केन्द्रीय भूमि जल बोर्ड

जल संसाधन, नदी विकास और गंगा संरक्षण

विभाग, जल शक्ति मंत्रालय

भारत सरकार

Central Ground Water Board

Department of Water Resources, River Development and Ganga Rejuvenation,

Ministry of Jal Shakti

Government of India

AQUIFER MAPPING AND MANAGEMENT OF GROUND WATER RESOURCES

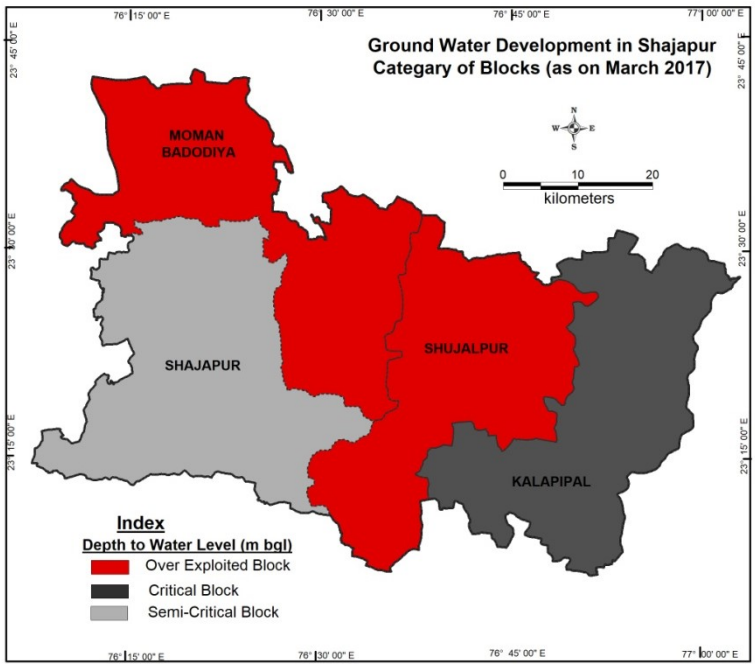
Shajapur District
Madhya Pradesh

उत्तर मध्य क्षेत्र, भोपाल

North Central Region, Bhopal

Central Ground Water Board
Department of Water Resources, River Development and Ganga Rejuvenation
Ministry of Jalshakti
Government of India

REPORT ON NAQUIM IN SAJAPUR, KALAPIPAL, MOMAN, BARODIA AD SHAJALPUR BLOCKS OF SAJAPUR DISTRICT, MADHYA PRADESH AAP 2019-20



By

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ACKNOWLEDGEMENTS

I would like to take an opportunity to thank **Shri P K Jain Regional Director,** CGWB, NCR, Bhopal for providing the necessary facilities to complete the NAQUIM study report.

I am very much delighted to express my deep sense of gratitude and regards to my respected Sh. M M Rao Sonkusare, Sc.D, CGWB, NCR, Bhopal for his valuable and meticulous guidance during the study and scrutiny of the report.

I am deeply thankful to Dr. K Paramashivam (AHG)**,** CGWB, NCR, Bhopal for his valuable help and guidance throuout the study.

I am thankful to all the officers and officials of CGWB, NCR, Bhopal for help and co-operation supported in completing the study.

(Anakha Ajai)

EXECUTIVE SUMMARY

National Project on Aquifer Mapping is intended in knowing, understanding and managing the aquifers for sustainable development of groundwater which is the most important part for ensuring water security in India.

The NAQUIM study of Shajapur district is designed in three parts. The first part consists understanding the topography, geology, climatic conditions, socio economic conditions, geomorphology etc. of Shajapur district which influence the groundwater in any manner.

The second part consists of data generation and mapping of aquifer to a 1:50000 scale for better understanding, aquifer charcteristics and preparation of 3-dimensional and 2-dimentional models of aquifer below ground level, assessment of resources available in the district.

The thisr part covers management plan proposed for sustainable development of groundwater in the whole district in block levels by demand side and supply side management.

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Scientist B

CGWB, NCR, Bhopal

Contents

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

1. Introduction

National project on Aquifer Mapping (NAQUIM) is a programme being carried out by Central Ground Water Board for mapping and documentation of aquifers, their characteristics, inter relations and controls all over India in a 1:50,000 scale. In simple words, NAQUIM involves the detailed hydrogeological investigation of an area with more priority given to the planning for development and sustainability of aquifer. OCS blocks and other groundwater stressed areas are prioritised in NAQUIM studies. It is comprehensive approach on aquifer mapping comprising geomorphlogical, geological, hydrological and hydrochemical investigation of aquifer systems.

1.1 Purpose and Scope

The activities under NAQUIM are aimed at various aspects including identification of the aquifer geometry, aquifer characteristics and their yield potential, analyzing and inferring chemical quality of water occurring at various depths, aquifer wise assessment of ground water resources, preparation of aquifer maps and formulating ground water management plan.

Shajapur district being spread over an area of 3473.25 sq.km have been entirely covered during the Annual Action Plan of 2019-20.

1.2 Location and Accessibility

Shajapur district is situated in Malwa plateau and bounded by Rajgarh, Ratlam and Ujjain districts in the North, Southwest and Northwest Respectively. Agar, Dewas and Sehore districts bounds Shajapur respectively in the West, South and the East. The area falls in survey of India toposheet No.s 55 A/3, 55 A/4, 55 A/6, 55 A/ 7, 55 A/8, 55 A/10, 55 A/11, 55 A/12, 55 A/14, 55 A/15, 55 A/16 and 55E/3. The district lies between north latitudes 23°06′ 00″ and 23° 42′ 00″, east longitude 76°10′00″ and 77°0′ 00″. The District is drained mainly Parvati, Newaj and Kalisindh rivers which forms the natural boundary in the East and West respectively.

Shajapur, the district head quarter formed in 1901 is located on National highway No. 3 i.e. Agra – Mumbai road. The study area is well connected to the surrounding districts by a good network of roads and railways. Important towns like Shajapur, Shujalpur, M. barodia and Kalapipal are connected by roads. All the villages in the study area are connected to this basic frame work by a secondary network of roads. The rail length in the study area comes to 135 kms and Shujalpur, Makshi and Kalapipal are the main railway stations. The district head quarter is 211 kms away from state capital Bhopal. The nearest airport is located at Indore 85 kms SW of Shajapur.

Figure No.1: Base Map of Shajapur district

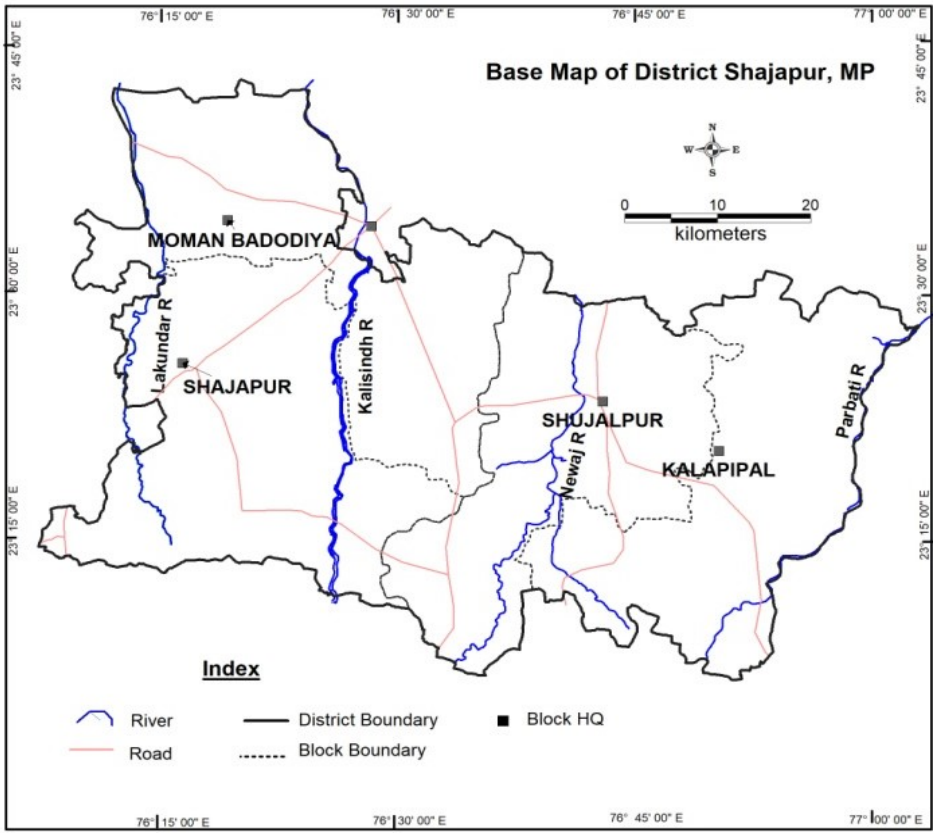
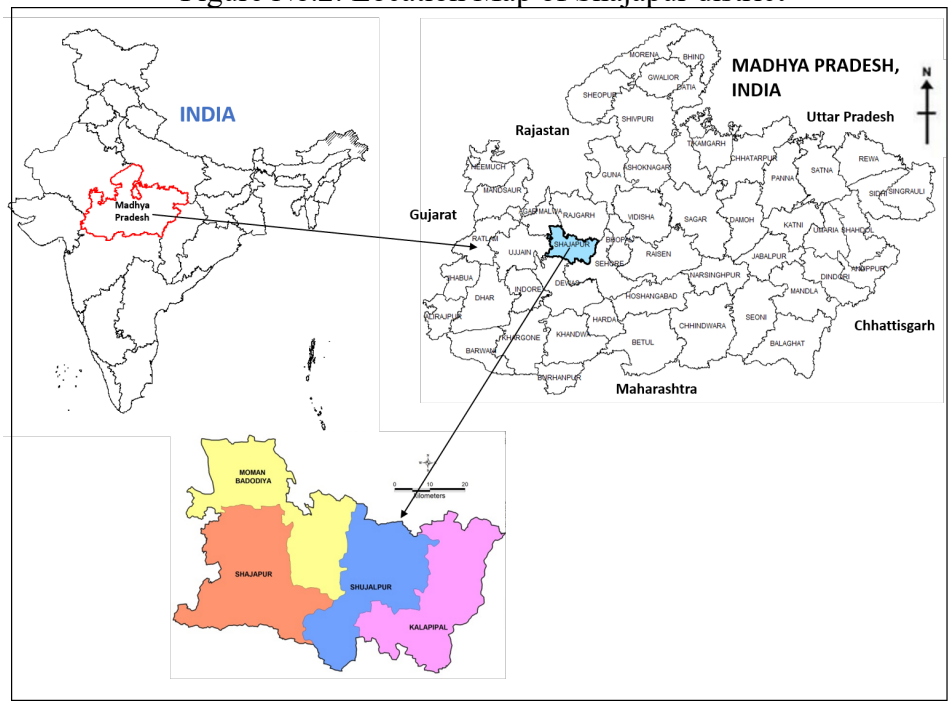


Figure No.2: Location Map of Shajapur district



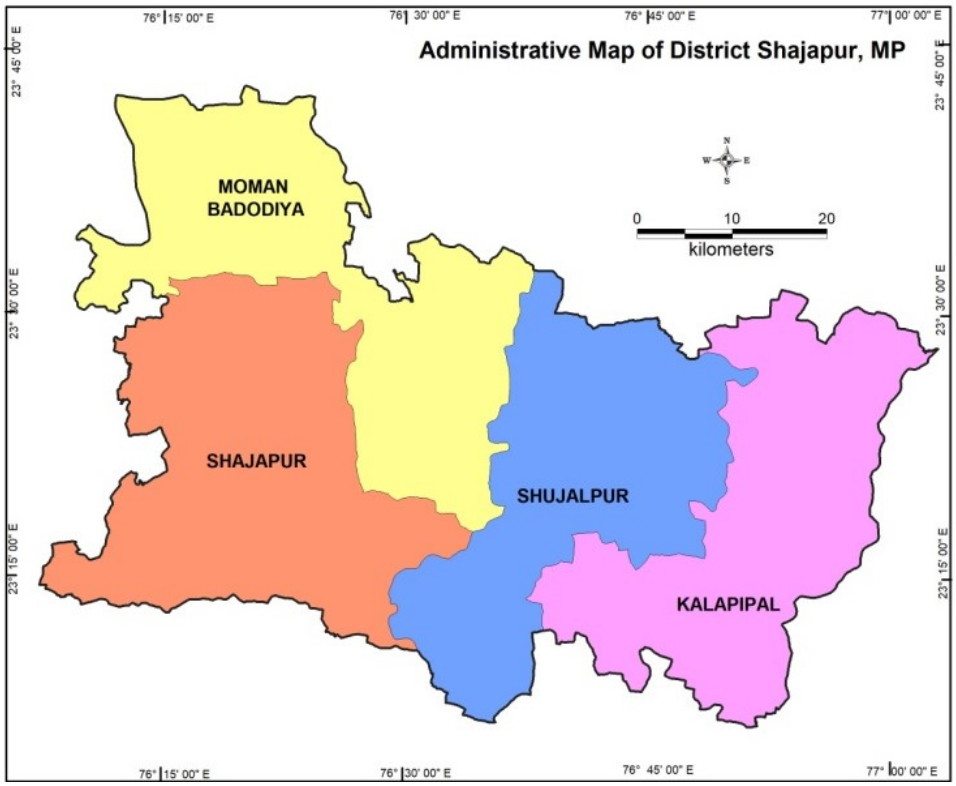
1.3 Population and Administrative Division

The administrative divisions of Shajapur district consist of 4 blocks. The total geographical area is 3473.25 sq. km consist of Shujalpur, Moman Barodia, Kalapiapl and Shajapur blocks with Shajapur being the district head quarter. Demography of the district with block wise details is given below.

Table No. 1 : Administrative Divisions in Shajapur

Tehsil	**Block/ Tehsil**	**Geographical Are (Sq. Km).**	**Population (2011) Census**	**Population Growth rate for 10 year (91-001)**	**No. of Villages**	**Gram Panchayat**	**Revenue Circle**
Shajapur	Shajapur	917.86	254293	24.76	181	84	3
M.Barodia	M.Barodia	904.05	179534	25.78	174	78	3
Shujalpur	Shujalpur	825.67	204825	27.18	236	63	2
Kalapipal	Kalapipal	825.67	171663	26.49	162	70	3
	Total	3473.25	810314	26.05	753	295	11

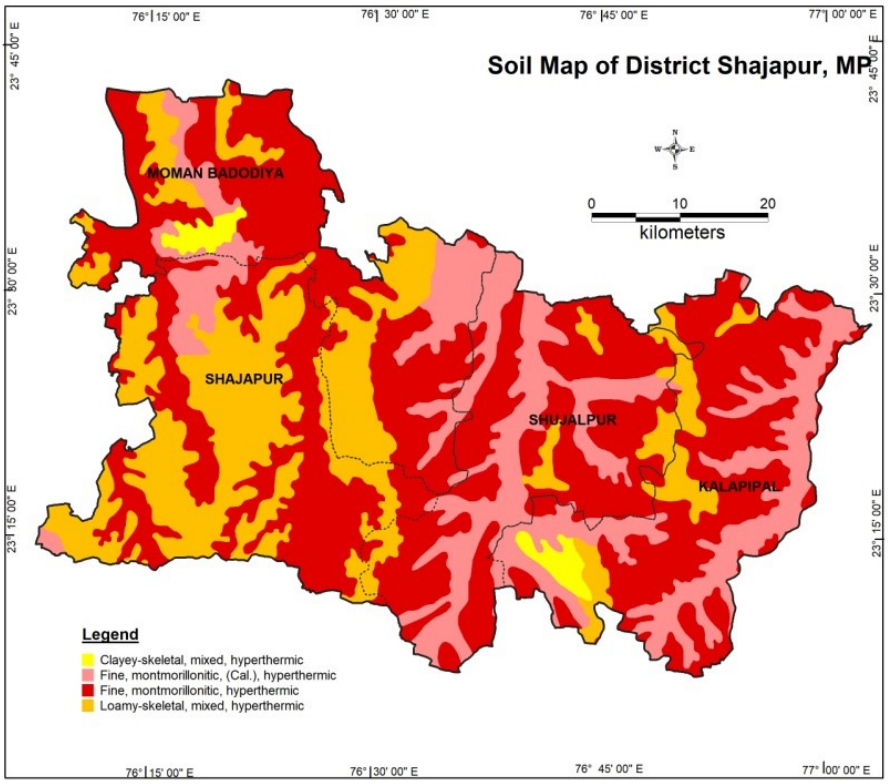
Figure No.3: Administrative map of Shajapur district



1.4 Soil types in Shajapur district

The soils, in the study area are of mixed type and there is no district boundary in between any two types of soils. The three categories of soils identified in the study area are Black cotton soil (Clayey-skeletal), Lateritic soil(Loamy skeletal) and Alluvial soil (fine, motmorillonitic. All these soils are clay rich loamy soils and the first two types are formed by the weathering of basaltic rocks and cover the major portion of district. Alluvial soil is found along the banks of Parvati and Kalisindh rivers.

Figure No.4: Soil Map of Shajapur district



1.5 Landuse and Cropping Pattern and Irrigation

Total geographical area of Shajapur district is 3473.25 sq.km in which 3396.17 sq.km is total recharge worthy area. An area of 2710 sq.km (80%) is cultivated and 15sq.km (0.44%) area is fallow land. Forest area is NIL in the district. 892.23sq.km (26%) is the double cropped area. Kharif crops (74.34%) are predominant in the study area. Wheat (8.89%) is the major rabi crop in the area. Nominal amount (0.08%) of rice is also being cultivated in the district. Oil seeds (Soyabean) and pulses constitute 56.91% and 14.52% of crops in both rabi and kharif crops, other predominant crops include Jawar (3.28%) and Maize (6.37%). Rabi Land use distribution for edible and non edible crops is 35.60% and 64.40% respectively in the study area. Net irrigated area to net sown area is 27.88% in the study area. Ground water is the major source (86.07%) of irrigation while surface water & others constituents only 13.95% irrigation in the study area. Canal irrigation constitutes only 0.67% of the total area. Area irrigated by tube well is 39% and dug well is 47%. Irrigation from ponds is 2.6% and other source is 10%.

Table No.2: Landuse in Shajapur district

Si .no	Type	Area (sq.km)
1	Total Geographical Area	3473.25
2	Total Recharge Worthy Area	3396.17
3	Hilly Area	77.08
4	Forest Area	NIL
5	Net sown Area	2710
6	Double cropped Area	892.23

1.6 Climatic conditions in Shajapur

The climate is tropical in Shajapur. The normal annual rainfall of Shajapur District is 873.9 mm. When compared with winter, the summers have much more rainfall and the climate here is classified as tropical wet and dry(Aw) climate by the Köppen-Geiger system. District receives maximum rainfall during south – west monsoon period i.e. June to September (about 92.3%). Only 7.7% of the annual rainfall takes place from October to May. Thus surplus water for ground water recharge is available only during the south – west monsoon period. The actual rainfall received at Shajapur in the year 2019 is 1036 mm.The normal maximum temperature recorded during the month of May is 39.9^0 C and minimum during the month of January 9.6^0 C. The normal annual means maximum and minimum temperature of Shajapur district is 31.3^0 C & 35.5^0 C respectively. During the south- west monsoon season the relative humidity generally exceeds 88% (July / August month). The rest of the year is drier. The driest part of the year is the summer season, when relative humidity is less than 33%. April is the driest month of the year.The wind velocity is higher during the pre-monsoon period as compared to post monsoon period. The maximum wind velocity is 27.0 km / hr. observed during the month of June and minimum 7.1 km/hr during the month of November. The average normal annual wind velocity of Shajapur district is 15.9 km / hr.

1.7 Geomorphology of Shajapur district

The study area is a part of the Malwa plateau with an elevation range of 390 to 550m aMSL and the average relief is 160 m aMSL. Maximum elevation is towards Jhonkar in Southwest, Arandiya in South and Kalapipal in East and Northeast directions. Minimum elevation is towards Chouma in Northwest. The entire area is characterized by a typical trappean-basaltic geomorphology comprising extensive plain, low lying hills and hill clusters with gentle northerly slope. Western, Southern and Southeastern parts are highly undulating terrains with broad flat topped hills, terraces and isolated hills constituting mesas and butte. Northeastern part of the district forms flat landmass having a moderately rolling topography with small mounds and hillocks. The central area towards Akodia and Shujalpur is a plain with scattered hillocks. Flood plain and valley deposits attaining a maximum thickness of 20m confined to the narrow banks are reported along the Kalisindh and lakundar rivers.

The major hydro-geomorphological units in the study area can be classified into depositional landforms including alluvial plains and valley fills, structural landforms including lineaments and intrusive landforms consisted of basaltic dykes. The basaltic up-lands and Deccan plateau basalts are main physiographic units in the study area which are acting as good groundwater occurring and control units.

1.7.1 Alluvial plain and valley fill

These are mostly unconsolidated sediments deposited over a flat, gently sloping or slightly undulating land and valley. The sediments are composed of gravel, sand, silt or clay sized unconsolidated material. The ground water potential of this unit is good to excellent.

1.7.2 Lineaments

These are linerar features in the form of faults, fractures, joints shear zones, contact zone and similar features which reflect the crustal structure. A majority of lineaments are seen to show NE-SW trend. As some of the lineaments are dislocation generated by structural disturbance, they provide channel for ground water movement especially at their intersection. The intersection areas of the lineaments thus have good to excellent ground water potential.

1.7.3 Dykes

These are dark grey, fine to medium grained, sparsely to moderately porphertic dense basalts. These generally have a NE-SE trend and act as a barrier as well as carrier of ground water and having good potential on the up grading side.

Table No.3 : Hydromorphological units in Shajapur district

Geomorphic Unit	Lithology	Structure	Description	Ground Water Occurrence
Alluvial Plain	Constites gravels sand silt or clay sized unconsolidated material.	-	Alluvium mainly composed of clay, silt, sand as unconsolidated material) over a flat, gently sloping or slightly undulating land.	Good to Excellent.
Basaltic Up-Land	Composed of basalts of deccan traps	-	Moderate relief upland with thin veneer of soil.	Poor to moderate along fractures.
Deccan Plateau	Composed of basalts of deccan traps	Fractured and jointed basalts.	Undulating topography with soil cover, normally cultivated.	Moderate to good along lineaments weathered zones and depression
Lineament	It may cut across various lithounits	Linear features	Fault lines, fractures joints shear zones contact shear zones, contact zones, other linear features and straight stream courses which are believed to reflect crustal structures.	Good,excellent at intersection of lineaments.

