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

DHULE DISTRICT
MAHARASHTRA

मध्यक्षेत्र, नागपुर

Central Region, Nagpur

AQUIFER MAPS AND GROUND WATER MANAGEMENTPLAN, DHULE DISTRICT, MAHARASHTRA

(AAP 2020-21) CONTRIBUTORS

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DHULE DISTRICT AT A GLANCE

1. GENERAL INFORMATION			
	Geographical Area	:	7195.00sq Km
	Administrative Divisions (2011)	:	Blocks-04:Dhule, Sakri, Shirpur and Shindkheda
	Villages (Census 2011)	:	683
	Population(Census 2011)	:	20,50,862
	Rainfall 2020		754.7 mm
	Normal rainfall (2001-2020)		608.4 mm
	Long term rainfall Trend (2001-2020)		-2.857 m/year
2. GEOMORPHOLOGY			
	Major Physiographic unit	:	Tapi valley proper and the region of the dykes and residual hills of the Sahayadri Spurs
	Major Drainage	:	Tapi River and its tributaries
3. LAND USE *(sources: mahasdb.maharashtra.gov.in/district Report)*			
	Forest Area	:	2088.90 Sq. Km. (29.29 %)
	Net Area Sown	:	4828.75 Sq. Km. (67.70 %)
	Cultivable Area	:	5546.87 Sq. Km.(77.77 %)
4.	**SOIL TYPE**	:	Deep fertile soils in Alluvial areas and Medium deep coarse soils to shallow stony soils away from Tapi River in Basaltic areas.
5. PRINCIPAL CROPS (2019-20)			
	Oil seeds	:	423.02 Sq. Km.
	Cotton	:	2244.57 Sq. Km.
	Pulses	:	594.43 Sq. Km.
	Cereals	:	2107.81 Sq. Km.
	Sugarcane		27.51 Sq. Km.
6. IRRIGATION BY DIFFERENT SOURCES (2020-21) **-** Nos. / Potential Created (ha)			
	Dugwells	:	17477
	Tubewells/Borewells	:	2649/53
7. GROUND WATER MONITORING WELLS (March 2021)			
	Dugwells	:	39
	Piezometers	:	02
8. GEOLOGY			
	Recent to sub-recent	:	Alluvium
	Late Cretaceous to Eocene	:	Basalt (Deccan Traps)
	Middle - Upper Cretaceous	:	Bagh beds
9. HYDROGEOLOGY			
	Water bearing formation	:	Basalt-Weathered/fractured/ jointed amygdaloidal/massive, under phreatic and semi-confined to confined conditions.

			Alluvium- Sand and Gravel under phreatic and semi-confined to confined conditions
	Depth to water level in Shallow Aquifer		
	Premonsoon Depth to Water Level (May-2020)	:	1.5 to 18.0mbgl
	Postmonsoon Depth to Water Level (Nov.-2020)	:	0.1 to 16.5mbgl
	Depth to water level in Deeper Aquifer		
	Premonsoon Depth to Water Level (May-2020)		15 to 87.5mbgl
	Postmonsoon Depth to Water Level (Nov.-2020)		7.4 to >100mbgl
	Water level Trend (2011-20)		
	Premonsoon Water Level Trend (2011-2020)	:	Rise: 0.003 to 0.7236 m/year
			Fall: -1.5959 to -0.00036 m/year
	Postmonsoon Water Level Trend (2011-2020)	:	Rise: 0.4185 to 1.2959 m/year
			Fall: -0.93928 to -0.0006 m/year
10. GROUND WATER EXPLORATION (As on March, 2021)			
	Wells Drilled	:	45(EW:33, OW:7, PZ:5)
	Depth Range	:	37.90-250.00
	Discharge	:	Meagre to 17.55lps
	Storativity	:	0.000357-0.028
	Transmissivity	:	9.25-131.11 m^2/day
11. GROUND WATER QUALITY			
	Water Quality Data	:	Good and suitable for drinking and irrigation purpose, potability is affected some localized places due to high No3 and F.
12. DYNAMIC GROUND WATER RESOURCES - (2017)			
	Net Annual Ground Water Recharge (MCM)	:	677.7881 MCM
	Annual Ground Water Extraction (Irrigation + Domestic+ Industrial)	:	363.3179 MCM
	Projected Demand for (Domestic use up to 2025)	:	61.2971 MCM
	Stage of Ground Water Development	:	53.24 %
	Category		All blocks are safe
13. MAJOR GROUND WATER PROBLEMS AND ISSUES			
	Moderate droughts have been observed in all the Blocks for 2 to 6 times, and declining rainfall is observed at the rate of 2.8 mm/year. Pre monsoon ground water falling trend greater than 0.2/ year covered 26% of the area mainly in parts of all blocks in isolated patches. In Shallow Aquifer (Aquifer-I), limited ground water potential is observed in 2699 Sq.Km. (about 42% area) with yield less than 15 m3/day. In Deeper Aquifer (Aquifer-II), limited ground water potential is observed		

	in 5515 Sq.Km. (about 85% area) with yield less than 1 lps. The stage of ground water extraction increases from 46.67% in 2004 to 53.24% in 2017. Ground water quality is adversely affected by nitrate contamination and fluoride contamination in some parts of the district.		
14.	**Aquifer Management Plan**		
	Supply side Management		Proposed AR structures: 129 Percolation Tanks 309 Check dams and 33 Recharge shafts. The expected recharge every year from these structures is 27.65 MCM.
	Demand side Management		A total of 27.51sq km area of sugarcane crop is proposed to cover under drip irrigation. 15.68 MCM of ground water can be saved.
	Development plan		Proposed 8771Dugwells and 1462 Borewells in phased manner for 6 years.

AQUIFER MAPS AND GROUND WATER MANAGEMENTPLAN, DHULE, SAKRI, SHINDKHEDA &SHIRPUR BLOCK, DHULE DISTRICT, MAHARASHTRA (AAP 2020-21)

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ANNEXURES

AQUIFER MAPS AND GROUND WATER MANAGEMENTPLAN, DHULE DISTRICT, MAHARASHTRA

1. INTRODUCTION

National Aquifer Mapping (NAQUIM) has been taken up in XII five-yearplansby CGWB to carry out detailed hydrogeological investigation on toposheet scale of 1:50,000. The NAQUIM has been prioritized to study Over-exploited, Critical and Semi-Critical Blocks as well as the other stress areas recommended by the State Govt. Aquifer mapping is a process wherein a combination of geological, geophysical, hydrological and chemical analyses is applied to characterize the quantity, quality and sustainability of ground water in aquifers.

The vagaries of rainfall, inherent heterogeneity & unsustainable nature of basalt aquifers, over exploitation of once copious alluvial aquifers, lack of regulation mechanism has a detrimental effect on ground water scenario of the Country in last decade or so. Thus, prompting the paradigm shift from "traditionalgroundwater developmentconcept" to"moderngroundwater management concept".

Varied and diverse hydrogeological settings demand precise and comprehensive mapping of aquifers down to the optimum possible depth at appropriate scale to arrive at the robust and implementable ground water management plans. The proposed management plans will provide the "Road Map" for ensuring sustainable management and equitable distribution of ground water resources, thereby primarily improving drinking water security and irrigation coverage. Thus, the crux of NAQUIM is not merely mapping, but reaching the goal-that of ground water management through community participation. The aquifer maps and management plans will be shared with the Administration of Dhule district, Maharashtra for its effective implementation.

The activities under NAQUIM are aimed at:

- Identifying the aquifer geometry,
- Aquifer characteristics and their yield potential
- Quality of water occurring at various depths,
- Aquifer wise assessment of ground water resources
- Preparation of aquifer maps and
- Formulate ground water management plan

1.1About the Area

Dhule district, formerly known as west Khandeshis located in northern part of MaharashtraState.Itisboundedbetweennorthlatitude20°38' to21°61'and east longitude 73°50' to 75°11'. The district is bounded by Dhule district in the north- west, Nashik district in south and Jalgaon district in east. The district headquarters is located at Dhule town. For administrative convenience, the district is divided into 4 talukas viz, Dhule, Sakri, Shirpur and Sindkheda. The district has a geographical area of 7195 sq. km. out of which 2089sq.km.is covered by forest, whereas cultivable area is 4752sq.km. and netsown area is 4966 sq. km. Agriculture is the main occupation of the people. The entire district forms a part of the Tapi basin. It has a total population of 2,050,862 as per 2011census. The district has 4 towns and 683 villages. Tapi is the main river flowing through thedistrict.

Since 1980, Central Ground Water Board has taken up several studies in the district.Keepinginviewthecurrentdemandandsupplyandfuturisticrequirementsofwater,

Central Ground Water Board initiated the National Aquifer Mapping Programme (NAQUIM)in country during XII five-year plan, with a priority to study Over-exploited, Critical and Semi-Critical talukas. Hence, Dhule and Sakri talukas of Dhule district have been taken up to carryout detailed hydrogeological studies during the year 2017-18 and Shirpur and Sindkheda talukas of Dhule district have been taken up to carryout detailed hydrogeological studies during the year 2020-21. Dhule district is categorized as safe as per Ground Water Resources Estimation as on March 2017.The Index map of the study area ispresentedin**Figure1.1**.

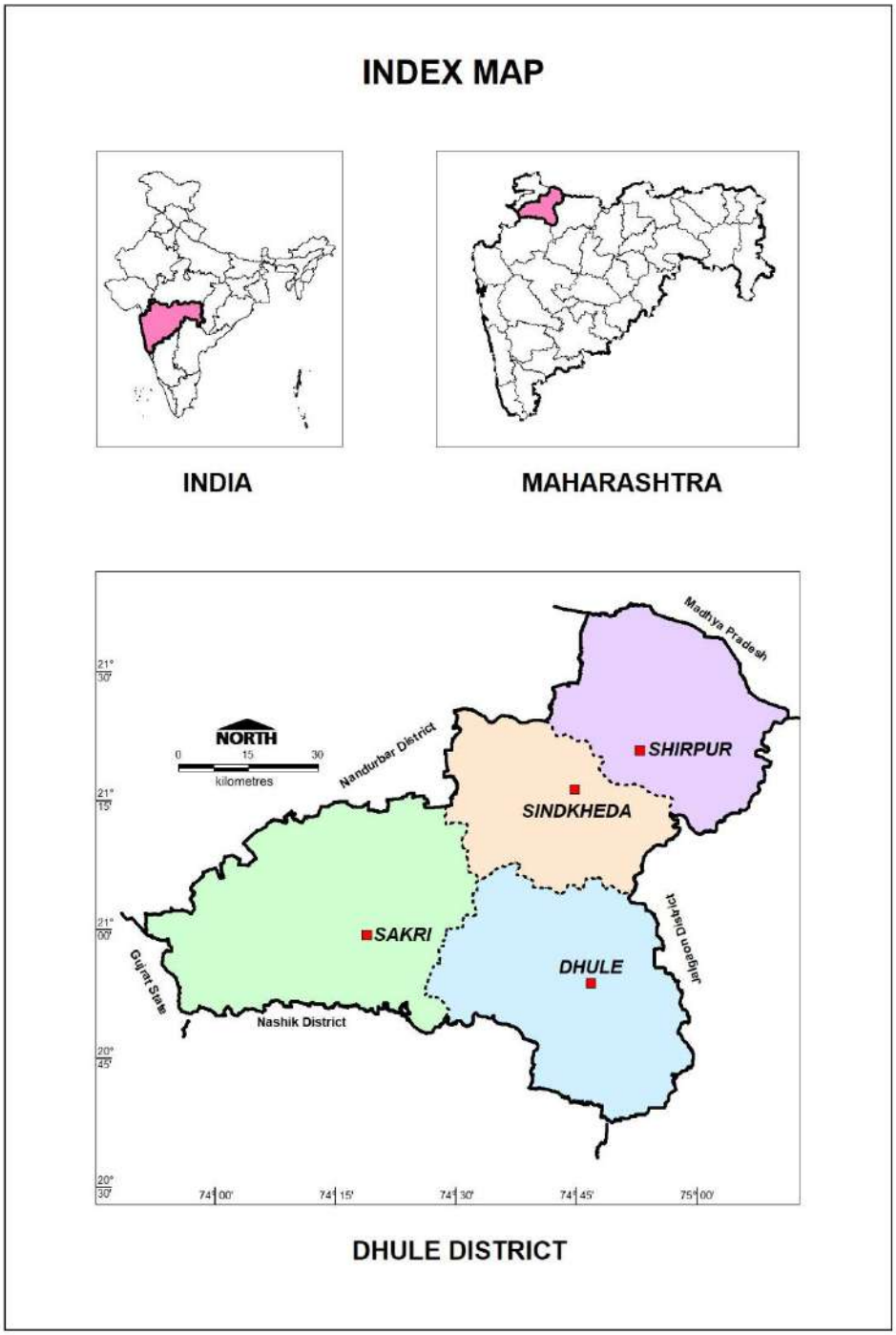


Figure.1.1: Index map, Dhule District

Ground water exploration has been carried out in the district in different phases, since 1957 covering alluvial and Deccan basalt occupied areas of the district to establish theaquifer geometry, disposition and potential of aquifers down to the depth of 200 m bgl. The exploration was taken up during 2017-18 and 2020-21 and total 19 wells were drilled in Tapi basin. Exploratory wells have been constructed where the data gap existed and accordingly 9 borewellswere constructed during 2017-18 and 10 bore wells (EW-7 and OW-3) were constructed during 2020-21 in the study area. The taluka wise salient features of ground waterexplorationaregiveninAnnexure –I.

A total of 39 existing ground water monitoring stations were being monitored 4 times in a year to assess the ground water scenario of the district. In view of Covid-19 pandemic, only 107 GSDA observation wells are being used to decipher the water level scenario, sub-surface lithological disposition and hydrogeological setup of shallow aquifer (Aquifer-I). The details of GWM and PMP wells are given in Annexure-II. Locations of existing ground water monitoring stations and exploratory wells are shown in **Figure.1.2**.

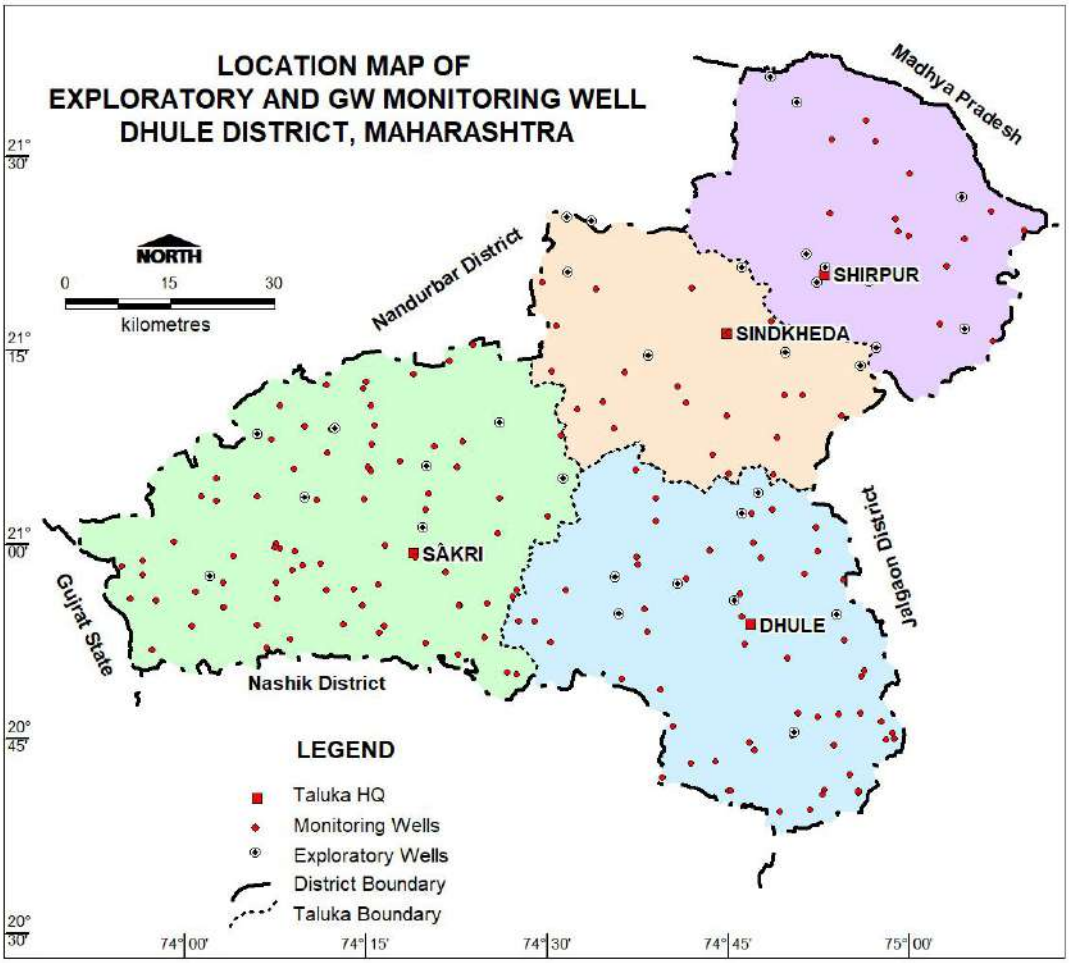


Figure 1.2: Location of Existing Exploratory wells and Ground Water Monitoring Wells

1.2 Geomorphology, Drainage, Land Use and Soil Types

The district can be broadly divided into following regions i) Satpura Region, ii) Tapi valley region iii) the region of the dykes and residual hills of the Sahyadri Spurs with eastward trending streams in between. The region of dykes and residual hills of the Sahyadri Spurs is observed in southern part of Sindkheda and entire Sakri and Dhule talukas. The geomorphological map of Dhule district is shown in **Figure. 1.3**

The district is drained by Tapi River and its tributaries. Tapi River flows west ward through the central part of the district. Panjra, Buriya and Aner rivers are the main tributaries of Tapi, flowing northward and south ward respectively to join Tapi River. The drainage map of Dhule district is shown in **Figure. 1.4**

Land Use (**Figure .1.5**) details have been observed that the major parts of the district are covered by agricultural land with net sown area of 4828.75 Sq.km (67.70%). Forest covers area of 2088.90 Sq.km (29.29 %) and double cropped area covers 966.59 Sq.km (13.55%). The built-up area is reflected wherever settlements have come up.

