rs 20 Lakh Per Stucture) |
| NB/CD/CP | 99 | 9.97 (Rs Five Lakh Per Stucture) |
| Recharge Shaft/ Tube Wells | 28 | 1.4 (Rs 10 Lakh Per Stucture) |
| Renovation of Village Ponds | 221 | 4.42 (Rs two Lakh Per Stucture) |
| **Total Cost** | | **18.59** |

## IMPACT

| **Block** | **Net GW Availability MCM** | **Gross Draft in MCM** | **Stage of Development %** | **Water Saving by sprinkler in mcm @0.08 m** | **Additional GW created by AR str.in MCM** | **Net GW Availability after construction AR str. MCM** | **After intervention of AR Structure & utilization of 60% of additional GW created. in MCM** | **Draft after sprinkler & additional GW created for agriculture in MCM** | **Stage of Development( %) after management plan implementation** | **Additional area Irrigated by GW after Intervention in Ha** |
|---|---|---|---|---|---|---|---|---|---|---|
| Damoh | **76.84** | **43.22** | **56.25** | **5.85** | **10.71** | **87.55** | **6.426** | **43.8** | **50.02** | **1607** |

# Proposed Sites for Artificial Recharge Structures
## Block Damoh, District Damoh, MP

## (i) Nala bund / Check dam

| Sr no | Longitude | Latitude | Sr no | Longitude | Latitude | Sr no | Longitude | Latitude |
|---|---|---|---|---|---|---|---|---|
| 1 | 79.445 | 23.911 | 41 | 79.3112 | 23.6902 | 81 | 79.4364 | 23.6862 |
| 2 | 79.467 | 23.93 | 42 | 79.3249 | 23.6182 | 82 | 79.3481 | 23.6784 |
| 3 | 79.4905 | 23.9682 | 43 | 79.4419 | 23.6097 | 83 | 79.3273 | 23.6852 |
| 4 | 79.5163 | 23.955 | 44 | 79.5002 | 23.6241 | 84 | 79.3854 | 23.6277 |
| 5 | 79.5251 | 23.9689 | 45 | 79.3707 | 23.4813 | 85 | 79.3988 | 23.6319 |
| 6 | 79.512 | 23.8903 | 46 | 79.3798 | 23.5103 | 86 | 79.3748 | 23.6116 |
| 7 | 79.5314 | 23.9374 | 47 | 79.3756 | 23.541 | 87 | 79.3761 | 23.5916 |
| 8 | 79.4867 | 23.9103 | 48 | 79.3404 | 23.7621 | 88 | 79.3434 | 23.6026 |
| 9 | 79.4249 | 23.884 | 49 | 79.3601 | 23.7355 | 89 | 79.4087 | 23.7662 |
| 10 | 79.5872 | 23.9372 | 50 | 79.3687 | 23.7794 | 90 | 79.6473 | 23.8991 |
| 11 | 79.5206 | 23.8671 | 51 | 79.4119 | 23.8052 | 91 | 79.6751 | 23.8936 |
| 12 | 79.6036 | 23.9036 | 52 | 79.5743 | 23.7699 | 92 | 79.6064 | 23.8478 |
| 13 | 79.5863 | 23.8804 | 53 | 79.5422 | 23.7241 | 93 | 79.6698 | 23.8142 |
| 14 | 79.6465 | 23.8809 | 54 | 79.4443 | 23.718 | 94 | 79.5706 | 23.9094 |
| 15 | 79.681 | 23.8656 | 55 | 79.3946 | 23.734 | 95 | 79.5451 | 23.8768 |
| 16 | 79.5485 | 23.865 | 56 | 79.318 | 23.7208 | 96 | 79.6248 | 23.8586 |
| 17 | 79.6384 | 23.8083 | 57 | 79.5153 | 23.7799 | 97 | 79.3706 | 23.6566 |
| 18 | 79.6344 | 23.8351 | 58 | 79.4667 | 23.7726 | 98 | 79.564 | 23.8461 |
| 19 | 79.6403 | 23.9187 | 59 | 79.4874 | 23.7071 | 99 | 79.6088 | 23.8637 |
| 20 | 79.3902 | 23.5916 | 60 | 79.5347 | 23.7073 | 100 | 79.677 | 23.8838 |
| 21 | 79.4063 | 23.6079 | 61 | 79.4016 | 23.782 | | | |
| 22 | 79.3244 | 23.5996 | 62 | 79.4648 | 23.7167 | | | |
| 23 | 79.352 | 23.5801 | 63 | 79.4535 | 23.8266 | | | |
| 24 | 79.362 | 23.6419 | 64 | 79.469 | 23.817 | | | |
| 25 | 79.4436 | 23.6336 | 65 | 79.4918 | 23.8248 | | | |
| 26 | 79.4235 | 23.6424 | 66 | 79.5152 | 23.8432 | | | |
| 27 | 79.3988 | 23.6723 | 67 | 79.4922 | 23.8523 | | | |
| 28 | 79.4619 | 23.652 | 68 | 79.5713 | 23.8144 | | | |
| 29 | 79.3489 | 23.7232 | 69 | 79.5509 | 23.8124 | | | |
| 30 | 79.3597 | 23.7986 | 70 | 79.532 | 23.8159 | | | |
| 31 | 79.418 | 23.7517 | 71 | 79.3386 | 23.7389 | | | |
| 32 | 79.4355 | 23.7776 | 72 | 79.3607 | 23.7569 | | | |
| 33 | 79.4126 | 23.8348 | 73 | 79.3835 | 23.7585 | | | |
| 34 | 79.4781 | 23.8006 | 74 | 79.3346 | 23.711 | | | |
| 35 | 79.527 | 23.83 | 75 | 79.4122 | 23.7268 | | | |
| 36 | 79.471 | 23.8545 | 76 | 79.3766 | 23.6857 | | | |
| 37 | 79.5856 | 23.758 | 77 | 79.3611 | 23.6967 | | | |
| 38 | 79.5868 | 23.8049 | 78 | 79.3981 | 23.696 | | | |
| 39 | 79.5151 | 23.7548 | 79 | 79.4078 | 23.6787 | | | |
| 40 | 79.3457 | 23.6904 | 80 | 79.4479 | 23.6769 | | | |

## (ii) Recharge Shaft

| Sr no | Longitude | Latitude |
|---|---|---|
| 101 | 79.3076 | 23.5029 |
| 102 | 79.3229 | 23.5809 |
| 103 | 79.4387 | 23.5751 |
| 104 | 79.3596 | 23.6222 |
| 105 | 79.4738 | 23.6476 |
| 106 | 79.3194 | 23.7088 |
| 107 | 79.4345 | 23.6224 |
| 108 | 79.468 | 23.6774 |
| 109 | 79.5443 | 23.7693 |
| 110 | 79.4028 | 23.757 |
| 111 | 79.4464 | 23.8501 |
| 112 | 79.4315 | 23.8447 |
| 113 | 79.5662 | 23.8257 |
| 114 | 79.5981 | 23.7739 |
| 115 | 79.5914 | 23.8725 |
| 116 | 79.5245 | 23.9118 |
| 117 | 79.4835 | 23.9524 |
| 118 | 79.4352 | 23.9056 |
| 119 | 79.6581 | 23.8835 |
| 120 | 79.6574 | 23.8198 |
| 121 | 79.4788 | 23.7761 |
| 122 | 79.3572 | 23.7648 |
| 123 | 79.391 | 23.6642 |
| 124 | 79.5025 | 23.8333 |
| 125 | 79.6578 | 23.8475 |
| 126 | 79.403 | 23.7145 |
| 127 | 79.4735 | 23.8002 |
| 128 | 79.3643 | 23.541 |

## (iii) Percolation Tank

| Sr no | Longitude | Latitude |
|---|---|---|
| 129 | 79.4741 | 23.8982 |
| 130 | 79.638 | 23.8846 |
| 131 | 79.3816 | 23.79 |
| 132 | 79.4333 | 23.7351 |
| 133 | 79.4901 | 23.7636 |
| 134 | 79.5135 | 23.8156 |
| 135 | 79.4164 | 23.6448 |
| 136 | 79.4565 | 23.7594 |
| 137 | 79.5149 | 23.7005 |
| 138 | 79.383 | 23.5777 |
| 139 | 79.5596 | 23.9733 |
| 140 | 79.3666 | 23.4631 |
| 141 | 79.3542 | 23.6686 |
| 142 | 79.3094 | 23.624 |

## 8.3 BLOCK HATTA

| Type of Structure | Number | Cost INR in Crores |
|---|---|---|
| **Percolation Tanks** | 8 | 1.6 (Rs 20 Lakh Per Stucture) |
| **NB/CD/CP** | 53 | 5.34 (Rs Five Lakh Per Stucture) |
| **Recharge Shaft/ Tube Wells** | 15 | 0.75 (Rs 10 Lakh Per Stucture) |
| Renovation of Village Ponds | 57 | 1.14 (Rs two Lakh Per Stucture) |
| **Total Cost** | | **8.84** |

### IMPACT

| Block | Net GW Availability MCM | Gross Draft in MCM | Stage of Development % | Water Saving by sprinkler in mcm @0.08 m | Additional GW created by AR str.in MCM | Net GW Availability after construction AR str. MCM | After intervention of AR Structure & utilization of 60% of additional GW created. in MCM | Draft after sprinkler & additional GW created for agriculture in MCM | Stage of Development(%) after management plan implementation | Additional area Irrigated by GW after Intervention in Ha |
|---|---|---|---|---|---|---|---|---|---|---|
| **Hatta** | **38.19** | **30.67** | **80.33** | **3.21** | **5.745** | **43.94** | **3.447** | **30.91** | **70.34** | **861.8** |