Figure No.5: Digital Elevation Map of Shajapur district

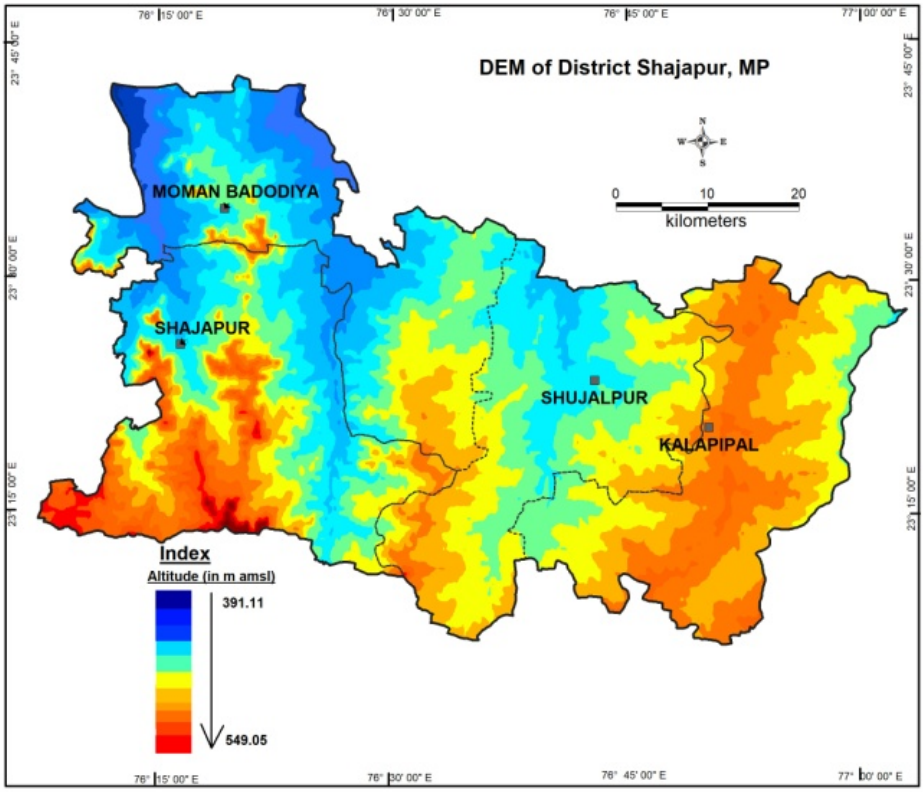
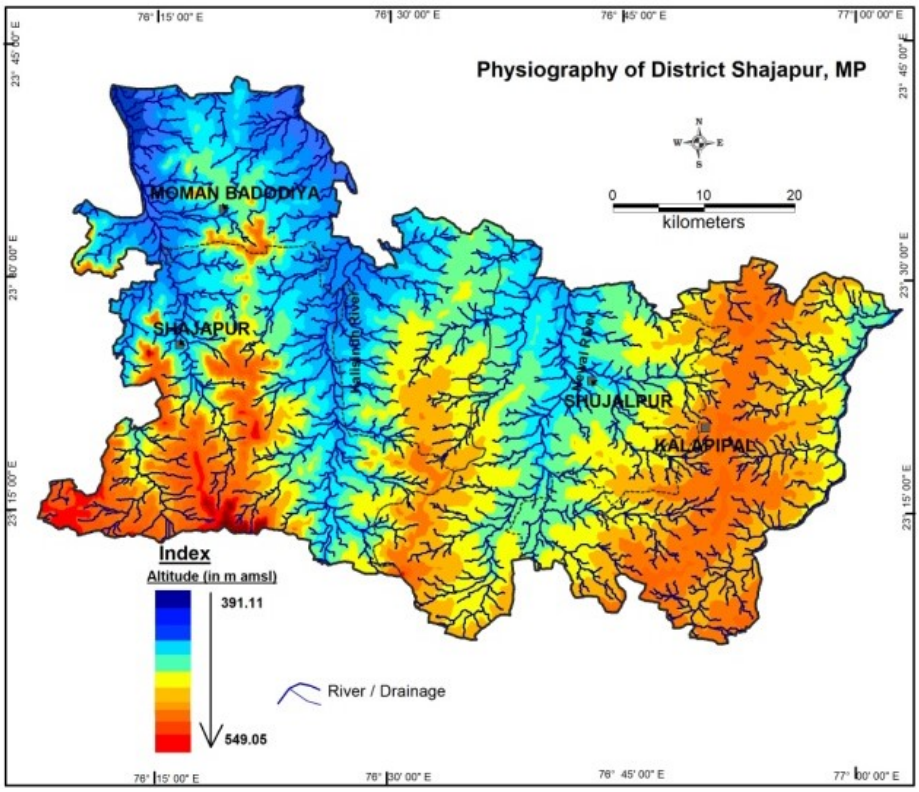


Figure No.6 Physiographic Map of Shajapur district

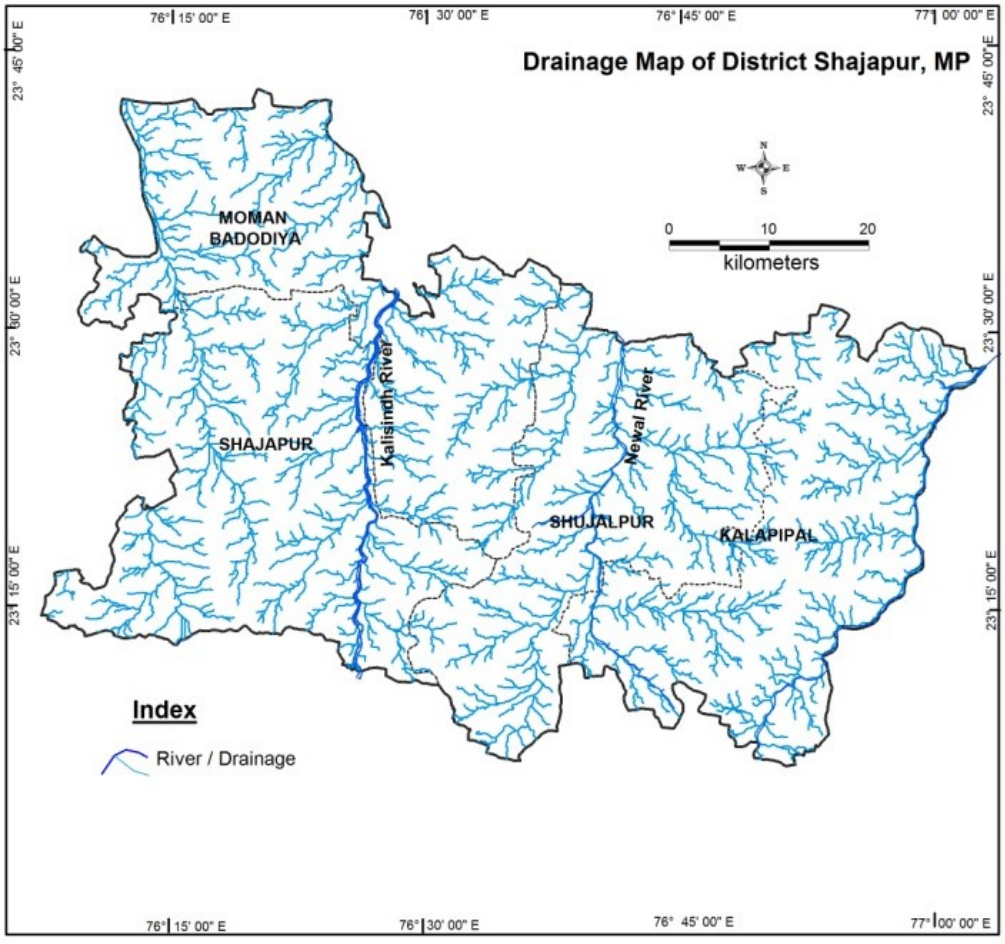


1.8 Drainage distribution in Shajapur district

The study area is prominently drained by North flowing rivers Kalisindh, Parvati and Newaj Kalisindh and Newaj constitute tributaries of the Chambal. Parvati river flows along the eastern margin of the district in the same direction. The chiller river, tributary of Kalisindh flow through Shajapur and drains the central and western parts of the study area. Choti Kalisindh, which is located towards the western side of district and is flowing from South to North. Drainage pattern is dendritic to sub dendritic and occasionally sub parallel with moderate drainage density. The natural drainage at few areas with gentle slope is interrupted by the construction of small earthern bunds that hold the surface run off from the areas.

The major river namely Kalisindh, Choti Kalisindh and Parvati, which were once perennial have now become ephemeral streams in the study area. Tributaries of these rivers are intermittent and the streams are flashier with peak flows occurring during monsoon season after the soil moisture deficits have been replenished. Smaller streams in the area ephemeral and usually short seeping in the head water area and gain run off in the down stream. As the streams in the district are ephemeral, domestic water supply depends upon groundwater, which is generally confined to weathered vesicular/amygdaloyidal basalt, occurring in the top portion of lava flows. In summer as the water table goes down the water resources dry up. This causes the permanent exploitation of deeper aquifer.

Figure No.7: Drainage Map of Shajapur district



CHAPTER 2

2. Geology of Shajapur district

Geologically the entire study area consists of a thick sequence of basaltic lava flows of the deccan trap basalt ranging in age from upper cretaceous to lower Eocene, overlain by fluvial alluvium. The area is mostly covered with a veneer of soil. Locally the formation is known as the Malwa group and have alternating layers of weathered basalt, vesicular basalt and massive basalt representing intermittent flows intercalated with fine grained red or yellow soil/clay known as the red boles/intratrappeans.

Tabel No. 4 : Generalized Geologic Succession

Geological Age	**Geological Unit**	**Flows Nos.**	**Lithology**
Pleistocene to Holocene (Cenozoic)	Alluvium	-	Yellowish brown silty sand with kankar and pebble.
Upper cretaceous to Paleocene	Deccan trap (Malwa group)	F 12-17	Indore formation (37 m) six fine grained, sparsely porphyritic Aa type flows.
		F 8-11	Kankariya-purukheri formation (30m) Four Aa and Pahoehoe type of Flow.
		F 3-7	Kalisindh formation (95M) Five fine grain, sparsely to moderately porphyritic Aa flows.
		F 0-2	Mandleswar formation (20m) two fine to medium grained sparely to moderately porphyritic Aa flows.

2.1.1 Deccan Traps

The rock formation exposed in the district range in age from Cretaceous to Holocene. They consist of Deccan traps capped by alluvium. The district is mainly occupied by a thick sequence of basaltic flows covering about 3380 sq km of study area. Total 17 basaltic flows have been identified in a vertical coloumn of 160 m between altitude 390m and 550m above msl.

The horizontal disposal of lava flows are mostly of Aa type. The flows exhibit andulatory contacts with 10-20m thickness and a northerly gradient. Individual flows have been

delineated by the occurrence of inter trappean beds, red boles, topographic breaks as well as texture, vesicularity and fragmented zones. In general, the rocks are dark grey, fine to medium grained, massive, hard and compact sparsely to moderate porphyritic basalts. The flows are massive at the bottom, grading upward into vesicular/amygdular zones followed by a fragmentary tope. Mineralogical they are composed of calcic plagioclase, feldspar, cline pyroxenes, glass and iron oxides.
The basaltic flows have been classified into four formation based on the physical characteristics and mode of eruption as Mandleswar Formation, Kalisindh Formation, Kankariya Pirukheri Formation and Indore Formation.

2.1.2 Mandleshwar Formation
The oldest formation, consists of two Aa type basalt flos and exposed at altitude between 320m and 340m above msl. It is observed along Kalisindh river and Kanthali nadi in the northern parts of the district and it is well exposed near Barai. Above this zone about 2 to 3m thick of inter trappean calcareous cherty limestone bed is present.

2.1.3 Kalisindh Formation (25m)
The overlying Kalisindh formation comprising five Aa type basalt flows occurs between 335 m and 430 m above msl. It is well exposed in the area west of sendili. The basalt is characterized by mega, colomner jointing and speriodal weathering near Lahariya and Raghunathgarh.

2.1.4 Kankariya-Pirukheri formation (30m)
The overlying Kankariya – Pirukheri formation consist of four Aa and compound pahochoe type basalt flows and is confined to altitude 430 m and 460m above masl. It occurs in eastern, southern western north western and south western part of the district. Lower and upper contact of the flows are marked by inter treppean beds and red boles, which are well exposed around Umariya, Pipalkhera, Kumariya Khas, towards west of Abhapur. Some of the inter treppean beds are fossiliferous containing physa fossils.

2.1.5 Indore Formation (37m)
The younger Indore formation consist of Six Aa type basalt flows and occurs between altitude 500m to 537m above msl. It occurs as north south belt in the western and south western part of the district. The upper contact is marked by the presence of a fragmentary tap. These flows are well exposed around Jogpura, Gangukheri, khera and Berchhi.

2.1.6 Inter Trappeans
The inter trappeans consists of chert cherty limestone and calcareous shale, which are sometimes fossliferous. One to three meter thick cherty limestone and fossiliferous limestone reported in northwestern part of the district. Impersistant chert (1-5 to 2.0m thick), limestone (3 m thick) and calcareous shale (2 m thick) reported at elevation 440m to 443m. A localized inter trappean is recorded at 450m in central part. Siliceous limestone (0.5 to 1.0m thick) is reported at 480 m in the north eastern and north western part of the area.

2.1.7 Alluvium
Alluvium is observed along the course of Kalisindh river in northern and southern most parts and along lakunder river in south western corner of the district. Along the Kalisindh river, it is about 10m thick and covers a vast area. It is generally yellowish/grayish in colour, soft unconsolidated, silty sand with Kanker and pebbles. A variety of soils are developed in the

district. They are black cotton soil overlying the vesicular zone, grayish soil on massive basalt and reddish brown soil.

2.1.8 Sub Surface Geology

To know the sub surface geology and details beheavior of aquifer in the area, central ground water board constructed 52 no of borewell in Shajapur district, during 2003-04 and 2016-17, under exploration drilling programme in four blocks namely Shajapur, Shujalpur, M. Barodia and Kalapipal. The depth of bore hole is ranges between 64.55 mbgl to 200 mbgl. The details of these bore wells are summurised and presented in annexure 2,4.

It is observed that each basaltic flow is distinctly separated by Red-bole/clay layer and three to four flow present in the bore wells. Each basaltic flow varies in thickness with a particular sequence of alternate massive and vesicular basalt filled with secondary minerals.

CHAPTER 3

3. Hydrogeology of Shajapur district

3.1 Surface Water Resources

The district Shajapur comes under Chambal sub basin of the Ganga river basin and is constituted by Kalisindh, Parvati, Lakundhar, Chillar, Newaj, Choti Kalisindh etc. The surface water divide running almost north – south also act as a ground water divide in the area. Kalisindh is the main river in the district. Lakunder, Chillar, Kantal and Tillar are main tributaries of kalisindh, a part from this, Newaj, Parvati, Choti Kalisindh and Adu rivers are also flowing along some part of the district. The rocky terrain coupled with high rates of monsoon to non-monsoon precipitation results in very high surface run off in the area. Details of major rivers and their tributaries are given as below.

Table No. 5– Details of main rivers and their surface water potential

S. No.	**Name of river**	**Watershed area in Sq. km.**	**% of water shed area in the district.**	**Lenth of river in the distt. In Kms**	**Quantity (TMC)**	**Quantity 0.46 MCM per Km.**
1	Kalisindh	1182.40	19.14	154	20.74	579.37
2	Lakundar	835.80	13.53	58	14.74	409.54
3	Chillar	332.20	5.38	22	5.75	162.77
4	Tillar	407.70	6.60	27	7.06	199.77
5	Kantal	679.50	11.00	45	11.76	332.95
6	Bhanderi	362.40	5.86	24	6.27	177.57
7	Parvati	604.00	9.78	80	10.47	295.96
8	Newaj	332.00	11.73	48	5.75	162.68
9	Aru	724.80	5.37	22	12.53	353.13
10	Chhoti Kalisindh	686.20	11.11	20	11.88	336.24
11	Others	31.00	0.50	-	0.54	15.20
	Total	**6178.00**	**100.00**	**-**	**107.49**	**3025.18**

The surface water irrigation in the area under present study is largely through tanks and their canals. Total 41 minor, 4 medium and 9 lift irrigation schemes are in Shajapur district.

The wide range in lithological composition, texture, structure and degree of weathering and fracturing produces a highly complex micro relief characteristic in a total of 17 basaltic flows which were identified by the geological survey of India. A typical flow unit consists of a lower dense massive layer, passing upwards into vesicular, amygdaloidal or jointed basalts. At places, tops of individual flows are marked by reddish brown/greenish/grey clayey material (commonly termed red bole) of few cm to a few meters thickness. The vesicular units are sometimes as much as 5 meter in thickness and form good potential ground water aquifers but water holding capability is reduced by the deposition of secondary mineral in the vesicles.

3.2 Occurrence of Ground Water

The distinct geohydrological features of lava flows is the significant primary porosity in the form of vesicles, formed due to escape of gases at a later stage of cooling. Secondary porosity is developed due to fracturing during culling of the lavas tectonic disturbances and weathering. The vesicular porosity is considerably reduced by filling up with minerals like zeolites and silica to from amygdales. One flow is separated from the other by sedimentary beds, deposited during quiescent period between successive expulsions. Flows are nearly conformable in stratification from effective confining layers. Alternating sequences of previous and compact horizon function as a multi aquifer system. If the flow dips at angles gentler than the land surface slope, artesian condition may result to cause free flow in wells.
Shallow ground water occurs in the weathered vesicular jointed and fractured zones of basaltic flows. When the weathered layer is continuous, the aquifer is likely to be extensive but of low permeability on higher ground the weathered basalt may be thin or will be restricted to the joints and will be localized in occurrence. In the shallow weathered jointed and fractured basaltic rocks, ground water occurs generally under unconfined conditions at some places under semi confined to confined conditions due to the presence of thick silty clays overlying the jointed rocks.
At deeper level ground water occurs under semi confined to confined conditions in the fractures jointed section, at the flow contacts and at some places in the vesicular amygdaloidal section. The recharge to the deep zones upto 60m occurs from the shallow aquifer through the deep joints and contact zones. Shallow aquifers are also noticed in alluvium (sandy and gravely) Alluvium pre dominantly clayey, occurs along Lakundar, Kalisindh, Parvati and Newaj rivers courses.

3.3 Aquifer System

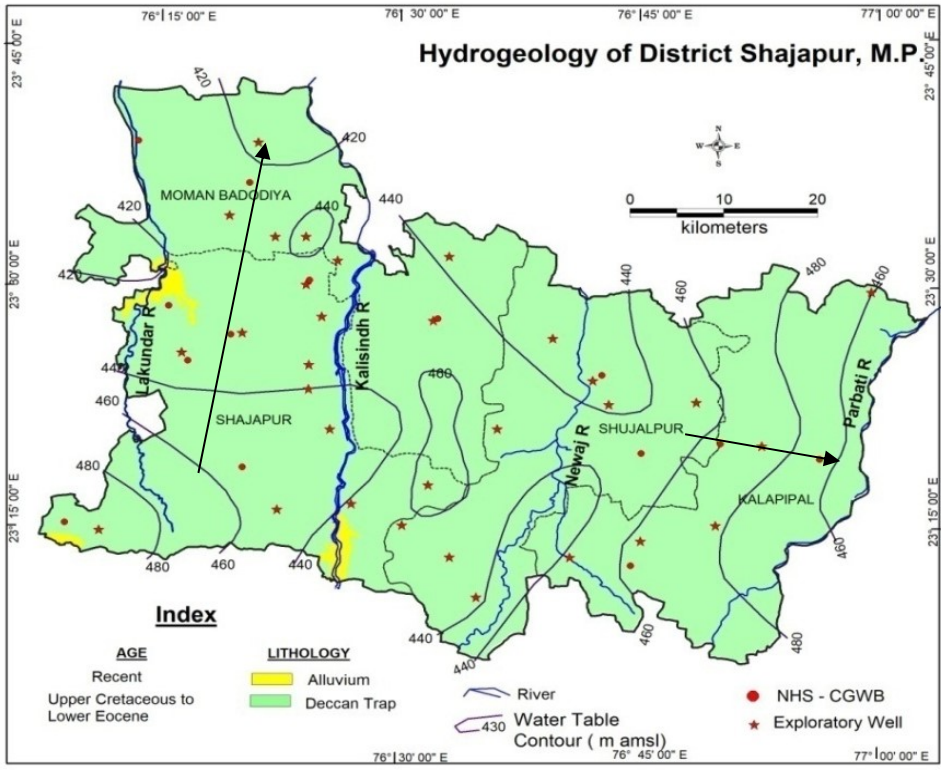
Geology of the study area is constituted by hard rocks as well as alluvium. The northwest to central part of the study area is mainly covered by the weathered basalts. It has low to moderate permeability the occurrence of ground water is in general moderate, but it forms potential (higher yielding) aquifers wherever it occurs in topographic depression and low lying areas and tapped by most dug wells and shallow tube wells. It covers most of Moman Barodia block. The water level depth during pre monsoon period ranges from 4.00 to 20.00 mbgl. The yields of the dug wells and shallow tube wells from 8 to 149 m^3/day.

Jointed basaltic layer is occurs below the weathered basalts in south and SW of Moman Barodia and SE of Shajapur block, where the basalt is fractured and joints are open than the high permeability can be expected in this layer. Depth to water level in this zone ranged from 7.00-15.00 mbgl and well yields ranges from 16 to 147 m^3/day.

South eastern part of the study area which covers parts of Shajapur, Shujalpur and Kalapipal blocks are covered by weathered fractured basalts with in fillings of zeolites and marked by number of shallow and deep tube wells. Water level of pre monsoon period ranges from 8.00 to 24.00 mbgl and wells yield ranged from 14 to 940 m^3/day. Weathered thickness in most of the parts of Kalapipal block is very less followed by clay and massive basalt rocks at the top which causes the sudden saturation of shallow aquifer during monsoon and the drying up of the same soon after.

Massive basalts with minor fractures as aquifer units are present in limited isolated pockets relatively on higher ground, where weathered layer thins out and the clay is sometimes absent. This massive basalt present at or very close to the surface and ground water will be restricted to joints and fractures. In this situation the aquifers is likely to be local patchy, pre monsoon water level varies 5.00 to 12.00 mbgl and yield of wells ranged between 120 ad 163 m^3/day. Alluvium soil generally consisting of sandy soil mixed with Kankar and pebbles with a thin band of friable calcareous sandstone at the base occur along major river like Choti Kalisindh, Newaj and Parvati. The thickness varies from less than a meter to 25 m. The occurrence of ground water in this zone is good to excellent. Depth to water levels in open wells ranges from 9.8 to 16.0 mbgl. The yields of the wells ranged from 30 to as much as 294 m^3/day.

Figure No.8 : Hydrogeology map of Shajapur district



3.4 Aquifer Parameters

During the course of detail hydrogeological studies carried out in the district during (1994-95). A total 15 pumping test were carried out on selected in dug wells in deccan trap (in different flows). The analysis of the yield test data reveals that percentage of recuperation of wells tapping jointed and highly weathered vesicular units locate favourable hydrogeological

environment is three times more than the wells tapping poorly jointed and zeolitic units of the flow. The percentage of recuperation is also higher in the wells tapping inter trappean zones.

22 bore wells had been drilled in 2016-17. The details of bore wells drilled and aquifer detail are given in annexure 2. Average discharge of wells ranges from 2-8 lps in most parts of the district. At some places, the average discharge of bore wells were observed upto 13lps in deeper aquifers. Specific yield of deeper aquifer is 0.02. Fractured vesicular basalt, fractured and jointed massive basalt act as major aquifer in the district. Weathered basalt and fractured vesicular basalt are observed in dug wells which is acting as the aquifer at shallow depths.