In the Tapi valley proper, the soils are deep black and extremely fertile except in some portions near the main river and its tributaries, which have cut down the land very badly and removed the top soil. Otherwise the soils grade from the deep fertile soils to coarse shallow to stony soils away from the river either northwards towards the Satpudas or south ward towards the residual hill sand dykes. The thematic map of soil distribution in the district is shown in **Figure. 1.6**

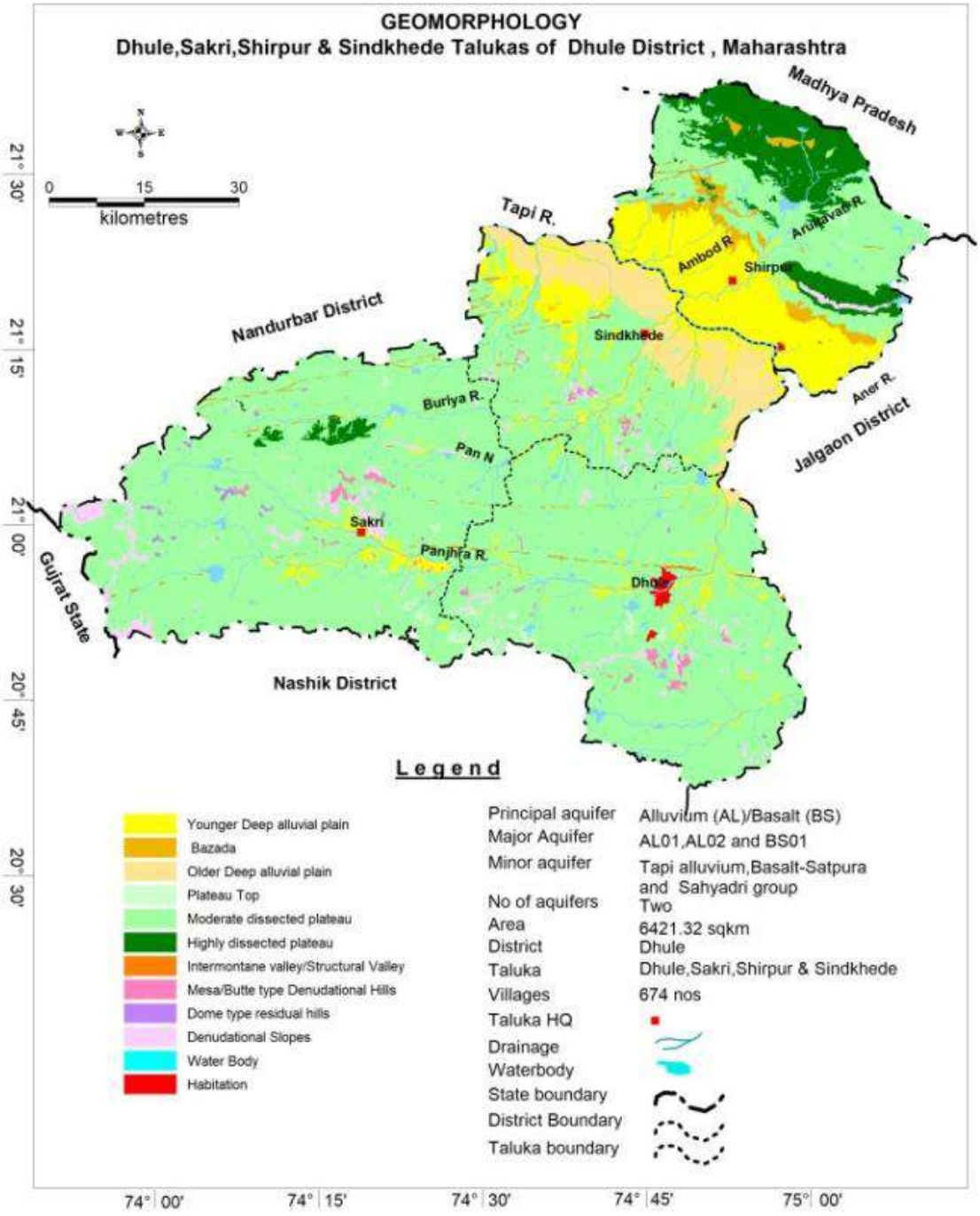


Figure 1.3: Geomorphology of Dhule District

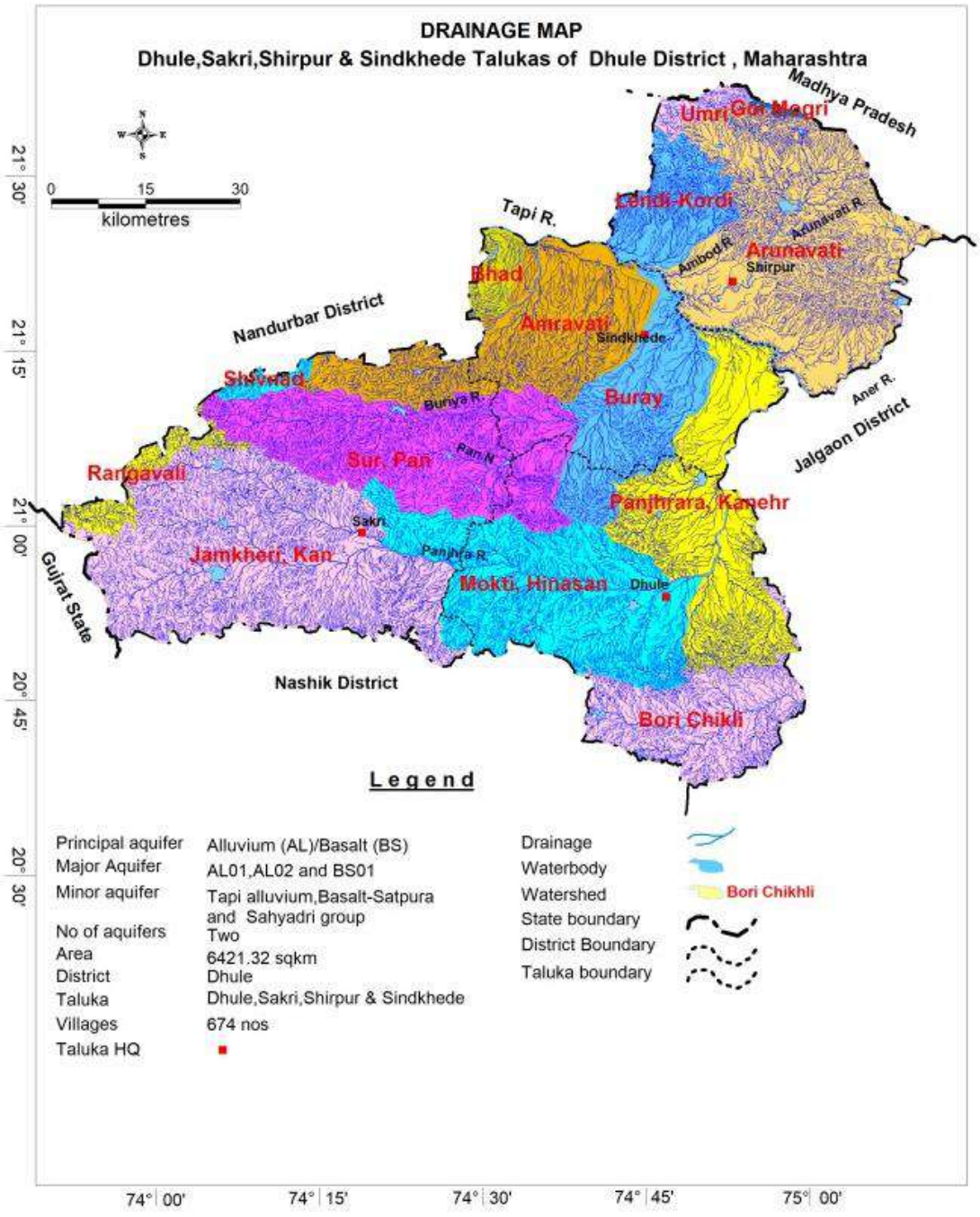


Figure 1.4: Drainage, Dhule District

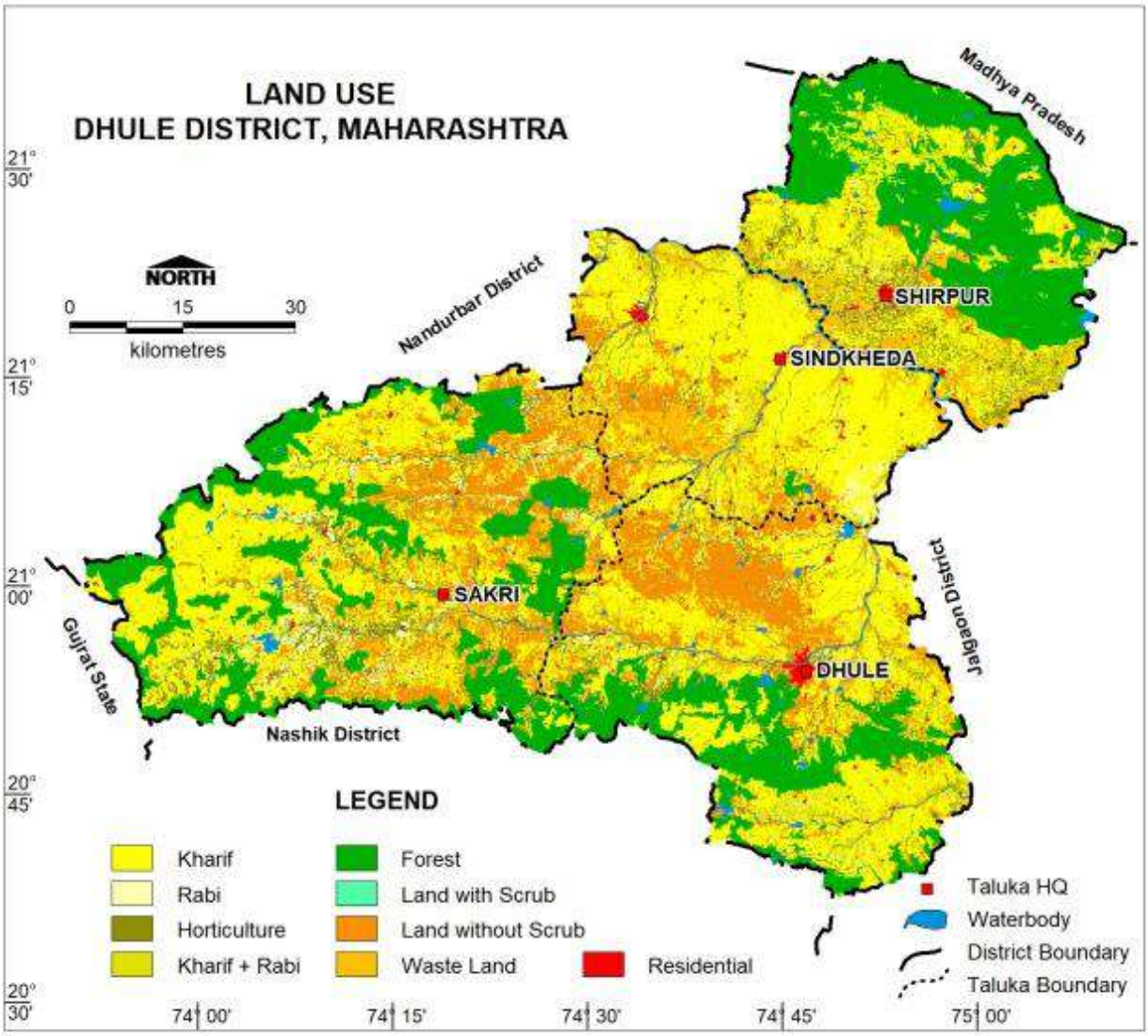


Figure 1.5: Land Use of Dhule District

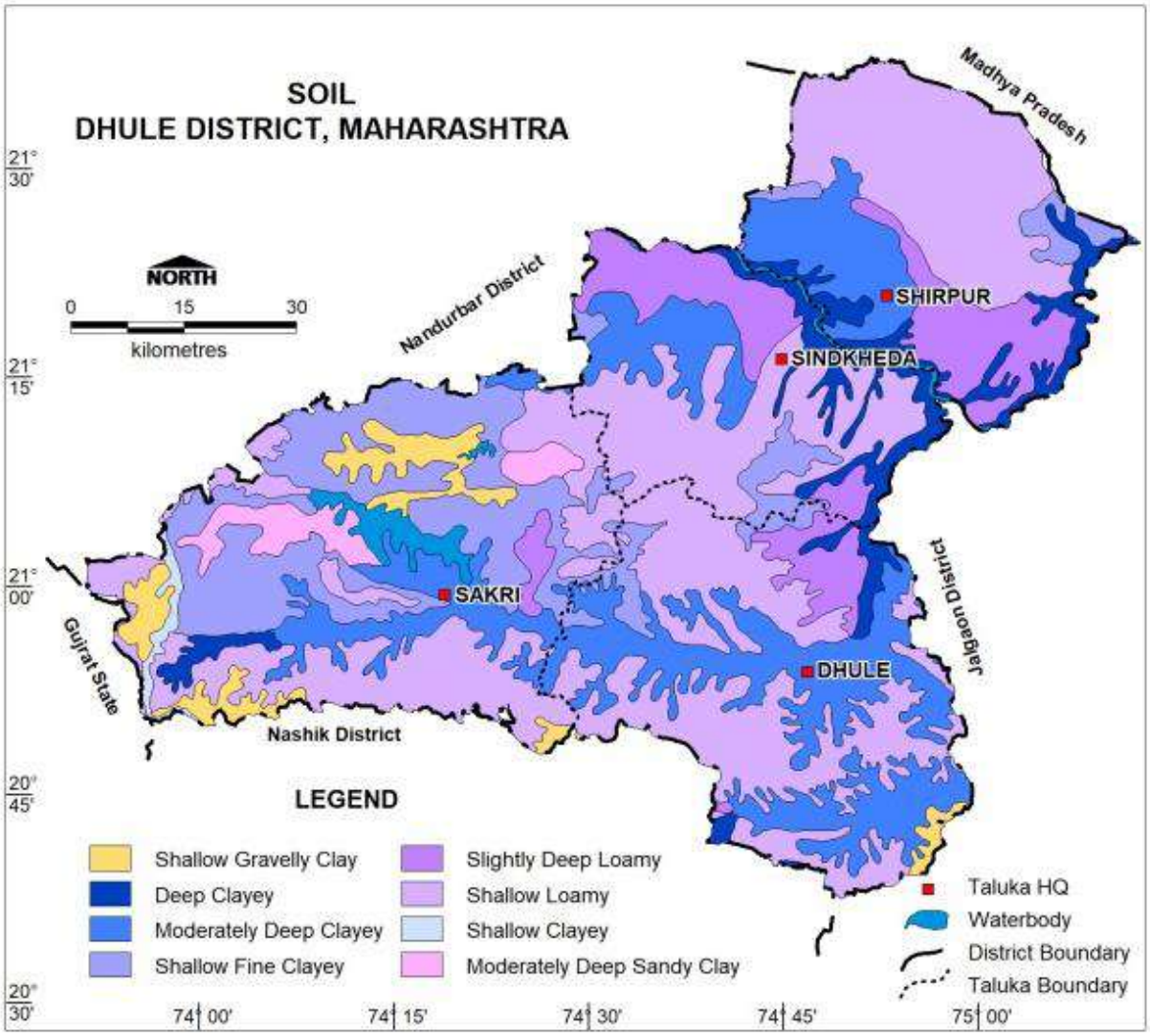


Figure 1.6: Soil, Dhule District

1.3 Climate and Rainfall

The climate of the district is mostly dry except during the south-west monsoon season. The year may be divided into four seasons. The cold season from December to February is followed by the hot season from March to May. The south-west monsoon season which follows thereafter, lasts till September. October and November constitute the post-monsoon season.

The rainfall is heavier in the hilly regions of the Western Ghats mountain range and the Satpura ranges. From about the latter half of February, temperatures increase steadily till May which is the hottest part of the year. The average summer temperature is 44 degrees Celsius while average winter temperature is 20 degrees Celsius.

From November, both day and night temperatures drop rapidly till January which is the coldest month. Except during the south-west monsoon season when the humidity is above 70 per cent, the air is rather dry over the district during the rest of the year.

The Normal rainfall of the district is 608.4 mm spread over 26 to 62 rainy days in normal condition. Long term rainfall analysis (1998-2020) and annual rainfall data of last ten years is given in **Table 1.1** and **1.2** and **Figure. 1.7**. The spatial distribution of the rainfall is given in **Figure. 1.8**.