Proposed Sites for Artificial Recharge Structures
Block Hatta, District Damoh, MP
N
W
E
S
0 2.5 5
kilometers
Legend
Block Boundary
Villages
Drainage
Waterbody
Nala Bund / Check dam
Percolation Tank
Recharge Shaft / Tubewell
HATTA
Kumharpura
Surajpura
Bachoama
Silapari
Raipura
Panari
Dongarpura
Banau
Symar Singi
Udaipura
Ghoghara
Ghat Kheda
Narayanpur Madiyadoh
Madanpura
Dhaurjya
Nainpar
Amaljhir
Karkoi
Kanakpura
Patha
Dadpur
Khadpura
Khamargoan
Muhanna
Harduwa Umrao
Sujantalaiya
Ibra Chakka
Madho
Nargi
Murachh
Bhatdeva
Madhiyadeh
Puramakheda
Tigra Fatehpur
Chandena
Khamariya Kalan
Bichhuwa Chakka
Garsabari
Shivpur
Doli
Deokar
Dandi
Udaipura
Bankhera Kalan
Bodwar
Adarshara
Mihguwan Mafi
Padri Bhagant
Tevraiya
Deori Fatehpur
Sakour
Husena
Chakarda Mafi
Abida
Sankuiya
Ghutariya
Sirri Fatehpur
Pipariya Kirau
Bhainsa
Dhaima
Beohari
Majhguwan Aman
Pani
Nayagaon Hatta
Singpura Rajoh
Jaronda
Binti
Banjari
Tidni Chhoti
Rampura Hatta
Manpura
Bhakalan
Dharampura Rajoh
Bhidari
Lohar Bandi
Bandha
Purena Bakshi
Kakra
Bilkhiriya
Muhra
Prempura
Bori Kalan
Bankhera Chain
Rasilpur
Singramgura

## (i) Nalabund

| Sr no | Longitude | Latitude | Sr no | Longitude | Latitude |
|---|---|---|---|---|---|
| 1 | 79.4085 | 24.3798 | 41 | 79.6475 | 24.1686 |
| 2 | 79.4588 | 24.3461 | 42 | 79.6416 | 24.1528 |
| 3 | 79.4622 | 24.3717 | 43 | 79.6211 | 24.1377 |
| 4 | 79.4727 | 24.3601 | 44 | 79.605 | 24.1203 |
| 5 | 79.5117 | 24.3555 | 45 | 79.5884 | 24.117 |
| 6 | 79.5217 | 24.3792 | 46 | 79.6738 | 24.1047 |
| 7 | 79.5633 | 24.4133 | 47 | 79.6765 | 24.1244 |
| 8 | 79.5793 | 24.4286 | 48 | 79.6857 | 24.1395 |
| 9 | 79.5408 | 24.3386 | 49 | 79.6663 | 24.0849 |
| 10 | 79.6054 | 24.3823 | 50 | 79.6959 | 24.3065 |
| 11 | 79.6209 | 24.3471 | 51 | 79.6676 | 24.3089 |
| 12 | 79.6394 | 24.3544 | 52 | 79.7496 | 24.2845 |
| 13 | 79.599 | 24.3432 | 53 | 79.6602 | 24.2556 |
| 14 | 79.5905 | 24.3314 | | | |
| 15 | 79.5706 | 24.318 | | | |
| 16 | 79.5804 | 24.2857 | | | |
| 17 | 79.6049 | 24.2985 | | | |
| 18 | 79.6429 | 24.3001 | | | |
| 19 | 79.6782 | 24.3612 | | | |
| 20 | 79.6973 | 24.3657 | | | |
| 21 | 79.7298 | 24.381 | | | |
| 22 | 79.7556 | 24.392 | | | |
| 23 | 79.7403 | 24.342 | | | |
| 24 | 79.7386 | 24.3525 | | | |
| 25 | 79.8231 | 24.285 | | | |
| 26 | 79.8011 | 24.289 | | | |
| 27 | 79.7892 | 24.2734 | | | |
| 28 | 79.7349 | 24.1378 | | | |
| 29 | 79.7027 | 24.1617 | | | |
| 30 | 79.7474 | 24.1867 | | | |
| 31 | 79.7266 | 24.1791 | | | |
| 32 | 79.7785 | 24.2064 | | | |
| 33 | 79.7638 | 24.2373 | | | |
| 34 | 79.7826 | 24.2445 | | | |
| 35 | 79.7946 | 24.2443 | | | |
| 36 | 79.7267 | 24.2493 | | | |
| 37 | 79.7104 | 24.2173 | | | |
| 38 | 79.6839 | 24.2006 | | | |
| 39 | 79.6678 | 24.1899 | | | |
| 40 | 79.6533 | 24.1765 | | | |

**(ii)Recharge shaft**

| Sr no | Longitude | Latitude |
|---|---|---|
| 54 | 79.422 | 24.3465 |
| 55 | 79.4831 | 24.3696 |
| 56 | 79.6076 | 24.3726 |
| 57 | 79.6592 | 24.3627 |
| 58 | 79.7542 | 24.3976 |
| 59 | 79.5981 | 24.2859 |
| 60 | 79.5727 | 24.3296 |
| 61 | 79.8028 | 24.2092 |
| 62 | 79.7647 | 24.2579 |
| 63 | 79.7568 | 24.349 |
| 64 | 79.659 | 24.1277 |
| 65 | 79.6717 | 24.2112 |
| 66 | 79.7016 | 24.2273 |
| 67 | 79.7359 | 24.195 |
| 68 | 79.7174 | 24.1195 |

**(iii) Percolation tank**

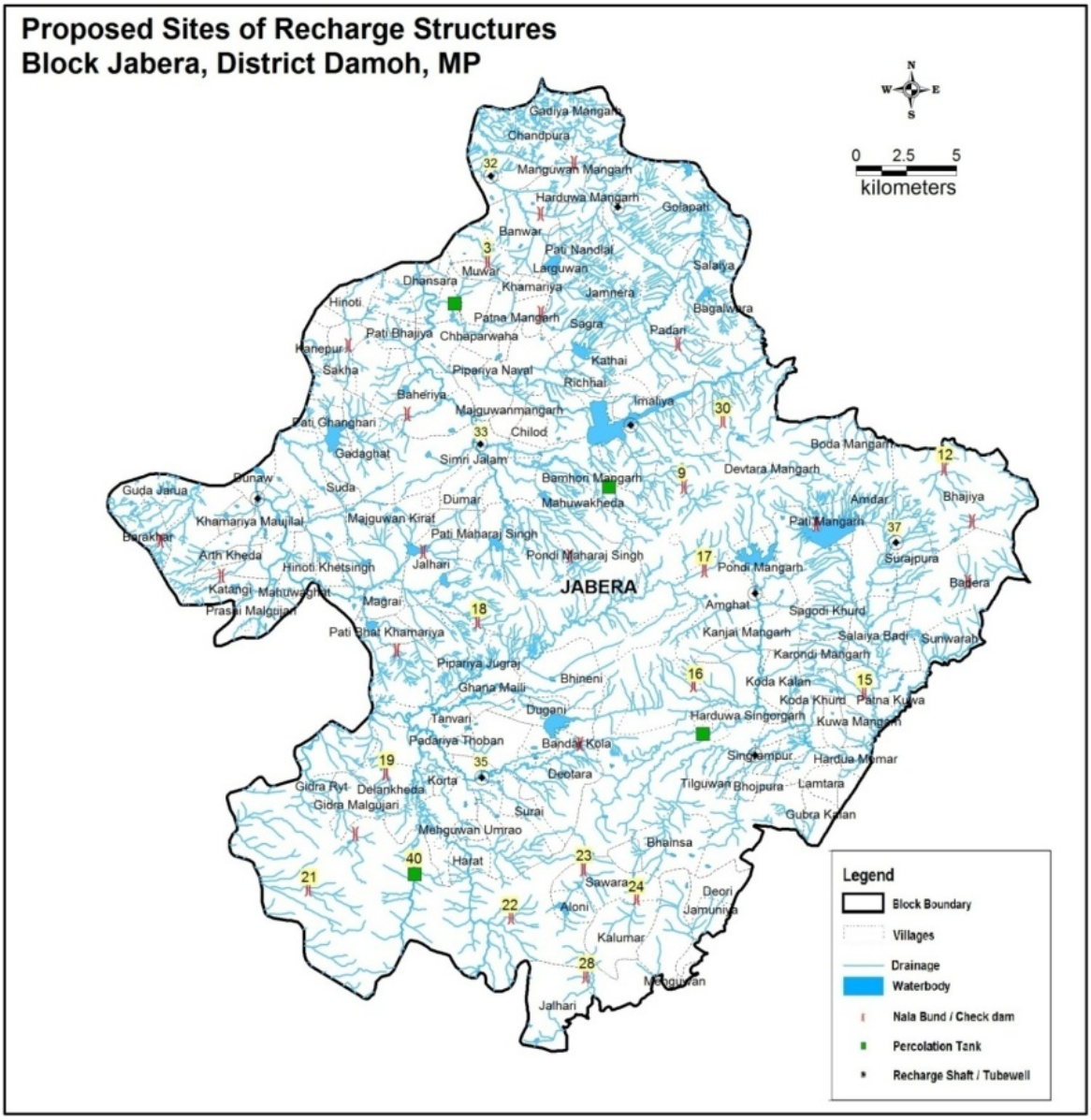
| Sr no | Longitude | Latitude |
|---|---|---|
| 69 | 79.4458 | 24.3562 |
| 70 | 79.523 | 24.3701 |
| 71 | 79.6151 | 24.3973 |
| 72 | 79.5662 | 24.2969 |
| 73 | 79.748 | 24.3716 |
| 74 | 79.7053 | 24.2072 |
| 75 | 79.7061 | 24.0884 |
| 76 | 79.8021 | 24.3428 |

## 8.4 BLOCK JABERA

| Type of Structure | Number | Cost INR in Crores |
|---|---|---|
| **Percolation Tanks** | 4 | 0.8 (Rs 20 Lakh Per Stucture) |
| **NB/CD/CP** | 30 | 3.09 (Rs Five Lakh Per Stucture) |
| **Recharge Shaft/ Tube Wells** | 9 | 0.45 (Rs 10 Lakh Per Stucture) |
| Renovation of Village Ponds | 179 | 3.58 (Rs two Lakh Per Stucture) |
| **Total Cost** | | **7.93** |

**IMPACT**

| Block | Net GW Availability MCM | Gross Draft in MCM | Stage of Development % | Water Saving by sprinkler in mcm @0.08 m | Additional GW created by AR str.in MCM | Net GW Availability after construction AR str. MCM | After intervention of AR Structure & utilization of 60% of additional GW created. in MCM | Draft after sprinkler & additional GW created for agriculture in MCM | Stage of Development(%) after management plan implementation | Additional area Irrigated by GW after Intervention in Ha |
|---|---|---|---|---|---|---|---|---|---|---|
| **Jabera** | **66.03** | **27.21** | **41.22** | **2.95** | **3.329** | **69.36** | **1.997** | **26.26** | **37.85** | **499.4** |