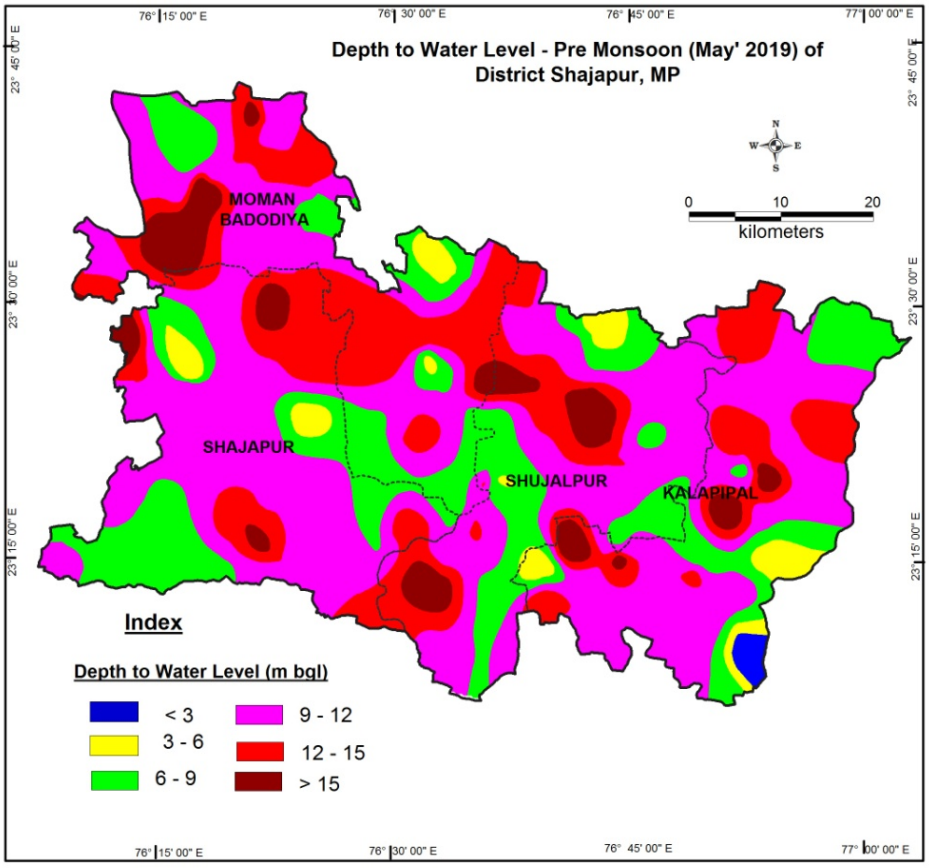
3.5 Water level in Shajapur district

In Shajapur district, it has been observed that in most of the places, water table is subdued replica of the land suface. Close to hills and high grounds, water table lies at comparatively higher altitudes than in valleys. The configuration of the water table confirm to the land surface to a greater degree in board undulating terrains than in rugged tarrains. The addition to the primary control of topography, water table is also influenced by geologic control like dykes and permeability of water bearing rocks. Local variation in abstraction and depletion from the ground water reservoirs are also reflected in the water table. In very permeable formation the water table may tend to be flat, irrespective of the topographic highs and lows.
Water level in the 114 key observation wells in the study area was measured during pre and post monsoon periods. 25 National hydrograph stations monitored by central ground water board as key wells falling in the study area so that the long-term data about the area could also be fruitfully utilizes.

3.5.1 Pre monsoon water level

The depth to water levels monitored in 114 key observation wells and 25 National Hydrograph Stations during May 2019 has been used to prepare the pre monsoon depth to water level map of the district. The map shows that the depth to water levels during pre monsoon period in general rages 10-15 mbgl. The water level ranges 5 to 10 mbgl occur in northeastern, southwestern and northwestern parts of the study area with small pocket in the central. Deeper water levels (15-20 m > 20 mbgl) occur as pocket in central part of the area around Shujalpur, Moman Barodia and Kalapipal blocks. Water level below 10m is observed in some parts of the district.

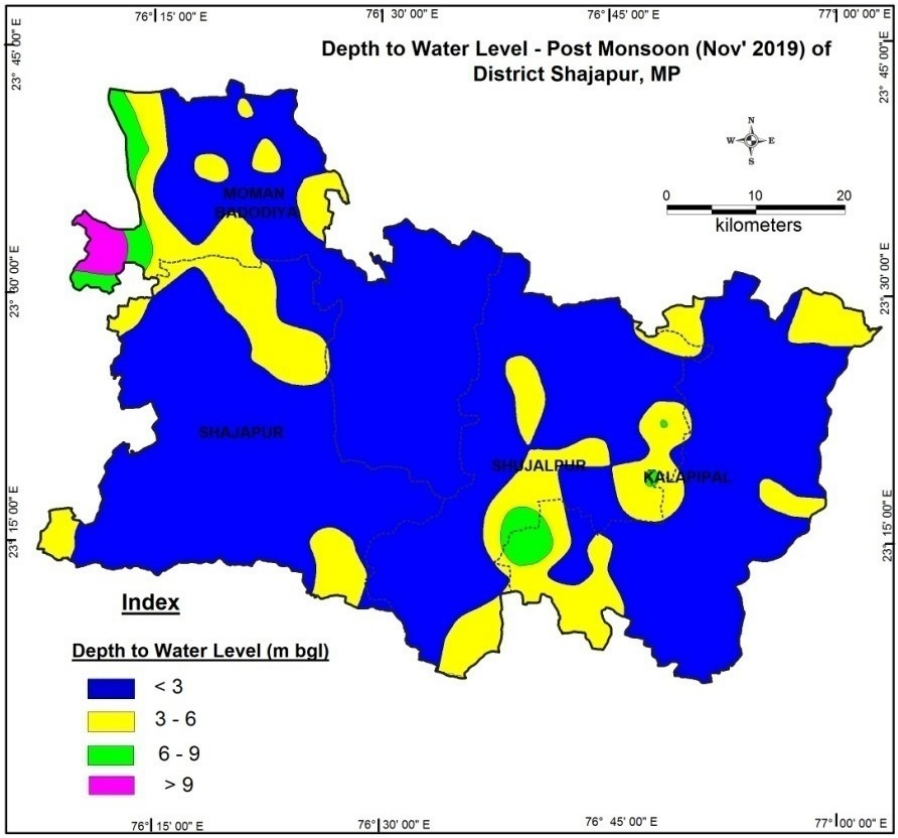
Figure No.9: Premonsoon water level map of Shajapur district



3.5.2 Post Monsoon Water Level

The post monsoon depth to water levels were monitored during November 2019 and has been used to prepared the post monsoon depth to water level maps The map shows water logging condition in 85% of the distrct. The average post monsoon water level map for last five years shows that the general depth to water level during post monsoon post monsoon period over the study area ranges from 3-6 mgl. Pockets of shallow water level (0-3m) occur in the SE to western part of the area, deeper water level > 6 mbgl area lso encountered in central part near Shujalpur and Kalaipal.

Figure No. 10: Post monsoon water level map of Shajapur district



3.5.3 Annual Water Level Fluctuation

The fluctuation between pre and post monsoon period water level for the year 2019 had calculated to determine the effect of rainfall on recharge. A general rise of water levels over the entire survey area is observed and average fluctuation of the area is 7 m recorded in 80% of the total study area the fluctuation range is 3 to 9 m higher level of water level fluctuation observed in central part near Kalapipal Shujalpur, parts of Shajapur and Moman Barodia blocks.

3.5.4 Decadal Water Level Trend

The trend of the ground water levels of an area over a period of time reflects the behavior of ground water over time. In order to understand the long trend water level trend in Shajapur district, decadal water level fluctuation map and hydrographs of Shajapur district were analyzed. The decadal water level trend map (2009-18) shows both falling and rising trend in the district. The decadal water level trends indicates that pre monsoon water levels are showing rise in major part of the district and the post monsoon water levels are declining in Moman Borodia and Shajapur and parts of Kalapipal block. This indicates that during and after post monsoon period, excessive pumping of groundwater is occurring in Shajapur district which cannot be balanced by natural rainfall recharge. The rising trend may due to the accelerated construction of recharge structures in all four blocks in the last 5 years through MNREGA and other schemes.

Figure No.11: Decadal Water Level Trend Map (Premonsoon) of Shajapur district

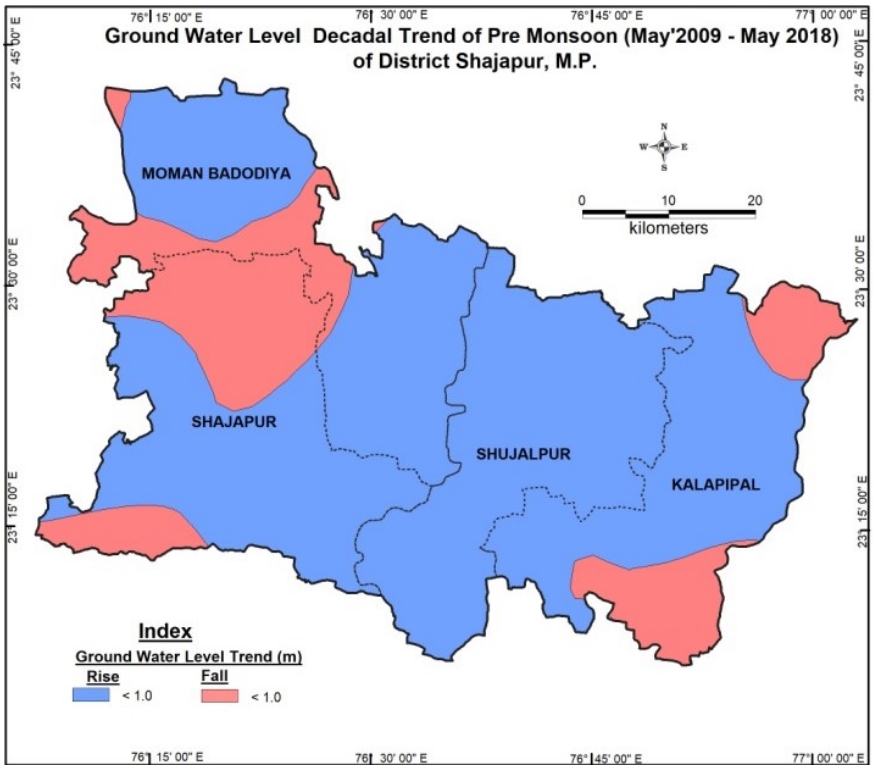
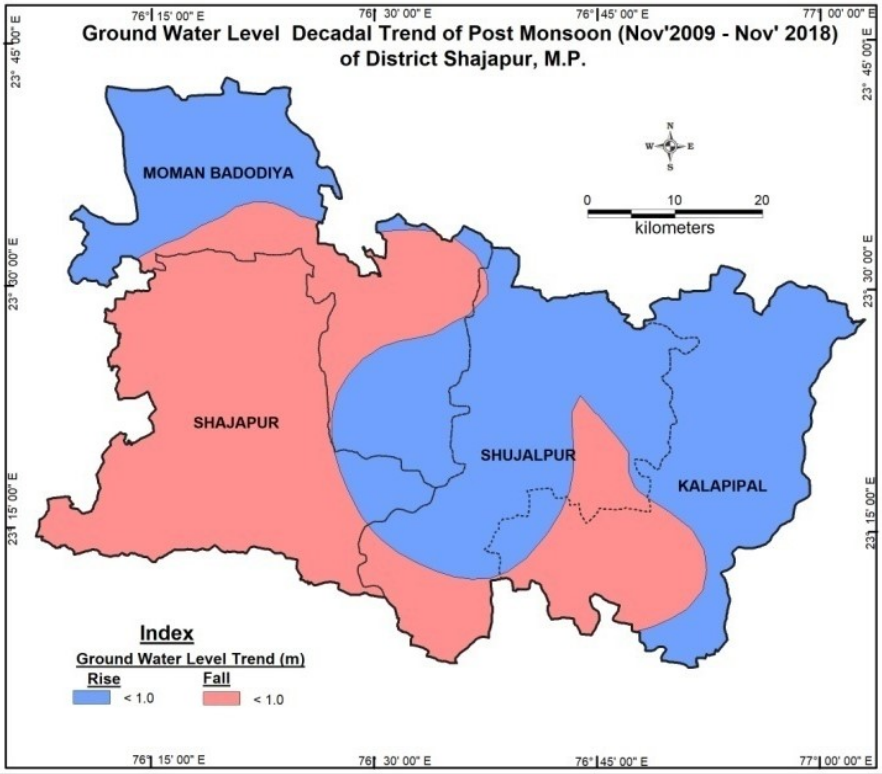


Figure No.12 Decadal Water Level trend map (post monsoon) of Shajapur district



Hydrograph monitored by central ground water board in the study area, it is observed that over a period of last 10 years (2010-19) that the levels have declining in the district especially in Kalapipal and Shajapur bocks.

Figure No.13: Hydrograph of Makshi Piezometer, Shajapur block

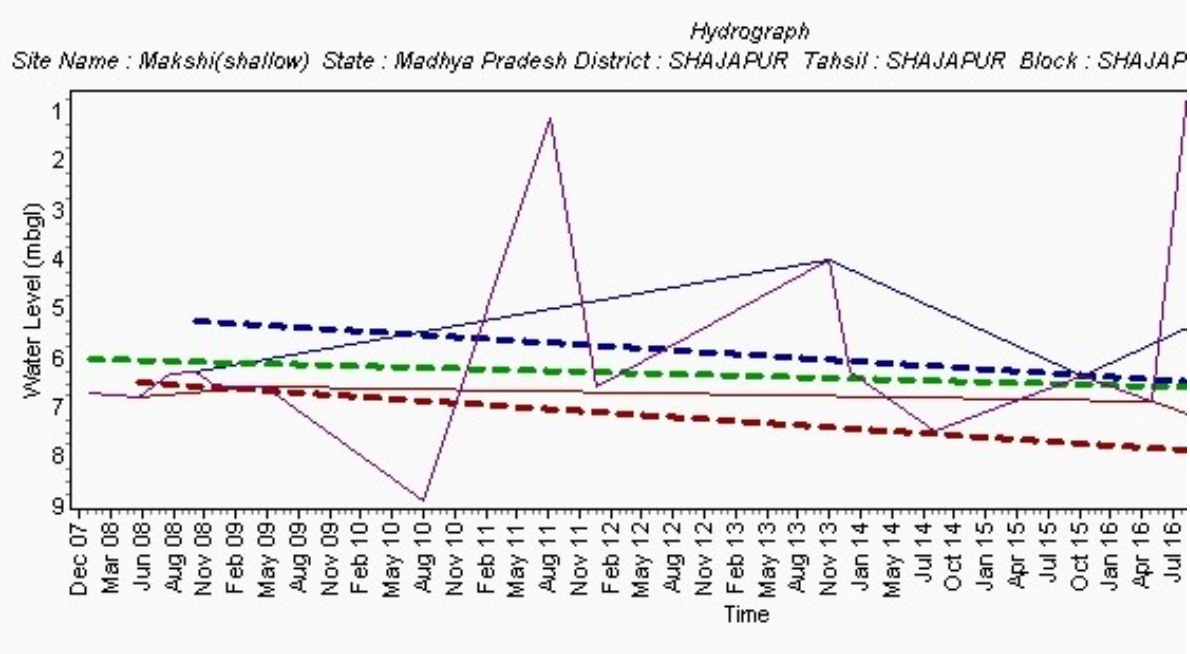
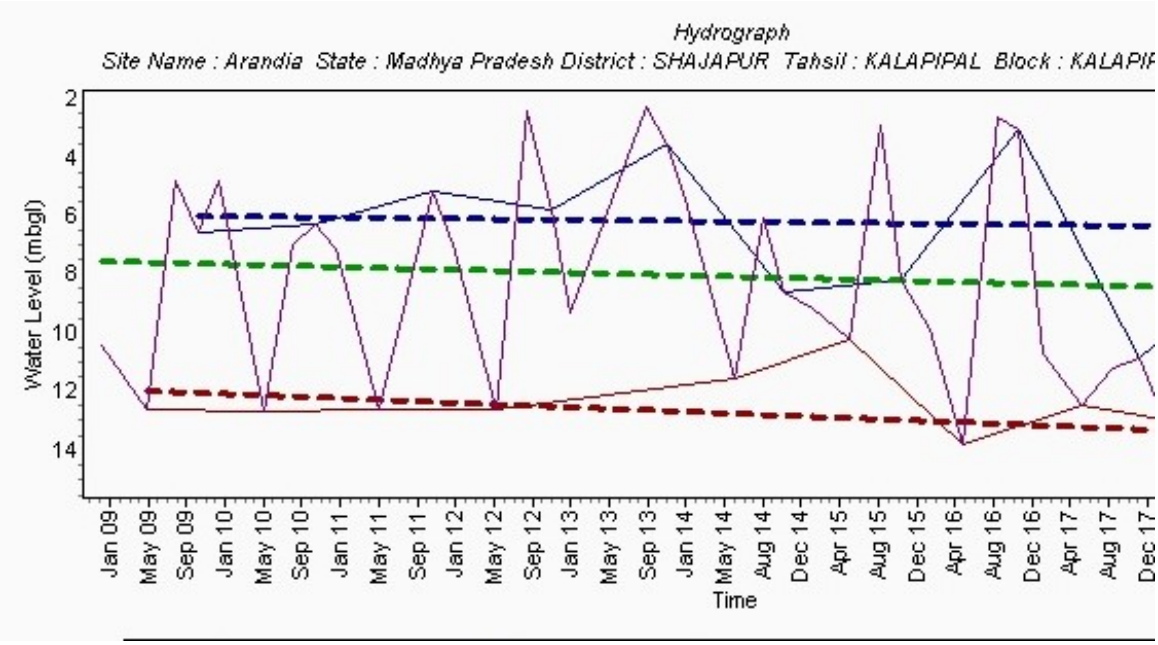


Figure No. 14: Hydrograph of Arandiya dug well, Kalapipal Block



3.6 Three-Dimensional and 2- Dimensional Aquifer model and Sections

Aquifer maps (3D), fence diagram and block wise sections had been prepared for the entire district using Rockworks software based on the borehole data for understanding aquifer disposition in subsurface which can be used for planning and construction of artificial recharge structures. The 3D aquifer model and block wise sections prepared are given below.

Figure No.15: Map showing location of exploratory wells in Shajapur district

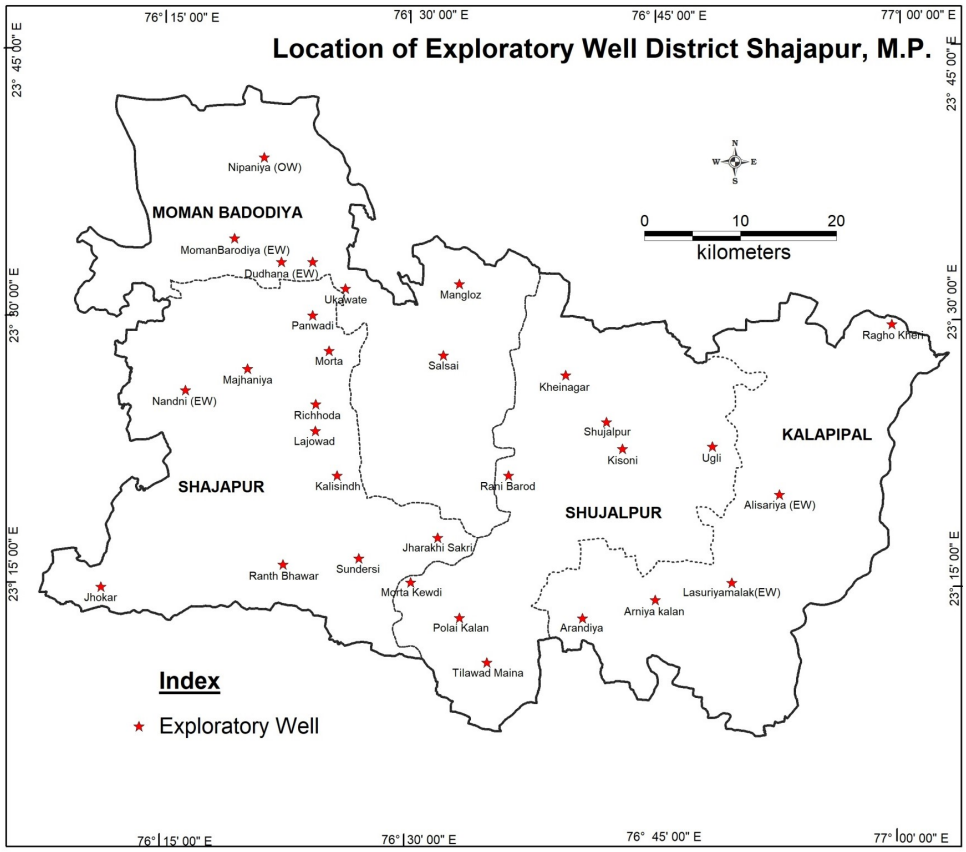


Figure No.16: 3-Dimensional Aquifer model of Shajapur district

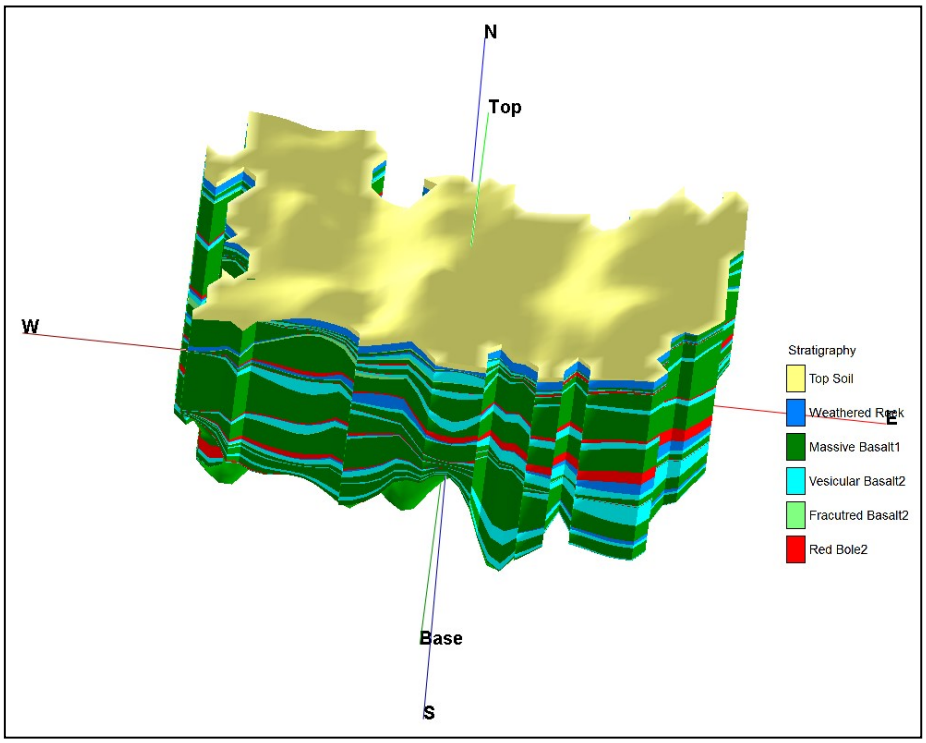


Figure No.17 & 18: 2-D Aquifer sections of Shajapur district

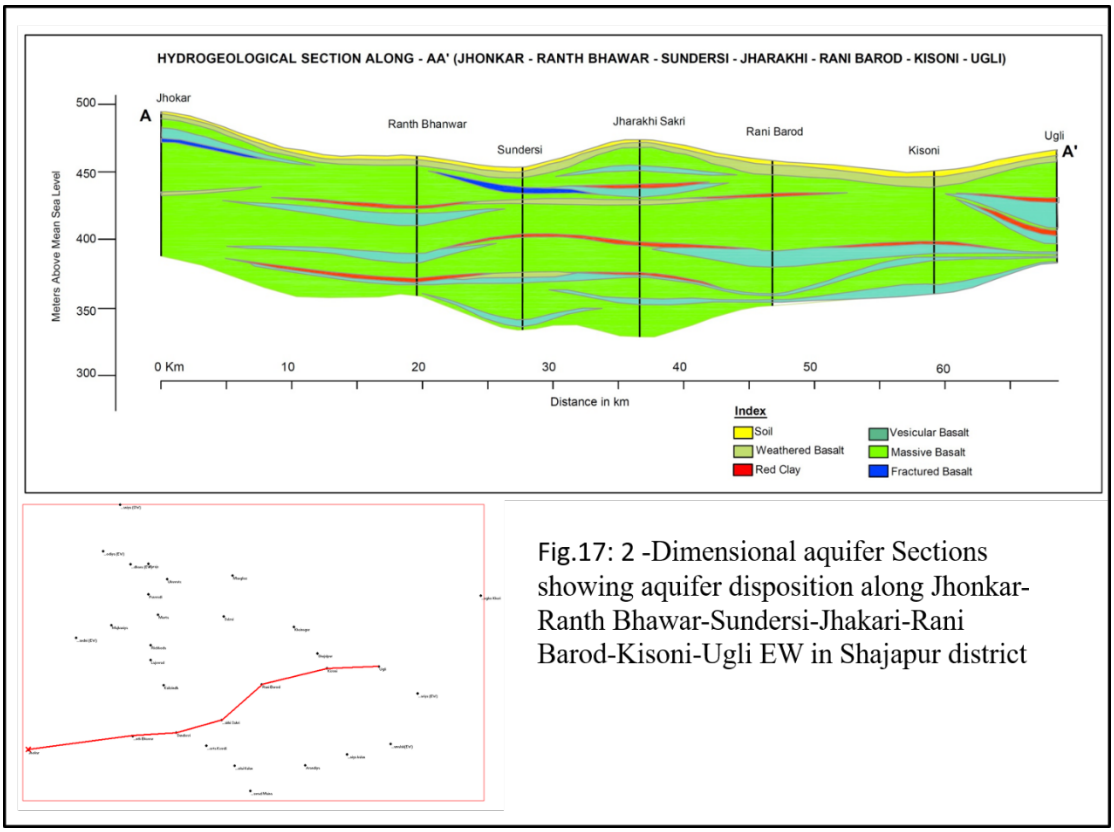


Fig.17: 2 -Dimensional aquifer Sections showing aquifer disposition along Jhonkar-Ranth Bhawar-Sundersi-Jhakari-Rani Barod-Kisoni-Ugli EW in Shajapur district