Table 1.1: Long-term rainfall analysis

District	Period	No of years	Normal Rainfall (mm)	Std. Deviation (mm)	Coefficient of Variation (%)	Rainfall Trend (mm/year)
Dhule	1998-2020	23	608.4	173.05	27.07	-1.526
	No of Years			% of total Years		
Departures						
Positive	10			57		
Negative	13			43		
Drought						
Moderate	3			13		
Severe	0			0		
Acute	0			0		
Normal & Excess RF						
Normal	13			56.52		
Excess	7			30.43		

Table 1.2:Annual rainfall data (2011-2020) (in mm)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average
Dhule	550.6	407.6	789.4	606.8	553.2	485.8	578.6	404.6	867	754.7	599.83

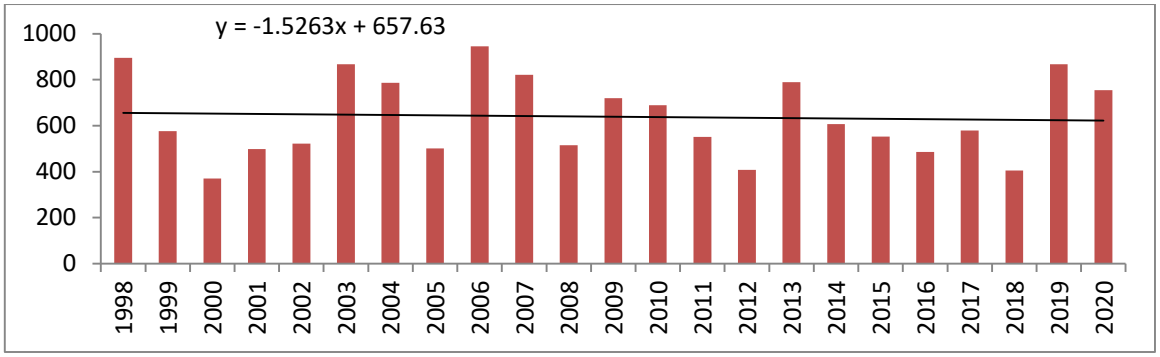


Figure 1.7: Rainfall Analysis (1998-2020), DhuleDistrict

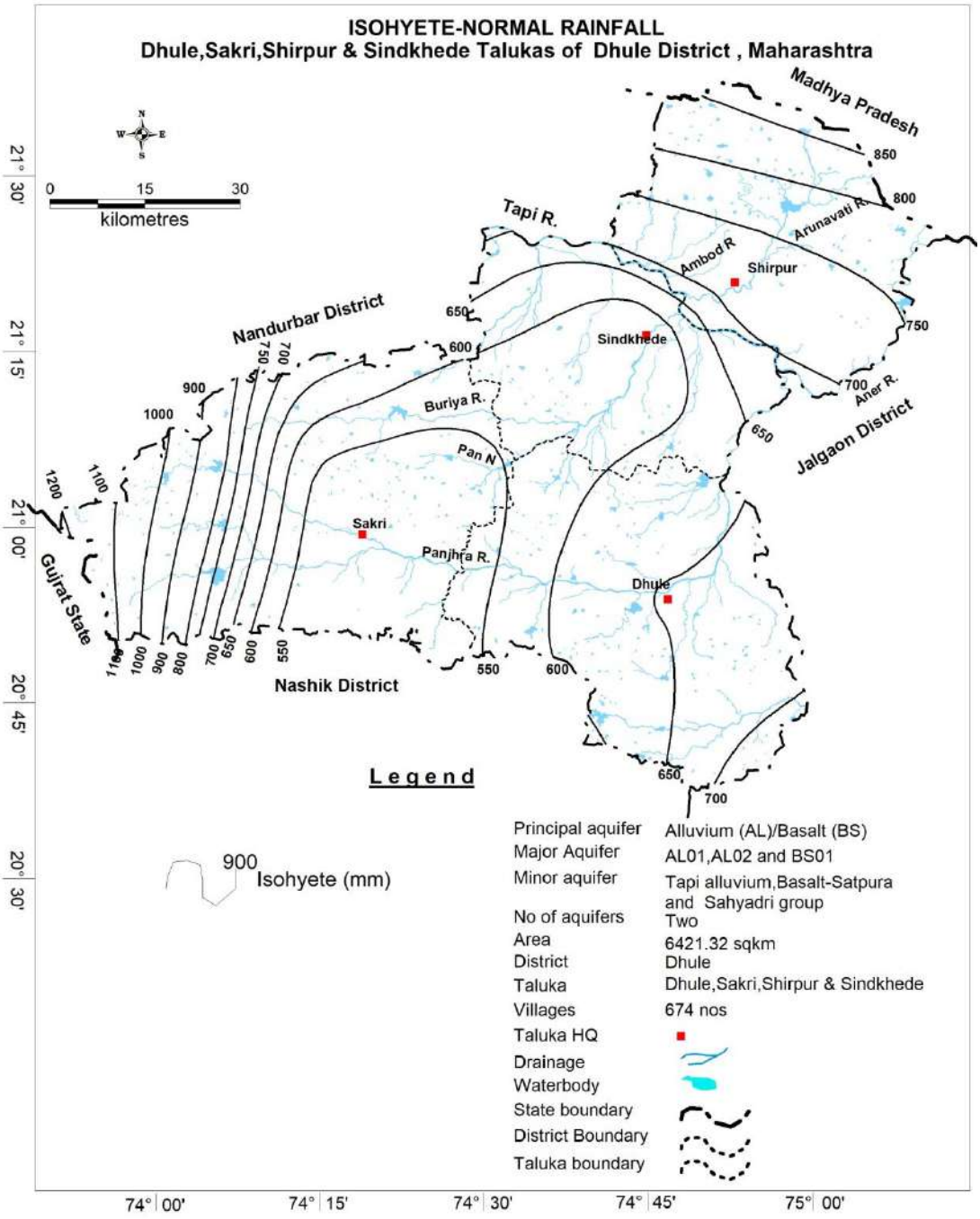


Figure 1.8: Isohyet map of Dhule District

1.4 Geology

The major part of the district is occupied by Basaltic flows commonly known as Deccan Traps intruded by dykes of Upper Cretaceous-Lower Eocene age. Tapi Alluvial deposits are observed in Tapi River valley occupying parts of Sindkheda and Shirpur talukas. A small patch of Bagh Beds is exposed in north western portion of the district. The geological map of the district is presented in **Figure 1.9** and the sequence is presented in**Table1.3**.

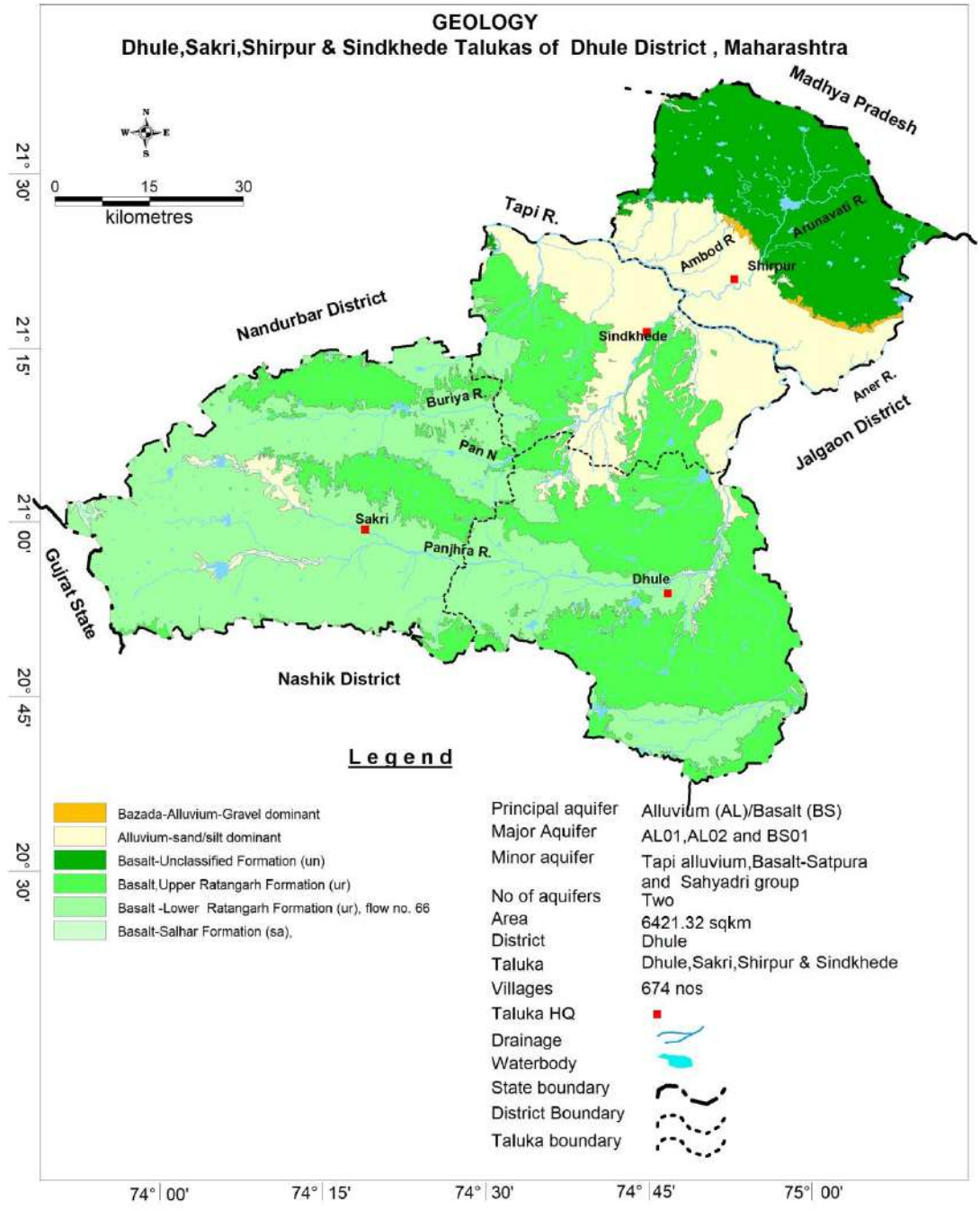


Fig. 1.9: Geology

1.4.1 Bagh Beds

They are met within the north western part of the district. The sandstones are fine to medium grained, pink in colour and hard compact in nature. They are overlain by Grey limestones. Between the overlying traps and the Bagh Beds there is a slight but distinct unconformity.

1.4.2 DeccanTrapBasalt

TheDeccanTrapincludesseveralflowsofBasaltwhicharesupposedtohaveextruded from fissure volcanoes. The flows have been grouped under the Massive Zeolitic, Vesicular and amygdaloidal types. The vesicular basalt occurs at the upper parts of the flowand the vesicles are generally round or ellipsoidal in shape. The Deccan trap

in the district consists of a number of flows ranging in thickness between 15 and 50m.The different Lava flows are separated by Redbole or intertrappean beds. The flows have been intruded by large number of dykes of doleritic composition. The dykes are aligned in an ENE-WSW direction and a few gave N-S or WNE-ESE trends. Basalt includes the "pahoehoe" and the "aa" types of flows, the former being very common.

1.4.3 Soft Rock Areas-Alluvium

Alluvial deposits of Tapi River valley occurs in long narrow basin, which are probably caused by faulting. About a 15% of the district is occupied by Alluvium. The alluvial tract is about 6.4 km idea round To rkhed and shirpur and about 12.8km wide around Taloda north of the Tapi River. The alluvium ranges in thickness from paper-edge near its contact with the Trap to about 48.7 m in the eastern part of the basin. It consists of clays, silt, sand ,gravels and boulders etc. The beds of sand and gravels are discontinuous and lenticular and pinch out laterally within short distance. They are mixed with large proportions of clayeymaterialrenderingdelimitingofindividualsgranularhorizonsdifficult.

Table1.3:Generalized Geological sequence DhuleDistrict

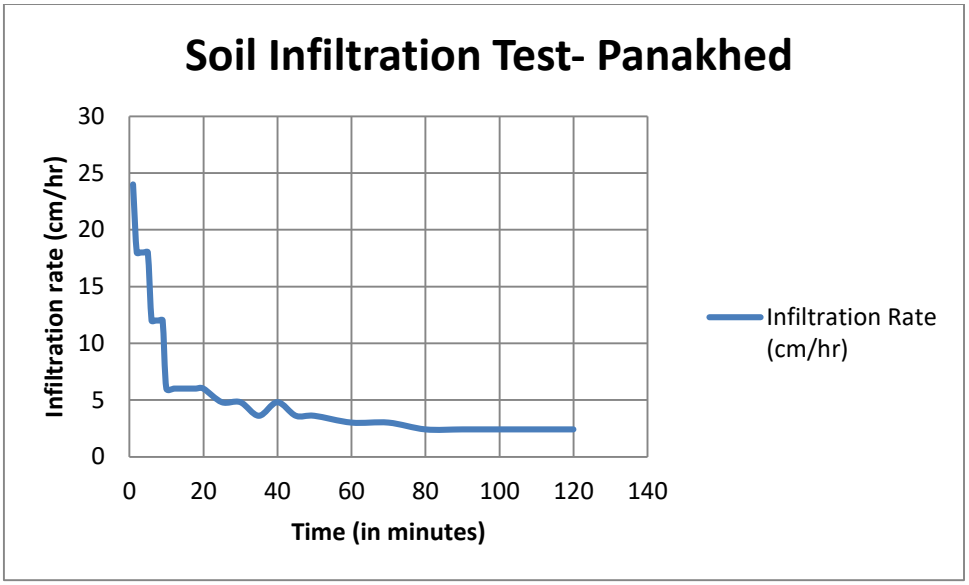
Age	Formation	Lithology
Recent	Alluvium	Clay, Silt, Sand, Gravel, Kanker etc.
Eocene to upper Cretaceous	Deccantraps	Basalth and,massive, vesicular, amygdaloidal varieties with intertrappean.
Unconformity		
Upper Cretaceous	Bagh Beds	Sandstones, Shales and Limestones

1.5 Soil Infiltration Tests

To estimate the actual rate of infiltration of various soil cover and their impact on recharge to ground water, 2 infiltration tests have been conducted at Panakhed and Bhadne in various soil types. The data has been analysed and the salient features of the infiltration tests are presented in **Table 1.4**, whereas the data is presented in **Annexure-V** and the plots of soil infiltration tests are presented in **Fig. 1.10**.The duration of the test ranges from 120 to 160 minutes, the depth of water infiltrated varied from 8.3 cm to 8.6 cm and the final infiltration rate in the area are 1.80 cm/hr at Bhadne and 2.4 cm/hr at Panakhed.

Table 1.4: Salient Features of Infiltration Tests

Sr. No.	Village	Date of Test	Duration (min)	Initial Water Level depth (cm agl)	Final Infiltrated water depth (cm)	Final Infiltration rate (cm/hr)
1	Panakhed	02.02.2021	120	21.4	8.6	2.4
2	Bhadne	02.02.2021	160	20.8	8.3	1.8



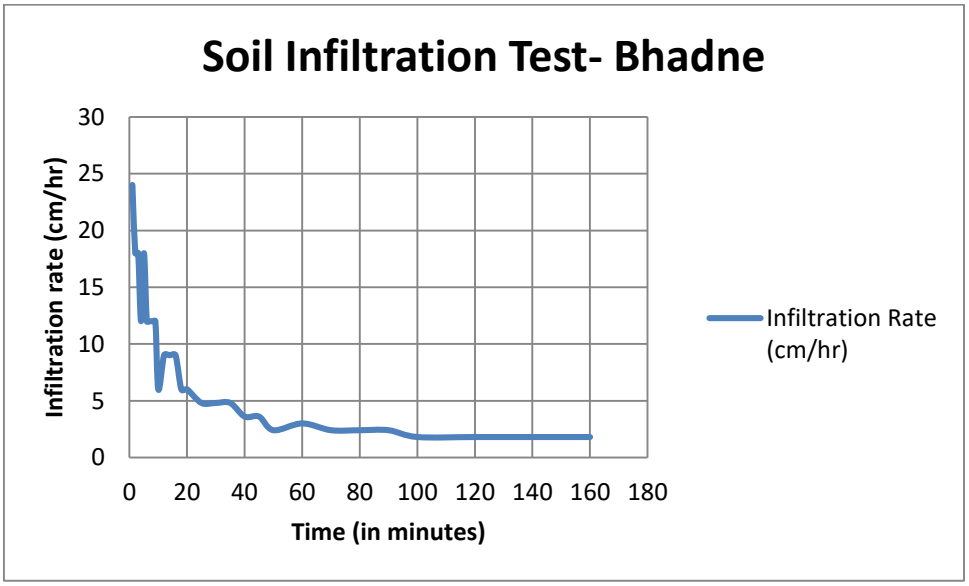


Figure 1.10: Soil Infiltration Tests of Dhule District

2. HYDROGEOLOGY

2.1 Major Aquifer Systems

There are 2 types of aquifer systems in the area namely Alluvium and Basalt.

Alluvium

Alluvial deposits are restricted along Tapi River valley which occurs in long narrow basin, probably caused by faulting. About 15% of the area of the district is occupied by Alluvium. It consists of clays, silt, sand, gravels and boulders etc. The beds of sand and gravels are discontinuous andlenticularandpinchoutlaterallywithinshortdistance.Theyaremixedwithlargeproportions of clayey material rendering delimiting of individuals granular horizons difficult.AspergroundwaterexplorationdataAlluviumisencounteredddownto77.60mdepth.Ground water occurs under water table, semi-confined and confined conditions in intergranular pore spaces of gravel and sand. The yield of the dugwells varies between 25 to 100 m^3/day and thato f exploratory wells varies from 1.50to6.00lps as per exploration data. The yields of the tubewells drilled by State ground water department/agency ranges from 20 to 250m^3/hr.