Proposed Sites of Recharge Structures
Block Jabera, District Damoh, MP
N
W
E
S
0 2.5 5
kilometers
JABERA
Gadiya Mangarh
Chandpura
Manguwan Mangarh
Harduwa Mangarh
Golapati
Banwar
Pati Nandlal
Muwar
Larguwan
Salaiya
Dhansara
Khamariya
Jamnera
Hinoti
Patna Mangarh
Sagra
Bagalwara
Padari
Pati Bhajiya
Chhaparwaha
Kanepur
Kathai
Sakha
Pipariya Nayal
Richhai
Baheriya
Imaliya
Malguwanmangarh
Pati Ghanghari
Chilod
Boda Mangarh
Gadaghat
Simri Jalam
Devtara Mangarh
Dunaw
Bamhori Mangarh
Guda Jarua
Suda
Dumar
Mahuwakheda
Amdar
Bhajiya
Khamariya Maujilal
Majguwan Kirat
Pati Mangarh
Barakhar
Pati Maharaj Singh
Arth Kheda
Pondi Maharaj Singh
Surajpura
Hinoti Khetsingh
Jalhari
Pondi Mangarh
Katangi
Mahuwaghat
Amghat
Badera
Magrai
Sagodi Khurd
Prasai Malgujari
Kanjai Mangarh
Salaiya Badi
Sunwarah
Pati Bhat Khamariya
Karondi Mangarh
Piparia Jugraj
Bhineni
Koda Kalan
Ghana Mali
Koda Khurd
Patna Kuva
Dugani
Harduwa Singorgarh
Kuwa Mangarh
Tanvari
Padariya Thoban
Banda Kola
Singrampur
Hardua Mamar
Deotara
Korta
Tilguwan
Bhojpura
Lamtara
Gidra Pyt
Delankheda
Gidra Malgujari
Gubra Kalan
Surai
Mehguwan Umrao
Bhainsa
Harat
Sawara
Deori
Aloni
Jamuniya
Kalumar
Mehguwan
Jalhari
Legend
Block Boundary
Villages
Drainage
Waterbody
Nala Bund / Check dam
Percolation Tank
Recharge Shaft / Tubewell

**(i)Nala bund**

| Sr no | Longitude | Latitude |
|---|---|---|
| 1 | 79.7287 | 23.8077 |
| 2 | 79.7125 | 23.7402 |
| 3 | 79.6862 | 23.7635 |
| 4 | 79.6181 | 23.7257 |
| 5 | 79.5261 | 23.6382 |
| 6 | 79.5558 | 23.6225 |
| 7 | 79.6418 | 23.5887 |
| 8 | 79.7268 | 23.6311 |
| 9 | 79.7824 | 23.6623 |
| 10 | 79.7795 | 23.7265 |
| 11 | 79.647 | 23.6951 |
| 12 | 79.91 | 23.6707 |
| 13 | 79.8472 | 23.6454 |
| 14 | 79.9214 | 23.6198 |
| 15 | 79.8707 | 23.5697 |
| 16 | 79.7872 | 23.5733 |
| 17 | 79.7924 | 23.6249 |
| 18 | 79.6814 | 23.6017 |
| 19 | 79.6363 | 23.5336 |
| 20 | 79.6215 | 23.5065 |
| 21 | 79.5984 | 23.4816 |
| 22 | 79.6977 | 23.4691 |
| 23 | 79.7334 | 23.4905 |
| 24 | 79.7593 | 23.4777 |
| 25 | 79.6548 | 23.6331 |
| 26 | 79.7122 | 23.785 |
| 27 | 79.9237 | 23.6468 |
| 28 | 79.7343 | 23.4426 |
| 29 | 79.7316 | 23.5468 |
| 30 | 79.8015 | 23.6918 |

**(ii) Recharge shaft**

| Sr no | Longitude | Latitude |
|---|---|---|
| 31 | 79.75 | 23.7881 |
| 32 | 79.6878 | 23.8019 |
| 33 | 79.6827 | 23.6815 |
| 34 | 79.5734 | 23.6572 |
| 35 | 79.6833 | 23.5319 |
| 36 | 79.8173 | 23.6146 |
| 37 | 79.8863 | 23.6374 |
| 38 | 79.7562 | 23.6902 |
| 39 | 79.8171 | 23.542 |

**(iii)Percolation tank**

| Sr no | Longitude | Latitude |
|---|---|---|
| 40 | 79.6504 | 23.4889 |
| 41 | 79.6698 | 23.7451 |
| 42 | 79.7916 | 23.5517 |
| 43 | 79.7455 | 23.6628 |

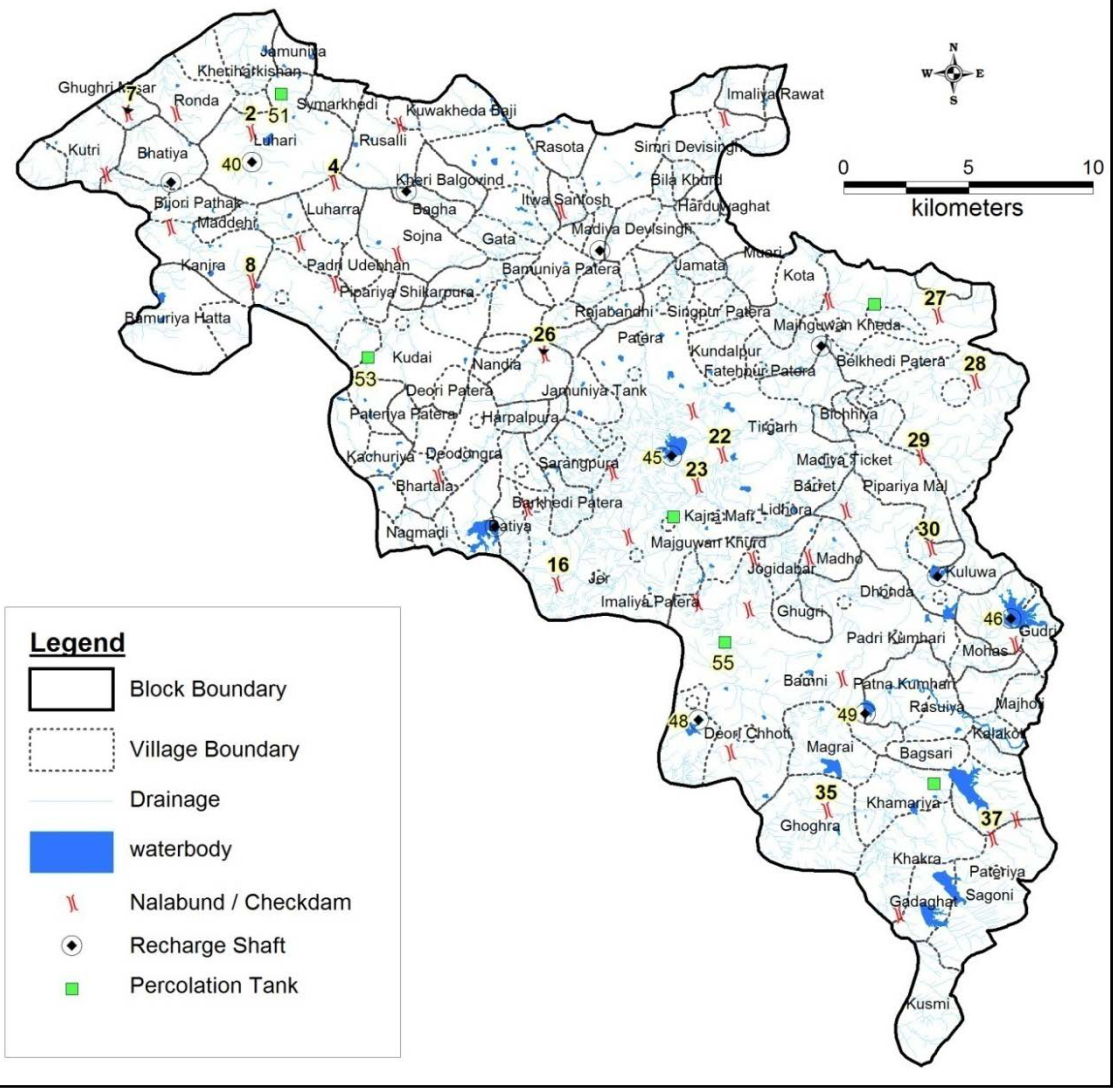
## 8.5 BLOCK PATERA

| Type of Structure | Number | Cost INR in Crores |
|---|---|---|
| **Percolation Tanks** | 23 | 4.6 (Rs 20 Lakh Per Stucture) |
| **NB/CD/CP** | 161 | 16.14 (Rs Five Lakh Per Stucture) |
| **Recharge Shaft/ Tube Wells** | 46 | 2.3 (Rs 10 Lakh Per Stucture) |
| Renovation of Village Ponds | 132 | 2.64 (Rs two Lakh Per Stucture) |
| **Total Cost** | | **25.69** |

### IMPACT

| Block | Net GW Availability MCM | Gross Draft in MCM | Stage of Development % | Water Saving by sprinkler in mcm @0.08 m | Additional GW created by AR str.in MCM | Net GW Availability after construction AR str. MCM | After intervention of AR Structure & utilization of 60% of additional GW created. in MCM | Draft after sprinkler & additional GW created for agriculture in MCM | Stage of Development(%) after management plan implementation | Additional area Irrigated by GW after Intervention in Ha |
|---|---|---|---|---|---|---|---|---|---|---|
| **Patharia** | **82.82** | **70.08** | **84.62** | **3.93** | **17.35** | **100.2** | **10.41** | **76.56** | **76.43** | **2602** |