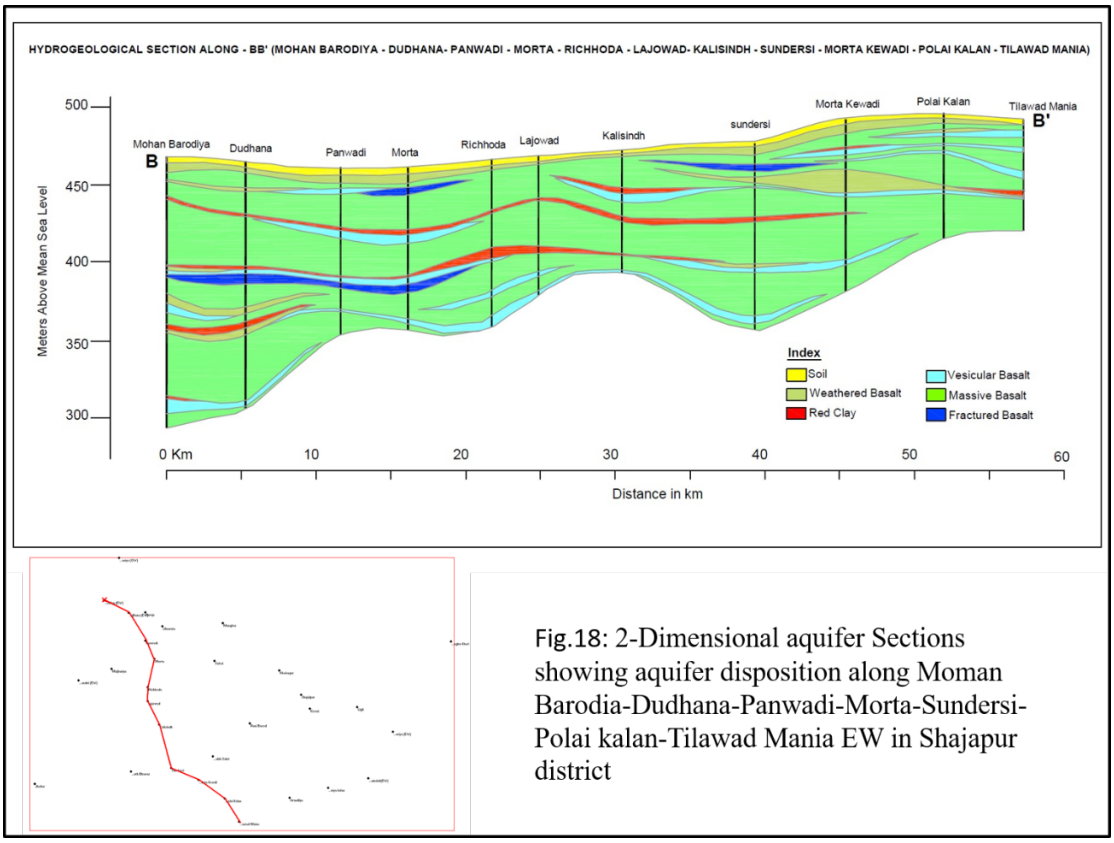


Fig.18: 2-Dimensional aquifer Sections showing aquifer disposition along Moman Barodia-Dudhana-Panwadi-Morta-Sundersi-Polai kalan-Tilawad Mania EW in Shajapur district

CHAPTER 4

4. Groundwater Resources of Shajapur district

4.1 Net Ground Water Availability in Shajapur district

The block wise groundwater resources is estimated for Shajapur district as per GEC 2015. Major source os recharge is rainfall and is calculated using rainfall infiltration factor method and water level fluctuation methods. The unaccounted natural discharge through river and nallas have been calculated by multiplying the factor 0.05 by total annual recharge and net ground water availability for command and non-command area have been calculated by subtracting the unaccounted natural discharge from annual total ground water recharge. The results (as on March 2017) are given in table No. 6 below:

Table No. 6: Dynamic groundwater resources as on March 2017

Si. No.	Assessment Unit/District	Command/ Non Command	Annual Extractable Ground Water Recharge (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 (11+12)	Allocation For Domestic & Industrial Water Supply in Ham	Net Ground Water Availability for Future Irrigation Development in Ham (10-11-14)
1	Kalapipal	Non-Command	14946.26	14140.66	406.90	14547.56	487.79	317.81
		Block Total	**14946.26**	**14140.66**	**406.90**	**14547.56**	**487.79**	**317.81**
2	Moman Barodia	Non-Command	14782.02	18754.50	420.05	19174.55	472.91	-4392.53
		Block Total	**14782.02**	**18754.50**	**420.05**	**19174.55**	**472.91**	**-4392.53**
3	Shajapur	Non-Command	13287.56	9383.56	599.94	9983.50	503.44	-3400.59
		Block Total	**13287.56**	**9383.56**	**599.94**	**9983.50**	**503.44**	**-3400.59**
4	Shujalpur	Non-Command	12642.17	12793.25	564.97	13358.22	643.41	716.05
		Block Total	**12642.17**	**12793.25**	**564.97**	**13358.22**	**643.41**	**716.05**
		District Total	**55658.04**	**55071.97**	**1991.86**	**57063.83**	**2107.55**	**-1390.18**

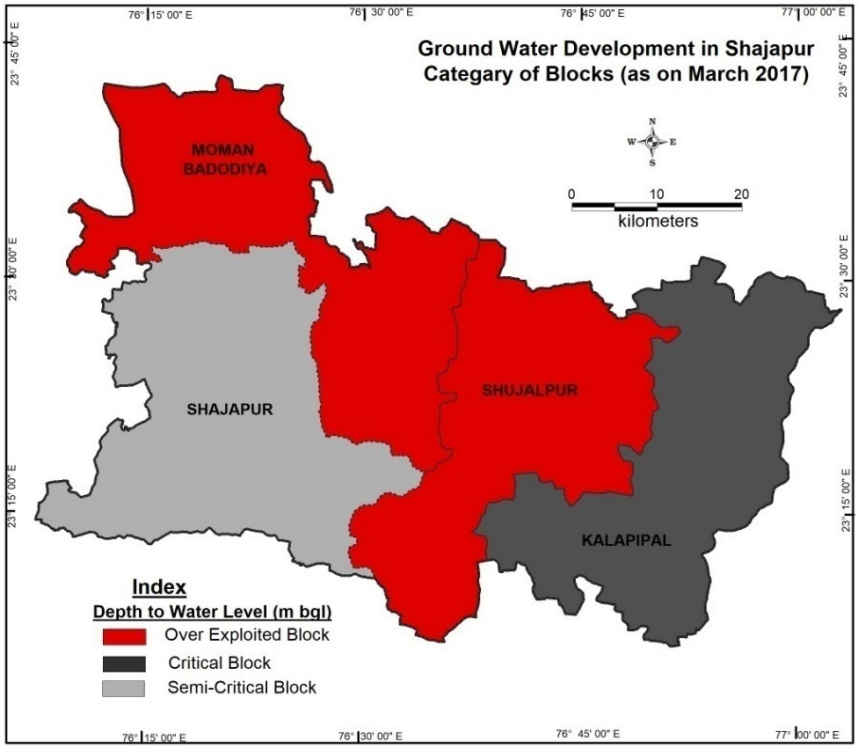
4.2 Stage of Extraction of Groundwater

The block wise stage of extraction of groundwater is calculated in percentage by dividing current annual gross ground water draft by net ground water availability in command and non command area based on long term water level trend each block and has been categorized as semi critical, critical and over exploited and given in table 7.

Table No.7: Table showing stage of extraction of Groundwater in Shajapur district as on March 2017

S.No.	**Block**	**Net Ground Water Availability (ham)**		**Current Annual Gross Ground Water Draft (ham)**		**Stage of Ground Water Development**		**Category**
		Comm..	**Non. Comm.**	**Comm**	**Non. Comm.**	**Comm..**	**Non. Comm.**	
1	Kalapipal	-	14946.26	-	14547.56	-	97.33	Critical
2	M.Barodiya	-	14782.02	-	19174.55	-	129.72	Over-Exploited
3	Shujalpur	-	12642.87	-	13358.22	-	105.66	Over-Exploited
4	Shajapur	-	13287.56	-	9983.50	-	75.13	Semi Critical

Figure No.19: Map showing stage of extraction of groundwater of Shajapur district as on March 2017



As a part of NAQUIM project 2019-20, groundwater resources of dynamic and static aquifers were calculated using water level fluctuation methods draft is calculated using unit draft method for each block in Shajapur district as given in the table no.s 8, 9 and 10 below.

Table no. 8: Groundwater resources of Dynamic Aquifer in Shajapur district

Groundwater Resources	**Shajapur**	**Kalapipal**	**Shujalpur**	**Moman Barodiya**	**Total**
First Aquifer					
Dynamic Resources (MCM)	132.87	149.46	126.42	147.82	556.57
Static Resources (MCM)	42.56	37.52	38.17	16.40	134.66
Total Resources (MCM)	**175.43**	**186.98**	**164.59**	**164.22**	**691.23**
Irrigation	54.08	64.97	35.34	80.67	235.05
Domestic+Industries	5.99	4.06	5.64	4.20	19.89
GW Draft (MCM)	60.07	69.03	40.98	84.87	254.94
Second Aquifer					
Static Resources (MCM)	90.07	110.93	110.93	119.92	463.52
GW Draft (MCM	40.15	76.30	92.78	107.16	316.39
Total GW Resources (MCM)	**265.51**	**297.91**	**275.52**	**284.14**	**1123.08**
Gross Ground Water Draft for irrigation (MCM)	93.83	141.40	127.93	187.54	550.70
Gross Ground Water Draft (MCM)	99.82	145.46	133.57	191.74	570.59
Stage of Ground Water Development (%)	**75.13**	**97.32**	**105.66**	**129.71**	101.95
Category	**Semicritical**	**Critical**	**Over-exploited**	**Over-exploited**	**Over-exploited**

Table No.9: Dynamic groundwater Resources in 2nd aquifer, Shajapur district

Dynamic Resources of 2nd aquifer	**Shajapur**	**Kalapipal**	**Shujalpur**	**Moman Barodiya**	**Total**
First Aquifer					
Dynamic Resources (MCM)	132.87	149.46	126.42	147.82	556.57
Static Resources (MCM)	42.56	37.52	38.17	16.40	134.66
Total Resources (MCM)	**175.43**	**186.98**	**164.59**	**164.22**	**691.23**
Irrigation	54.08	64.97	35.34	80.67	235.05
Domestic+Industries	5.99	4.06	5.64	4.20	19.89
GW Draft (MCM)	60.07	69.03	40.98	84.87	254.94
Second Aquifer					
Dynamic Resources (MCM)	94.49	37.52	86.62	51.32	269.95
Static Resources (MCM)	90.07	110.93	110.93	119.92	463.52
GW Draft (MCM	40.15	76.30	92.78	107.16	316.39
Total GW Resources (MCM)	**265.51**	**297.91**	**275.52**	**284.14**	**1123.08**
Gross Ground Water Draft for irrigation (MCM)	93.83	141.40	127.93	187.54	550.70
Gross Ground Water Draft (MCM)	99.82	145.46	133.57	191.74	570.59
Total Dynamic resources (MCM)	227.36	186.98	213.04	199.14	826.52
Stage of Ground Water Development (%)	**43.90**	**77.79**	**62.69**	**96.28**	**70.17**
Category	**Safe**	**Semi-Critical**	**Safe**	**Critical**	**Safe**

Table No. 10: Total Draft calculation using unit draft method

Block		**Shajapur**	**Kalapipal**	**Shujalpur**	**Moman Barodiya**
Irrigation Draft (mcm)		93.830	141.400	127.930	187.540
Domestic+Industries (mcm)		5.990	4.060	5.640	4.200
Dugwell	*Number*	7210	6698	6310	10756
Noncommand	Unit draft (mcm)	0.0075	0.0097	0.0056	0.0075
	total Draft	54.075	64.9706	35.336	80.67
Dugwell	*Number*	-	-	-	-
command	Unit draft (mcm)	-	-	-	-
	Total Draft	-	-	-	-
Bore well	*Number*	-	-	-	-
command	Unit draft mcm	-	-	-	-
	Draft	-	-	-	-
Bore well	*Number*	1587	4710	5490	5700
Noncommand	Unit draft mcm	0.0253	0.0162	0.0169	0.0188
	Draft	40.1511	76.302	92.781	107.16
Total Draft		194.0	286.7	261.7	379.6

CHAPTER 5

5. Hydrochemistry

Ground water is not pure and contains dissolved minerals. The type and concentration of these dissolved minerals affects the quality and usefulness of ground water for various purpose. Ground water is usually free from suspended particles, and is bacteria free, clear and odorless. These characteristic in contrast to surface water makes ground water preferable to surface water. Thus it is important to assess the chemical constituents of ground water for drinking, irrigation and industrial uses. In order to determine the chemical quality of ground water in the study area water samples were collected from selected dug wells. The results of chemical analysis are tabulated in annexure 3.

5.1 Quality of Shallow groundwater

As per chemical analysis of pre-monsoon 2019, the ground water in the area of Shajapur district is neutral to slightly alkaline in nature and the pH of ground water ranged in between 6.66 to 7.79; the highest value of pH (7.88) has been observed in Panwadi dug well. The electrical conductivity of ground water in Shajapur district ranged between 728 to 2412 µS/cm at 25°C and the maximum EC value at Aradiya (2412 µS/cm at 25°C). The electrical conductivity shows that the ground water is good to saline in nature and at some location shows in slightly saline i.e. Panwadi (1828), Chouma (1574), Moman Badodia (2344), Kalapipal (1250), Salslai (1544) and Akodia (1164).

The fluoride concentration was ranged in between 0.13 to 0.80 mg/l. In the district, fluoride concentrations have not been observed more than BIS recommendation of fluoride concentration in drinking water i.e. 1.5 mg/l.

In the district, nitrate concentration in ground water ranged in between 2 to 128 mg/l. About 21.0% ground water samples recorded nitrate concentration within the acceptable limit of 45 mg/l and 79.0% water samples recorded more than 45 mg/l as per BIS recommendation. The high nitrate concentration has been recorded in ground water of Akodia (67 mg/l), Majhania (69mg/l), Chouma (87 mg/l), Tilawad Govind (90 mg/l) and Moman Badodia (128 mg/l). Total hardness of ground water in the study area ranged in between 74 to 970 mg/l. The high concentration has been observed in the dug well of Akodia (773 mg/l) and Moman Badodia (970 mg/l).

As per the piper diagram, water samples are Calcium Bi-carbonate (temporary hardness), Mixed Type (Calcium Magnesium Chloride), Mixed Type (Calcium Sodium Bi-Carbonate) and Sodium Chloride type of water. The US Salinity Diagram shows the ground water is low to high salinity classes i.e. C_2S_1, C_3S_1, C_4S_1, C_3S_3 and C_4S_2. The C_3S_1, C_3S_3, C_4S_1 and C_4S_2 classes of water may be used for irrigation purpose with proper soil management. Chemical quality diagrams are given below.

Figure No.20: Piper Diagram showing distribution of cations and anions

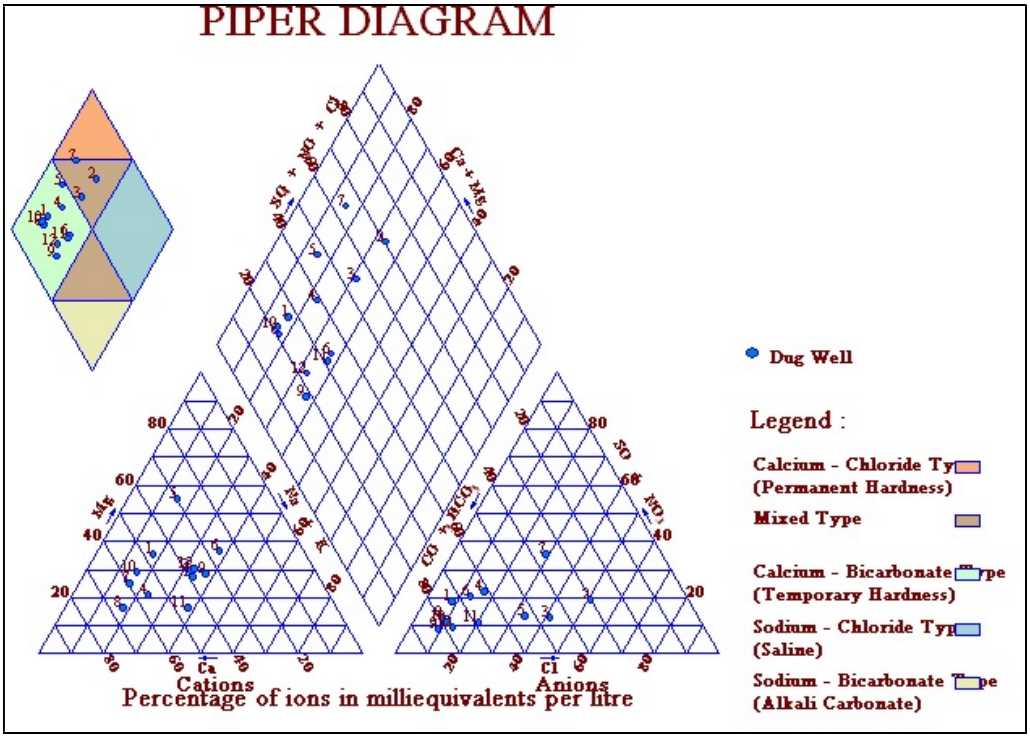
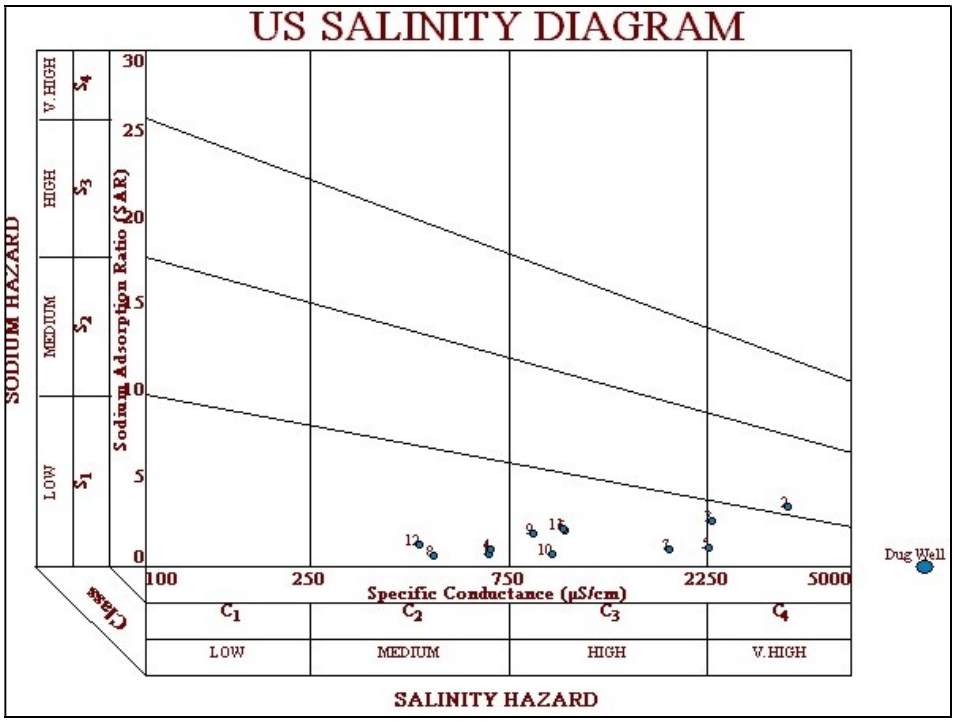


Figure No.21: US Salinity Diagram showing suitability of GW for irrigation



Analytical results of water samples from deep aquifer of tube wells drilled by Central ground water Board under accelerated exploration drilling summarized in annexure 1. Chemical quality of deeper aquifer good and concentration of constituents is within permissible limit (prescribed limit) except concentration of fluoride content. In nearly 50 percent villages

showing fluoride concentration is more than 1.5 mg/1. The drilling carried out under accelerated exploration drilling programme find the fluoride concentration upto 7.13 mg/1 max.

5.2 Ground Water contamination

The results of chemical analysis of samples collected from study area do not indicate to any pollution in the area except for nitrate which can be caused by agrochemicals and over use of detergents. Also there are no major industries in the area that could possibly pollute the ground water. It is recommended to keep a watch over the use of chemical fertilizers and proper disposal of human waste.