Basalt

The Deccan Trap includes several flows of Basalt which are supposed to have extruded from fissure volcanoes. The flows have been intruded by large number of dykes of doleritic composition. The dykes arealignedinanENE-WSW direction and a few gave N-S or WNE-ESE trends. Basalt includes the "pahoehoe" and the "aa" types of flows, the former being very common. The ground water occurs in the near surface strata down to the depth of 35 m under unconfined conditions inthe weathered zone, vesicular/amygdaloidal Basalt, jointed and fractured massive Basalt.The water bearing strata occurring below 35 m depth, beneath the red bole and dense massive Basalt exhibit semi-confined to confined conditions. On the elevated plateau top shaving large areal extent, local water table develops in top most layers and the wells in such areas show rapid decline water levels in post-monsoon season and go dry during peak summer.

In the foot hills zone the water table is relatively shallow near the water courses and deep away from it and near the water divides. In the valleys and plains of river basin the water table aquifer occurs at shallow depth and the wells in such areas do not go dry and sustain perennial yield except in extreme summer or drought conditions. The yield of the dugwells varies up to 100 m^3/day, whereas those of borewells vary from 2 to > 20m^3/hr, however in most of the borewells it ranges between22to10m^3/ hr. Hydrogeology of the district is depicted in **Figure 2.1**.

Broadly speaking, two distinct aquifer systems are available in the Basalts in areas underlain by Deccan Traps ,Dhule district being one such area.

- Shallow water table or phreatic aquifer down to 35 m depth in weathered/ fractured basalt.
- Confined aquifers, which are noticed at still deeper levels in flows not exposed and available from about 30 m to about 198.50mbgl.

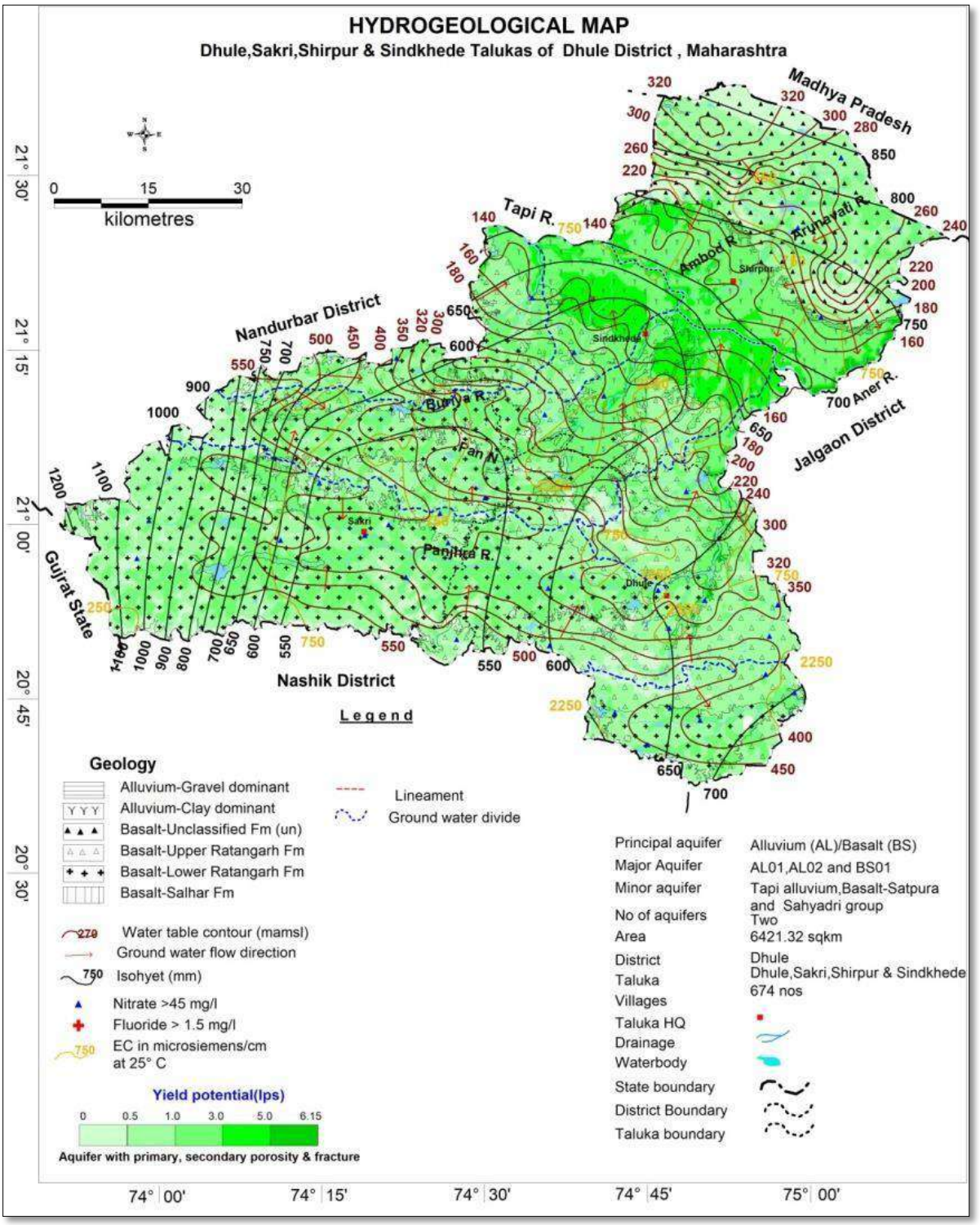


Figure 2.1: Hydrogeology

Water Table Elevation in Dhule district ranges between 550 m amsl and 140 m amsl. The entire district is mainly drained by Tapi River and its tributaries namely Panjhara, Bhuriya and Arunavati Rivers. The drainage pattern is mainly dendritic, sub dendritic to sub parallel. The general slope is towards central part (Tapi river) from north and south. The overall ground water movement in the area is towards Tapi river both from Southern and Northern parts.In the Northern part of the district, Arunavati river has GW movement from SE to SW and towards south with elevation from 320 m to 140 m amsl

while Panjhara river in southern part of the district has GW movement towards north direction with elevation from 550 m to 220 m amsl. Buriya river has GW movement from E, NE to north with elevation from 550 m to 140 m amsl. It has been observed that the ground water flow direction follows the drainage and topography ofthe area.

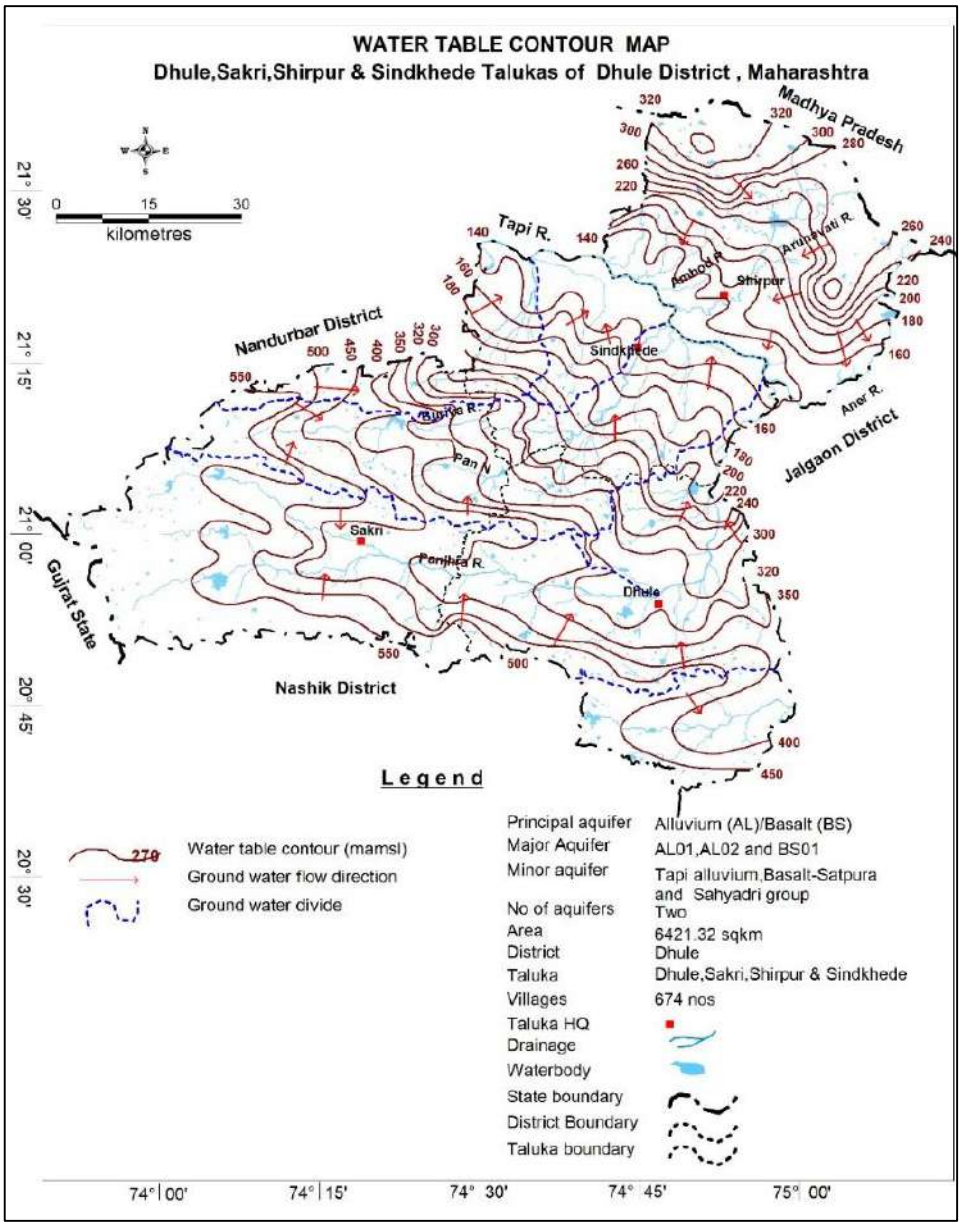


Figure 2.2: Water Table contour

Table 2.1: Aquifer Characteristic of Dhule district

Major Aquifers	Basalt (Deccan Traps)		Alluvium
Type of Aquifer	Aquifer-I	Aquifer-II	Aquifer-I (AL02)
Formation	Weathered/Fractured Basalt	Jointed / Fractured Basalt	Alluvium
Depth of Occurrence (mbgl)	5 to 35	30 to 198.50	10 to 77.60
SWL (mbgl)	2.4 to 21	7.4 to 87.5	5.0 to 31.0
Granular/Weathered /Fractured rocks thickness (m)	5 to 20	0 to 12	8 to 30
Fractures/granular zone encountered (mbgl)	Up to 35	Upto 198.50	Upto 77.60
Yield	Up to 100 m^3/day	Up to 5.0lps	25-100m^3/day
Sustainability	1 to 4hrs	0.5 to 3 hrs	2 to 5hrs
Transmissivity (m^2/day)	9.25 - 89.04	10.85- 131.11	70- 170
Specific Yield/ Storativity (Sy/S)	0.019 to 0.028	$1.20x10^{-4}$ to $3.57x10^{-4}$	0.06 to 1
Suitability for drinking/ irrigation	Suitable for both (except NO3, F affected villages)	Suitable for both, (except high EC, NO3, F affected villages)	Suitable for both (except NO3, F affected villages)

There are two major aquifers such as Deccan Trap Basalt and Alluvium. Weathered/Fractured Basalt and Jointed / Fractured Basalt are the water bearing formations in Deccan Trap Basalt of Dhule District. Yield of Aquifer –I is up to 100 m^3/day, Aquifer-II is up to 3.0lps and Aquifer-I Alluvium having yield of 25-100m^3/day.

Depth of occurrence and fractured/granular rock thickness of Aquifer-I and Aquifer-II is shown in **Figure 2.3 and 2.4** respectively. Depth of occurrence of Aquifer –I Basalt (Weathered /Fractured Basalt) is 5 to 35 m and Aquifer –I Alluvium is 10 to 77.60 m while depth of occurrence of Aquifer-II Basalt (Jointed & Fractured Basalt) is 30 to 198.50 m.

Yield Potential of Aquifer-I (Basalt & Alluvium) and Aquifer-II (Basalt) is shown in **Figure 2.5 and2.6**. Aquifer –I Alluvium having yield potential of 25 to 100 m^3/day while yield potential of Aquifer-I Basalt is up to 100 m^3/day. Yield Potential of Aquifer-II Basalt is up to 5.0 lps.

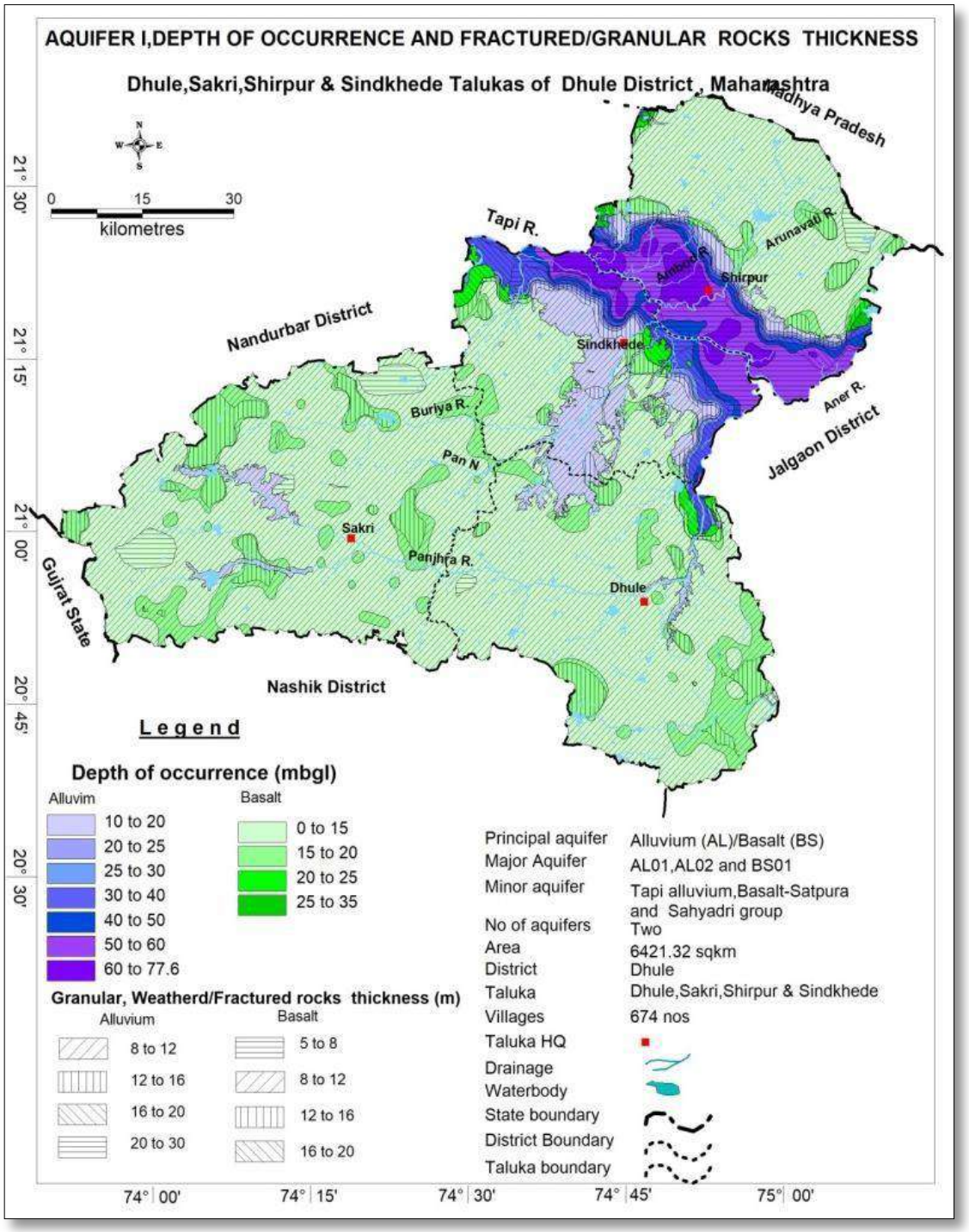


Figure 2.3: Depth of occurrence and fractured/granular rock thickness of Aquifer-I