**Proposed Sites for Artificial Recharge Structures Block Patera, District Damoh, MP**



## (i) NalaBund / Checkdam

| Sr No | Longitude | Latitude |
|---|---|---|
| 1 | 79.5221 | 24.0829 |
| 2 | 79.5518 | 24.076 |
| 3 | 79.61 | 24.0789 |
| 4 | 79.5844 | 24.0579 |
| 5 | 79.5196 | 24.0417 |
| 6 | 79.4944 | 24.0606 |
| 7 | 79.5027 | 24.0829 |
| 8 | 79.5519 | 24.022 |
| 9 | 79.5705 | 24.0358 |
| 10 | 79.5847 | 24.0212 |
| 11 | 79.6092 | 24.0317 |
| 12 | 79.6736 | 24.0473 |
| 13 | 79.6254 | 23.9514 |
| 14 | 79.6601 | 23.9399 |
| 15 | 79.7254 | 23.9751 |
| 16 | 79.6722 | 23.9124 |
| 17 | 79.7273 | 23.9056 |
| 18 | 79.7476 | 23.9034 |
| 19 | 79.7494 | 23.9215 |
| 20 | 79.7859 | 23.9391 |
| 21 | 79.7714 | 23.9221 |
| 22 | 79.7372 | 23.9593 |
| 23 | 79.7273 | 23.9481 |
| 24 | 79.7 | 23.9297 |
| 25 | 79.6939 | 23.9532 |
| 26 | 79.6816 | 23.9649 |
| 27 | 79.8223 | 24.0098 |
| 28 | 79.837 | 23.9858 |
| 29 | 79.8156 | 23.9587 |
| 30 | 79.8195 | 23.9256 |
| 31 | 79.7791 | 24.015 |
| 32 | 79.738 | 24.0809 |
| 33 | 79.7843 | 23.8782 |
| 34 | 79.7405 | 23.8515 |
| 35 | 79.7785 | 23.8304 |
| 36 | 79.8069 | 23.7929 |
| 37 | 79.8439 | 23.8205 |
| 38 | 79.8532 | 23.8272 |
| 39 | 79.8527 | 23.8906 |

## (ii) Recharge Shaft

| Sr No | Longitude | Latitude |
|---|---|---|
| 40 | 79.5519 | 24.0651 |
| 41 | 79.52 | 24.0577 |
| 42 | 79.6129 | 24.0544 |
| 43 | 79.689 | 24.0331 |
| 44 | 79.6479 | 23.933 |
| 45 | 79.7174 | 23.9588 |
| 46 | 79.8512 | 23.8998 |
| 47 | 79.8222 | 23.9151 |
| 48 | 79.7281 | 23.8631 |
| 49 | 79.7937 | 23.8654 |
| 50 | 79.7763 | 23.9985 |

## (iii) Percolation Tank

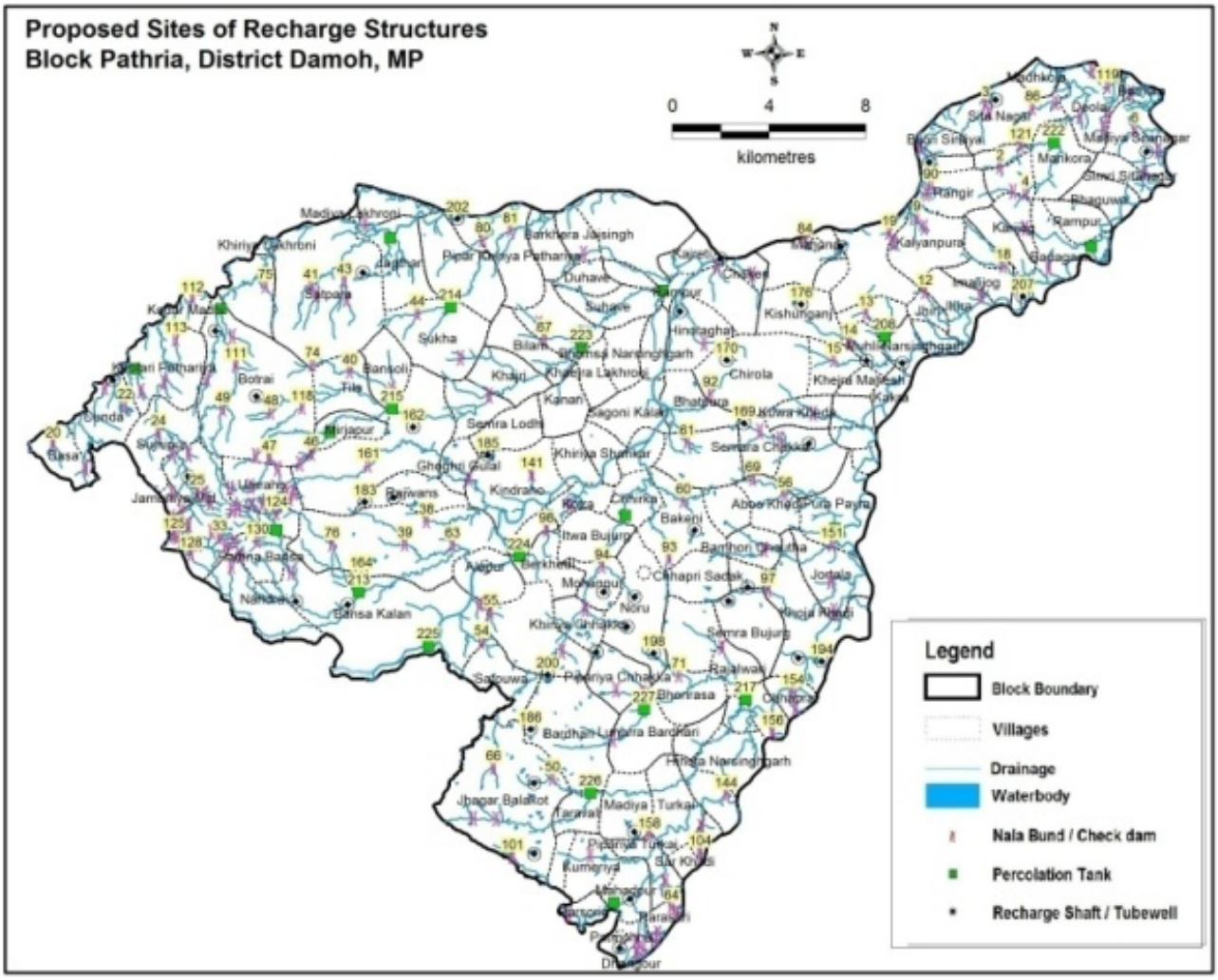
| Sr No | Longitude | Latitude |
|---|---|---|
| 51 | 79.5634 | 24.0901 |
| 52 | 79.7181 | 23.9368 |
| 53 | 79.5975 | 23.9947 |
| 54 | 79.7972 | 24.0139 |
| 55 | 79.7383 | 23.8915 |
| 56 | 79.8207 | 23.8404 |

## 8.6 LOCK PATHARIA

| Type of Structure | Number | Cost INR in Crores |
|---|---|---|
| **Percolation Tanks** | 23 | 4.6 (Rs 20 Lakh Per Stucture) |
| **NB/CD/CP** | 161 | 16.14 (Rs Five Lakh Per Stucture) |
| **Recharge Shaft/ Tube Wells** | 46 | 2.3 (Rs 10 Lakh Per Stucture) |
| Renovation of Village Ponds | 132 | 2.64 (Rs two Lakh Per Stucture) |
| **Total Cost** | | **25.69** |

### IMPACT

| Block | Net GW Availability MCM | Gross Draft in MCM | Stage of Development % | Water Saving by sprinkler in mcm @0.08 m | Additional GW created by AR str.in MCM | Net GW Availability after construction AR str. MCM | After intervention of AR Structure & utilization of 60% of additional GW created. in MCM | Draft after sprinkler & additional GW created for agriculture in MCM | Stage of Development(%) after management plan implementation | Additional area Irrigated by GW after Intervention in Ha |
|---|---|---|---|---|---|---|---|---|---|---|
| **Patharia** | **82.82** | **70.08** | **84.62** | **3.93** | **17.35** | **100.2** | **10.41** | **76.56** | **76.43** | **2602** |


Proposed Sites of Recharge Structures
Block Pathria, District Damoh, MP
N
W
E
S
0
4
8
kilometres
Legend
Block Boundary
Villages
Drainage
Waterbody
Nala Bund / Check dam
Percolation Tank
Recharge Shaft / Tubewell

## 1. Nalabund

| Sr no | Longitude | Latitude | Sr no | Longitude | Latitude | Sr no | Longitude | Latitude |
|---|---|---|---|---|---|---|---|---|
| 1 | 79.4685 | 24.043 | 41 | 79.1688 | 23.9756 | 81 | 79.2491 | 23.9963 |
| 2 | 79.4461 | 24.0196 | 42 | 79.1712 | 23.9722 | 82 | 79.4157 | 23.9971 |
| 3 | 79.4404 | 24.0429 | 43 | 79.1823 | 23.9775 | 83 | 79.4032 | 23.9912 |
| 4 | 79.4565 | 24.0097 | 44 | 79.2117 | 23.9656 | 84 | 79.3676 | 23.9925 |
| 5 | 79.4894 | 24.0385 | 45 | 79.2406 | 23.9351 | 85 | 79.3466 | 23.9798 |
| 6 | 79.5004 | 24.0333 | 46 | 79.169 | 23.914 | 86 | 79.4593 | 24.0413 |
| 7 | 79.5044 | 24.0172 | 47 | 79.1521 | 23.9123 | 87 | 79.4418 | 24.0395 |
| 8 | 79.4565 | 23.9967 | 48 | 79.1528 | 23.9291 | 88 | 79.4879 | 24.0332 |
| 9 | 79.4126 | 24.0006 | 49 | 79.1333 | 23.9302 | 89 | 79.4988 | 24.0465 |
| 10 | 79.4167 | 24.0093 | 50 | 79.2661 | 23.7943 | 90 | 79.4184 | 24.0125 |
| 11 | 79.4385 | 23.9716 | 51 | 79.2435 | 23.7792 | 91 | 79.3712 | 23.9284 |
| 12 | 79.416 | 23.9734 | 52 | 79.2905 | 23.8083 | 92 | 79.3295 | 23.936 |
| 13 | 79.3922 | 23.9656 | 53 | 79.27 | 23.8408 | 93 | 79.3131 | 23.8752 |
| 14 | 79.3858 | 23.9552 | 54 | 79.2376 | 23.8444 | 94 | 79.2861 | 23.8724 |
| 15 | 79.3791 | 23.9484 | 55 | 79.241 | 23.8554 | 95 | 79.2794 | 23.8563 |
| 16 | 79.3325 | 23.9825 | 56 | 79.3597 | 23.8989 | 96 | 79.3782 | 23.8664 |
| 17 | 79.4658 | 23.9819 | 57 | 79.3577 | 23.9191 | 97 | 79.3528 | 23.8636 |
| 18 | 79.4475 | 23.983 | 58 | 79.3262 | 23.7764 | 98 | 79.2637 | 23.8859 |
| 19 | 79.4016 | 23.9952 | 59 | 79.3026 | 23.8257 | 99 | 79.2369 | 23.8583 |
| 20 | 79.0651 | 23.9173 | 60 | 79.3187 | 23.8965 | 100 | 79.2343 | 23.7794 |
| 21 | 79.0782 | 23.9081 | 61 | 79.3203 | 23.9182 | 101 | 79.25 | 23.7653 |
| 22 | 79.0941 | 23.9315 | 62 | 79.3497 | 23.9219 | 102 | 79.2725 | 23.744 |
| 23 | 79.1006 | 23.9368 | 63 | 79.2259 | 23.8803 | 103 | 79.3116 | 23.7563 |
| 24 | 79.1074 | 23.9217 | 64 | 79.3139 | 23.7469 | 104 | 79.3255 | 23.7669 |
| 25 | 79.1231 | 23.8998 | 65 | 79.3 | 23.7341 | 105 | 79.3085 | 23.737 |
| 26 | 79.1283 | 23.8955 | 66 | 79.2423 | 23.7983 | 106 | 79.3 | 23.7301 |
| 27 | 79.1196 | 23.8873 | 67 | 79.2629 | 23.9562 | 107 | 79.3027 | 23.7313 |
| 28 | 79.1168 | 23.8925 | 68 | 79.3513 | 23.8783 | 108 | 79.3071 | 23.7348 |
| 29 | 79.127 | 23.9411 | 69 | 79.3467 | 23.9045 | 109 | 79.1833 | 23.9705 |
| 30 | 79.1494 | 23.8953 | 70 | 79.3344 | 23.8424 | 110 | 79.1373 | 23.9568 |
| 31 | 79.1452 | 23.8946 | 71 | 79.317 | 23.8322 | 111 | 79.1387 | 23.9465 |
| 32 | 79.1398 | 23.8935 | 72 | 79.273 | 23.8948 | 112 | 79.1212 | 23.9708 |
| 33 | 79.132 | 23.8829 | 73 | 79.2813 | 23.7655 | 113 | 79.1144 | 23.9562 |
| 34 | 79.129 | 23.8849 | 74 | 79.1694 | 23.9467 | 114 | 79.1098 | 23.9399 |
| 35 | 79.1601 | 23.8973 | 75 | 79.1506 | 23.9756 | 115 | 79.2607 | 23.9616 |
| 36 | 79.1348 | 23.8797 | 76 | 79.1774 | 23.8804 | 116 | 79.2787 | 23.9874 |
| 37 | 79.1406 | 23.8759 | 77 | 79.161 | 23.8698 | 117 | 79.2014 | 23.9373 |
| 38 | 79.2154 | 23.889 | 78 | 79.1585 | 23.9003 | 118 | 79.1653 | 23.9309 |
| 39 | 79.2068 | 23.8805 | 79 | 79.1907 | 23.998 | 119 | 79.4895 | 24.0491 |
| 40 | 79.1846 | 23.9442 | 80 | 79.2381 | 23.9926 | 120 | 79.4784 | 24.0381 |