Figure no.22: Map showing Nitarte concentartion in grounndwater in Shajapur distrcit

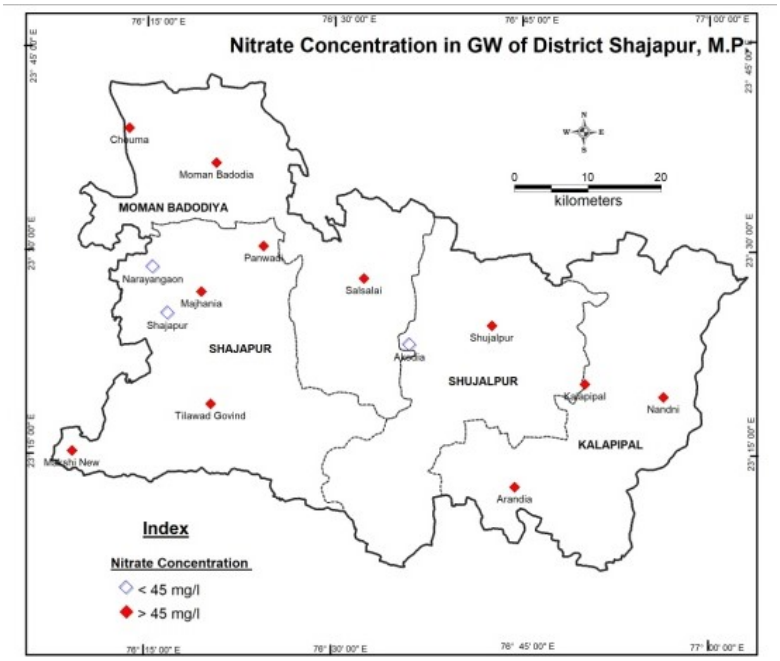


Figure No. 23: Map showing Fluorinde concentartion in groundwater in Shajapur district

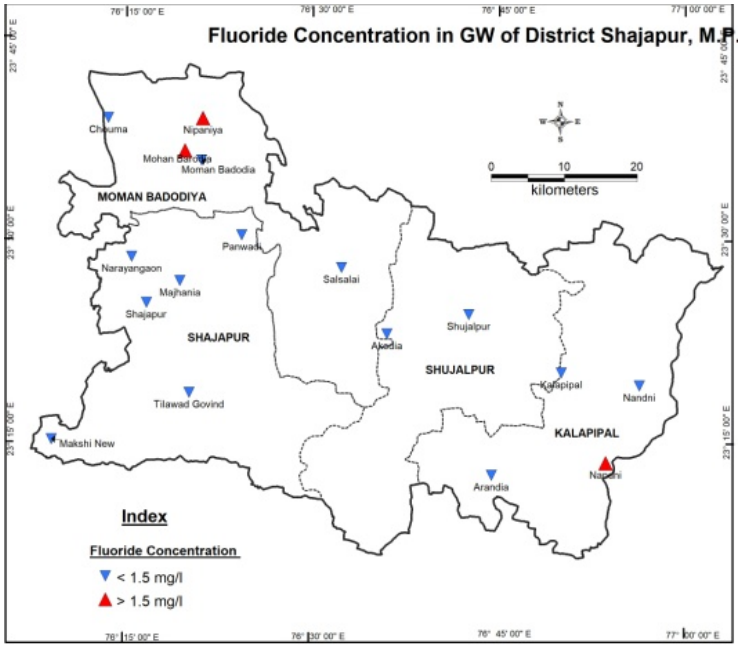
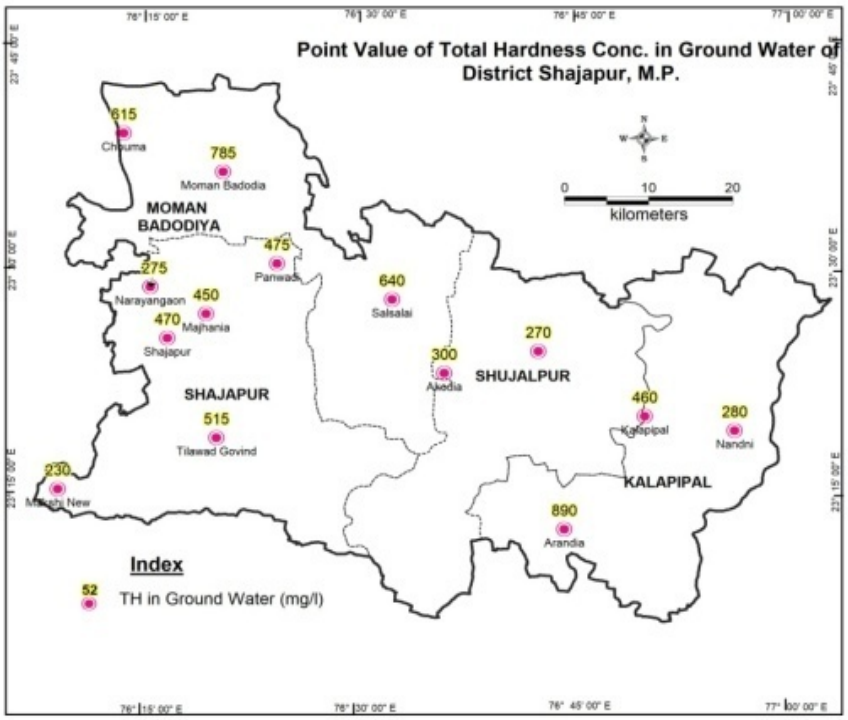


Figure no. 24: Maps showing point value of total hardness of groundwater in Shajapur district



CHAPTER 6

6. Management Plan

Based on the aquifer disposition, available resources and storage space, a management plan had been developed for each of the blocks in the district by proposing suitable recharge structures and other methods including micro-irrigation for proper utilization of available resources. As per the resource estimation 2017, groundwater available for future irrigation is negative or nil which means the resources may be utilized with proper planning and may be recharged enough to maintain the sustainability of aquifer in future.

6.1 Management plan of Shajapur block

Average post monsoon water level of Shajapur block based on 114 key observation wells is 5.69 and the unsaturated zone available in the block is 2.69m which is the space available for recharge. The subsurface storage calculated is 47mcm and the non-committed runoff available is 63.33 mcm. Based on this data, a recharge plan had been proposed for Shajapur block.

Table No. 11: Proposed management plan for Shajapur block

Strutcure	**Percolation Tank (40%@ 0.18 cr.)**	**Recharge Shaft/Tube Well (20% @ 0.05cr.)**	**Nala Bund/Concrete Plug (15% @ 0.01cr.)**	**Renovation of village pond (5% @0.025cr.)**
Number	72	126	632	53
Cost(cr.)	12.69	6.3	6.32	1.325

In Shajapur block, 72 percolation tanks, 126 tube well/ recharge shaft and 632 Nala bunds/concrete plug is proposed which is 40%, 20% and 15% of the subsurface storage available. Renovation of 53 village ponds are also proposed in Shajapur block and the total cost of production is 26.9 crores. These numbers are calculated using the formula and reducing the number of already existing structures in the block.

In addition to the recharge structures, micro-irrigation is also proposed in Shajapur block by sprinkler irrigation method. According to Anand et.al., (2012), 20% water can be saved by adopting sprinkler irrigation in basaltic terrain.

Table No.12: Reduction in draft proposed by sprinkler irrigation

Net Groundwater availability (mcm)	**Annual draft for Irrigation (mcm)**	**Gross annual draft (mcm)**	**Stage of Extraction of groundwater (%)**	**Savings by Sprinkler (mcm@20%)**
132.87	93.83	99.820	**75.12**	18.77

After implementation of recharge structures, total recharge is 63.19mcm which increase the dynamic resources to 196.05 mcm. The additional savings by micro-irrigation in Shajapur block is 18.77 mcm which can cause a reduction in the gross draft. Together the recharge structures and the micro-irrigation will be able to increase the utilization of more area for irrigation and cropping and reduce the stage of groundwater extraction in Shajapur block and hence increase the sustainability of aquifer.

Table no.13 Projected groundwater availability and stage of extarction plan for Shajapur block

Savings by Sprinkler (mcm)	**Additional recharge by AR structures (mcm)**	**Net Groundwater available (mcm)**	**Utilization of 75% of additional GW created (mcm)**	**Gross draft after intervetion (mcm)**	**Stage of groundwater Extraction (%)**	**Additional area irrigated (Sq.Km)**
18.77	63.19	196.05	47.3	128.4	**65.51**	11848

The stage of groundwater extraction after implementing the proposed recharge plan may be reduced by 10% from 75.12% to 65.51% and the block will move on to safe category from semi-critical category.

6.2 Management plan of Moman-Barodiya block

Average post monsoon water level of Moman-Barodiya block based on 114 key observation wells is 5.17 and the unsaturated zone available in the block is 2.17m which is the space available for recharge. The subsurface storage calculated is 38.2mcm and the non-committed runoff available is 62.3 mcm. Based on this data, a recharge plan had been proposed for Moman-Barodiya block.

Table No. 14: Proposed management plan for Moman-Barodiya block

Strutcure	**Percolation Tank (40%@ 0.18 cr.)**	**Recharge Shaft/Tube Well (20% @ 0.05cr.)**	**Nala Bund/Concrete Plug (15% @ 0.01cr.)**	**Check dam (35% @ 0.04cr.)**
Number	58	102	367	65
Cost(cr.)	10.44	5.1	3.67	2.6

In Moman Barodiya block, 58 percolation tanks, 102 tube well/ recharge shaft, 65 check dam, and 367 Nala bunds/concrete plug is proposed which is 40%, 20%, 35% and 15% of the subsurface storage available. Renovation of village ponds is not since already existing ponds

outnumber the proposed number of ponds in Moman Barodiya block and the total cost of production is 21.8 crores. These numbers are calculated using the formula and reducing the number of already existing structures in the block.

In addition to the recharge structures, micro-irrigation is also proposed in Moman Barodiya block by sprinkler irrigation method.

Table No.15: Reduction in draft proposed by sprinkler irrigation

Net Groundwater availability (mcm)	**Annual draft for Irrigation (mcm)**	**Gross annual draft (mcm)**	**Stage of Extraction of groundwater (%)**	**Savings by Sprinkler (mcm@20%)**
147.82	187.54	191.74	**129.71**	37.51

After implementation of recharge structures, total recharge is 50.9mcm which increase the dynamic resources to 198.72 mcm. The additional savings by micro-irrigation in Shajapur block is 37.51 mcm which can cause a reduction in the gross draft. Since stage of groundwater extraction is 129.7%, it is not feasible to utilize additional area for irrigation. Together the recharge structures and the micro-irrigation reduce the stage of groundwater extraction in Moman Barodiya block and hence increase the sustainability of aquifer.

Table No. 16: Projected groundwater availability and stage of extraction plan for Moman barodiya block

Savings by Sprinkler (mcm)	**Additional recharge by AR structures (mcm)**	**Net Groundwater available (mcm)**	**Gross draft after intervetion (mcm)**	**Stage of groundwater Extraction (%)**
37.51	50.9	198.72	154.2	**77.61**

The stage of groundwater extraction after implementing the proposed recharge plan may be reduced by 52% from 129.7% to 77.61% and the block will move on to semi-critical category from over-exploited category.

6.3 Management plan for Shujalpur block

Average post monsoon water level of Shujalpur block based on 114 key observation wells is 6.93 and the unsaturated zone available in the block is 3.93m which is the space available for recharge. The subsurface storage calculated is 54.6mcm and the non-committed runoff available is 50.53 mcm. Based on this data, a recharge plan had been proposed for Shajapur block.

Table No. 17: Proposed management plan for Shujalpur block

Strutcure	**Percolation Tank (40%@ 0.18 cr.)**	**Recharge Shaft/Tube Well (20% @ 0.05cr.)**	**Nala Bund/Concrete Plug (15% @ 0.01cr.)**	**Check dam (35% @ 0.04)**	**Renovation of village pond (5% @0.025cr.)**
Number	51	101	505	176	38
Cost(cr.)	9.18	5.01	5.05	7.04	0.95

In Shujalpur block, 51 percolation tanks, 101 tube well/ recharge shaft, 505 Nala bunds/concrete plug and 176 check dam is proposed which is 40%, 20%, 15% and 35% respectively of the subsurface storage available. Renovation of 38 village ponds are also proposed in Shujalpur block and the total cost of production is 27.2 crores. These numbers are calculated using the formula and reducing the number of already existing structures in the block.

In addition to the recharge structures, micro-irrigation is also proposed in Shujalpur block by sprinkler irrigation method.

Table No.18: Reduction in draft proposed by sprinkler irrigation

Net Groundwater availability (mcm)	**Annual draft for Irrigation (mcm)**	**Gross annual draft (mcm)**	**Stage of Extraction of groundwater (%)**	**Savings by Sprinkler (mcm@20%)**
126.420	127.930	133.570	**105.65**	25.59

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After implementation of recharge structures, total recharge is 64.15mcm which increase the dynamic resources to 190.57 mcm. The additional savings by micro-irrigation in Shajapur block is 25.59 mcm which can cause a reduction in the gross draft. Together the recharge structures and the micro-irrigation will be able to increase the utilization of more area for irrigation and cropping and reduce the stage of groundwater extraction in Shajapur block and hence increase the sustainability of aquifer.

Table No. 19: Projected groundwater availability and stage of extraction plan for Shujalpur block

Savings by Sprinkler (mcm)	**Additional recharge by AR structures (mcm)**	**Net Groundwater available (mcm)**	**Utilization of 35% of additional GW created (mcm)**	**Gross draft after intervetion (mcm)**	**Stage of groundwater Extraction (%)**	**Additional area irrigated (Sq.Km)**
25.59	64.15	190.57	22.4	130.4	**68.45**	5613

The stage of groundwater extraction after implementing the proposed recharge plan may be reduced by 37% from 105.65% to 68.45% and the block will move on to safe category from over-exploited category.

6.4 Management Plan for Kalapipal block

Average post monsoon water level of Kalapipal block based on 114 key observation wells is 3.07 and the unsaturated zone available in the block is 0.07m which is the space available for recharge. The block has wter logging condition soon after monsoon sicne the thickness of shallow aquifer is very less in the block. The subsurface storage calculated is 1.1mcm and the non-committed runoff available is 57.75 mcm. Based on this data, a recharge plan had been proposed for Kalapipal block for 1.52 mcm.

Table No. 20: Proposed management plan for Kalapipal block

Strutcure	**Recharge Shaft/Tube Well (80% @ 0.05cr.)**
Number	15
Cost(cr.)	0.75

In Kalapipal block, 15 tube well/ recharge shaft, 100% of the subsurface storage available. No other structures are proposed in Kalapipal block as recharge of shallow aquifer is not feasible in the block. The total cost of production is 0.75 crores. These numbers are calculated using the formula and reducing the number of already existing structures in the block.

In addition to the recharge structures, micro-irrigation is also proposed in Kalapipal block by sprinkler irrigation method.

Table No.21: Reduction in draft proposed by sprinkler irrigation

Net Groundwater availability (mcm)	Annual draft for Irrigation (mcm)	Gross annual draft (mcm)	Stage of Extraction of groundwater (%)	Savings by Sprinkler (mcm@20%)
149.4	141.4	145.460	**97.32**	28.28

After implementation of recharge structures, total recharge is 1.52mcm which increase the dynamic resources to 150.98 mcm . The additional savings by micro-irrigation in Shajapur block is 28.28 mcm which can cause a reduction in the gross draft. Since stage of groundwater extraction is 97.3%, and recharge possible is only 1.52mcm, it is not feasible to utilize additional area for irrigation. Together the recharge structures and the micro-irrigation reduce the stage of groundwater extraction in Kalapipal block and hence increase the sustainability of aquifer.

Table No.22: Projected groundwater availability and stage of extraction plan for Kalapipal block

Savings by Sprinkler (mcm)	Additional recharge by AR structures (mcm)	Net Groundwater available (mcm)	Gross draft after intervetion (mcm)	Stage of groundwater Extraction (%)
28.28	1.52	150.98	117.18	**77.61**

The stage of groundwater extraction after implementing the proposed recharge plan may be reduced by 20% from 97.32% to 77.61% and the block will move on to semi-critical category from critical category.

Table No. 23: Management plan proposed for Shajapur district

District:SHAJAPUR	Area Suitable for AR	Volume of Surface Water available for AR (MCM)	Volume of Water required for recharge (MCM)	Proportionate Surface water for planning AR (MCM)	Percolation Tanks (Proprsed-existing)		NB/ CD/ CP (Proprsed-existing)		Recharge shaft/ Tube well		Renovation of Village Ponds (Proprsed-existing)		Total Cost of RS in crores	Existing NB/ CD/ CP	Existing Percolation Tanks	Existing other recharge structures
					No.	Cost (Cr.)	No.	Cost (Cr.)	No.	Cost (Cr.)	No.	Cost (Cr.)				
Shajapur	883.1	231.52	63.18	69.45	63	12.6	76	7.6	126	6.3	99	1.98	28.5	366	0	82

M.Brodiya	881.8	231.17	50.9	69.4	51	10.2	0	0	102	5.1	54	1.08	16.38	554	0	120
Kalapipal	815.7	213.84	1.52	64.15	0	0	0	0	3	0.15	129	2.58	2.73	220	2	33
Shujalpur	815.7	213.84	85.3	64.15	48	9.6	0	0	128	6.4	212	4.24	20.24	214	16	24
TOTAL	**3396.9**	**890.37**	**200.87**	**267.1**	**162**	**32.4**	**76**	**7.6**	**402**	**17.8**	**753**	**15.1**	**67.83**			

Table No.24: Projected groundwater availability and stage of extraction plan for Shajapur district

Block	**Net GW Availability**	**Draft (Irrigation)**	**Draft (Domestic & Industrial)**	**Gross Draft**	**Stage of Extraction**	**Saving Sprinkler (mcm)**	**Additional recharge created by AR**	**After intervention of AR Structure Net GW Avl.**	**AR Structure & utilisation of additional GW created.**	**Irrigation sprinkler & additional area created for agriculture**	**Development W/O GW use for additional Area**	**Additional area irrigated by GW after intervention**
Shajapur	132.87	93.83	5.99	99.82	75.12	18.77	63.19	196.1	31.59	131.41	67.03	7898
Kalapipal	149.46	141.4	4.06	145.5	97.32	28.28	1.52	150.98	0	145.46	96.34	0
Shujalpur	126.42	127.9	5.64	133.6	105.65	25.59	64.15	190.57	25.66	133.64	70.13	6415
Mohan Barodiya	147.82	187.5	4.20	191.7	129.710	37.51	50.90	198.72	0	154.23	77.61	0
TOTAL	**556.57**	**550.7**	**19.89**	**570.6**	**101.95**	**110.1**	**422.6**	**979.13**	**57.25**	**517.70**	**77.78**	**14313**

CHAPTER 7

7 Conclusion and Recommendations

7.1 Conclusions

The area under present study comprises of Shajapur, M. Barodia, Kalapipal and Shujalpur blocks of Shajapur district. The total area covered is 3473.25 sq. kms.

Physiographically, the area forms a parts of Malwa pleateau. The entire study area is characterized by a typical trappean geomorphology comprising extensive plains, low lying hills and hill clusters with gently northerly slope.

The area is part of Chambal, Sub basin of the Ganga basin. Prominent north flowing rivers Kalisindh, Newaj, and Parvati drain the area are tributaries of Chambal river. The drainage pattern is dendritic to sub dendritic with moderate drainage density.

The major aquifers in the district comprise of alluvium, vesicular/amygdaloidal basalt and fractured/jointed basalts of deccan traps. Basalt acts as a multi aquifer system in the district. The aquifer occurring in the study area are not highly potential. The alluvium is of limited thickness and supperts tube wells having 2-8 lps discharge. Vesicular, weathered fracture and jointed zone sustain tube wells of upto 13 lps discharge.

10 years water level data reveals that the pre monsoon water level have shows rising trend in the study area and post monsoon water level shows declining trend.

As per block wise ground water resources estimation March 2017, Shujalpur and Moman Barodia blocks falls under over-exploited category, Kalapipal falls under critical and Shajapur block falls under semi-critical category. The stage of development in Kalapipal, M Barodia, Shujalpur and Shajapur blocks are 97%, 129%, 105% and 75% respectively.

The aquifer and water level of the district is considerably affected by the accelerated constriction of recharge structures in last five years.

Cropping pattern have considerable role in stage of groundwater extraction in the district as Rabi crops are more cultivated in the district. Cultivation of orange is also reported in Moman Barodiya and Shujalpur blocks which causes the decline in water levels.

The quality of ground water in general in the study area is suitable for domestic, industrial and irrigation uses. Almost all the ground water in the area is of calcium carbonate type.

By implementing artificial recharge structures and micro-irrigation, the sustainability of aquifer in the district can be increased, dynamic resources can be increased and additional area can be utilized for irrigation and cropping.

7.2 Recommendations

- Additional recharge structures may be constructed in all 4 blocks.
- Existing recharge structures may renovate and maintained properly.

- Canal/Pipeline irrigation may be intensified from Parvati and Newaj rivers to villages in Kalapipal block.

- Micro-irrigation may be adopted in all 4 blocks.

- Cultivation of water intensive crops including orange and sugar cane may be stopped/reduced.

ANNEXURES

Annexure-1 Chemical Quality data of Deeper Aquifer under accelerated exploration drilling programme in parts of Shajapur District

Location/ Village	District	Source	Date of Collection	Depth of well mbgl (mt)	PH	EC	CO3	HCO 3	Cl	NO3	F	TH	Ca	Mg	Na	K
Panwadi	Shajapur	EW	20/02/2004	78	7.8	1079	0	177	170	49	0.59	170	34	21	176	3.5
Dudhana	Shajapur	EW	21/02/2004	127	7.7	1779	0	37	589	8	1.47	270	98	6	295	3.7
Dudhana	Shajapur	EW	21/02/2004	133	7.7	1783	0	49	571	10	2.48	145	44	9	350	3.6
Raniberod	Shajapur	EW	29/02/2004	106	7.3	1152	0	73	252	4	5.9	100	38	1	225	1.9
Ukawata	Shajapur	EW	02/03/2004	110.25	7.46	466	0	159	50	3	0.47	175	38	19	17	1.1
Manglaz	Shajapur	EW	03/03/2004	163	7.64	1668	0	79	418	0	2.35	185	62	7	2&7j	2.4
Salsalai	Shajapur	EW	03/03/2004	105	7.44	244	0	122	7	6	0.29	55	30	9	25	0.4
Shajapur	Shajapur	EW	22/02/2004	46	7.6	627	0	165	71	4	1.3	145	44	9	85	1.6
Shajapur	Shajapur	EW	05/03/2004	91	7.5	1081	0	250	160	26	2.94	215	58	17	156	0.9
Shajapur	Shajapur	LEW	22/02/2004	47	7.78	598	0	153	74	0	1.42	130	42	6	46	1.6
Kalisindh	Shajapur	EW	26/02/2004	34	7.5	1841	0	43	610	3	1.79	445	174	2	223	2.5
Majhaniya	Shajapur	EW(D)	01/03/2004	146	7.35	684	0	171	96	50	3.24	125	34	10	104	3
Morta Kewadi	Shajapur	EW	29/02/2004	101	7	932	0	134	160	65	3.95	210	58	16	122	1
Morta Kewadi	Shajapur	EW	29/02/2004	101	7.44	774	0	104	163	50	6.41	70	22	4	134	2.1
Ladawad	Shajapur	EW(D)	04/03/2004	31	7.4	1028	0	104	230	65	1.02	225	30	36	125	1
Richhoda	Shajapur	EW(D)	05/03/2004	140	7.44	1972	0	67	603	20	2.83	290	114	1	332	4.2
Khedinagar	Shajapur	EW	05/03/2004	91	7.57	1052	0	128	223	6	0.83	30	56	22	125	1
Khedinagar	Shajapur	EW	05/03/2004	91	7.62	1038	0	116	230	4	0.7	230	52	24	116	1

Ugali	Shajapur	EW(D)	06/03/2004	78	7.5	1015	0	92	234	9	7.13	65	24	1	191	5.3
Kisori	Shajapur	EW(D)	06/03/2004	91	7.52	920	0	226	124	9	6.6	135	34	12	145	2.8
Tilawadmaing	Shajapur	EW(D)	08/03/2004	64	7.21	1030	0	323	113	9	0.42	270'	24	51	96	2.7
Ranitu Bhavar	Shajapur	EW	29/02/2004	76	7.6	228	0	122	14.2	1	0.3	65	22	2	25	0.8

Annexure-2 Details of exploratory bore well drilled under accelerated exploratory drilling programme by CGWB in M., Barodia, Shajapur, Shujalpur and Kalapipal block of Shajapur district during 2003-04.