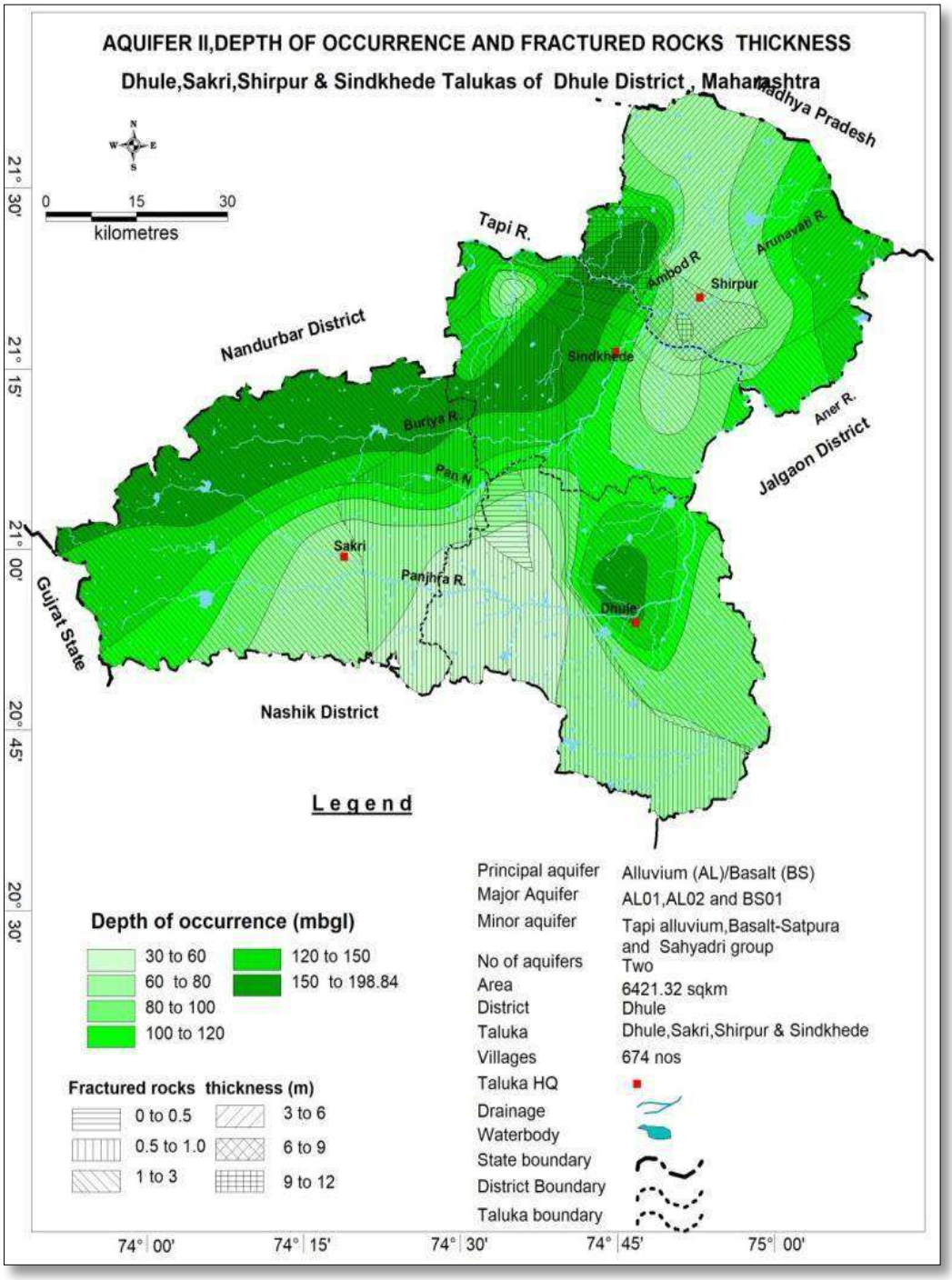


Figure 2.4: Depth of occurrence and fractured/granular rock thickness of Aquifer-II

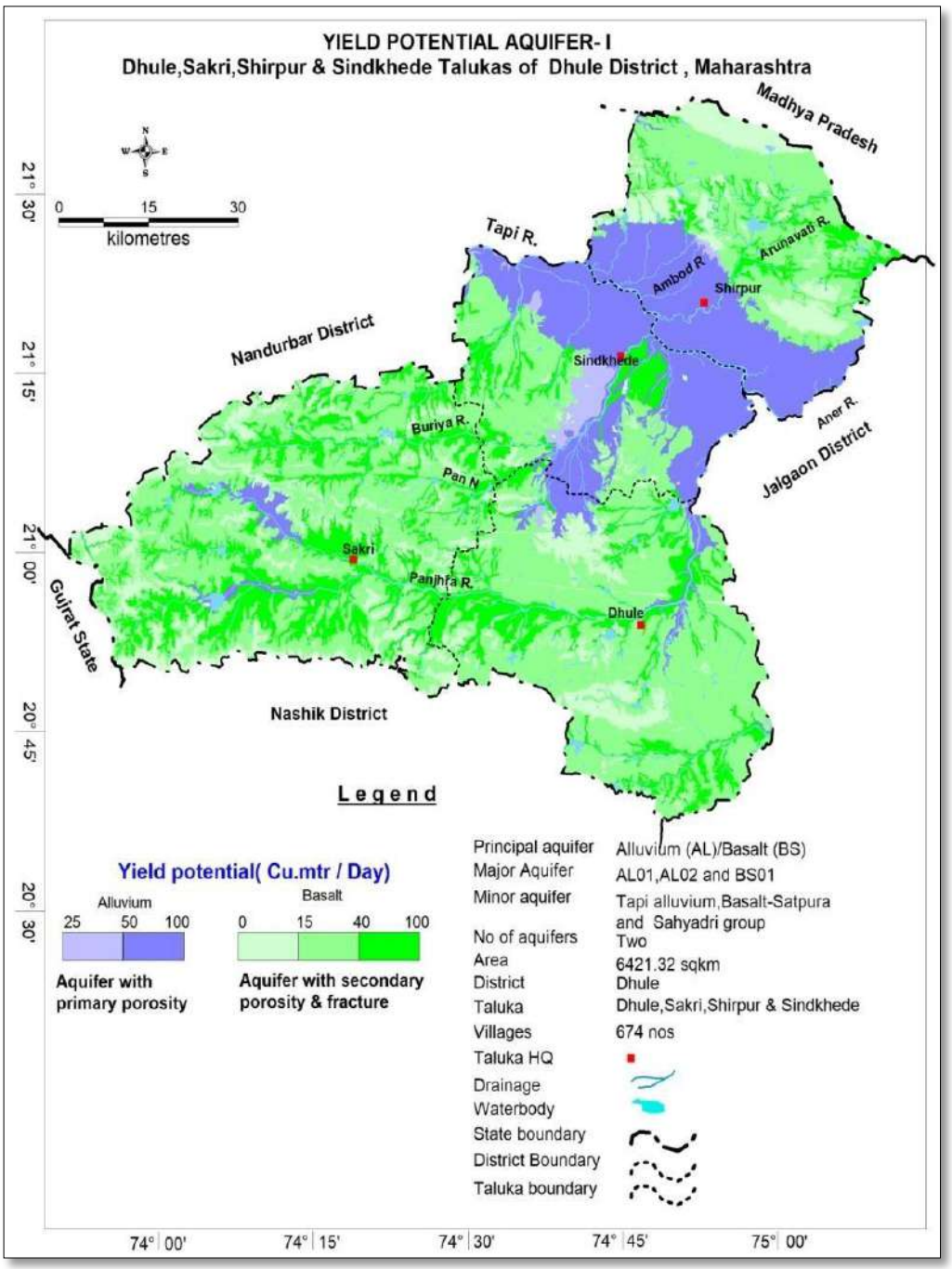


Figure 2.5: Aquifer-I Yield Potential (Basalt & Alluvium)

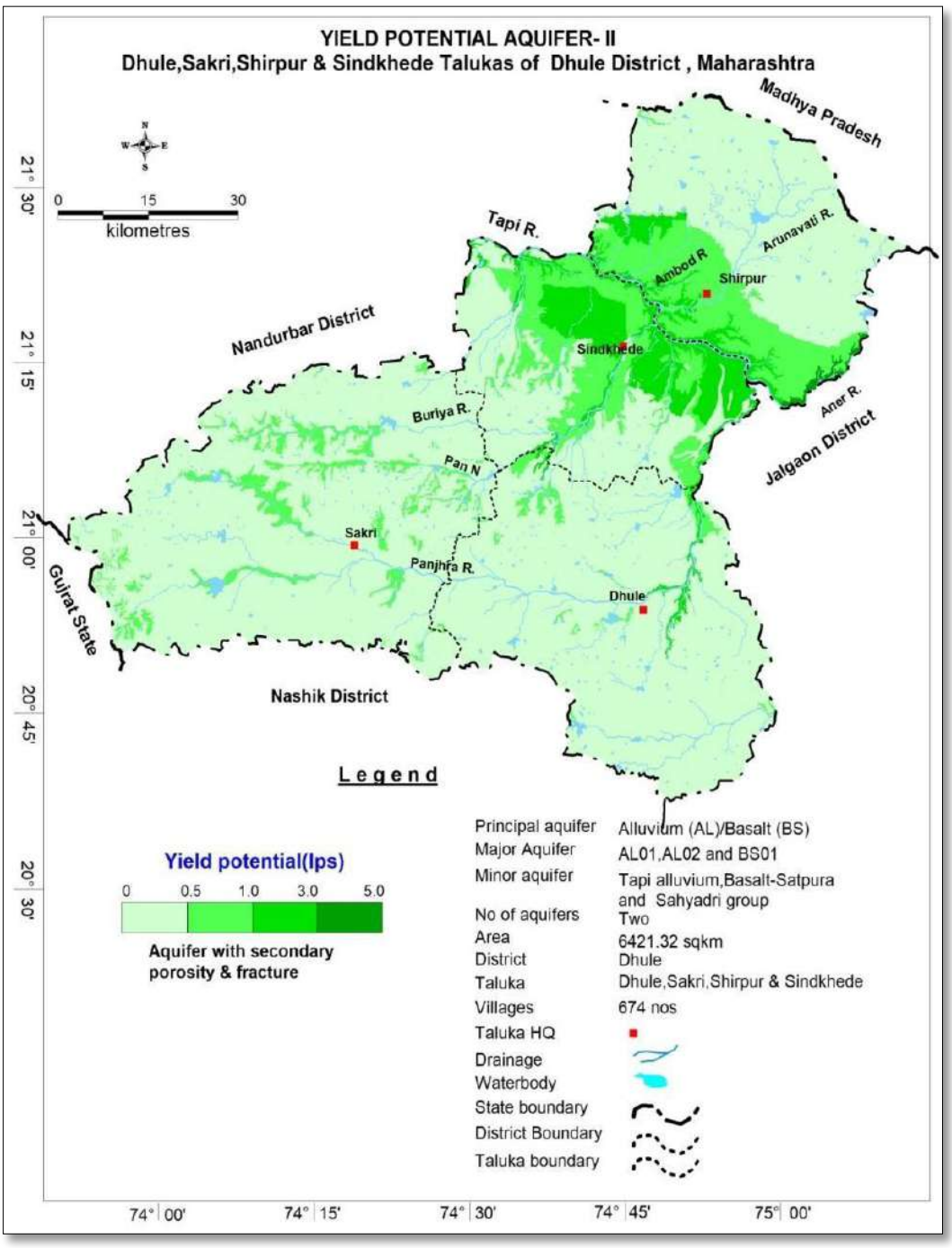


Figure 2.6: Aquifer-II Yield Potential (Basalt)

2.2 **Aquifer Parameters**

Aquifer parameters are available from ground water exploration carried out in the basaltic area of the district as well as from the pumping tests carried out on dugwells in Basaltic and Alluvial terrain. In Basalt transmissivity ranges from 6 to96 m^2/day, the storativity varies between 0.017 to 0.0429 and the specific capacity ranges from 41 to 220 lpm/m of drawdown, whereas in Alluvium transmissivity is about 70 m^2/day and the specific capacity ranges from 173 to 616 lpm/m of drawdown.

2.3 3-D and 2-D Aquifer Disposition

Based on the existing data, 3D aquifer disposition, Fence diagram and hydrogeological sections along different directions have been prepared and shown in **Figure 2.7, 2.8 and 2.9 (a to d)** to understand the subsurface disposition of aquifer system.