| Sr no | Longitude | Latitude | Sr no | Longitude | Latitude | Sr no | Longitude | Latitude |
|---|---|---|---|---|---|---|---|---|
| 121 | 79.4544 | 24.0272 | 136 | 79.1197 | 23.9134 | 151 | 79.3785 | 23.8803 |
| 122 | 79.1382 | 23.8812 | 137 | 79.1131 | 23.9138 | 152 | 79.2292 | 23.9489 |
| 123 | 79.1372 | 23.8928 | 138 | 79.1132 | 23.8988 | 153 | 79.3793 | 23.8559 |
| 124 | 79.155 | 23.8918 | 139 | 79.1263 | 23.8992 | 154 | 79.3629 | 23.8262 |
| 125 | 79.1138 | 23.884 | 140 | 79.1622 | 23.8992 | 155 | 79.3639 | 23.8201 |
| 126 | 79.1148 | 23.883 | 141 | 79.2577 | 23.9062 | 156 | 79.3546 | 23.8114 |
| 127 | 79.1127 | 23.8903 | 142 | 79.086 | 23.9381 | 157 | 79.3162 | 23.7448 |
| 128 | 79.1205 | 23.8768 | 143 | 79.1466 | 23.9129 | 158 | 79.3051 | 23.7733 |
| 129 | 79.1237 | 23.8803 | 144 | 79.3358 | 23.7883 | 159 | 79.2918 | 23.8266 |
| 130 | 79.1473 | 23.8818 | 145 | 79.3535 | 23.816 | 160 | 79.2326 | 23.9043 |
| 131 | 79.1369 | 23.8721 | 146 | 79.4513 | 24.0101 | 161 | 79.1919 | 23.9095 |
| 132 | 79.1364 | 23.9011 | 147 | 79.5098 | 24.0254 | | | |
| 133 | 79.1447 | 23.9017 | 148 | 79.4832 | 24.0549 | | | |
| 134 | 79.1556 | 23.9081 | 149 | 79.414 | 24.0264 | | | |
| 135 | 79.1644 | 23.91 | 150 | 79.3272 | 23.9544 | | | |

## (ii) Recharge shaft

| Sr no | Longitude | Latitude | Sr no | Longitude | Latitude | Sr no | Longitude | Latitude |
|---|---|---|---|---|---|---|---|---|
| 162 | 79.21 | 23.9236 | 177 | 79.3173 | 23.9662 | 192 | 79.3357 | 23.7933 |
| 163 | 79.1468 | 23.935 | 178 | 79.4068 | 23.9471 | 193 | 79.365 | 23.8386 |
| 164 | 79.189 | 23.8694 | 179 | 79.0892 | 23.9409 | 194 | 79.3744 | 23.8374 |
| 165 | 79.2865 | 23.8629 | 180 | 79.1304 | 23.959 | 195 | 79.3368 | 23.8597 |
| 166 | 79.3232 | 23.8858 | 181 | 79.1194 | 23.9053 | 196 | 79.2992 | 23.861 |
| 167 | 79.3447 | 23.8647 | 182 | 79.1627 | 23.8595 | 197 | 79.296 | 23.8501 |
| 168 | 79.3692 | 23.9175 | 183 | 79.1907 | 23.8961 | 198 | 79.3068 | 23.8404 |
| 169 | 79.343 | 23.925 | 184 | 79.1898 | 23.9806 | 199 | 79.2836 | 23.8407 |
| 170 | 79.3361 | 23.9483 | 185 | 79.24 | 23.9134 | 200 | 79.2641 | 23.8324 |
| 171 | 79.382 | 23.9902 | 186 | 79.2572 | 23.8123 | 201 | 79.3925 | 23.9482 |
| 172 | 79.5052 | 24.0252 | 187 | 79.2587 | 23.7663 | 202 | 79.2278 | 24.0005 |
| 173 | 79.4176 | 24.0212 | 188 | 79.2586 | 23.7924 | 203 | 79.1836 | 23.8583 |
| 174 | 79.4445 | 24.0441 | 189 | 79.2989 | 23.7745 | 204 | 79.2021 | 23.8976 |
| 175 | 79.494 | 24.053 | 190 | 79.2971 | 23.7499 | 205 | 79.2777 | 23.9557 |
| 176 | 79.3661 | 23.9688 | 191 | 79.293 | 23.7318 | 206 | 79.3334 | 23.9857 |
| | | | | | | 207 | 79.4554 | 23.9718 |

## (iii) Percolation tank

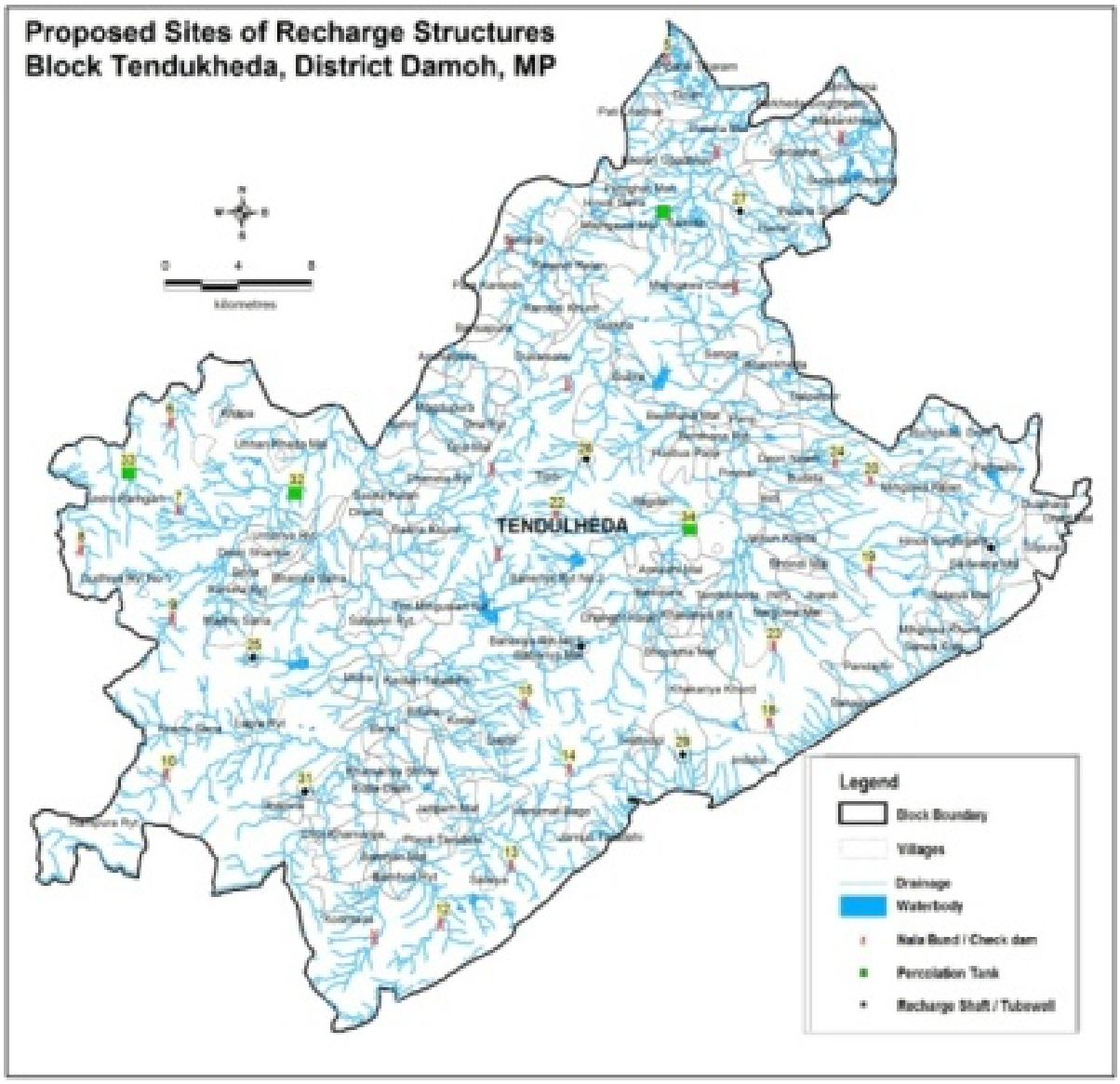
| Sr no | Longitude | Latitude | Sr no | Longitude | Latitude | Sr no | Longitude | Latitude |
|---|---|---|---|---|---|---|---|---|
| 208 | 79.3996 | 23.9571 | 216 | 79.2906 | 23.7487 | 224 | 79.2525 | 23.8761 |
| 209 | 79.1326 | 23.9675 | 217 | 79.3438 | 23.8234 | 225 | 79.216 | 23.8432 |
| 210 | 79.098 | 23.9454 | 218 | 79.3796 | 23.8866 | 226 | 79.2814 | 23.789 |
| 211 | 79.155 | 23.886 | 219 | 79.2953 | 23.8912 | 227 | 79.3028 | 23.8199 |
| 212 | 79.1764 | 23.9219 | 220 | 79.3102 | 23.9742 | 228 | 79.2007 | 23.9935 |
| 213 | 79.188 | 23.863 | 221 | 79.4827 | 23.9904 | | | |
| 214 | 79.2249 | 23.968 | 222 | 79.4677 | 24.0286 | | | |
| 215 | 79.2015 | 23.9306 | 223 | 79.2777 | 23.9533 | | | |