Name of site/village	Blocks	Toposheet No.	Co-ordinate		Total depth mbgl	Discharge lps	SWL mbgl	Draw down in mts.	Aquifer Zones	Remarks/ Aquifer
1	2	3	4		5	6	7	8	9	10
Panwadi	M.Barodia	55A/6, 3B	$76^0$24'00"	$23^0$30'00"	78.26	0.8	14.27	39.00	17.50-24.00	PYT duration 15 minutes V Basalt
Rani Barod	M.Barodia	55A/11, 2B	$76^0$36'00"	$23^0$21'00"	105.68	2.5	14.06	26.62	94.00-103.00	Vesi. Basalt
Ukawate	M.Barodia	55A/6, 3C	$76^0$26'00"	$23^0$31'30"	110.25	12.5	63.50	10.00	91.00-105.00	Vesi. Basalt
Mangloz	M.Barodia	55A/10, 3A	$76^0$33'00"	$23^0$31'45"	165.09	10.5	102.00	12.00	14.00-18.00 155.00-162.00	Vesi. Basalt
Salsai	M.Barodia	55A/11, 1A	$76^0$32'00"	$23^0$27'45"	119.39	5.00	8.60	7.00	15.00-21.00 85-95 113.00-116.00	Vesi. Basalt
Karaje	M.Barodia	55A/6, 2B	$76^0$24'00"	$23^0$33'00"	169.66	-	37.42	DRY	37.00-42.00	Vesi. Basalt
Dudlana	M.Barodia	55A/6, 3B	$76^0$24'45"	$23^0$33'15"	123.96	14.50	61.00	0.5	7.00-10.5 86-95 119-123	Vesi. Basalt
Jhokar	Shajapur	55A/4, 1C	$76^0$11'00"	$23^0$14'45"	105.58	0.8	8.5	37.00	-	Vesi. Basalt
Kalisindh	Shajapur	55A/7, 2C	$76^0$25'30"	$23^0$21'00"	64.55	3.8	31.00	3.07	31.00-34.00	Vesi. Basalt
Shajapur	Shajapur	55A/7, 1A	$76^0$10'30"	$23^0$28'30"	91.97	2.0	2.44	40.06	4.5-6.0 48-56.00	F & W Basalt
Sundorsi	Shajapur	55A/7, 3A	$76^0$26'50"	$23^0$16'20"	128.53	9.00	37.28	0.20	16-18 122-28.53	V Basalt
Jharakhi Sakri	Shajapur	55A/11, 3A	$76^0$31'40"	$23^0$17'30"	174.23	0.5	85.90	-	20.00-23.00	D/dow negligible
Ranlt Bhawar	Shajapur	55A/7, 3A	$76^0$22'10"	$23^0$16'00"	101.11	4.5	3.76	-	51.00-59.00	

Berchhla										
Major haniya	Shajapur	55A/7, 3A	76^{0}20’00”	23^{0}27’00”	151.38	-	21.00	-	46.00-55.00	V Basalt
Morta	Shajapur	55A/7, ICCIB	76^{0}25’00”	23^{0}28’00”	101.11	4.5	65.00	15.00	25-30 74.80	V Basalt
Lajowad	Shajapur	55A/7, 2B	76^{0}24’10”	23^{0}23’30”	59.98	Negligible	37.50	-	59.00-62.00	V Basalt
Richhoda	Shajapur	55A/7, 2B	76^{0}24’11”	23^{0}25’00”	142.24	2.8	94.20	17.00	130.00-136.00	V Basalt
Morta Kewdi	Shujalpur	55A/12, 1A	76^{0}30’00”	23^{0}15’00”	110.25	3.00	59.50	15.50	97-102	V Basalt
Shujalpur	Shujalpur	55A/11, 2C	76^{0}42’00”	23^{0}24’00”	91.97	7.5	16.15	10.0	80-85	V Basalt
Kheinagar	Shujalpur	55A/11, 2B	76^{0}39’30”	23^{0}26’38”	91.97	6.00	38.40	15.00	87.-91	V Basalt
Ugli	Shujalpur	55A/15. 1A	76^{0}48’30”	23^{0}22’38”	78.26	4.8	46.00	20.00	59.00-66.00	V Basalt
Kisoni	Shujalpur	55A/11, 2C	76^{0}43’00”	23^{0}22’30”	91.97	7.5	49.00	15.00	85.00-91.00	V Basalt
Tilawad Maina	Shujalpur	55A/12	76^{0}34’40”	23^{0}10’30”	64.55	13.8	7.15	2.00	95-12 23-26 50-60	V Basalt
Arniya kalan	Shujalpur	55A/12, 1C	76^{0}45’00”	23^{0}14’00”	78.26	Negligible	68.00	-	-	V Basalt

Annexure-3 Chemical quality of water Samples of NHS wells for May 2019

S. No.	Block	Location	Lat.	Long.	pH*	EC*	HCO_3	Cl	SO_4*	NO_3*	F*	PO_4*	SiO_2*	TH	Ca	Mg*	Na*	K*
1	Shujalpur	Akodia	23.382	76.599	7.68	1164	437	89	55	33	0.42	0.08	47	300	16	63	119	10.2
2	Kalapipal	Arandia	23.208	76.739	7.28	2412	344	520	61	67	0.61	0.15	63	890	232	75	133	10.1
3	Moman Badodia	Chouma	23.649	76.225	7.33	1574	523	173	17	87	0.63	0.09	45	615	120	77	69	7.9
4	Kalapipal	Kalapipal	23.334	76.833	7.40	1250	381	144	25	65	0.18	0.08	43	460	104	49	65	10.3
5	Shajapur	Majhania	23.448	76.321	7.40	1100	455	67	11	69	0.18	0.07	48	450	110	43	35	11.1
6	Shajapur	Makshi New	23.253	76.148	7.67	1005	246	126	44	66	0.73	0.12	35	230	50	26	114	10.7

7	Moman Badodia	Moman Badodia	23.606	76.341	7.29	2344	596	302	89	128	0.49	0.09	51	785	144	103	166	10.8
8	Kalapipal	Nandni	23.318	76.938	7.47	794	369	17	15	47	0.46	0.07	40	280	60	32	44	10.9
9	Shajapur	Narayangaon	23.478	76.256	7.70	728	295	45	10	37	0.55	0.09	37	275	42	41	32	10.6
10	Shajapur	Panwadi	23.504	76.404	7.88	1828	467	230	89	77	0.80	0.11	48	475	50	85	191	10.2
11	Moman Badodia	Salsalai	23.464	76.538	7.35	1544	437	173	78	62	0.24	0.09	52	640	158	60	49	11.1
12	Shajapur	Shajapur	23.421	76.276	7.48	1195	430	94	66	2	0.27	0.08	44	470	116	44	47	11.8
13	Shujalpur	Shujalpur	23.406	76.709	7.37	796	172	87	74	52	0.13	0.06	33	270	64	27	48	10.2
14	Shajapur	Tilawad Govind	23.310	76.333	7.50	1358	301	220	13	90	0.47	0.08	54	515	146	36	64	10.6

Annexure-4 Details of bore wells used to prepare aquifer model and sections.

Si No	Bore Well	Easting	Northing	Elevation	TotalDepth
1	Jhokar	621055	2571227	499	105.58
2	Alisariya (EW)	691908	2581507	493	110.8
3	Jharakhi Sakri	656243	2576632	481	174.23
4	Lasuriyamalak(EW)	687036	2572311	479	153.5
5	Polai Kalan	658605	2568351	474	63.41
6	Ragho Kheri	703390	2599358	472	50.3
7	Morta Kewdi	653450	2571988	470	110.25
8	Ugli	684823	2586437	467	78.26
9	Arniya kalan	679052	2570429	467	78.26
10	Tilawad Maina	661498	2563768	467	64.55
11	Ranlt Bhawar	640075	2573702	464	101.11
12	Arandiya	671479	2568462	459	192
13	Majhaniya	636193	2593967	458	151.38
14	Rani Barod	663559	2583171	458	105.68
15	Salsai	656611	2595554	455	119.39
16	Kheinagar	669404	2593635	452	91.97

17	Dudhana (EW)	639629	2605073	450	174.2
18	Kisoni	675455	2586076	448	91.97
19	Shujalpur	673719	2588824	448	91.97
20	Sundersi	648025	2574394	447	128.53
21	Kalisindh	645667	2582984	446	64.55
22	Mangloz	658234	2602955	445	165.09
23	MomanBarodiya (EW)	634707	2607463	444	191.4
24	Lajowad	643351	2587575	444	60
25	Nandni (EW)	629743	2591694	442	169.5
26	Richhoda	643352	2590343	440	142.24
27	Panwadi	642950	2599568	437	78.26
28	Morta	644688	2595894	434	101.11
29	Nipaniya (OW)	637747	2615882	429	123
30	Karaje	642896	2605104	425	169.66
31	Ukawate	646326	2602370	424	110.25

Annexure-5 Details of Key Observation wells in Shajapur district

BLOCK	SITE	Long	Lat	Toposheet No.	Owner	Accessibility	Static Water level (mbmp) May-2019	Static Water level (mbmp) November-2019
Kalapipal	Rushtampur	23.265423	76.733535	55A/11	Karansingh Bansilal	RHS of road (Ashta-Shujalpur road), 50m away from govt. primary school near T-junction in the agricultural field. 50m befor milestone Ashta 33km, Shujalpur-16km.	8.72	1.45
Kalapipal	Panchidaheriya (panchidehriya)	23.264333	76.684947	55A/11	Govind Singh	50m from milestone Dhabla Ghosi-2km, Shujalpur road 6km at hanumanji temple. On the LHS of road going to Dhabla Ghosi, A small transformer is also present.	20.2	
Kalapipal	Arniya Kalan	23.248803	76.739595	55A/12	Rajendra Chaudhary	RHS of Arniya Kalan village in the house of Rajendra Choudhary ji near the board and a transformer in Shujalpur-Ashta road.	16.14	4.63
Kalapipal	Rolakhedi	23.180496	76.722648	55A/12	Vijay Singh	50m away from milestone Rolakhedi-1km, Bawdikheri-3km, Tilawad-4km on the RHS of road in the house of Vijay Singh.	9.62	5.82
Kalapipal	Tilawad	23.219269	76.709173	55A/12	Gopilal Ganpat	RHS of road Shujalpur- Ashta road, in the house of Gopilal Ganpat near Tilawad Bypass.	9.2	1.44

Kalapipal	Parlia	23.208836	76.658375	55A/12	Ladsingh Kuwarlal	LHS of village from Shujalpur - Ashta road infront of bus stand (yatri pratishalaya) back side of his house.	13.7	3.68
Kalapipal	Arniya Khurd	23.241805	76.660243	55A/12	govt	Community well, near Satya Chabutara, Hatai Mohalla.	4.05	8.18
Kalapipal	Kanadiya	23.246681	76.767087	55A/12	Laxman Singh	RHS of road near milestone Arniya Kalan-3km and Kanadiya-1km in the Agricultural field.	11	1.47
Kalapipal	Lasuriyaghag	23.195893	76.78171	55A/12	Vikram Raj	RHS of road at the milestone, nipaniya Khurd-2km Jabariya gharwas-2km in the agricultural field. 50m away from gram panchayat.	9.73	2.18
Kalapipal	Pocchaner	23.151059	76.797491	55A/12	Bhopal Singh	RHS of road 1km away from pocchaner village towards ranayal, back side of Agricultural field of the Bhopal Singh	10.5	0.7
Kalapipal	Ranayal	23.127625	76.848595	55A/12	Temple Trust	LHS of road when coming from Nipaniya khurd Mandir trust, near Samshan ghat, Ram mandir, 30m away from Idea Tower.	8.43	1.38
Kalapipal	Sadankhedi (sajankhedi)	23.359922	76.871571	55A/15	Govt.	RHS of road at the (Dugdha Utpadak Sahkari Samiti Sadankheri and Hanuman Temple.	13.43	1.23
Kalapipal	Aagkhedi	23.407445	76.903391	55A/15	Ranchod Singh S/O Prahlad Singh	At the Trijunction of Aagkhedi near milestone Richdi-4km Mainroad-0km, near Teastall.	16.43	3.1
Kalapipal	Khokhra Kalan	23.407445	76.903391	55A/15	Govt.	RHS of road at the back side of Gram Panchayat Office of Khokhra Kalan.	5.22	2.32

Kalapipal	Khardon Kalan	23.466788	76.970842	55A/15	Vijay Patidar	RHS of road in the house of Vijay Patidarji, infront of Samshan ghat and 50m ahead gas Godown (HP).	8.22	3.1
Kalapipal	Ramadi	23.476761	76.863513	55A/15	Bhairavlal Meena	At the junction of Ramri, LHS of road, near milestone Shujalpur-22km, Kurawar-20km.	13.7	1.72
Kalapipal	Kamalpur	23.470076	76.831429	55A/15	Ramesh Ahirwar	LHS of road in the house of Ramesh Ahirwar at the electricity pole in the agricultural field, going towards Shujalpur-Ramedi road.	11.38	4.87
Kalapipal	Lasuriyamalak (Lasuldiyamalak)	23.249441	76.828235	55A/15	Govt	Infront of Gram panchayat office of Lasuriyamalak.	6.8	1.96
Kalapipal	Ronsla	23.234782	76.819589	55A/16	Govt	Near Nala, in the village Ronsla near Shiv temple, back side of Devsingh ji Rajput.	12.34	1.8
Kalapipal	Kolwa	23.191004	76.83895	55A/16	Kailash Malviya S/O Chainsingh Malviya	Near the junction milestone Amlaya-13km, Kalapipal -19km and Amlaya- Kalapipal jod-0km sherpur-2km, below power transmission line. And Berchdatar- 2km.	10.6	2.28
Kalapipal	Khamliya	23.153985	76.874606	55A/16	Govt	Near Water tank at the trijunction of Khamlaya Village.		1.93
Kalapipal	Kothri	23.217696	76.87068	55A/16	Ghesilal S/O Dario Singh.	RHS of road in the agricultural field of Ghesilal, near Shiv temple (Choti Si Chabutara) near Culvert.	10.82	2.57
Kalapipal	Pharad	23.246844	76.897852	55A/16	govt.	Govt. well located within village, near Culvert Nala.(Already invented by DK rai sir)	4.32	1.38

Kalapipal	Bhuriya khajuriya	23.293879	76.853404	55A/15	Bhagirath Phundilal	250m ahead of milestone jabariya Bhil-2km, LHS of road in the agricultural field of Bhagirath Phundilal	17.84	2.15
Kalapipal	Jabri	23.287597	76.892523	55A/15	Govt.	50m ahead of Gram Panchayat Bhawan and govt. primary school jabri.	10.24	1.32
Kalapipal	Alniya	23.329802	76.894847	55A/15	Govt.	1km away from main road towards the village Alniya near the culvert before village.	17.24	1.33
Kalapipal	Kankariya	23.350734	76.922104	55A/15	Manohar Meena	100m away from road back side of govt. Middle School and milestone Kankariya-1km and main road-2km near culvert.	10.45	2.64
Kalapipal	Semliya	23.381363	76.939712	55A/15	Mahesh Patidar	LHS of road near milestone Badbeli-1.2km, Bhaisa- Nagin-1km infront of house of Mahesh Patidar.	12.94	1.53
Kalapipal	Rosi	23.317045	76.795572	55A/15	Govt.	On the RHS of road coming from Kalapipal, back side of primary school.	8.05	6.22
Kalapipal	Kalapipal Gaon	23.336004	76.872648	55A/15	Govt.	LHS of road coming from Nandani near culvert and board Kalapipal, near Devnarayan Temple.	8.23	1.38
Kalapipal	Pratapura	23.305192	76.929001	55A/15	Govt.	LHS of road coming from Nandni near milestone Kalapipal-1km and Kankarkheda-1km.	10	3.55
Moman Barodiya	Ramal Khedi	23.589289	76.410901	55A/6 (2C)	Amar Singh	300m ahead of milestone-Agar-48km, sarangpur-5km while coming from sarangpur, on the RHS of Agar- Sarangpur road at	8.4	3.05

						the junction of T-point which leads to Ramalkhedi village.		
Moman Barodiya	Mandola	23.601299	76.419987	55A/6 (2C)		300m before vetenary hospital and overhead tank in the LHS of road while going towards mandola village.	8.38	4.6
Moman Barodiya	Karju	23.629543	76.408848	55A/6 (2B)	govt	Near hanuman temple, LHS of road while going towards karju near milestone karju-1km	14.81	1.55
Moman Barodiya	Dudhana	23.557411	76.391159	55A/6 (3B)	Kannu Kumhar	LHS of the turning point of road going towards dudhana, 100m before sankul kendra shaskiya high school, near milestone-0.88km dudhana	9.91	2.22
Moman Barodiya	Mankamaneshwar Temple (Kumhariya Khas)	23.565385	76.349391	55A/6	Temple	Inside mankamaneshwar temple premises in the village kumhariya khas	9.3	3.2
Moman Barodiya	Bakani	23.546771	76.371666	55A/6	Ram Singh	Near Samshan ghat, 150m from govt. School Bakani	9.5	2.34
Moman Barodiya	moman barodiya	23.600732	76.349249	55A/6 (2B)	Dinesh Uthkar	On the LHS of Agar-Sarangpur road, 50m before Essar Petrol Pump	11	0.7
Moman Barodiya	Pharadkhedi	23.622983	76.305494	55A/6	Vishnu Prasad Patidar	On the LHS of Agar-Sarangpur road, 500m away from Pharadkhedi (at warehouse) 2km from milestone Agar-32km, Sarangpur- 19km.	11.4	5.84
Moman Barodiya	Govinda	23.648526	76.287409	55A/6	govt	200m before village govinda near milestone 8 and culvert, 1500m	7.6	1.48

						from main road- sarangpur road		
Moman Barodiya	Umariya Daya	23.612679	76.295369	55A/6	Govardhan Singh Rajput	Pharadkhedi-Dhandheda gaon road before milestone dhandheda-4.43km Sarangpur road-2km	18.6	1.84
Moman Barodiya	Bhawarasa	23.67251	76.373474	55A/6		Near Culvert, LHS of road along the side of Hanuman Temple while coming from village bhanwarsa	9.08	2.13
Moman Barodiya	Mohna	23.685295	76.351663	55A/6 (1B)		2km away from village mohna, infront of Vijaylaxmi HP Gas distribution	16.32	3.32
Moman Barodiya	Malyakhedi	23.717823	76.335015	55A/6		At the trijunction of road going to malyakhedi (moman barodia-Nalkheda marg) from badagaon	11.77	2.3
Moman Barodiya	Sirsodiya	23.638742	76.372855	55A/6(2B)	govt	LHS of road while coming from nipaniya near transformer before 100m govt. school	13.05	4.15
Moman Barodiya	Nipaniya	23.649914	76.343806	55A/6	Shiv narayan	At the agricultural field of shiv Narayan before entering to the village nipaniya, near culvert at moman barodia- Nalkhera road	12.5	1.12
Moman Barodiya	Bandahedi	23.610077	76.272854	55A/6	Suraj Singh	Near culvert,500m before bandakhedi village in the house of Suraj singh near board (pradhanmantri Gramin Sadak Yojna)	9.52	1
Moman Barodiya	Ankhali	23.561064	76.256683	55A/6	Sidhu singh S/o Jaggu Singh	LHS of road coming from chouma near milestone 17/4, 300m before milestone shajapur 16km and hankhali 0km	19	

Moman Barodiya	Bolai	23.380151	76.478839	55A/7	Bharav Singh and Bhagawat singh	LHS of road, back of bada hanuman temple at bolai-Makhawad road (akodia road) milestone Akodia 14km Bolai-0km near km stone 15/2	8.22	1.88
Moman Barodiya	Gulana	23.432135	76.469831	55A/7	govt	RHS of road at the side of sub health centre govt. in Gulana-Madana road.	12.9	1.2
Moman Barodiya	Madana	23.482106	76.501669	55A/7		LHS of road near milestone madana-2km, LHS of road coming from Shujalpur, at Shujalpur- Sarangpur road entering from madana- 4km milestone.	13.2	2.52
Moman Barodiya	Manglaj	23.530942	76.554865	55A/10	govt	Back side of Rammandir temple, LHS of road going to chitawad-3km before	5.42	1.62
Moman Barodiya	Nolai	23.528114	76.613594	55A/10	Sukhram Rajput	500m away from T-point of gansoda, LHS of road in the agricultural field of Sukhram Rajput (orange field)	13.8	1.22
Moman Barodiya	Khamkheda	23.511003	76.588658	55A/10	Hiralal	LHS of road Khamakheda 400m before village khamakheda in the agricultural field of Hiralal.	12.3	1.6
Moman Barodiya	Badigaon	23.454497	76.511832	55A/11	govt	LHS of road near culvert, 50m at hanuman temple, 100m away badigaon bus stop	13.32	2.19
Moman Barodiya	Bamori	23.441071	76.538145	55A/11	Babulal S/O Dhulji	2km away from main road (Akodia-Sarangpur road), 50m before bamori village at the turning point of village.	4.64	0.8

Moman Barodiya	Bhaisrod	23.422401	76.550675	55A/11	Iqubal seth	LHS of road going to village bhainsrod in the agricultural field of Iqubal seth, 2km from main road (Akodia- Sarangpur road).	7.96	
Moman Barodiya	Kethalay	23.396496	76.546696	55A/11	Babu Malviya	RHS of road in the house of babu Malviya at the turning point before 150m kethalay village.	11.2	0.68
Moman Barodiya	Makhawad	23.369301	76.523415	55A/11	Prem Singh	Parallel to the railway line in the house of Prem Singh, 2km inside the makhawad road, before 1km from makhawad village.	12.95	1.4
Moman Barodiya	Rani Barod	23.350236	76.598903	55A/11	govt	Govt. well 50m Ilay mata temple, 50m from BSNL tower. 100m back side of road (Akodia road) near nala	7.22	1.52
Moman Barodiya	Niwaliya	23.322257	76.595978	55A/11	Mor khan (molta wale)	In the agricultural field of Mor khan, RHS of road 30m away from Niwaliya road.	12.1	2.74
Moman Barodiya	Polai Khurd (choti polai)	23.308623	76.563045	55A/11		near Ramdevji Temple (Chandni Chowk), from Sarswati Sishu Mandir near Transformer within the village.	7.3	1.26
M. Barodia	Dupada	23.53980556	76.205	55A/3	Govt.	Behind Govt. hospital building, Dupada village	15.2	3.28
Shujalpur	Patlawad	23.415757	76.6497	55A/11	Laxminarayan Parmar	milestone 1km before patlawad village and 100m away from trijunction board of (patlawad-1km), LHS of road (infront of devkaran ji house)	10	2.02
Shujalpur	Pewnchi	23.468757	76.641256	55A/11	Ishwar Singh	Inside the Rajput warehouse, after 20m from nala, 3km before katwala village	5.2	1.38

Shujalpur	Mayapur-Magrola	23.471304	76.718614	55A/11		At the base Rajput Thakur Samaj, on the RHS of road going to mayapur (mayapur Shujalpur road)	9.24	1.7
Shujalpur	Chitora	23.43089	76.710541	55A/11		On the RHS of Shujalpur-Pachore road going to mayapur at the house having shiv temple (on LHS warehouse is there, near power grid pole, 1km from milestone Shujalpur-3km Pachore-33km	10.57	2.12
Shujalpur	Badi-Raipur	23.462359	76.685269	55A/11	Bharav Singh Chauhan	in the agricultural field of Bharav Singh Chauhan RHS of road near milestone-4, raipur-1km and Dugdha-4km.	13.2	3.38
Shujalpur	Khedinagar	23.398104	76.660599	55A/11	govt	At the gram panchayat of khedinagar, south of village(old well)	18.62	1.28
Shujalpur	Kolia	23.424683	76.603749	55A/11	Deepsingh Mawara	RHS of road in the agricultural field of Deepsingh Mewara, milestone mitara-6.1km, (sarangpur- Akodia joint-3km)	14	2.8
Shujalpur	Amlavati	23.450048	76.604069	55A/11	govt	LHS of road in the campus of govt. middle school amlawati.	16.1	1.6
Shujalpur	Shujalpur Mandi	23.369659	76.721304	55A/11	govt	near Srilal Saxena smiriti college (SLS), RHS of road 100m from petrol pump turn right from (Shujalpur Mandi-Ashta road)	13	3.41
Shujalpur	Gairkhedi	23.34622	76.733422	55A/11	Dilip Mewara	LHS of road going to village gairkhedi, (Shujalpur-Ashta road) (Dandi jod to Gairkheri) way from Adani Soyabean plant.	11.1	