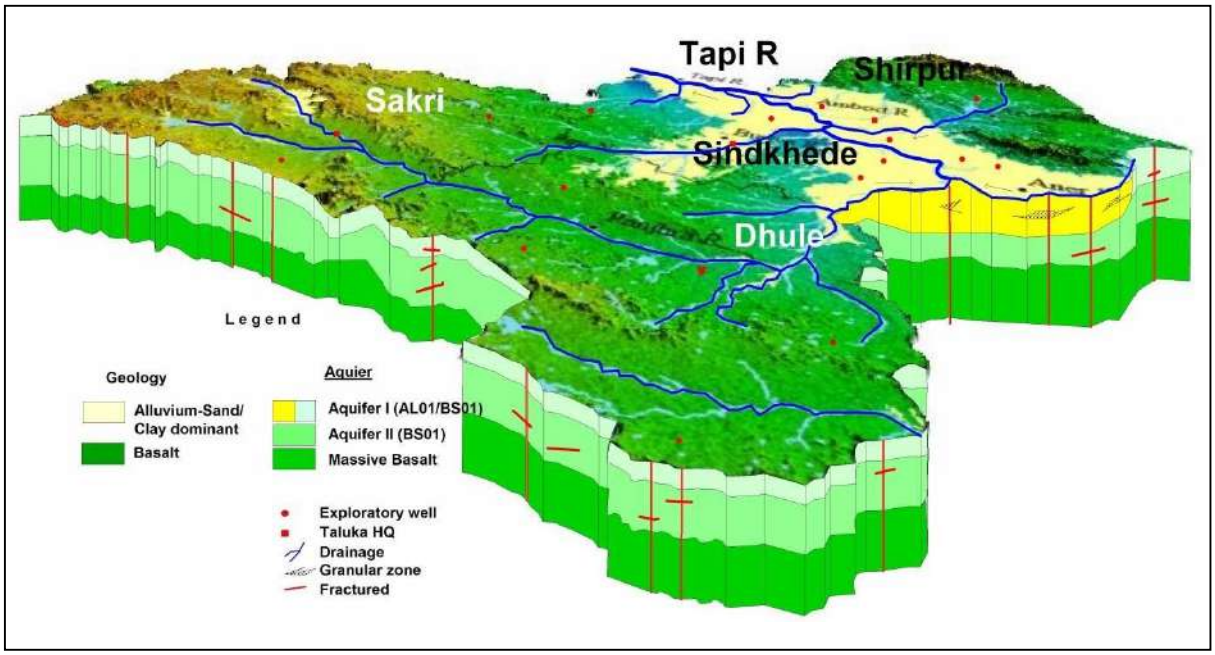


Figure 2.7-3D Aquifer Disposition

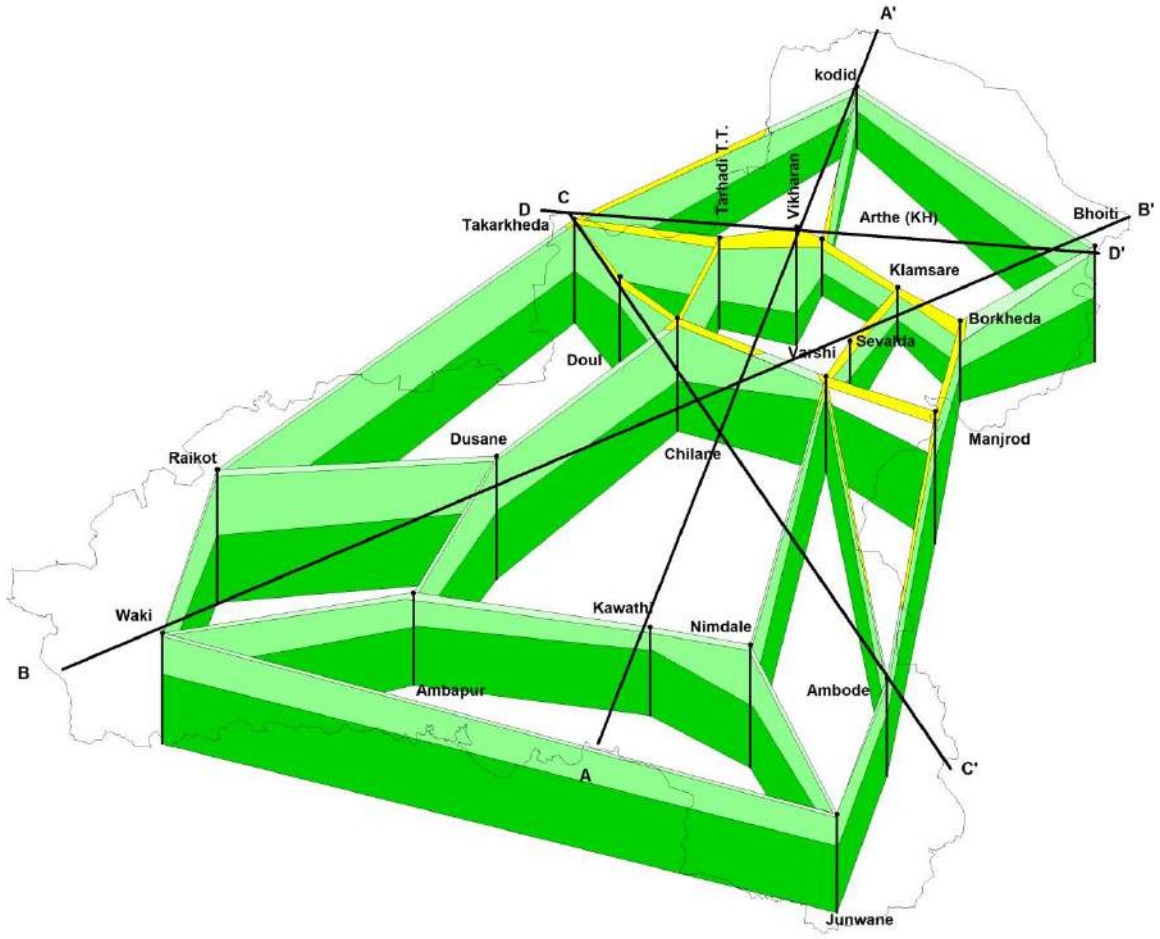


Figure2.8: Fence Diagram

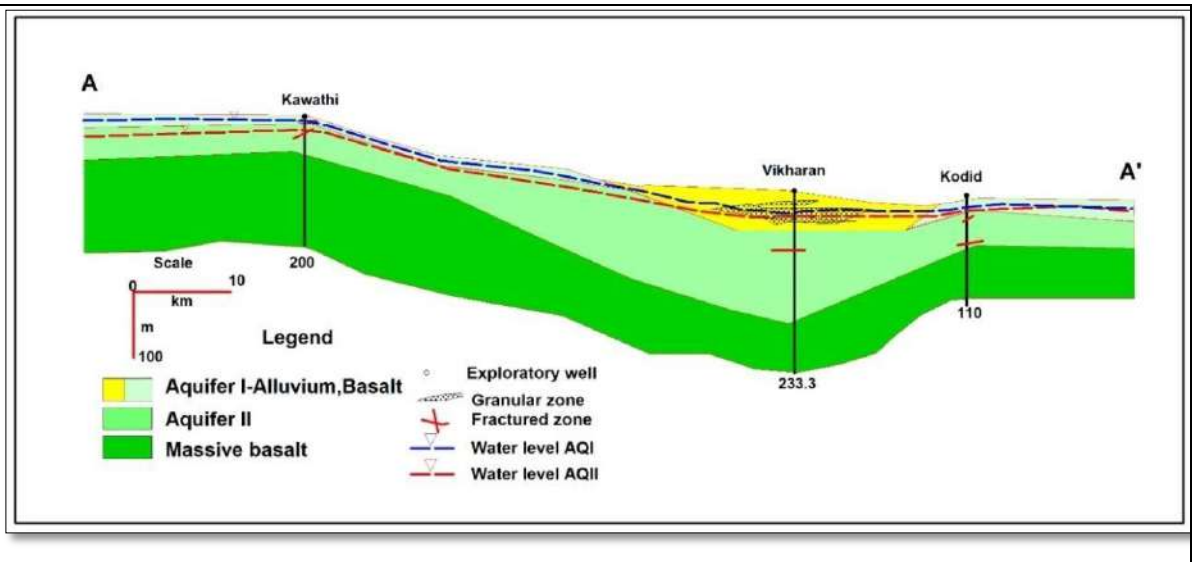


Figure2.9 (a): Lithological section

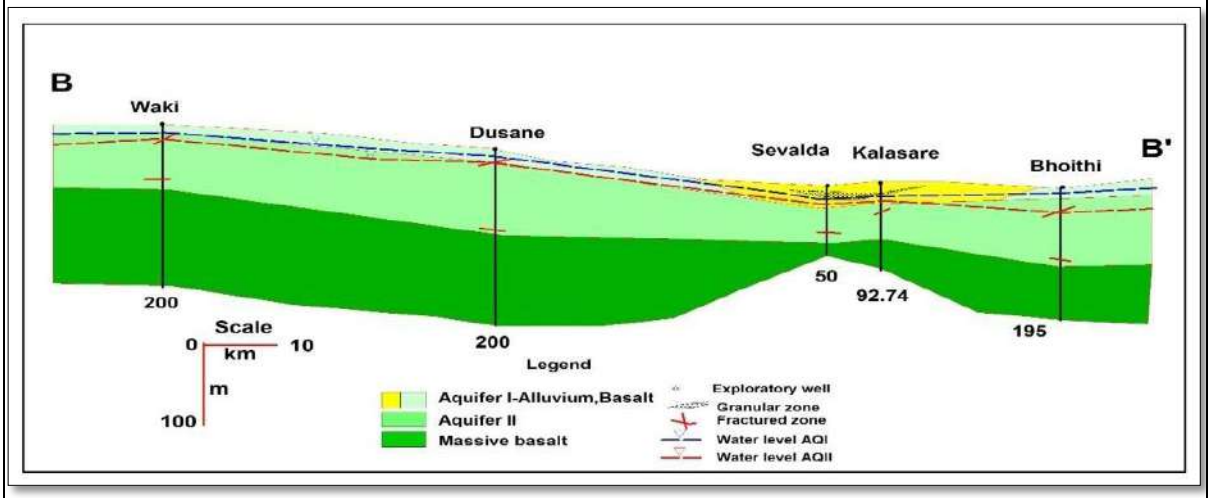


Figure2.9 (b): Lithological section

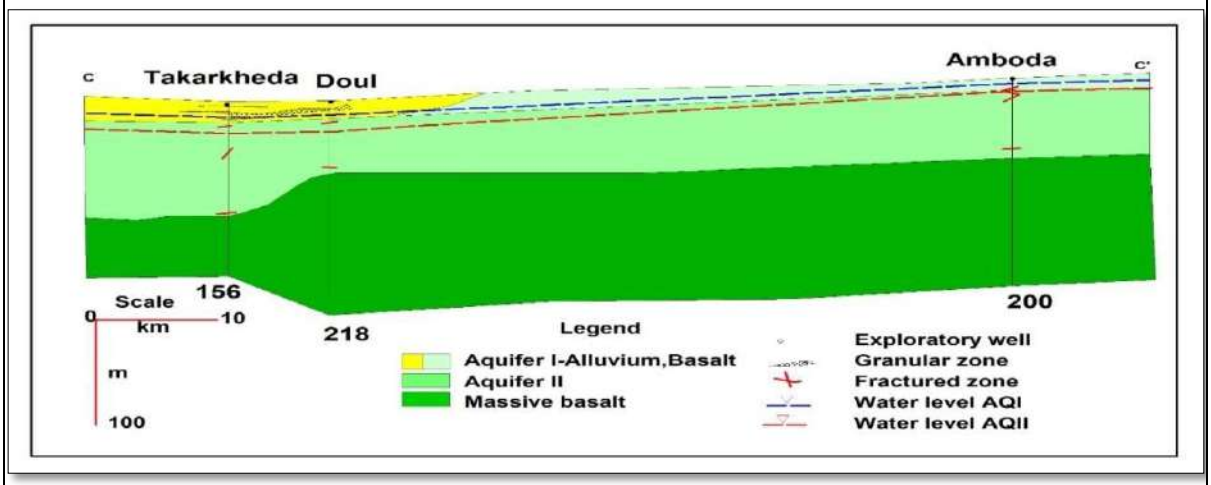


Figure2.9(c): Lithological section

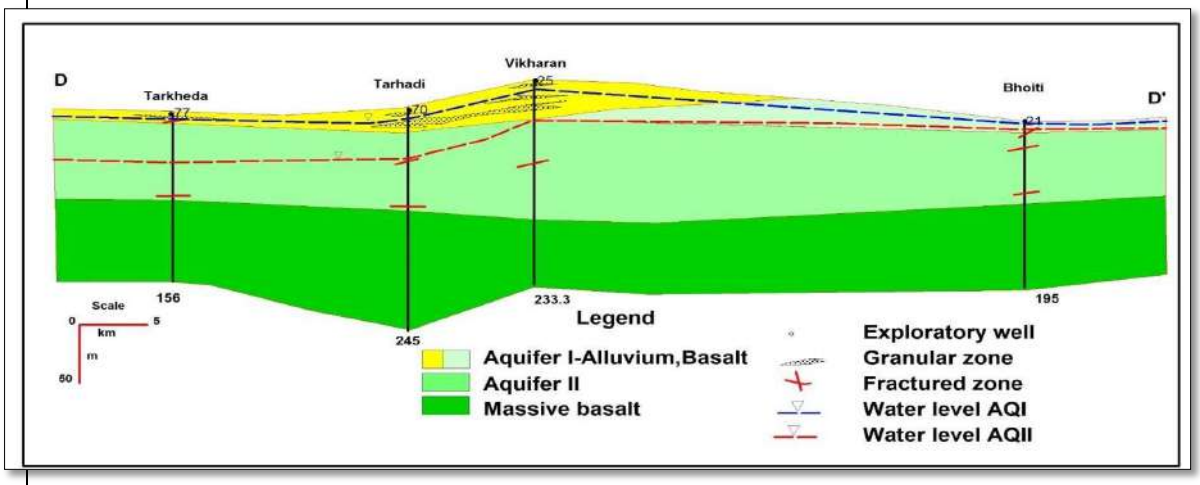


Figure2.9 (d): Lithological section

3. WATER LEVEL SCENARIO

3.1 Depth to Water level (Aquifer-I/Shallow Aquifer)

Central Ground Water Board periodically monitors 39(GWMW-39)Ground Water monitoring wells in the Dhule district, four times a year i.e. in January, May (Pre monsoon), August and November (Post monsoon).In view of Covid-19 pandemic, only 107 number of GSDA observation wells are being used to decipher the water level scenario for NAQUIM studies in Dhule district during the year 2020.Under NAQUIM studies of Dhule district, these data have been used for preparation of depth to water level maps of the district. Pre-monsoon and post monsoon water levels along with fluctuation during 2020 and long-term water level trends (2011-2020) are given in Annexure-VI.

3.1.1 Pre-monsoon DTW (May-2020)

The depth to water levels in Dhule district during May 2020 ranges between 1.5 (Borkund, Dhule block) and 18.00mbgl (Takarkhede, Shindkheda block).The depth to water levels less than 5 mbgl and more than 10 mbgl are observed in isolated patches in all blocks of Dhule district.The depth to Water level between 5-10 mbgl covers almost the entire area of the district. Water level range between 2-5 m bgl is observed in isolated patches of all blocks. Water level ranges between 0-2 m bgl is observed in small patches of Dhule and Sakri blocks of the Dhule district. The premonsoon depth to water level map is depicted in **Figure. 3.1.**

3.1.2 Post-monsoon DTW (November-2020)

The depth to water levels in Dhule district during November 2020 ranges between 0.10 (Basaraval, Chail, Sakri block, Karle, Shevade, Shindkheda block, Gadhaddev, Shirpur block) and 16.50mbgl (Takarkhede, Shindkheda block). The depth to water levels less than 5 mbglare observed in major parts of the district. The depth to Water level between 5-10 mbgl observed in isolated patches of Dhule, Sakri and Shirpur blocks and major parts of Shindkheda block of the district.Water level range between 2-5 m bgland more than 10 mbgl is observed in isolated patches of all blocks.Water level ranges between 0-2 m bgl is observed in southern, western part of the Dhule district and north eastern part of the district. The post monsoon depth to water level map is depicted in **Figure. 3.2.**

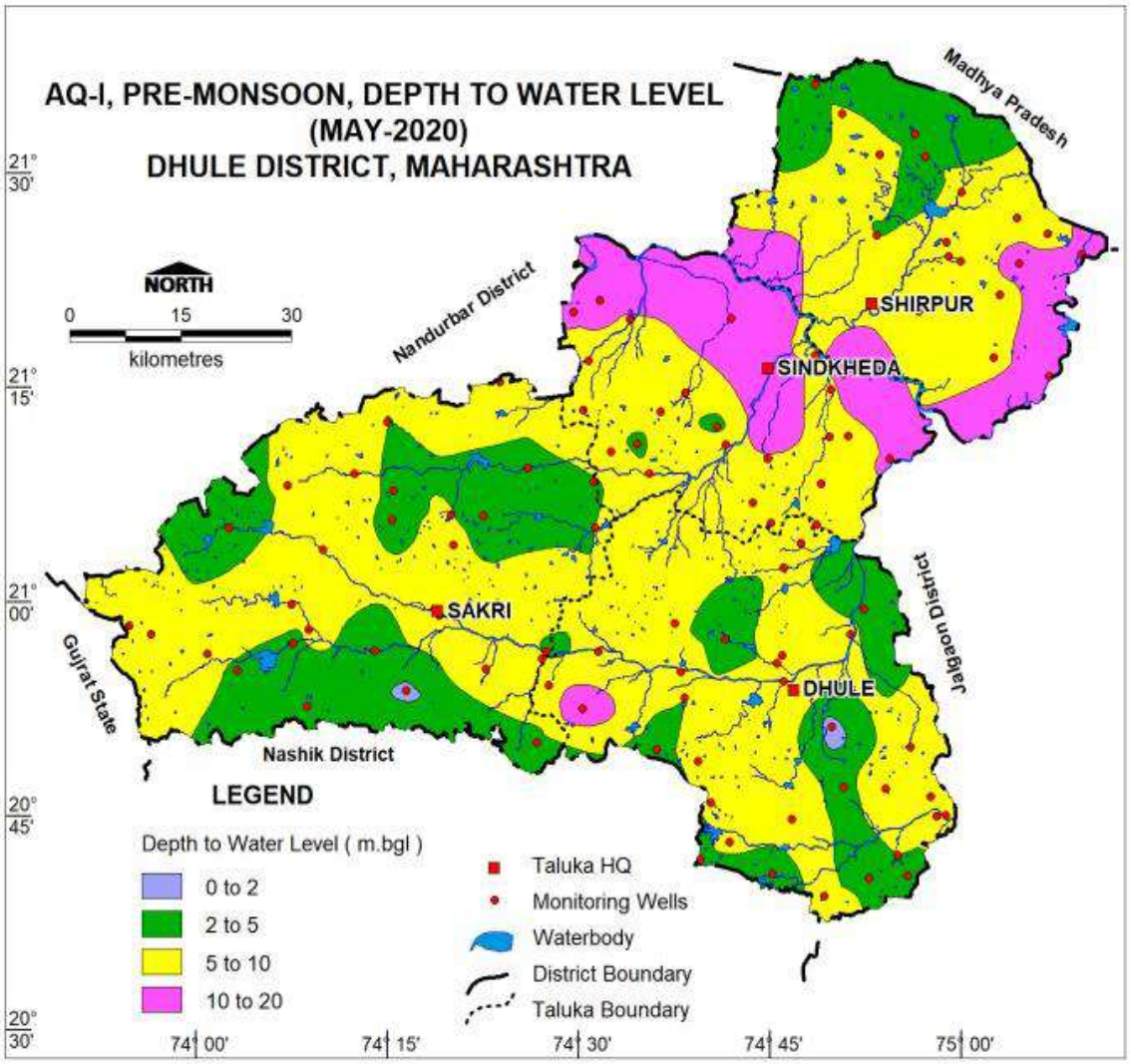


Figure 3.1: DTWL shallow aquifer (May 2020)

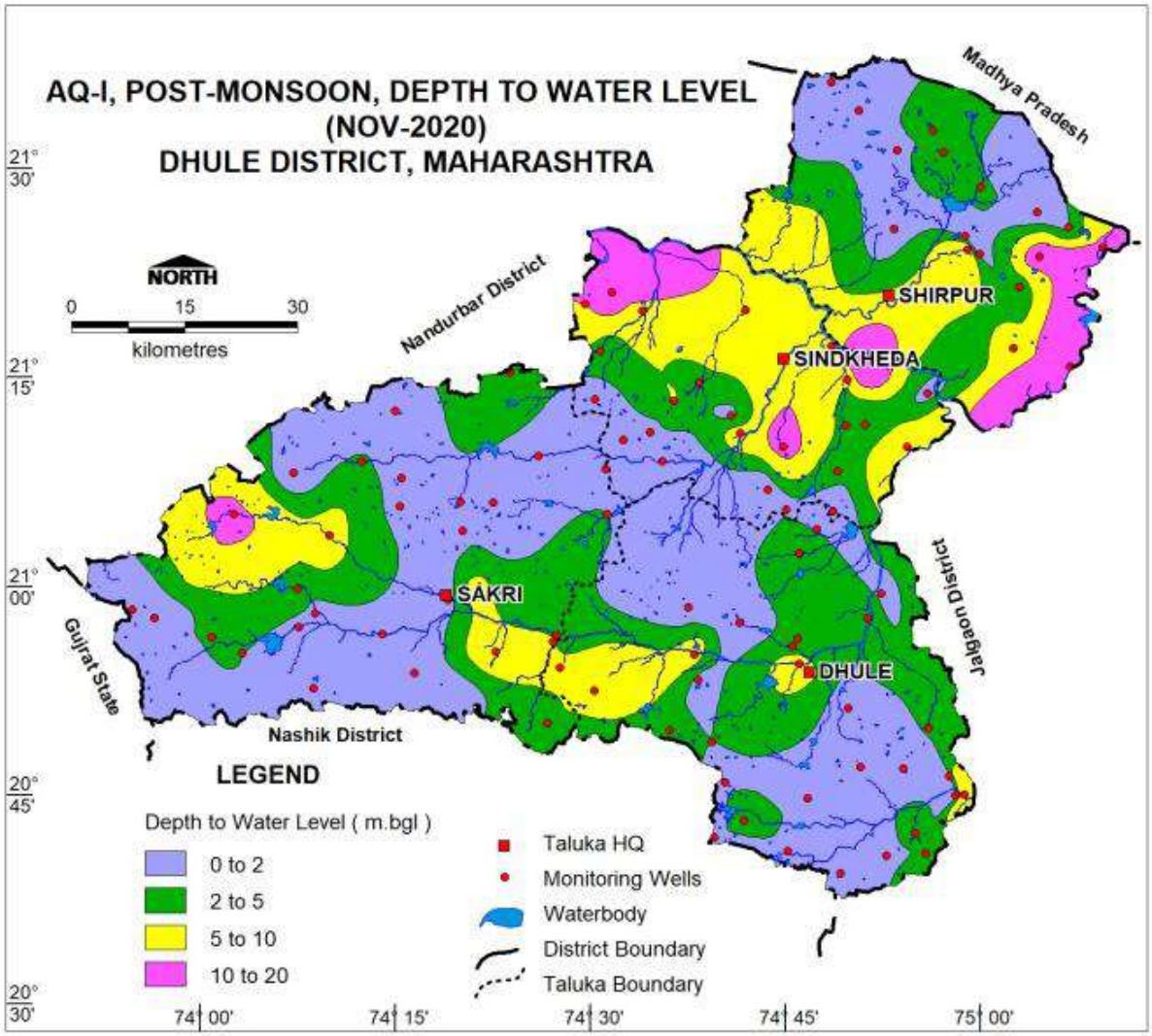


Figure 3.2: DTWL shallow aquifer (Nov. 2020)

3.1.3 Seasonal Water Level Fluctuation (May-Nov2020)

It is observed that minimal water level fluctuation was observed at Mordad, Dhule block (0.20 m) while maximal water level fluctuation was measured at Velhane Bk, Dhule block (8.80 m).Declining water level has been observed in most of the locations of the blocks except for the few locations in the district.