## 8.7 BLOCK TENDUKHEDA

| Type of Structure | Number | Cost INR in Crores |
|---|---|---|
| **Percolation Tanks** | 4 | 0.8 (Rs 20 Lakh Per Stucture) |
| **NB/CD/CP** | 24 | 2.45 (Rs Five Lakh Per Stucture) |
| **Recharge Shaft/ Tube Wells** | 7 | 0.35 (Rs 10 Lakh Per Stucture) |
| Renovation of Village Ponds | 181 | 3.62 (Rs two Lakh Per Stucture) |
| **Total Cost** | | **7.23** |

### IMPACT

| Block | Net GW Availability MCM | Gross Draft in MCM | Stage of Development % | Water Saving by sprinkler in mcm @0.08 m | Additional GW created by AR str.in MCM | Net GW Availability after construction AR str. MCM | After intervention of AR Structure & utilization of 60% of additional GW created. in MCM | Draft after sprinkler & additional GW created for agriculture in MCM | Stage of Development(%) after management plan implementation | Additional area Irrigated by GW after Intervention in Ha |
|---|---|---|---|---|---|---|---|---|---|---|
| **Tendukhera** | **33.63** | **17.67** | **52.55** | **2.54** | **2.64** | **36.27** | **1.584** | **16.71** | **46.08** | **396** |


Proposed Sites of Recharge Structures
Block Tendukheda, District Damoh, MP
TENDULHEDA
Legend
Block Boundary
Villages
Drainage
Waterbody
Nala Bund / Check dam
Percolation Tank
Recharge Shaft / Tubewell

## (i) Nalabund

| Sr no | Longitude | Latitude | Sr no | Longitude | Latitude | Sr no | Longitude | Latitude |
|---|---|---|---|---|---|---|---|---|
| 1 | 79.5351 | 23.5779 | 9 | 79.2466 | 23.3501 | 17 | 79.416 | 23.4226 |
| 2 | 79.5451 | 23.5119 | 10 | 79.2434 | 23.2739 | 18 | 79.5632 | 23.2996 |
| 3 | 79.4259 | 23.5326 | 11 | 79.3538 | 23.1939 | 19 | 79.6163 | 23.3739 |
| 4 | 79.6013 | 23.5851 | 12 | 79.389 | 23.2011 | 20 | 79.6167 | 23.418 |
| 5 | 79.5087 | 23.6251 | 13 | 79.426 | 23.2296 | 21 | 79.4561 | 23.4642 |
| 6 | 79.2457 | 23.4462 | 14 | 79.4569 | 23.2767 | 22 | 79.45 | 23.4014 |
| 7 | 79.2497 | 23.4034 | 15 | 79.4333 | 23.3088 | 23 | 79.5654 | 23.3369 |
| 8 | 79.198 | 23.3837 | 16 | 79.4191 | 23.3814 | 24 | 79.5982 | 23.4263 |

## (ii)Recharge shaft

| Sr no | Longitude | Latitude |
|---|---|---|
| 25 | 79.2891 | 23.3307 |
| 26 | 79.4658 | 23.4278 |
| 27 | 79.5475 | 23.5491 |
| 28 | 79.6804 | 23.3845 |
| 29 | 79.5171 | 23.2831 |
| 30 | 79.463 | 23.3364 |
| 31 | 79.3166 | 23.2652 |

## (iii)Percolation tank

| Sr no | Longitude | Latitude |
|---|---|---|
| 32 | 79.3116 | 23.4116 |
| 33 | 79.2233 | 23.4214 |
| 34 | 79.5207 | 23.3941 |
| 35 | 79.5068 | 23.549 |

# AAEXURE-I
# LOCATION DETAILS Of EXPLRATION BORE WELLS

| Bore | Easting | Northing | Elevation | TD |
|---|---|---|---|---|
| Aam Khera | 961010 | 2647766 | 352 | 262.3 |
| Aam Khera (Bilani) | 934113 | 2655564 | 360 | 231.8 |
| Abhana | 962432 | 2629918 | 345 | 300 |
| Bairagadh | 965014 | 2611337 | 358 | 233.14 |
| Bandakpur | 966271 | 2642999 | 344 | 268.4 |
| Bansa Tarkheda | 943413 | 2638886 | 359 | 304 |
| Basakala | 927387 | 2644446 | 367 | 200 |
| Batiagarh(S)-RODC | 943268 | 2672932 | 359 | 36 |
| Batiyagadh | 943268 | 2672932 | 454 | 153 |
| Battiagarh WRD | 942300 | 2674937 | 405 | 30.44 |
| Bhajiya | 996794 | 2622104 | 402 | 254.71 |
| Borda | 953247 | 2694655 | 506 | 200 |
| Bothrai | 926961 | 2657817 | 379 | 134.2 |
| Chirola | 941240 | 2654240 | 365 | 215 |
| Chopra Khurd | 953635 | 2638740 | 374 | 268.4 |
| Damoh Polytechnic | 954740 | 2639700 | 378 | 305.12 |
| Damoh WRD | 951746 | 2644696 | 366 | 38.1 |
| Damoh(D)-RODC | 952180 | 2641687 | 372 | 80 |
| Datla | 968222 | 2629209 | 341 | 200 |
| Dharoli | 950906 | 2587384 | 411 | 201.3 |
| Fatehpur-RODC | 959189 | 2682321 | 343 | 134.5 |
| Futera-RODC | 960746 | 2680583 | 346 | 107.5 |
| Gaisabad1-RODC | 990443 | 2688800 | 316 | 200 |
| Gubra | 993509 | 2609956 | 406 | 233.35 |
| Guhanchi-RODC | 949408 | 2602798 | 368 | 144.65 |
| Harat | 946768 | 2675077 | 356 | 200 |
| Hatta WRD | 965886 | 2680935 | 332 | 30.48 |
| Hatta(D)-RODC | 967030 | 2676252 | 325 | 85 |
| Hindoriya | 965982 | 2651937 | 363 | 269.4 |
| Imilitol | 963411 | 2581975 | 518 | 201.3 |
| Jabera(D)-RODC | 978690 | 2612395 | 377 | 49.25 |
| Jhalon | 948698 | 2603306 | 368 | 201.3 |
| Jhalon old | 948378 | 2602027 | 373 | 303.53 |
| Kalhera | 974337 | 2617653 | 356 | 294.24 |
| Kendraho | 931996 | 2650566 | 360 | 103.7 |
| Kishanganj-RODC | 944570 | 2657458 | 361 | 200 |
| KishunGanj | 945392 | 2657453 | 356 | 268 |
| Konda Kalan | 991459 | 2615905 | 399 | 269.09 |
| Kudai-RODC | 969733 | 2661253 | 336 | 168.49 |
| Kusmi (Mangarh) EW | 995183 | 2610939 | 391 | 245.53 |
| Malankhera-RODC | 970129 | 2616776 | 349 | 162.75 |
| Nargawan | 965600 | 2592845 | 392 | 271.09 |
| Narsinghpur | 946132 | 2661023 | 345 | 305 |
| Nohta | 966514 | 2626656 | 339 | 152.5 |
| Pada Jhir | 967184 | 2587805 | 514 | 143 |
| Patera WRD | 975855 | 2662135 | 329 | 30.48 |

| | | | | |
|---|---|---|---|---|
| Patera(D)-RODC | 976227 | 2661190 | 333 | 200 |
| Patharia | 959588 | 2638990 | 357 | 54.9 |
| Patharia WRD | 932024 | 2649642 | 361 | 32 |
| Patharia(D)-RODC | 927717 | 2649575 | 375 | 70.2 |
| Pondi Mangarh EW | 990861 | 2620977 | 421 | 166.36 |
| Rajwas | 928683 | 2649480 | 371 | 200 |
| Reneh-RODC | 980834 | 2678410 | 327 | 200 |
| Sahajpur | 970609 | 2587606 | 535 | 231.75 |
| Sajni Hatna | 947147 | 2637458 | 370 | 200 |
| Samnapur2-RODC | 948757 | 2584921 | 402 | 184.12 |
| Sanga | 960903 | 2606425 | 549 | 201.3 |
| Sanga old | 960903 | 2606425 | 399 | 280.24 |
| Sarra-RODC | 941452 | 2591084 | 388 | 175 |
| Selwara | 975483 | 2595475 | 559 | 298.6 |
| Sitanagar | 952614 | 2666624 | 342 | 277 |
| Tajgarh WRD | 959601 | 2611628 | 363 | 31.69 |
| Taradehi(D)-RODC | 945862 | 2582674 | 391 | 105.6 |
| Taradehi1-RODC | 945862 | 2582674 | 391 | 200 |
| Tendukheda | 963646 | 2594326 | 402 | 303.5 |
| Tendukheda(D)-RODC | 963646 | 2594326 | 402 | 60 |