Shujalpur	Dehandi (ganeshpura)	23.34622	76.733422	55A/11	govt	RHS of village ganeshpura infront of overhead tank and a transformer, village dehandi is 4km away from it.	9.6	
Shujalpur	Dunglai	23.316823	76.676649	55A/11	Kamal singh Dhangar	Near Km stone Dunglai- 1.85km and Ashta shujalpur road -7km, LHS if coming from Dunglai Village	6	0.38
Shujalpur	Hadlay Kalan	23.325959	76.609805	55A/11		RHS of road when going to hadlay kalan village from main road near milestone Hadlay kalan-3km and Akodia-2km, near Culvert	9.6	3
Shujalpur	Unchod	23.337222	76.659911	55A/11	govt	govt well and back side of Hanuman temple in unchod village	12.2	1.42
Shujalpur	kharsut	23.274959	76.585547	55A/11	govt.	RHS of road near statue-Dinesh Kalmodiya, back side of haat bazaar office kharsut.	14.4	2.45
Shujalpur	Makori	23.280134	76.510807	55A/11	govt.	Near Hanuman Temple, back side of Sarswati Shishu Mandir School makori.	9.55	0.85
Shujalpur	Mortar Kewari	23.256967	76.554478	55A/12	Rambabu	LHS of road near milestone Mortar Kewari 0km and akodia-16km.	17.5	1.9
Shujalpur	Polai Kalan (badi polai)	23.220912	76.54246	55A/12		LHS of road infront of HP petrol pump and 200m north of Higher Secondary School.	7.6	1.35
Shujalpur	Lalpura	23.205738	76.610998	55A/12	govt	At the back of Office Gram Panchayat and Govt. middle School Lalpura	8.92	5.6

Shujalpur	Barodia	23.142695	76.590739	55A/12	Bharav Singhji Jaoriya	RHS of road in the house of Bharav Singh ji Jaoriya 50m before vodafone tower and Idea tower, near milestone 8	10.8	0.9
Shujalpur	Pagrawat Kalan	23.160276	76.551081	55A/12	Govt	Near Gram panchayat office and hanuman mandir, Vetenary hospital, Community Well	11.92	1.82
Shujalpur	Chakrod	23.337846	76.7816	55A/15	govt.	LHS of road coming from Kalapipal-Shujalpur road, 1km inside govt. well.	7.91	
Shujalpur	Merkhedi	23.367736	76.775413	55A/15	Ramcharan Ji	RHS of road coming from Chakrod and LHS when coming from Shujalpur Mandi in the house of Ramcharan ji.	10.84	6.12
Shujalpur	Bhikheda	23.367859	76.809453	55A/15	Vikram Singh Bhilkhera	Near the power line, RHS of road, back side of Vikram Singh Bhilkhera ji's house (near Pan Dukan)	11.55	1.16
Shujalpur	Narola	23.408255	76.797888	55A/15	Saber Khan	RHS of Kurawar- Shujalpur road coming from Shujalpur in the back side of Saber Khan's house near milestone-8, Shujalpur-10km	3.5	1.6
Shajapur	Mahupura	23.4275	76.2803611	55A/7	Temple trust, Omkareshwar temple, Mahupura	Inside Omkareshwar Shiv temple, Mahupura	10.45	2.9
Shajapur	Tukrana	23.47963889	76.3185556	55A/7	Govt.	Near Cemetery inside Tukrana village, can be aproached through the road along side Devi temple	17.1	4.2
Shajapur	Kunkudi, Abhaypur	23.50272222	76.3722222	55A/7	Ramesh Sarpanch	Kunkudi inside abhaypur village, by the side of Ramesh Sarpanch's	11.5	3.1

						house		
Shajapur	Rampura	23.43805556	76.3624444	55A/7	Govt.	Opposite to anganwadi kendra, Rampura on Rampura- Mewasa road	13.1	5.42
Shajapur	Mehndi	23.43027778	76.4121389	55A/7	Govt.	Behind Govt. hosppital, Mehndi village	4.3	1.65
Shajapur	Larawad	23.3885	76.4030556	55A/7	Dandsingh Patidar	Square cut Bawari inside Larawd village	9.2	1.64
Shajapur	Lohri	23.37805556	76.3723611	55A/7	Pvt	On a barren land inside Lohri village on lohri - Bakshukhedi road.	10.3	1.8
Shajapur	Dillod	23.37011111	76.2728333	55A/7	Govt.	Inside Dillod village, Near culvert and natuaral Stream on the side of Chosla Kulmi - Dillod road	9.6	1.48
Shajapur	Kanja	23.42144444	76.3058333	55A/7	Dheerav singh	Inside farm land behind the house of Lakhan singh on the LHS side of Kanja-Kheda Bamori road	8.2	1.68
Shajapur	Chosla Kulmi	23.30075	76.2523889	55A/7	Ramchand Netaji	Inside the village chosla kulmi	7.9	3.66
Shajapur	Gadroli	23.27277778	76.1455278	55A/4	Muneer Ali	Inside Gadroli Village, 15th ward, by the side of Muneer Ali's house, Gadroli	8.4	1.98
Shajapur	Jhonkar	23.23822222	76.17975	55A/4	Govt.	Toda, in front of knatilal Donglik's house inside Jhonkar village	9.6	1.1
Shajapur	Kapalia	23.30677778	76.2155	55A/3	Govt.	inside a farm land in Kapalia village on sirolia road	9.5	1.85

Shajapur	khakri	23.39288889	76.2170833	55A/3	Pvt	Near Culvert and kilometer stone showing Khakri 0 km. Private well in barren land	12.5	2.12
Shajapur	Bamanyakhedi	23.43180556	76.2260833	55A/3	Chandramat	Outskirts of Bamanyakhedi village ,behind the house of Chandramat Ji	18.2	
Shajapur	Lalakhedi Gujar	23.46125	76.2168611	55A/3	Rakesh Sharma	In a barren land near imli tree, behid the house of Prabhulal Patel	11.5	9.75
Shajapur	Bercha	23.29363889	76.333	55A/7	Mansingh S/o Saulal	Inside a farm land, outskirts of Bercha village opposite to HP petrol pump	14.5	0.4
Shajapur	Rantambhawar	23.30397222	76.3685833	55A/7	Govt.	Near Bhairav mandir and culvert inside the village	11.7	1.4
Shajapur	Ghansoda	23.31977778	76.4029444	55A/7	Ramsingh S/o Ratanalal	Near Raliance telephone tower, behind the house of Ramsingh in the outskirts of Ghansoda village	10.8	1.28
Shajapur	Simrol	23.32825	76.4911111	55A/7	Pvt	Place called Mayaran Gujar in Simrol private well from where whole village is taking water	7.6	2.38
Shajapur	Tandapindonia	23.24180556	76.3859722	55 A/8	Pvt	Inside a farmland in the outskirts of village, 1 km before entering into the village, near culvert	11.4	1.32
Shajapur	Udali	23.2625	76.3607222	55A/7	Ramchnadar	Opposite to Hanuman temple inside the village behind Imli and pipla trees	15.8	2.32
Shajapur	Raheli	23.23597222	76.3021389	55 A/8	Chandansingh S/o Bahirav singh	inside the farm land of Chandansingh in outskirts of village	7.8	2.12
Shajapur	Taleni	23.26319444	76.4834167	55A/7	Pvt	Near Pipal tree inside Taleni	8.9	1

						village		
Shajapur	Aser	23.23419444	76.4552778	55 A/8	Govt.	Square cut bawari inside Aser village.	11.05	5.03
Shajapur	kasamkhedi	23.20866667	76.4698333	55 A/8	Pvt	Outside the village, 1km after the village, near culvert on Kasamkhedi- umrod Road	12.4	3.42

Annexure-6 Water Bodies/Tanks in Shajapur district

S.N.	District/Block/GP	Name of Scheme	Project Category	Coordinates		Capacity (Cubic meter) Before intervention
				Latitude	Longitude	
Minor scheme						
1	Shajapur/Shajapur	Lakhundar Dam	Tank	23^0-14'-38"	76^0-15'-28"	30.65
2	Shajapur/Shajapur	Chillar Dam	Tank	23^0-23'-45"	76^0-17'-06"	31.12
3	Shajapur/Shajapur	bori tank	Tank	23^0-24'-16"	76^0-13'-45"	1.05
4	Shajapur/Shajapur	berchhi tank	Tank	23^0-15'-01"	76^0-18'-54"	0.45
5	Shajapur/Shajapur	kheda old tank	Tank	23^0-24'-47"	76^0-20'-53"	0.24
6	Shajapur/Shajapur	kheda New tank	Tank	23^0-25'-15"	76^0-20'-41"	0.38
7	Shajapur/Shajapur	Ranthbawar tank	Tank	23^0-18'-02"	76^0-21'-16"	0.69
8	Shajapur/Shajapur	Kanja tank	Tank	23^0-24'-50"	75^0-19'-02"	0.56
9	Shajapur/Shajapur	Birgod tank	Tank	23^0-14'-18"	76^0-21'-00"	0.76
10	Shajapur/Shajapur	Rulki tank	Tank	23^0-16'-19"	76^0-16'-40"	1.01
11	Shajapur/Shajapur	Lahori tank	Tank	23^0-21'-45"	76^0-21'-24"	0.35
12	Shajapur/Shajapur	Khajuri makodi tank	Tank	23^0-17'-28"	76^0-30'-53"	0.6

13	Shajapur/Shajapur	Tilawad govind tank	Tank	23^0-19'-37"	76^0-20'-33"	0.53
14	Shajapur/Shajapur	Ranthbawar New tank	Tank	23^0-19'-00"	76^0-21'-52"	0.22
15	Shajapur/Shajapur	Makodi umarsinghi tank	Tank	23^0-16'-00"	76^0-31'-08"	1.59
16	Shajapur/Shajapur	Ragbel weir	Weir	23^0-29'-44"	76^0-14'-42"	0.27
17	Shajapur/Shajapur	Bhatkhedi weir	Weir	23^0-24'-00"	76^0-26'-12"	0.69
18	Shajapur/Shajapur	Devlavihar weir	Weir	23^0-21'-35"	76^0-26'-34"	0.45
19	Shajapur/Shajapur	Ghatiyakhurd stopdam	Stopdam	23^0-18'-29"	76^0-26'-14"	0.86
20	Shajapur/Shajapur	Bherughata weir	Weir	23^0-32'-37"	76^0-15'-10"	1.16
21	Shajapur/Shajapur	Dhobighat weir	Weir	23^0-13'-22"	76^0-25'-59"	1.94
22	Shajapur/shujalpur	Siloda tank	Tank	23^0-18'-18"	76^0-47'-50"	3.84
23	Shajapur/shujalpur	Akodia tank	Tank	23^0-23'-16"	76^0-35'-07"	0.55
24	Shajapur/shujalpur	Tanda tank	Tank	23^0-11'-31"	76^0-29'-35"	0.96
25	Shajapur/shujalpur	Narola tank	Tank	23^0-24'-23"	76^0-48'-37"	3.24
26	Shajapur/shujalpur	Khadi tank	Tank	23^0-13'-51"	76^0-31'-09"	0.94
27	Shajapur/shujalpur	Deoli tank	Tank	23^0-15'-03"	76^0-35'-43"	0.33
28	Shajapur/shujalpur	Badi polai tank	Tank	23^0-13'-30"	76^0-32'-59"	0.81
29	Shajapur/shujalpur	Arandia tank	Tank	23^0-11'-58"	76^0-40'-39"	0.27
30	Shajapur/shujalpur	Arniya tank	Tank	23^0-14'-00"	76^0-03'-00"	0.23
31	Shajapur/shujalpur	Kham tank	Tank	23^0-18'-06"	76^0-33'-09"	0.6
32	Shajapur/shujalpur	Dorapur weir	Stop dam	23^0-15'-28"	76^0-25'-48"	2.16

33	Shajapur/Kalapipal	Khonkhara tank	Tank	23^0-25'-43"	76^0-56'-29"	1.00
34	Shajapur/Kalapipal	Baorikheda tank	Tank	23^0-9'-07"	76^0-44'-53"	1.74
35	Shajapur/Kalapipal	Bhanyakhedi tank	Tank	23^0-22'-03"	76^0-50'-42"	1.12
36	Shajapur/Kalapipal	Chakrod tank	Tank	23^0-19'-32"	76^0-48'-28"	0.55
37	Shajapur/Kalapipal	Imlikheda tank	Tank	23^0-23'-16"	76^0-51'-32"	1.13
38	Shajapur/Kalapipal	Tilawad tank	Tank	23^0-11'-28"	76^0-43'-00"	0.15
39	Shajapur/Kalapipal	Pochaner	Tank	23^0-32'-52"	76^0-40'-00"	0.23
40	Shajapur/Kalapipal	Harrajkheda	Tank	23^0-09'-50"	76^0-42'-19"	0.22
41	Shajapur/Kalapipal	Khejriya tank	Tank	23^0-12'-51"	76^0-42'-37"	0.65
42	Shajapur/Kalapipal	Himleshwar tank'	Tank	23^0-15'-05"	76^0-32'-32"	0.32
43	Shajapur/Kalapipal	Raghunathpura tank	Tank	23^0-13'-05"	76^0-30'-50"	0.52
44	Shajapur/Kalapipal	Jethada tank	Tank	23^0-18'-47"	76^0-41'-51"	0.74
45	Shajapur/Kalapipal	Jhundi weir	Weir	23^0-24'-35"	76^0-59'-14"	0.32
46	Shajapur/Kalapipal	Bapcha weir	Weir	23^0-26'-54"	77^0-01'-19"	1.57
47	Shajapur/Kalapipal	Bankkhedi dunglai weir	Weir	23^0-18'-03"	76^0-39'-24"	1.61
48	Shajapur/Kalapipal	Awantipur Barodia	Weir	23^0-09'-07"	76^0-35'-58"	1.35
49	Shajapur/Kalapipal	Banjari weir	Weir	23^0-13'-12"	76^0-36'-03"	0.8
50	Shajapur/Kalapipal	Tilawad Barrage	Barrage	23^0-12'-16"	76^0-41'-35"	0.14
51	Shajapur/Kalapipal	Kothari weir	Weir	23^0-13'-58"	76^0-55'-49"	0.9
52	Shajapur/Kalapipal	Kashmiri Barrage	Barrage	23^0-14'-42"	76^0-45'-46"	0.23
53	Shajapur/Kalapipal	Pardakhedi weir	Weir	23^0-22'-00"	76^0-59'-35"	0.9

54	Shajapur/Kalapipal	Kheda raipur barrage	Barrage	23^0-29’-06”	76^0-41’-35”	0.65
55	Shajapur/Kalapipal	Pilikarar weir	Weir	23^0-10’-10”	76^0-50’-30”	0.8
56	Shajapur/Kalapipal	Binaya weir	Weir	23^0-11'-25"	76^0-36'-25"	0.8
57	Shajapur/Kalapipal	Bolda weir	Weir	23^0-15'-54"	76^0-38'-11"	1
58	Shajapur/Kalapipal	Devankhedi weir	Weir	23^0-07'-37"	76^0-34'-15"	0.33
59	Shajapur/Moman badodiya	Bhesrod tank	Tank	23^0-24'-55"	76^0-35'-15"	2.31
60	Shajapur/Moman badodiya	Burlay tank	Tank	23^0-39'-10"	76^0-15'-46"	2.43
61	Shajapur/Moman badodiya	Nipaniya tank	Tank	23^0-37'-55"	76^0-21'-13"	4.58
62	Shajapur/Moman badodiya	polaykhurd tank	Tank	23^0-19'-26"	76^0-34'-48"	0.43
63	Shajapur/Moman badodiya	Borsali tank	Tank	23^0-19'-57"	76^0-32'-46"	0.19
64	Shajapur/Moman badodiya	Semlichacha tank	Tank	23^0-18'-22"	76^0-28'-30"	0.32
65	Shajapur/Moman badodiya	Simrol no. 1 tank	Tank	23^0-19'-47"	76^0-30'-29"	2.75
66	Shajapur/Moman badodiya	Simrol no.2 tank	Tank	23^0-18'-49"	76^0-30'-33"	0.88
67	Shajapur/Moman badodiya	Karju weir	Weir	23^0-40'-16"	76^0-24'-25"	0.30
68	Shajapur/Moman badodiya	Bhandedi Stopdam	Stopdam	23^0-37'-01"	76^0-13'-21"	1.03
69	Shajapur/Moman badodiya	Karadiya tingajpur Weir	Weir	23^0-29'-04"	76^0-26'-56"	0.09
70	Shajapur/Moman badodiya	Pipliyakhal karju weir	Weir	23^0-40'-18"	76^0-24'-00"	0.2

71	Shajapur/Moman badodiya	Wazirpur barrage	Barrage	23^0-25'-57"	76^0-25-45"	1.95
72	Shajapur/Moman badodiya	Dhinka barrage	Barrage	23^0-39'-50"	76^0-24'-56"	1.42
73	Shajapur/Moman badodiya	Meghakhedi barrage	Barrage	23^0-41'-06"	76^0-12'-34"	1.38
(Source-WRD)						
Nagar Palika Shujalpur						
74	Shajapur/Shujalpur	Bawan Ghat	Dam	23.420 N	76.685 E	2.17

Annexure-7 Traditional Water Bodies in Shajpur

S.N.	District/Block/GP	Scheme name	Geo Cordinates		Type of water body (tank, ponds,lakes etc.)	Capacity (Cubic meter) Before intervention
			Latitude	Longitude		
Minor scheme						
1	Shajapur	Lakhundar Dam	23^0-14'-38"	76^0-15'-28"	Tank	30.65
2	Shajapur	Chillar Dam	23^0-23'-45"	76^0-17'-06"	Tank	31.12
Source-WRD						
3	Shajapur	Girwar	23.42706	76.27289	Pond	1.75 Lakh Cum
4	Shajapur	Rajrajeshwari mandir Campus	23.41905	76.27539	Bawdi	150 Cum

Source- Nagar Palika Shajapur

Annexure-8 Government Building with functional Rain Water Harvesting

S.N.	District/Block/GP	Geo Coordinates		Type of Government Building having RWH structures (Offices, Schools, Hospitals etc)	Functional (Yes/No)
		Latitude	Longitude		
1	Shajapur City	23·4273^0	76·2730^0	EVM GODOWN	Yes
2	Shajapur City	23·4273^0	76·2730^0	Collector Office	Yes
3	Shajapur City	23·4273^0	76·2730^0	District Hospital Building	Yes
4	Shajapur City	23·4273^0	76·2730^0	District Lab Building (PHE)	Yes
5	Shajapur City	23·4273^0	76·2730^0	Railway Building	Yes
6	Shajapur City	23·4273^0	76·2730^0	Central School Building	Yes
7	Shajapur City	23.41536	76.29096	Municipal Council Building	Yes
8	Shujalpur City	23.41 N	76.71 E	Community Hall Building	Yes
9	Shujalpur City	23.41 N	76.71 E	Community Hall Building	Yes
10	Shujalpur City	23.39 N	76.70 E	Old Water Treatment Plant Building	Yes
11	Shujalpur City	23.39 N	76.70 E	New Water Treatment Plant Building	Yes
12	Shujalpur City	23.39 N	76.70 E	Water Work Store Building	Yes
13	Shujalpur City	23.41 N	76.74 E	Dr.Shail Kumar Shrama Stadium-1	Yes
14	Shujalpur City	23.52 N	76.65 E	Dr.Shail Kumar Shrama Stadium-2	Yes

Annexure-9 Bore wells Requiring Point Recharge

S.No.	District	Block	Gram Panchayat	Geo Coordinates		No. of Borewells	Depth of bore well (Feet)
				Latitute	Longitute		
1	Shajapur	Shajapur	Morta	**23.475**	**76.4169**	2	400
2	Shajapur	Shajapur	Narayangad	**23.4559**	**76.4037**	1	400
3	Shajapur	Shajapur	Richhoda	**23.4125**	**76.4037**	1	380
4	Shajapur	Shajapur	**Pachola Banhal**	**23.4280**	**76.3923**	1	400
5	Shajapur	Shajapur	**Bamori**	**23.4290**	**76.3488**	1	390

6	Shajapur	Shajapur	Pipdoniya	**23.4206**	**76.3736**	1	400
7	Shajapur	Shajapur	dharakhedi	**23.3634**	**76.2939**	1	400
8	Shajapur	Shajapur	Sankota	**23.3549**	**76.3159**	1	395
9	Shajapur	Shajapur	Mullakhedi	**23.3595**	**76.3180**	2	400
10	Shajapur	Shajapur	Pipliya Gopal	**23.3830**	**76.3247**	1	380
11	Shajapur	Shajapur	Jhonkar	**23.2371**	**76.1823**	1	390
12	Shajapur	Shajapur	Sihoda	**23.3370**	**76.2225**	1	400
13	Shajapur	Shajapur	Dillod	**23.3723**	**76.2775**	1	380
14	Shajapur	Shajapur	Bhadoni	**23.4445**	**76.2312**	1	395
15	Shajapur	Shajapur	Jadmi	**23.4410**	**76.2206**	1	400
16	Shajapur	Shajapur	Rampura Gurjar	**23.4745**	**76.2039**	1	380
17	Shajapur	Shajapur	Loharwas	**23.5062**	**76.2977**	1	400
18	Shajapur	Shajapur	Hirpurteka	**23.4826**	**76.3019**	1	395
19	Shajapur	Shajapur	Sundarshi	**23.2695**	**76.4398**	1	400
20	Shajapur	Shajapur	Sakrai	**23.2902**	**76.5325**	1	400
21	Shajapur	Shajapur	Makodi	**23.2815**	**76.5118**	1	395
22	Shajapur	Shajapur	Semalichacha	**23.3145**	**76.4588**	1	400
23	Shajapur	Shajapur	Sakhedi	**23.2797**	**76.4854**	1	400
24	Shajapur	Shajapur	Ladawad	**23.3887**	**76.4058**	1	380
25	Shajapur	Shajapur	Berchha	**23.2840**	**76.3266**	1	400
26	Shajapur	Shajapur	Batwadi	**23.2705**	**76.3381**	1	395
27	Shajapur	Shajapur	Birgoad	**23.2529**	**76.3521**	1	400
28	Shajapur	Shajapur	Dorapura	**23.2351**	**76.4278**	1	380

29	Shajapur	Shajapur	Hanoti	**23.2493**	**76.2129**	1	395
30	Shajapur	Shajapur	Lalupura	**23.2473**	**76.2337**	1	400
31	Shajapur	Shajapur	Badanpur	**23.2909**	**76.2419**	1	395
32	Shajapur	Mo.Badodiya	Chitawad	**23.5068**	**76.5576**	1	400
33	Shajapur	Mo.Badodiya	Malikhedi	**23.4968**	**76.5199**	1	380
34	Shajapur	Mo.Badodiya	Dhaturiya	**23.4034**	**76.4992**	2	400
35	Shajapur	Mo.Badodiya	Piploda Ismail	**23.5486**	**76.6092**	1	395
36	Shajapur	Mo.Badodiya	Nolaya	**23.5372**	**76.6150**	1	400
37	Shajapur	Mo.Badodiya	Gulana	**23.4324**	**76.4719**	1	380
38	Shajapur	Mo.Badodiya	Mudlay	**23.4417**	**76.5647**	1	400
39	Shajapur	Mo.Badodiya	Bagli	**23.3385**	**76.4638**	1	385
40	Shajapur	Mo.Badodiya	Jhundakheda	**23.3583**	**76.5359**	1	400
41	Shajapur	Mo.Badodiya	Simrol shu	**23.3315**	**76.4927**	1	385
42	Shajapur	Mo.Badodiya	palsawad shu	**23.3723**	**76.5583**	1	395
43	Shajapur	Mo.Badodiya	Bhaisroad	**23.4223**	**76.5439**	1	400
44	Shajapur	Mo.Badodiya	Morta Malothar	**23.3383**	**76.5638**	1	380
45	Shajapur	Mo.Badodiya	Rijawata	**23.5595**	**76.4282**	1	400
46	Shajapur	Mo.Badodiya	Chouma	**23.6581**	**76.2235**	1	400
47	Shajapur	Mo.Badodiya	Jawadi	**23.6413**	**76.2547**	1	395
48	Shajapur	Mo.Badodiya	Sagdiya	**23.6316**	**76.2420**	1	380
49	Shajapur	Mo.Badodiya	Parsula	**23.7004**	**76.2217**	1	400
50	Shajapur	Mo.Badodiya	Shadipura	**23.5693**	**76.4254**	1	400
51	Shajapur	Mo.Badodiya	Rasulpur	**23.5170**	**76.4407**	1	385