3.2 Depth to water level (Aquifer-II /Deeper Aquifer)

3.2.1 Pre-monsoon Depth to Water Level (May-2020)

The pre-monsoon depth to water level in deeper aquifer of Dhule district, during May 2020 range from15.00 mbgl (Sevalda, Tardi, Shirpiur block) and 87.50 mbgl (Chilane, Shindkheda block, Lonkhede, Sakri block). The depth to water level between 10 and 20 mbgl is observed in the eastern parts of Shirpur and northern and north western parts of Sinkheda blocks and very small patches of Dhule, Sakri blocks. The deepest water level (>40 mbgl) has been observed in the central part of the district and western part of Shirpur and Sakri blocks. The pre-monsoon depth to water level map of Aquifer-II is given in **Figure 3.3.**

3.2.2 Post-monsoon Depth to Water Level (Nov-2020)

In Aquifer-II, the post-monsoon depth to water levels in Dhule District during November 2020 range between 7.4mbgl (Varshi, Shindkheda block, Klid, Shirpur block) and more than 100mbgl (Vitai, Shindkheda block).Depth to water level less than 10 m bgl has been observed in isolated patches of Shirpur and Shindkheda blocks. Depth to water level more than 30 mbgl is observed in the central part of the district and isolated patches in western part of Shirpur and Sakri blocks.The post-monsoon depth to water level map of Aquifer-II is given in **Figure3.4.**

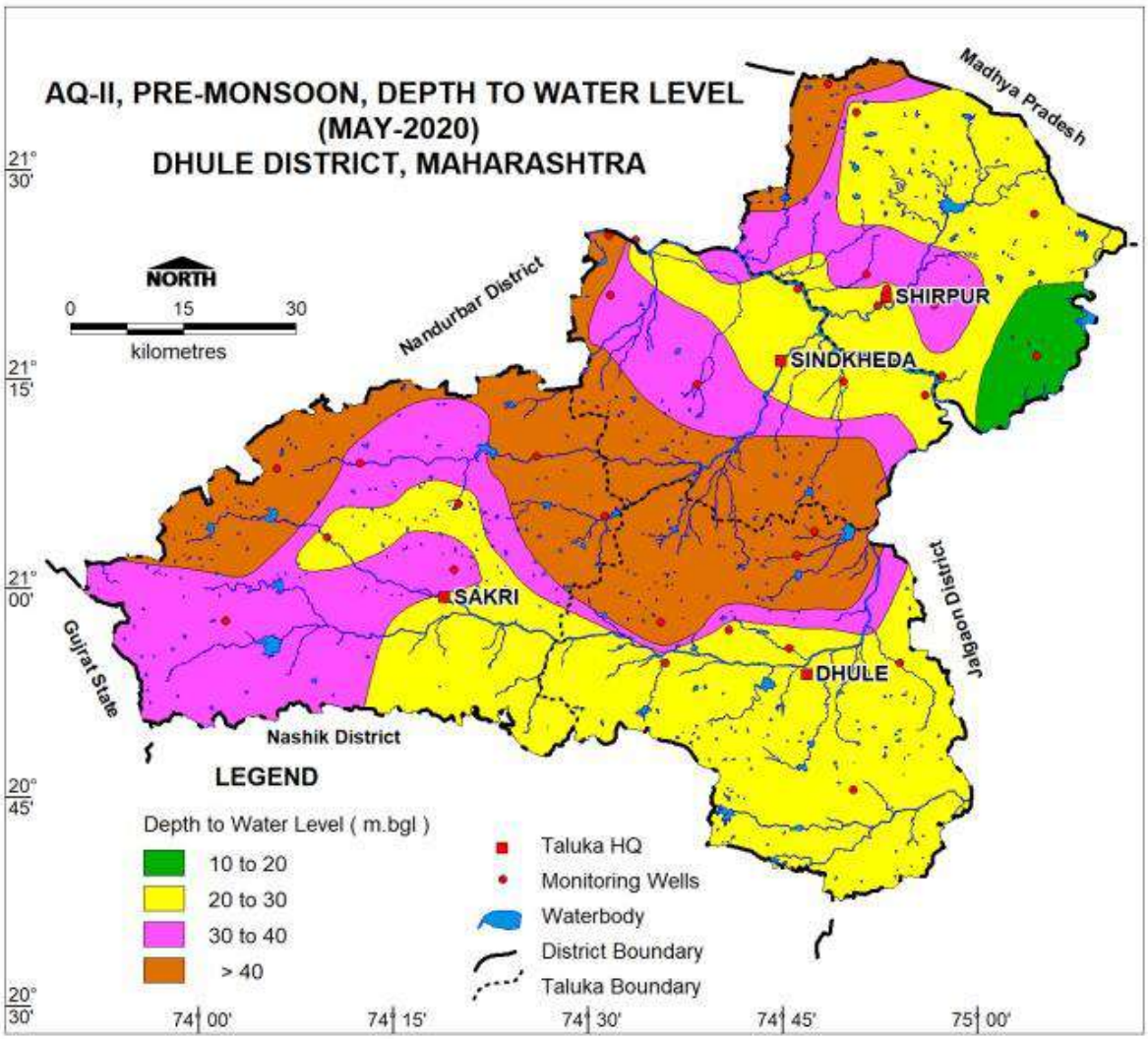


Figure3.3: DTWL deeper aquifer (May 2020)

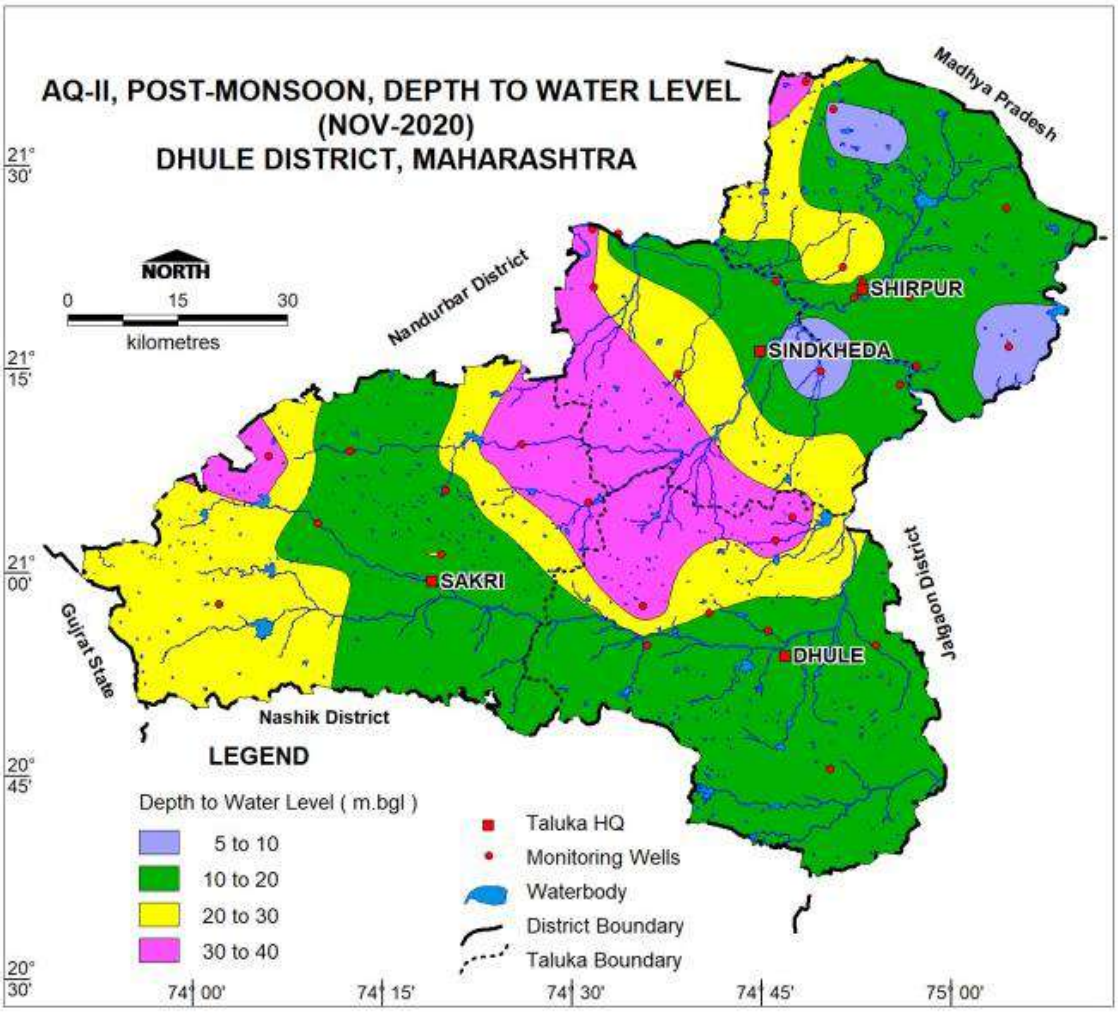


Figure3.4: DTWL deeper aquifer (Nov. 2020)

3.3 Water Level Trend (2011-2020)

During pre-monsoon, rise in water level trend has been recorded at 57 stations and ranges from 0.003 m/year (Vaskhedi, Sakri block) to 0.7236 m/year (Khambale, Shirpur block) while falling trend was observed in 47 stations varying from 0.00036 (Borkund, Dhule block) to 1.5959 m/year (Domkani, Sakri block). Area showing rising trend >0.2 m observed in isolated patches in all the blocks**.**Area showing falling trend >0.2 m observedin 26% area. **(Figure 3.5).**

During post monsoon, rise in water level trend has been recorded at 64 stations andit ranges between 0.4185 m/year (Tonde, Shirpur block) to 1.2959 m/year (Sayane, Sakriblock) while falling trend was observed in 40 stations varying from 0.0006 (Udane, Dhule block) to 0.9393 m/year (Waghadi Kh, Shindkheda block). Area showing rising trend >0.2 m observedin all the blocks**.** Area showing falling trend >0.2 m observed in12% area.(**Figure3.6).**

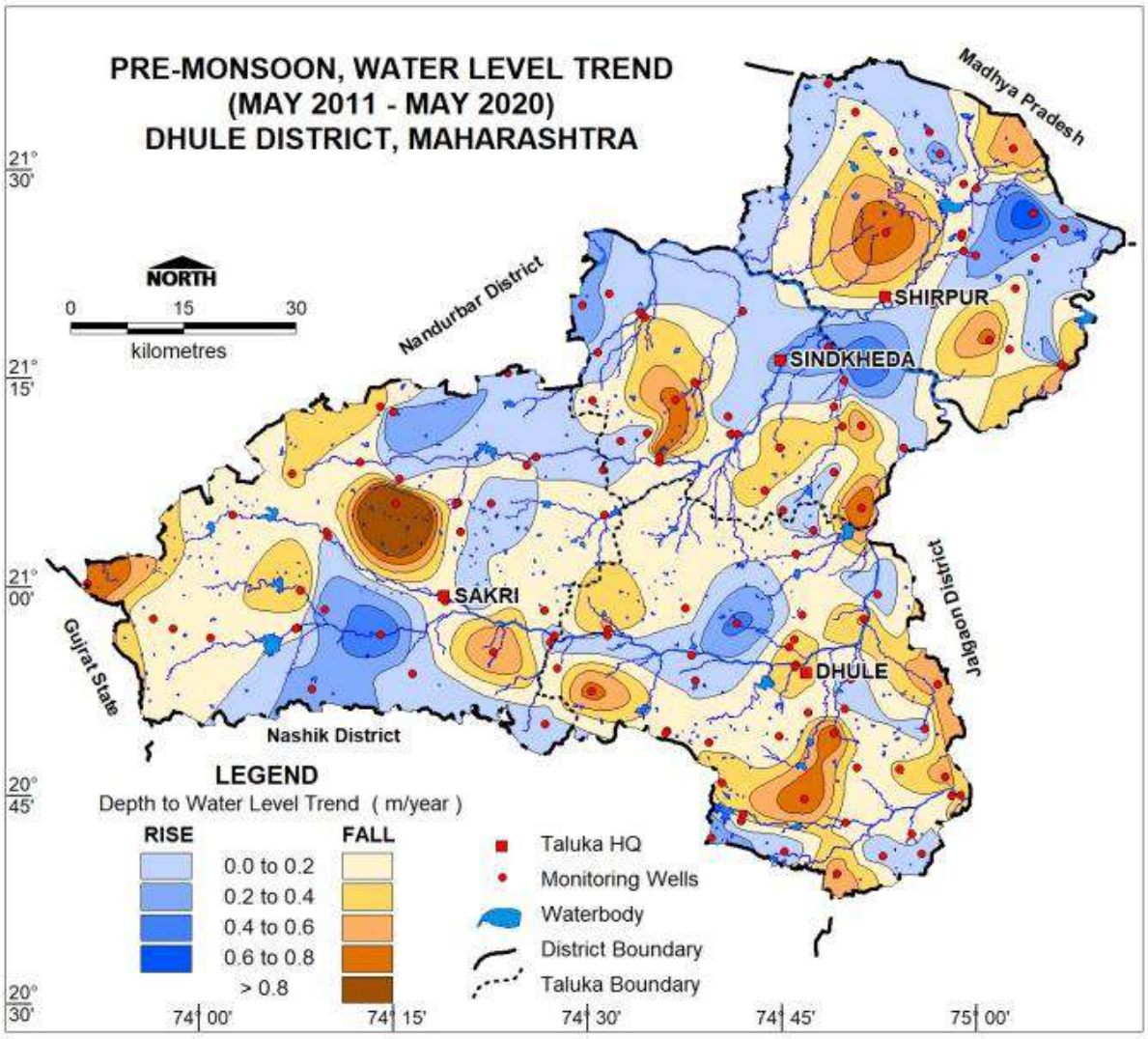


Figure 3.5: Pre-monsoon decadal trend (2011-20)

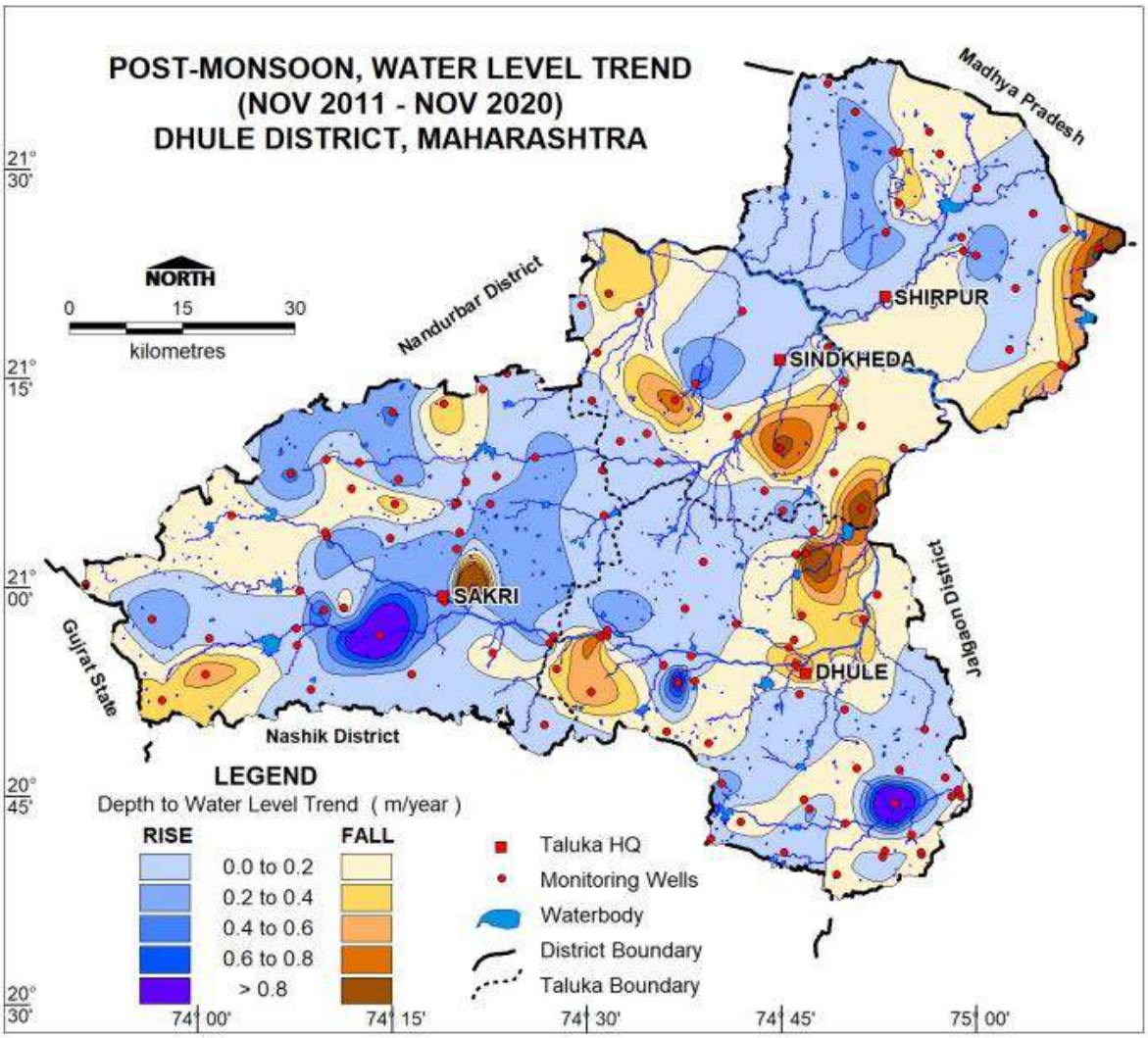


Figure 3.6: Post-monsoon decadal trend (2011-20)

3.4 Hydrograph Analysis

The variation in short term and long-term water level trends may be due to variation in natural recharge due to rainfall and withdrawal of groundwater for various agricultural activities, domestic requirements, and industrial needs. The analysis of hydrographs shows that the annual rising limbs in hydrographs indicate the natural recharge of groundwater regime due to monsoon rainfall, as the monsoon rainfall is the sole source of natural recharge to the ground water regime (**Figure. 3.7a to n**). However, continuous increase in the groundwater draft is indicated by the recessionary limb.