# ANEXURE-I I
# LITHOLOGS DETAILS Of EXPLRATION BORE WELLS

| Bore | Depth1 | Depth2 | Lithology |
|---|---|---|---|
| Aam Khera | 0 | 14 | Shale: weathered |
| Aam Khera | 14 | 152 | Shale |
| Aam Khera | 152 | 154 | Shale: Fractured |
| Aam Khera | 154 | 262.3 | Shale |
| Aam Khera (Bilani) | 0 | 14 | Shale: weathered |
| Aam Khera (Bilani) | 14 | 142 | Shale |
| Aam Khera (Bilani) | 142 | 146 | Shale: Fractured |
| Aam Khera (Bilani) | 146 | 231.8 | Shale |
| Abhana | 0 | 4.83 | Shale: Highly weathered |
| Abhana | 4.83 | 300 | Shale |
| Bairagadh | 0 | 50.54 | Shale |
| Bairagadh | 50.54 | 233.14 | Sandstone |
| Bandakpur | 0 | 13 | Shale: weathered |
| Bandakpur | 13 | 147 | Shale |
| Bandakpur | 147 | 153 | Shale: Fractured |
| Bandakpur | 153 | 268.4 | Shale |
| Bansa Tarkheda | 0 | 1.83 | Shale: weathered |
| Bansa Tarkheda | 1.83 | 304 | Shale |
| Basakala | 0 | 10.84 | Alluvium |
| Basakala | 10.84 | 13.84 | Alluvium |
| Basakala | 13.84 | 200 | Shale |
| Batiagarh(S)-RODC | 0 | 19 | Limestone:Highly weathered |
| Batiagarh(S)-RODC | 19 | 30 | Sandstone:weathered & Fractured |
| Batiagarh(S)-RODC | 30 | 36 | Sandstone |
| Batiyagadh | 0 | 20.09 | Alluvium |
| Batiyagadh | 20.09 | 26.18 | Shale |
| Batiyagadh | 26.18 | 137 | Sandstone |
| Batiyagadh | 137 | 138 | Sandstone:Fractured |
| Batiyagadh | 138 | 153 | Sandstone |
| Battiagarh WRD | 0.00 | 16.72 | Shale: Highly weathered |
| Battiagarh WRD | 16.72 | 24.34 | Shale: weathered & Fractured |
| Battiagarh WRD | 24.34 | 30.44 | Sandstone |
| Bhajiya | 0 | 14.11 | Sandstone:Weathered |
| Bhajiya | 14.11 | 135.91 | Shale |
| Bhajiya | 135.91 | 138.91 | Sandstone:Fractured |
| Bhajiya | 138.91 | 166.36 | Sandstone |
| Bhajiya | 166.36 | 196.81 | Shale |
| Bhajiya | 196.81 | 221.17 | Limestone |
| Bhajiya | 221.17 | 245.53 | Shale |
| Bhajiya | 245.53 | 254.71 | Limestone |
| Borda | 0 | 27.33 | Sandstone:weathered & Fractured |
| Borda | 27.33 | 38.09 | Sandstone |
| Borda | 38.09 | 41 | Shale:Fractured |
| Borda | 41 | 200 | Shale |
| Bothrai | 0 | 4 | Sandstone:Weathered |
| Bothrai | 4 | 20 | Shale:Fractured |

| | | | |
|---|---|---|---|
| Bothrai | 20 | 134.2 | Shale |
| Chirola | 0 | 7.92 | Sandstone:Weathered |
| Chirola | 7.92 | 26.19 | Shale:Fractured |
| Chirola | 26.19 | 123.63 | Shale |
| Chirola | 123.63 | 172.35 | Limestone |
| Chirola | 172.35 | 208.89 | Shale |
| Chirola | 208.89 | 215 | Sandstone:Fractured |
| Chopra Khurd | 0 | 10 | Shale: weathered |
| Chopra Khurd | 10 | 268.4 | Shale |
| Damoh Polytechnic | 0 | 7.92 | Shale: weathered |
| Damoh Polytechnic | 7.92 | 305.12 | Shale |
| Damoh WRD | 0 | 5.17 | Shale: weathered |
| Damoh WRD | 5.17 | 9.14 | Shale:Fractured |
| Damoh WRD | 9.14 | 38.1 | Shale |
| Damoh(D)-RODC | 0 | 6.6 | Shale: Highly weathered |
| Damoh(D)-RODC | 6.6 | 29 | Shale |
| Damoh(D)-RODC | 29 | 32 | Shale: weathered & Fractured |
| Damoh(D)-RODC | 29.8 | 57.6 | Shale |
| Damoh(D)-RODC | 57.6 | 60 | Shale:Fractured |
| Damoh(D)-RODC | 60 | 80 | Shale |
| Datla | 0 | 16 | Shale: weathered & Fractured |
| Datla | 16 | 33.5 | Shale |
| Datla | 33.5 | 34 | Shale:Fractured |
| Datla | 34 | 200 | Shale |
| Dharoli | 0 | 10 | Sandstone:weathered & Fractured |
| Dharoli | 10 | 201.3 | Sandstone |
| Fatehpur-RODC | 0 | 15.75 | Shale: Highly weathered |
| Fatehpur-RODC | 15.75 | 30 | Shale |
| Fatehpur-RODC | 30 | 31.5 | Shale: weathered & Fractured |
| Fatehpur-RODC | 31.5 | 49 | Shale |
| Fatehpur-RODC | 49 | 77 | Sandstone |
| Fatehpur-RODC | 77 | 79 | Sandstone:Fractured |
| Fatehpur-RODC | 79 | 88 | Sandstone |
| Fatehpur-RODC | 88 | 91 | Sandstone:Fractured |
| Fatehpur-RODC | 91 | 134.5 | Sandstone |
| Futera-RODC | 0 | 16.25 | Shale: Highly weathered |
| Futera-RODC | 16.25 | 26.25 | Shale |
| Futera-RODC | 26.25 | 107.5 | Sandstone |
| Gaisabad1-RODC | 0 | 10.5 | Shale: Highly weathered |
| Gaisabad1-RODC | 10.5 | 47 | Shale |
| Gaisabad1-RODC | 47 | 50 | Shale:Fractured |
| Gaisabad1-RODC | 50 | 84 | Shale |
| Gaisabad1-RODC | 84 | 87 | Shale:Fractured |
| Gaisabad1-RODC | 87 | 105 | Shale |
| Gaisabad1-RODC | 105 | 109 | Shale:Fractured |
| Gaisabad1-RODC | 109 | 131.25 | Shale |
| Gaisabad1-RODC | 131.25 | 134 | Sandstone:weathered & Fractured |
| Gaisabad1-RODC | 134 | 160 | Sandstone |
| Gaisabad1-RODC | 160 | 200 | Shale |
| Gubra | 0 | 4.93 | Sandstone:Weathered |

| | | | |
|---|---|---|---|
| Gubra | 4.93 | 14.11 | Shale: weathered |
| Gubra | 14.11 | 233.35 | Shale |
| Guhanchi-RODC | 0 | 7.75 | Shale: Highly weathered |
| Guhanchi-RODC | 7.75 | 18.7 | Sandstone:weathered |
| Guhanchi-RODC | 30 | 32 | Sandstone:Fractured |
| Guhanchi-RODC | 32 | 73.5 | Sandstone |
| Guhanchi-RODC | 73.5 | 74.5 | Shale: weathered & Fractured |
| Guhanchi-RODC | 74.5 | 94.5 | Shale |
| Guhanchi-RODC | 94.5 | 97 | Shale: weathered & Fractured |
| Guhanchi-RODC | 97 | 131.25 | Sandstone |
| Guhanchi-RODC | 131.25 | 144.65 | Shale |
| Harat | 0 | 10.84 | Shale: Highly weathered |
| Harat | 1.84 | 16.37 | Shale: weathered |
| Harat | 16.37 | 200 | Shale |
| Hatta WRD | 0.00 | 3.04 | Shale: Highly weathered |
| Hatta WRD | 3.04 | 12.19 | Sandstone:weathered & Fractured |
| Hatta WRD | 12.19 | 22.86 | Shale |
| Hatta WRD | 22.86 | 30.48 | Sandstone |
| Hatta(D)-RODC | 0 | 8.1 | Limestone:Weathered |
| Hatta(D)-RODC | 8.1 | 18.7 | Sandstone:weathered & Fractured |
| Hatta(D)-RODC | 18.7 | 30.54 | Shale |
| Hatta(D)-RODC | 30.54 | 40.1 | Limestone:Weathered & Fractured |
| Hatta(D)-RODC | 40.1 | 71 | Shale |
| Hatta(D)-RODC | 71 | 76 | Shale:Fractured |
| Hatta(D)-RODC | 76 | 85 | Shale |
| Hindoriya | 0 | 12 | Shale: weathered |
| Hindoriya | 12 | 161 | Shale |
| Hindoriya | 161 | 166 | Shale:Fractured |
| Hindoriya | 166 | 269.4 | Shale |
| Imilitol | 0 | 6.4 | Sandstone:Weathered |
| Imilitol | 6.4 | 42.7 | Sandstone |
| Imilitol | 42.7 | 73.2 | Shale |
| Imilitol | 73.2 | 131.1 | Sandstone |
| Imilitol | 131.1 | 137.2 | Shale |
| Imilitol | 137.2 | 201.3 | Sandstone |
| Jabera(D)-RODC | 0 | 10.2 | Shale: weathered |
| Jabera(D)-RODC | 10.2 | 30.5 | Limestone |
| Jabera(D)-RODC | 30.5 | 35.5 | Shale:Fractured |
| Jabera(D)-RODC | 35.5 | 36 | Shale |
| Jabera(D)-RODC | 36 | 37 | Sandstone |
| Jabera(D)-RODC | 37 | 49.25 | Limestone |
| Jhalon | 0 | 5 | Sandstone:Weathered |
| Jhalon | 5 | 134.2 | Sandstone |
| Jhalon | 134.2 | 158.6 | Shale |
| Jhalon | 158.6 | 201.3 | Sandstone |
| Jhalon old | 0 | 75.01 | Sandstone |
| Jhalon old | 75.01 | 157.18 | Shale |
| Jhalon old | 157.18 | 190.72 | Sandstone |
| Jhalon old | 190.72 | 230 | Shale |
| Jhalon old | 230 | 303.53 | Sandstone |