52	Shajapur	Mo.Badodiya	Jaman	**23.5420**	**76.3881**	1	400
53	Shajapur	Mo.Badodiya	Kumariyapal	**23.5873**	**76.4311**	1	400
54	Shajapur	Mo.Badodiya	Dhenka	**23.6212**	**76.4438**	1	395
55	Shajapur	Mo.Badodiya	Kamardipur	**23.5357**	**76.4569**	1	400
56	Shajapur	Mo.Badodiya	Karju	**23.6379**	**76.4012**	1	340
57	Shajapur	Mo.Badodiya	Barnawad	**23.6640**	**76.3220**	1	400
58	Shajapur	Mo.Badodiya	matewa	**23.5982**	**76.3036**	1	395
59	Shajapur	Mo.Badodiya	Dhakdi	**23.5986**	**76.3094**	1	400
60	Shajapur	Mo.Badodiya	Matana	**23.5735**	**76.3232**	1	380
61	Shajapur	Mo.Badodiya	Kadula	**23.6946**	**76.3107**	1	400
62	Shajapur	Mo.Badodiya	Nipaniya Karju	**23.6497**	**76.3497**	1	400
63	Shajapur	Mo.Badodiya	Ghanshoda	**23.5233**	**76.5997**	1	400
64	Shajapur	Mo.Badodiya	Khamkheda	**23.5093**	**76.5933**	1	395
65	Shajapur	Mo.Badodiya	Gawadi	**23.5376**	**76.5647**	1	400
66	Shajapur	Mo.Badodiya	Khedawad	**23.5527**	**76.5555**	1	380
67	Shajapur	Mo.Badodiya	Badigoav	**23.4527**	**76.5106**	1	400
68	Shajapur	shujalpur	Ugli	**23° 26' 49.5386'**	**76° 48' 24.4463'**	**2**	395
69	Shajapur	shujalpur	Satendi	**23° 20' 27.1176'**	**76° 42' 29.1985'**	1	380
70	Shajapur	shujalpur	Kohliya	**23° 24' 30.4171'**	**76° 35' 57.8308'**	**3**	400
71	Shajapur	shujalpur	Mandalkha	**23° 31' 18.8367'**	**76° 38' 17.0107'**	**2**	400
72	Shajapur	shujalpur	Chouki Shahpur	**23° 29' 15.2406'**	**76° 36' 38.9135**	**2**	400
73	Shajapur	shujalpur	Amlawati	**23° 26' 53.5224'**	**76° 36' 15.7110'**	**2**	395
74	Shajapur	shujalpur	Pevachi	**23° 27' 37.7060'**	**76° 38' 27.0238'**	**2**	400

75	Shajapur	shujalpur	Tajpur Ukala	23° 26' 3.8962'	76° 44' 48.0453	1	380
76	Shajapur	shujalpur	Dehandi	23° 20' 49.2885'	76° 41' 49.3669'	1	400
77	Shajapur	shujalpur	Bhogipur	23° 21' 1.4857'	76° 40' 20.0067'	1	395
78	Shajapur	shujalpur	Jethda	23° 19' 36.6234'	76° 42' 54.5171	1	380
79	Shajapur	shujalpur	Ajnai	23° 23' 51.2625'	76° 38' 0.6887'	1	400
80	Shajapur	shujalpur	Chapdiya	23° 24' 29.0429'	76° 37' 4.4720'	1	400
81	Shajapur	shujalpur	Ugah	23° 26' 2.8623'	76° 38' 30.0244'	1	400
82	Shajapur	shujalpur	Magrola	23° 28' 20.6232'	76° 42' 21.2479'	1	395
83	Shajapur	shujalpur	Titwas	23° 27' 54.2980'	76° 46' 46.8029'	1	400
84	Shajapur	shujalpur	Shyampur	23° 27' 27.5623'	76° 43' 23.7709'	1	380
85	Shajapur	shujalpur	Jhadla	23° 23' 4.2649'	76° 46' 36.8704'	1	400
86	Shajapur	shujalpur	Rupahedi	23° 31' 10.5042'	76° 37' 4.0786'	1	395
87	Shajapur	shujalpur	Dugdha	23° 29' 33.1750'	76° 40' 8.5429'	1	380
88	Shajapur	shujalpur	Laharkheda	23° 31' 26.8778'	76° 38' 53.8308'	1	400
89	Shajapur	shujalpur	Raypur	23° 27' 22.4870'	76° 40' 57.1742'	1	400
90	Shajapur	shujalpur	Kishoni	23° 21' 45.8341'	76° 42' 44.6821'	1	400
91	Shajapur	shujalpur	Jamner	23° 19' 16.8926'	76° 45' 18.1246'	1	395
92	Shajapur	shujalpur	Chitoda	23° 26' 28.6723'	76° 42' 37.2199'	1	400
93	Shajapur	shujalpur	Mo.Kheda	23° 23' 39.9608'	76° 39' 44.5881'	1	380
94	Shajapur	shujalpur	Kadwala	23° 28' 43.3545'	76° 37' 35.4159'	1	400
95	Shajapur	shujalpur	Mitera	23° 27' 38.6446'	76° 37' 2.2247'	1	395
96	Shajapur	shujalpur	Chouki Muridpur	23° 28' 11.8917'	76° 38' 40.0671'	1	380
97	Shajapur	shujalpur	Gandlakhedi	23° 26' 47.3023'	76° 38' 40.5635'	1	400

98	Shajapur	shujalpur	Gunjari	23° 26' 20.3163'	76° 51' 18.7839'	1	400
99	Shajapur	shujalpur	Tungani	23° 26' 21.3654'	76° 49' 56.6786'	1	400
100	Shajapur	shujalpur	Banjari behrawal	23° 26' 40.4200'	76° 47' 11.7902'	1	395
101	Shajapur	kalapipl	Mugoad	23° 19' 37.5335'	76° 40' 37.2487'	1	400
102	Shajapur	kalapipl	Rani Badode	23° 20' 35.3516'	76° 39' 55.5763'	1	380
103	Shajapur	kalapipl	Khatsur	23° 17' 38.7468'	76° 42' 30.4674'	1	400
104	Shajapur	kalapipl	Bhardi	23° 16' 56.5778'	76° 45' 31.6628'	1	395
105	Shajapur	kalapipl	Bhuriya Khajuriya	23° 13' 27.1260'	76° 36' 51.6862'	1	380
106	Shajapur	kalapipl	Raghokhedi	23° 19' 31.1291'	76° 37' 19.6037'	1	400
107	Shajapur	kalapipl	Semliya	23° 18' 9.7941'	76° 37' 30.0025'	1	400
108	Shajapur	kalapipl	Roshla	23° 12' 0.9330'	76° 28' 41.3865'	1	400
109	Shajapur	kalapipl	Bhanyakhedi	23° 19' 42.1749'	76° 39' 21.5445'	1	395
110	Shajapur	kalapipl	Lasudiya Malak	23° 9' 52.0723'	76° 36' 44.8033	1	400
111	Shajapur	kalapipl	Kamalpur	23° 8' 26.6970'	76° 35' 42.0845'	1	380
112	Shajapur	kalapipl	Khajuriya alahdad	23° 11' 4.5665'	76° 37' 27.9507'	1	400
113	Shajapur	kalapipl	Magraniya	23° 16' 2.7897'	76° 37' 19.1326'	**2**	395
114	Shajapur	kalapipl	banahedi	23° 20' 51.9376'	76° 36' 15.4975'	**2**	400
115	Shajapur	kalapipl	dabri	23° 16' 18.5042'	76° 34' 59.7826'	**2**	380
116	Shajapur	kalapipl	nipaniya hajamuddin	23° 19' 12.9991'	76° 49' 59.2940'	**2**	400
117	Shajapur	kalapipl	saliya	23° 17' 29.1985'	76° 50' 34.6832'	**2**	400
118	Shajapur	kalapipl	batwadi	23° 29' 40.3339'	76° 59' 35.7324'	**2**	400
119	Shajapur	kalapipl	hadlaykala	23° 23' 6.4257'	76° 56' 23.0647'	**2**	395
120	Shajapur	kalapipl	tanda khurd	23° 13' 55.3921'	76° 49' 8.8106'	**2**	400

121	Shajapur	kalapipl	uchod	23° 21' 50.0746'	76° 50' 22.6928	**2**	380
122	Shajapur	kalapipl	mo.pawadiya	23° 14' 59.6493'	76° 49' 43.7482'	**2**	400
123	Shajapur	kalapipl	nevajkhedi	23° 28' 24.6465'	76° 49' 53.2699'	**2**	395
124	Shajapur	kalapipl	shambhupura	23° 15' 12.1940'	76° 56' 11.2979'	**2**	400
125	Shajapur	kalapipl	mo.machnai	23° 27' 44.2016'	77° 1' 2.9015'	1	400
126	Shajapur	kalapipl	lasudiya patla	23° 29' 6.6445'	76° 58' 22.8658	1	400
127	Shajapur	kalapipl	Ganeshpur	23° 27' 42.5255'	76° 59' 12.4246'	1	380
128	Shajapur	kalapipl	Khokhrakala	23° 25' 41.9643'	76° 56' 57.5852'	1	400
129	Shajapur	kalapipl	Khokhra Khurd	23° 25' 10.6928'	76° 57' 16.8468'	1	400
130	Shajapur	kalapipl	Arandiya	23° 12' 10.6664'	76° 40' 56.0546'	1	400
131	Shajapur	kalapipl	Salkankhedi	23° 12' 12.9269'	76° 39' 24.3911'	1	395
132	Shajapur	kalapipl	arniya khurd	23° 14' 18.4286'	76° 39' 27.4212'	1	400
133	Shajapur	kalapipl	bolda	23° 15' 42.1408'	76° 38' 51.4329'	1	380
134	Shajapur	kalapipl	khejdiya	23° 14' 24.6268'	76° 41' 49.5030'	1	400
135	Shajapur	kalapipl	tilawad maina	23° 12' 35.5240'	76° 42' 14.5313'	1	395
136	Shajapur	kalapipl	bagoda	23° 13' 35.7445'	76° 47' 1.6862'	1	400
137	Shajapur	kalapipl	arniya kala	23° 14' 0.5557'	76° 44' 20.9108'	1	400
138	Shajapur	kalapipl	alisriya	23° 12' 7.8628'	76° 44' 25.5278'	1	380
139	Shajapur	kalapipl	jabdiya bhil	23° 17' 29.3092'	76° 52' 26.2938'	1	400
140	Shajapur	kalapipl	nipaniya khurd	23° 11' 4.4017'	76° 45' 57.9965'	1	400
141	Shajapur	kalapipl	pochaner	23° 9' 29.8311'	76° 48' 48.1497'	1	400
142	Shajapur	kalapipl	ranayal	23° 7' 46.6125'	76° 51' 3.5551'	1	395
143	Shajapur	kalapipl	Bamuliya muchali	23° 11' 45.0720'	76° 52' 21.0765'	1	400

144	Shajapur	kalapipl	berchha datar	23° 12' 6.6820'	76° 50' 34.9695'	1	380
145	Shajapur	kalapipl	bisankhedi	23° 29' 18.4951'	76° 51' 46.7919'	1	400
146	Shajapur	kalapipl	khardon khurd	23° 30' 0.8706'	76° 53' 28.4875'	1	395
147	Shajapur	kalapipl	kherkhedi	23° 30' 51.8108'	76° 54' 3.8759'	1	400
148	Shajapur	kalapipl	bakayan	23° 28' 41.0689'	76° 54' 55.8448'	1	400
149	Shajapur	kalapipl	ghati muktyarpur	23° 24' 9.0613'	76° 53' 50.0459'	1	400
150	Shajapur	kalapipl	khardon kala	23° 28' 4.9792'	76° 57' 51.9839'	1	380
151	Shajapur	kalapipl	sadankhedi	23° 21' 35.9139'	76° 52' 14.6461'	1	400
152	Shajapur	kalapipl	kakriya	23° 21' 20.6347'	76° 55' 4.8766'	1	400
153	Shajapur	kalapipl	kakadkheda	23° 18' 13.0764'	76° 54' 22.0206'	1	400
154	Shajapur	kalapipl	chayni	23° 18' 55.9693'	76° 58' 35.8461'	1	395
155	Shajapur	kalapipl	jagdiya gharwas	23° 11' 57.7798'	76° 48' 8.2593'	1	400
156	Shajapur	kalapipl	badalpur	23° 9' 45.0473'	76° 47' 11.6859'	1	380
157	Shajapur	kalapipl	kolwa	23° 11' 24.6220'	76° 50' 49.7781'	1	400
158	Shajapur	kalapipl	Farad	23° 14' 48.9077'	76° 54' 2.9325'	1	395
159	Shajapur	kalapipl	Lalakhei	23° 14' 42.6653'	76° 53' 58.1871'	1	400
160	Shajapur	kalapipl	hadlaykhurd	23° 14' 57.0282'	76° 48' 25.1315'	1	395
161	Shajapur	kalapipl	dorabad	23° 17' 42.5831'	76° 50' 0.9052'	1	400
162	Shajapur	kalapipl	mandalkhedi	23° 15' 42.0569'	76° 52' 40.9087'	1	380
163	Shajapur	kalapipl	kohadi	23° 25' 45.3630'	76° 55' 42.0967'	1	400
164	Shajapur	kalapipl	aagkhedi	23° 24' 17.8610'	76° 54' 37.6747'	1	395
165	Shajapur	kalapipl	bhisayanagin	23° 24' 17.8610'	76° 54' 37.6747'	1	400
166	Shajapur	Shujalpur	Shujalpur	23.39 N	76.71 E	14	268.10

Annexure-10 Watershed Activities

S.N.	District	Block	GP	Geo Cordinates		Nature of watershed works(Check dam/Gully Plugs /percolation tanks)	Number of works
				Latitude	Longitude		
1	Shajapur	Kalapipal	Chayni	23°18'49" N	76°58'10"E	Check dam	1
2			Chayni	23°20'0" N	76°58'14"E	Check dam	1
3			Chayni	23°18'40" N	76°57'58"E	Check dam	1
4			Chayni	23°18'45" N	76°58'32" E	Check dam	1
5			Chayni	23°18'57" N	76°58'1" E	Check dam	1
6			Chayni	23°19'0" N	76°57'27" E	Stop Dam	1
7			Chayni	23°20'1" N	76°57'9" E	Check dam	1
8			Chayni	23°18'56" N	76°57'5" E	Check dam	1
			Total				**08**
9			Pratapura	23°18'43" N	76°56'36"E	Check dam	1
10			Pratapura	23°18'28" N	76°56'51"E	Check dam	1
11			Pratapura	23°18'37" N	76°56'51"E	Check dam	1
12			Pratapura	23°17'21" N	76°56'39"E	Check dam	1
13			Pratapura	23°18'19" N	76°56'50"E	Stop Dam	1
14			Pratapura	23°19'4" N	76°56'54"E	Stop Dam	1
			Total				**05**
15			Nandni	23°18'32" N	76°55'37"E	Check dam	1
16			Nandni	23°18'38" N	76°55'20"E	Check dam	1
17			Nandni	23°18'39" N	76°55'32"E	Check dam	1
18			Nandni	23°17'54" N	76°55'19"E	Check dam	1
19			Nandni	23°18'43" N	76°55'16"E	Check dam	1
20			Nandni	23°18'38" N	76°55'48"E	Stop Dam	1
21			Nandni	23°18'52" N	76°56'6"E	Stop Dam	1
			Total				**07**
22			Kankadkheda	23°18'32" N	76°55'12"E	Stop Dam	1

23			Kankadkheda	23°18’23” N	76°54’37”E	Stop Dam	1
24			Kankadkheda	23°18’19” N	76°54’18”E	Stop Dam	1
25			Kankadkheda	23°17’7” N	76°54’20”E	Stop Dam	1
26			Kankadkheda	23°18’24” N	76°55’10”E	Check dam	1
27			Kankadkheda	23°17’31” N	76°54’16”E	Check dam	1
28			Kankadkheda	23°17’25” N	76°54’18”E	Check dam	1
			Total				**07**
29			Badbeli	23°22’45” N	76°57’3”E	Check dam	1
30			Badbeli	23°22’24” N	76°56’19”E	Stop Dam	1
			Total				**02**
31			Rampura	23°21’32” N	76°54’35”E	Stop Dam	1
32			Rampura	23°21’19” N	76°55’18”E	Stop Dam	1
33			Rampura	23°21’39” N	76°55’16”E	Check dam	1
34			Rampura	23°21’42” N	76°55’27”E	Check dam	1
35			Rampura	23°21’19” N	76°55’19”E	Check dam	1
36			Rampura	23°21’47” N	76°55’32”E	Check dam	1
37			Rampura	23°21’31” N	76°54’56”E	Check dam	1
38			Rampura	23°21’54” N	76°55’58”E	Check dam	1
39			Rampura	23°21’60” N	76°55’51”E	Check dam	1
40			Rampura	23°21’60” N	76°55’51”E	Check dam	1
41			Rampura	23°21’30” N	76°54’18”E	Check dam	1
42			Rampura	23°21’29” N	76°54’32”E	Check dam	1
43			Rampura	23°21’59” N	76°55’46”E	Check dam	1
44			Rampura	23°21’58” N	76°55’35”E	Check dam	1
		Total					**14**
45		Shujalpur	Dugdha	23.2922 N	76.3953 E	Check dam	1
46			Dugdha	23.2930 N	76.4100 E	Check dam	1
47			Dugdha	23.2925 N	76.3959 E	Check dam	1
48			Dugdha	23.2840 N	76.3920 E	Check dam	1
49			Dugdha	23.2904 N	76.3933 E	Check dam	1
50			Dugdha	23.2924 N	76.4059 E	Check dam	1

51			Dugdha	23.2908 N	76.3936 E	Check dam	1
			Total				**07**
52			Ugah	23.2626 N	76.3830 E	Stop Dam	1
53			Ugah	23.2641 N	76.3833 E	Check dam	1
54			Ugah	23.2607 N	76.3837 E	Check dam	1
55			Ugah	23.2641 N	76.3833 E	Check dam	1
56			Ugah	23.2553 N	76.3809 E	Check dam	1
57			Ugah	23.2553 N	76.3758 E	Check dam	1
58			Ugah	23.2536 N	76.33721 E	Check dam	1
			Total				**07**
59			Kadwala	23.2846 N	76.3755 E	Stop Dam	1
60			Kadwala	23.2856 N	76.3709 E	Check dam	1
61			Kadwala	23.2838 N	76.3817 E	Check dam	1
62			Kadwala	23.2933 N	76.3805 E	Check dam	1
63			Kadwala	23.2923 N	76.3817 E	Check dam	1
64			Kadwala	23.2857 N	76.3658 E	Check dam	1
65			Kadwala	23.2900 N	76.3644 E	Check dam	1
			Total				**07**
66			Mitera	23.2737 N	76.3701 E	Stop Dam	1
67			Mitera	23.2727 N	76.3728 E	Stop Dam	1
68			Mitera	23.2734 N	76.3708 E	Check dam	1
			Total				**03**
69			Amalavti	23.2726 N	76.3643 E	Stop Dam	1
70			Amalavti	23.2727 N	76.3644 E	Stop Dam	1
71			Amalavti	23.2729 N	76.3638 E	Check dam	1
72			Amalavti	23.2714 N	76.3602 E	Check dam	1
73			Amalavti	23.2741 N	76.3601 E	Check dam	1
74			Amalavti	23.2739 N	76.3554 E	Check dam	1
75			Amalavti	23.2739 N	76.3614 E	Check dam	1
			Total				**07**
76			Pevchi	23.2754 N	76.3851 E	Stop Dam	1

77			Pevchi	23.2739 N	76.3831 E	Stop Dam	1
78			Pevchi	23.2836 N	76.3852 E	Stop Dam	1
79			Pevchi	23.2837 N	76.3853 E	Stop Dam	1
		Total					**04**
80		Moman Badodiya	Bedarnager	23.2909 N	76.3609 E	Stop Dam	1
81			Bedarnager	23.2912 N	76.3620 E	Check dam	1
82			Bedarnager	23.2815 N	76.3504 E	Check dam	1
83			Bedarnager	23.2905 N	76.3622 E	Check dam	1
			Total				**04**
84			Dhanana	23.2705 N	76.3521 E	Stop Dam	1
85			Dhanana	23.2708 N	76.3534 E	Check dam	1
86			Dhanana	23.2703 N	76.3524 E	Check dam	1
87			Dhanana	23.2716 N	76.3545 E	Check dam	1
		Total					**07**

Annexure-11 Intensive Aforestation in Shajapur

May 2019

S.N.	District/Block/GP	Number of Saplings Planted	Survival Percentage	Area Planted in Hectare
1	Shajapur	15760	75	50.45
2	Shajapur	22000	57	40.35
3	Shajapur/Shujalpur	851	96	1.15
Total		**38611**		

(Source-Agriculture ,Horticulture and Nagar Palika Shujalpur)

(Source-Watershed)

Annexure-12 Existing Recharge Measures

S. N.	Interventions	Name of Department	Name of Activity	1 July to 15 July 2019		16 July to 31 July 2019		01 Aug. to 15 Aug. 2019		16 Aug. to 31 Aug. 2019		01 Sep. to 15 Sep. 2019	
				Target (No.)	Expenditure (in Rs.)	Target (No.)	Expenditure (in Rs.)	Target (No.)	Expenditure (in Rs.)	Target (No.)	Expenditure (in Rs.)	Target (No.)	Expenditure (in Rs.)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Water Conservation Rain Water Harvesting	PHE	Roof Top Rain Water Harvesting Structures Public					1	28500				
		Nagar Palika Shajapur	Roof Top Rain Water Harvesting Structures Public	3	87000	4	106000	3	87000	3	87000	2	58000
			Roof Top Rain Water Harvesting Structures Private	5	50000	7	70000	9	90000	4	40000	10	100000
		Nagar Palika Shujalpur	Roof Top Rain Water Harvesting Structures Public	02	12000	05	30000						
			Roof Top Rain Water Harvesting Structures Private					4	24000	5	30000		
		Nagar Palika Akodiya	Roof Top Rain Water Harvesting Structures Private			2	20000	5	50000	3	30000		
		Nagar Palika Maksi	Roof Top Rain Water Harvesting			1	20000	2	40000	1	15000		

			Structures Public										
			Roof Top Rain Water Harvesting Structures Private			1	10000	2	20000	2	20000		
2	Renovation of Traditional and Water Bodies/Tanks	WRD	Restoration of RRR Dam and canals									11	1209.70 Lakhs
		Nagar Palika Akodiya	Rejuvenation of water Bodies					2	40000				
		Nagar Palika Shajapur	Rejuvenation of water Bodies			02	-						
		Nagar Palika Maksi	Rejuvenation of water Bodies					2					
		Janpad Panchayat Moman Badodiya	Check Dams	7	925000	8	950000						
		Janpad Panchayat Moman Badodiya	Ponds	1	500000	2	350000	2	350000				
		Janpad Panchayat Shujalpur	Check Dams	15	1530000	10	970000						
		Janpad Panchayat Shujalpur	Ponds	1	175000	2	325000	1	150000	1	175000		
		Janpad Panchayat Kalapipal	Ponds	1	450000	2	3000000	1	350000				

3	Watershed Development	IWMP	Other Watershed construction activities	03	796908	01	144000	02	666000				
4	Reuse and Borewell Recharge Structures	Nagar Palika Akodiya	Reuse of Treated Waste Water					02	40000				
		Nagar Palika Shajapur	Community Sokpit			5	45000	10	90000	5	45000		
			Borewell Recharge Public			1	20000	2	40000	2	40000		
		Nagar Palika Maksi	Reuse of Treated Waste Water							3	60000		