| | | | |
|---|---|---|---|
| Kalhera | 0 | 8.2 | Sandstone:Weathered |
| Kalhera | 8.2 | 50.65 | Shale |
| Kalhera | 50.65 | 87.19 | Sandstone |
| Kalhera | 87.19 | 90.19 | Shale:Fractured |
| Kalhera | 90.19 | 111.55 | Shale |
| Kalhera | 111.55 | 123.73 | Sandstone |
| Kalhera | 123.73 | 193.72 | Shale |
| Kalhera | 193.72 | 266.8 | Sandstone |
| Kalhera | 266.8 | 269.89 | Sandstone:Fractured |
| Kalhera | 269.89 | 294.24 | Sandstone |
| Kendraho | 0 | 30 | Shale: weathered |
| Kendraho | 30 | 64 | Shale |
| Kendraho | 64 | 68 | Limestone:Fractured |
| Kendraho | 68 | 103.7 | Shale |
| Kishanganj-RODC | 0 | 120.75 | Limestone |
| Kishanganj-RODC | 120.75 | 200 | Dolomite |
| KishunGanj | 0 | 1.83 | Limestone:Weathered |
| KishunGanj | 1.83 | 25.29 | Limestone |
| KishunGanj | 25.29 | 70.72 | Shale |
| KishunGanj | 70.72 | 77.01 | Shale: weathered & Fractured |
| KishunGanj | 77.01 | 165.36 | Shale |
| KishunGanj | 165.36 | 201.9 | Sandstone |
| KishunGanj | 165.36 | 236 | Sandstone |
| KishunGanj | 236 | 238 | Sandstone:Fractured |
| KishunGanj | 238 | 268 | Sandstone |
| Konda Kalan | 0 | 14.11 | Sandstone:Weathered |
| Konda Kalan | 14.11 | 178.54 | Sandstone |
| Konda Kalan | 178.54 | 181 | Shale: weathered & Fractured |
| Konda Kalan | 181 | 269.09 | Shale |
| Kudai-RODC | 0 | 5.25 | Shale: Highly weathered |
| Kudai-RODC | 5.25 | 25 | Slate |
| Kudai-RODC | 25 | 27 | Slate:Fractured |
| Kudai-RODC | 27 | 133.75 | Slate |
| Kudai-RODC | 133.75 | 168.49 | Shale |
| Kusmi (Mangarh) EW | 0 | 8.32 | Shale: weathered |
| Kusmi (Mangarh) EW | 8.32 | 129.82 | Shale |
| Kusmi (Mangarh) EW | 129.82 | 148.09 | Sandstone |
| Kusmi (Mangarh) EW | 148.09 | 233.35 | Shale |
| Kusmi (Mangarh) EW | 233.35 | 245.53 | Limestone:Fractured |
| Malankhera-RODC | 0 | 21 | Sandstone :weathered |
| Malankhera-RODC | 21 | 149.5 | Sandstone |
| Malankhera-RODC | 149.5 | 162.75 | Shale |
| Nargawan | 0 | 26.2 | Sandstone |
| Nargawan | 26.2 | 32.38 | Shale: weathered |
| Nargawan | 32.38 | 160.26 | Shale |

| | | | |
|---|---|---|---|
| Nargawan | 160.26 | 271.09 | Sandstone |
| Narsinghpur | 0 | 20.1 | Limestone:Weathered |
| Narsinghpur | 20.1 | 105.35 | Limestone |
| Narsinghpur | 105.35 | 196.8 | Shale |
| Narsinghpur | 196.8 | 305 | Sandstone |
| Nohta | 0 | 21.3 | Sandstone |
| Nohta | 21.3 | 42.7 | Shale |
| Nohta | 42.7 | 152.5 | Sandstone |
| Pada Jhir | 0 | 23.2 | Sandstone:weathered & Fractured |
| Pada Jhir | 23.2 | 75.01 | Sandstone |
| Pada Jhir | 75.01 | 96.28 | Shale |
| Pada Jhir | 96.28 | 143 | Sandstone |
| Patera WRD | 0 | 4.57 | Shale: Highly weathered |
| Patera WRD | 4.57 | 9.14 | Shale: weathered |
| Patera WRD | 9.17 | 30.48 | Shale |
| Patera(D)-RODC | 0 | 3.05 | Shale: Highly weathered |
| Patera(D)-RODC | 3.05 | 6.5 | Shale: weathered |
| Patera(D)-RODC | 6.5 | 61 | Shale |
| Patera(D)-RODC | 61 | 64 | Shale:Fractured |
| Patera(D)-RODC | 64 | 200 | Shale |
| Patharia | 0 | 6.7 | Sandstone:Weathered |
| Patharia | 6.7 | 48.7 | Shale |
| Patharia | 48.7 | 54.9 | Limestone:Fractured |
| Patharia(D)-RODC | 0 | 3.6 | Limestone:Highly weathered |
| Patharia(D)-RODC | 3.6 | 22.6 | Limestone:Weathered |
| Patharia(D)-RODC | 22.6 | 36.75 | Limestone |
| Patharia(D)-RODC | 36.75 | 48.9 | Sandstone:Fractured |
| Patharia(D)-RODC | 48.9 | 70.2 | Sandstone |
| Pondi Mangarh EW | 0 | 5.03 | Sandstone |
| Pondi Mangarh EW | 5.03 | 26.33 | Shale: weathered |
| Pondi Mangarh EW | 26.33 | 56.81 | Shale |
| Pondi Mangarh EW | 56.81 | 90 | Limestone |
| Pondi Mangarh EW | 90 | 93 | Limestone:Fractured |
| Pondi Mangarh EW | 93 | 129.81 | Limestone |
| Pondi Mangarh EW | 129.81 | 139 | Sandstone |
| Pondi Mangarh EW | 139 | 154.18 | Shale |
| Pondi Mangarh EW | 154.18 | 157.27 | Sandstone:weathered & Fractured |
| Pondi Mangarh EW | 157.27 | 166.36 | Shale |
| Rajwas | 0 | 10.84 | Shale: Highly weathered |
| Rajwas | 10.84 | 34 | Shale |
| Rajwas | 34 | 36 | Shale:Fractured |
| Rajwas | 36 | 200 | Shale |
| Reneh-RODC | 0 | 5.25 | Shale: Highly weathered |
| Reneh-RODC | 5.25 | 91.75 | Shale |
| Reneh-RODC | 91.75 | 105 | Sandstone |
| Reneh-RODC | 105 | 200 | Shale |
| Sahajpur | 0 | 14 | Sandstone:Weathered |
| Sahajpur | 14 | 20.2 | Sandstone |
| Sahajpur | 20.2 | 231.75 | Shale |

| | | | |
|---|---|---|---|
| Sajni Hatna | 0 | 16.37 | Shale: weathered |
| Sajni Hatna | 16.37 | 46 | Shale |
| Sajni Hatna | 46 | 47 | Shale:Fractured |
| Sajni Hatna | 47 | 200 | Shale |
| Samnapur2-RODC | 0 | 3.5 | Sandstone:weathered |
| Samnapur2-RODC | 3.5 | 47.25 | Sandstone |
| Samnapur2-RODC | 47.25 | 49.75 | Shale |
| Samnapur2-RODC | 49.75 | 103 | Sandstone |
| Samnapur2-RODC | 103 | 105 | Sandstone:Fractured |
| Samnapur2-RODC | 105 | 118 | Sandstone |
| Samnapur2-RODC | 118 | 123.25 | Shale |
| Samnapur2-RODC | 123.25 | 184.12 | Sandstone |
| Sanga | 0 | 6.4 | Sandstone:Weathered |
| Sanga | 6.4 | 42.7 | Sandstone |
| Sanga | 42.7 | 73.2 | Shale |
| Sanga | 73.2 | 73.8 | Sandstone:Fractured |
| Sanga | 73.2 | 131.1 | Sandstone |
| Sanga | 131.1 | 137.2 | Shale |
| Sanga | 137.2 | 201.3 | Sandstone |
| Sanga old | 0 | 29.28 | Sandstone |
| Sanga old | 29.28 | 62.73 | Shale |
| Sanga old | 62.73 | 93.18 | Sandstone |
| Sanga old | 93.18 | 105.36 | Shale |
| Sanga old | 105.36 | 141.9 | Sandstone |
| Sanga old | 141.9 | 214.18 | Shale |
| Sanga old | 214.18 | 280.24 | Sandstone |
| Sarra-RODC | 0 | 18.25 | Sandstone:weathered |
| Sarra-RODC | 18.25 | 136 | Sandstone |
| Sarra-RODC | 136 | 138 | Sandstone:Fractured |
| Sarra-RODC | 138 | 146 | Sandstone |
| Sarra-RODC | 146 | 148 | Sandstone:Fractured |
| Sarra-RODC | 148 | 175 | Sandstone |
| Selwara | 0 | 139.68 | Sandstone |
| Selwara | 139.68 | 298.6 | Shale |
| Sitanagar | 0 | 26.17 | Shale: weathered |
| Sitanagar | 26.17 | 53 | Shale |
| Sitanagar | 53 | 56 | Shale:Fractured |
| Sitanagar | 56 | 115.45 | Shale |
| Sitanagar | 115.45 | 145.9 | Limestone |
| Sitanagar | 145.9 | 155.08 | Limestone:Fractured |
| Sitanagar | 155.08 | 225.07 | Shale |
| Sitanagar | 225.07 | 277 | Sandstone |
| Tajgarh WRD | 0 | 18.28 | Alluvium |
| Tajgarh WRD | 18.28 | 27.43 | Alluvium |
| Tajgarh WRD | 27.69 | 31.69 | Sandstone |
| Taradehi(D)-RODC | 0 | 18.6 | Shale: Highly weathered |
| Taradehi(D)-RODC | 18.6 | 105.6 | Shale |
| Taradehi1-RODC | 0 | 4.75 | Sandstone:weathered |
| Taradehi1-RODC | 4.75 | 200 | Sandstone |
| Tendukheda | 0 | 68 | Shale |

| | | | |
|---|---|---|---|
| Tendukheda | 68 | 68.92 | Shale: weathered |
| Tendukheda | 68.92 | 202.8 | Sandstone |
| Tendukheda | 202.8 | 208.89 | Sandstone:Fractured |
| Tendukheda | 208.89 | 303.5 | Shale |
| Tendukheda(D)-RODC | 0 | 3.6 | Shale: Highly weathered |
| Tendukheda(D)-RODC | 3.6 | 18.6 | Shale: weathered |
| Tendukheda(D)-RODC | 18.6 | 27.6 | Shale |
| Tendukheda(D)-RODC | 27.6 | 29.4 | Shale: weathered & Fractured |
| Tendukheda(D)-RODC | 29.4 | 45.6 | Shale |
| Tendukheda(D)-RODC | 45.6 | 60 | Shale: weathered & Fractured |