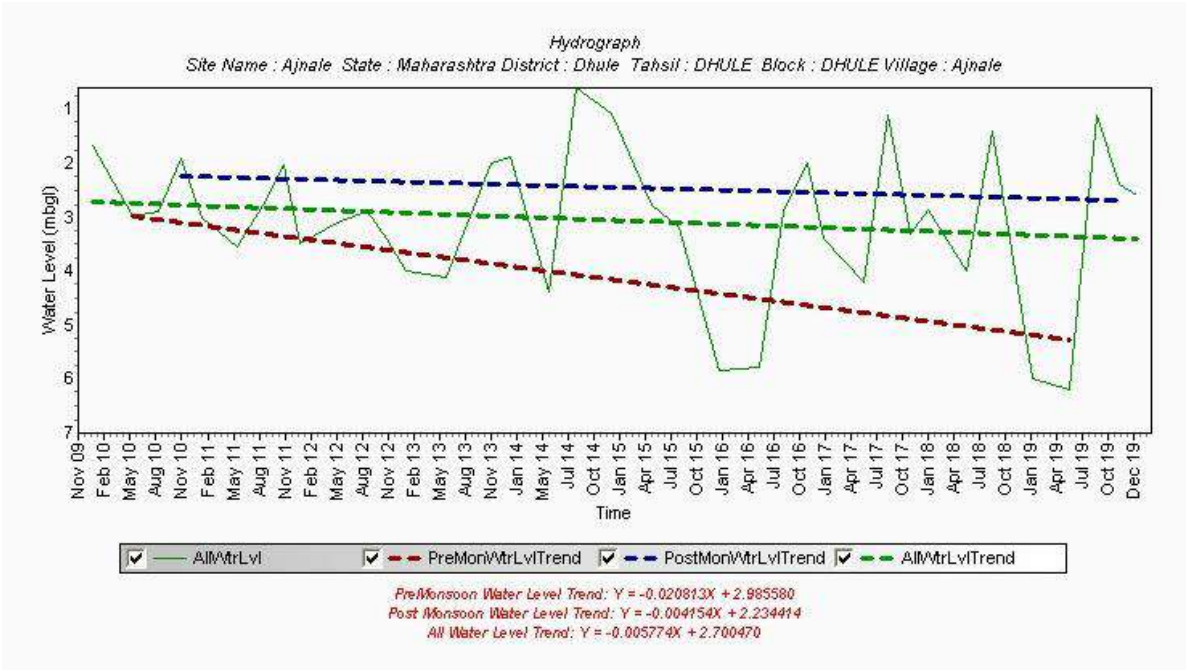


Figure 3.7a: Hydrograph (2010-19), Ajnale, Dhuleblock

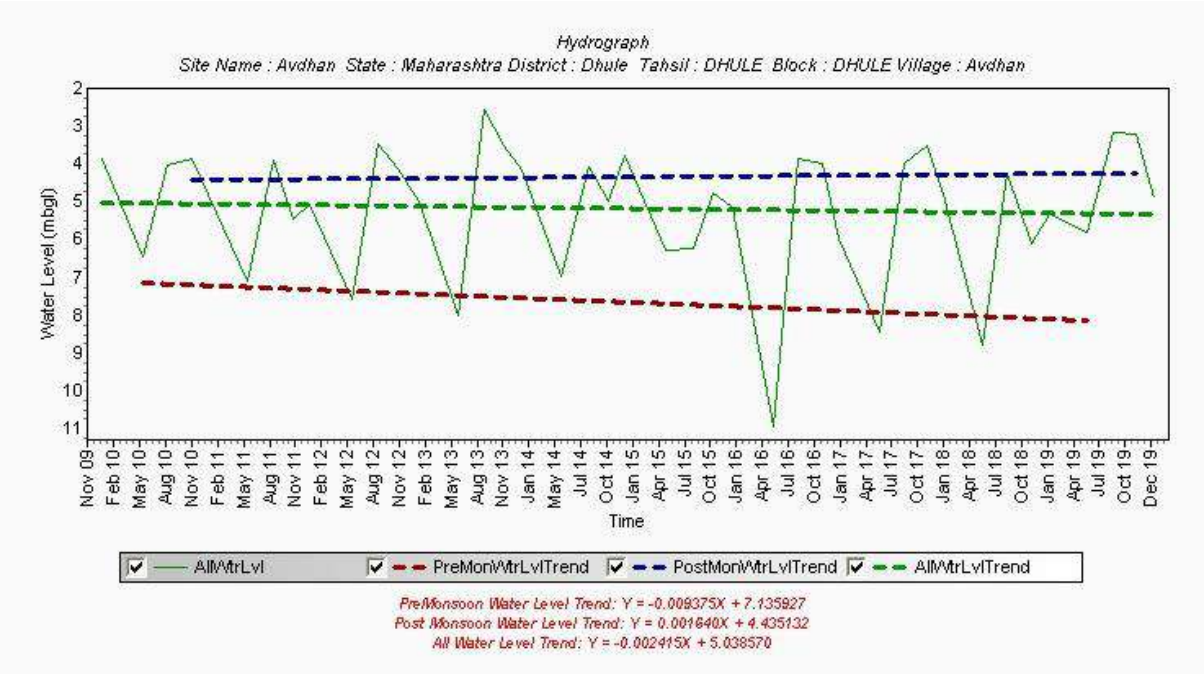


Figure 3.7b: Hydrograph (2010-19), Avdhan, Dhule block

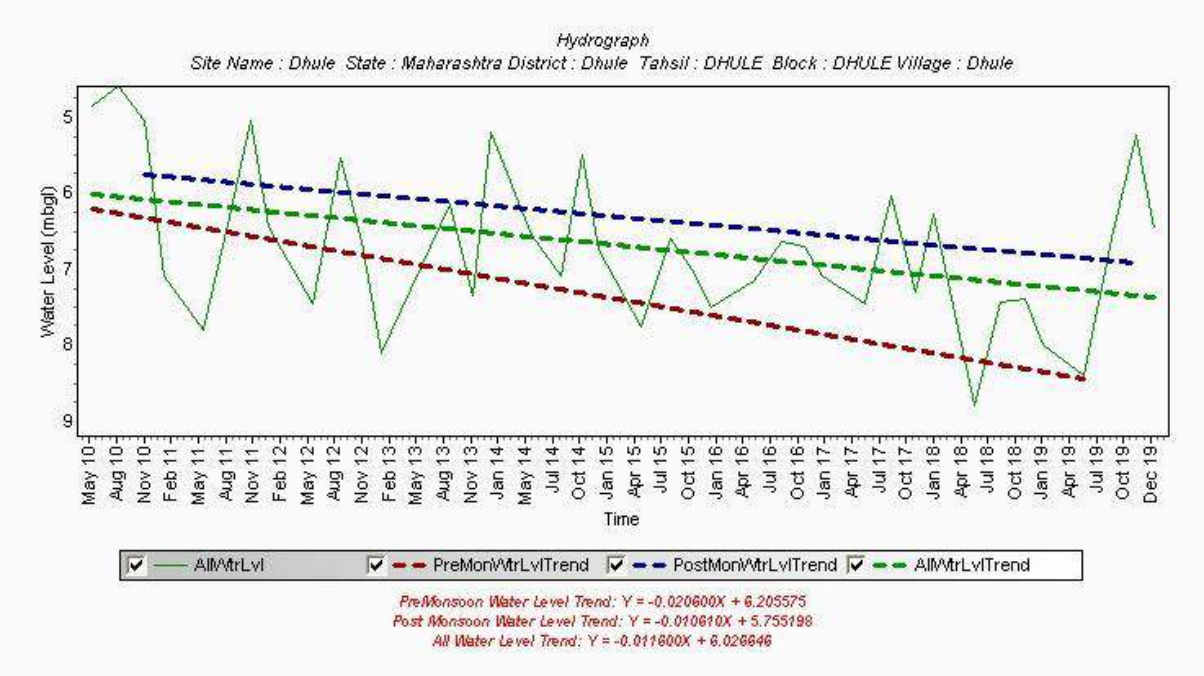


Figure 3.7c: Hydrograph (2010-19), Dhule, Dhule block

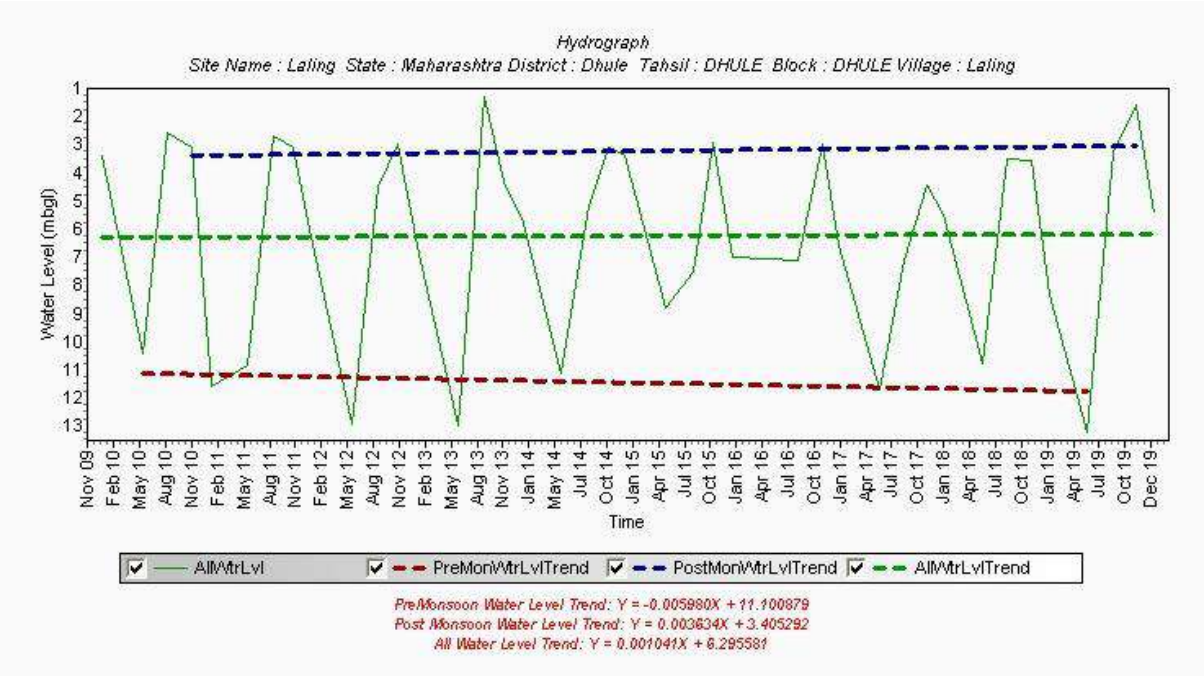


Figure 3.7d: Hydrograph (2010-19), Laling, Dhule block

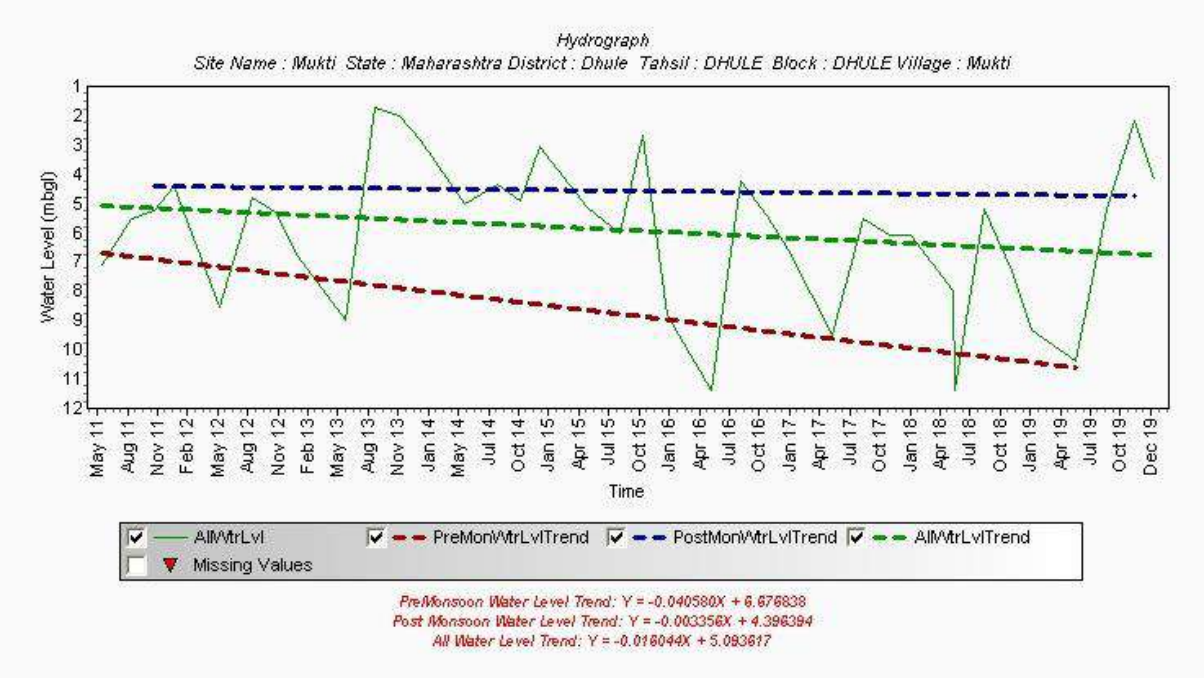


Figure 3.7e: Hydrograph (2010-19), Mukti, Dhule block

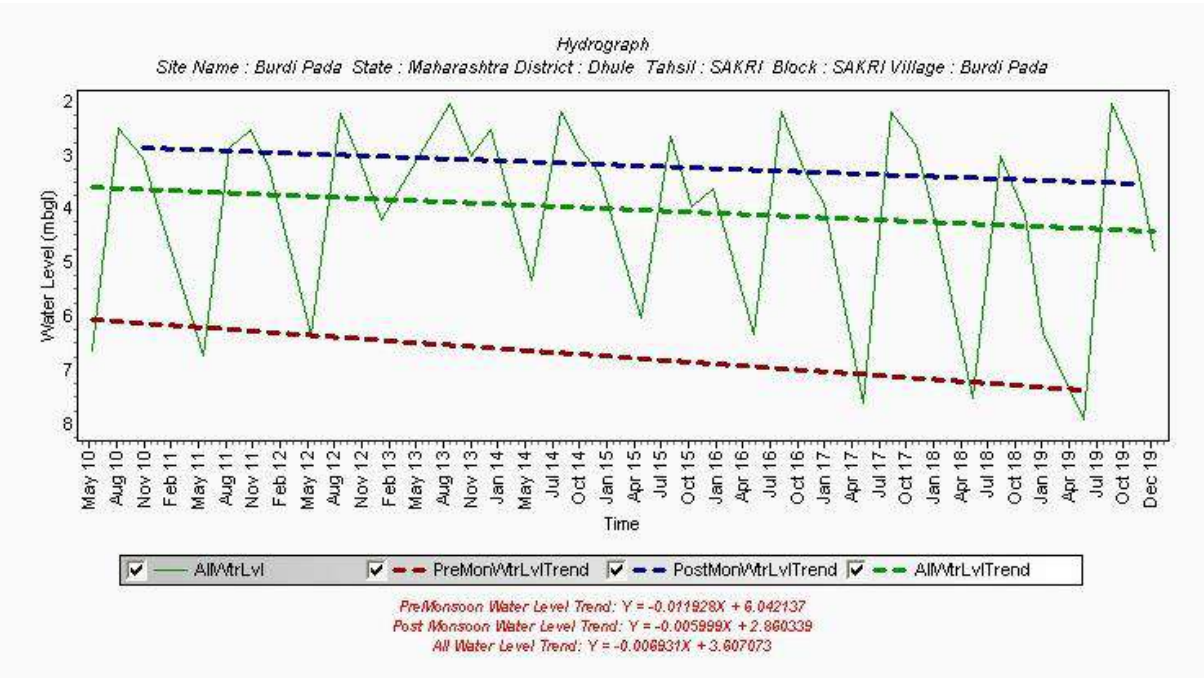


Figure 3.7f: Hydrograph (2010-19), Burdipada, Sakri block

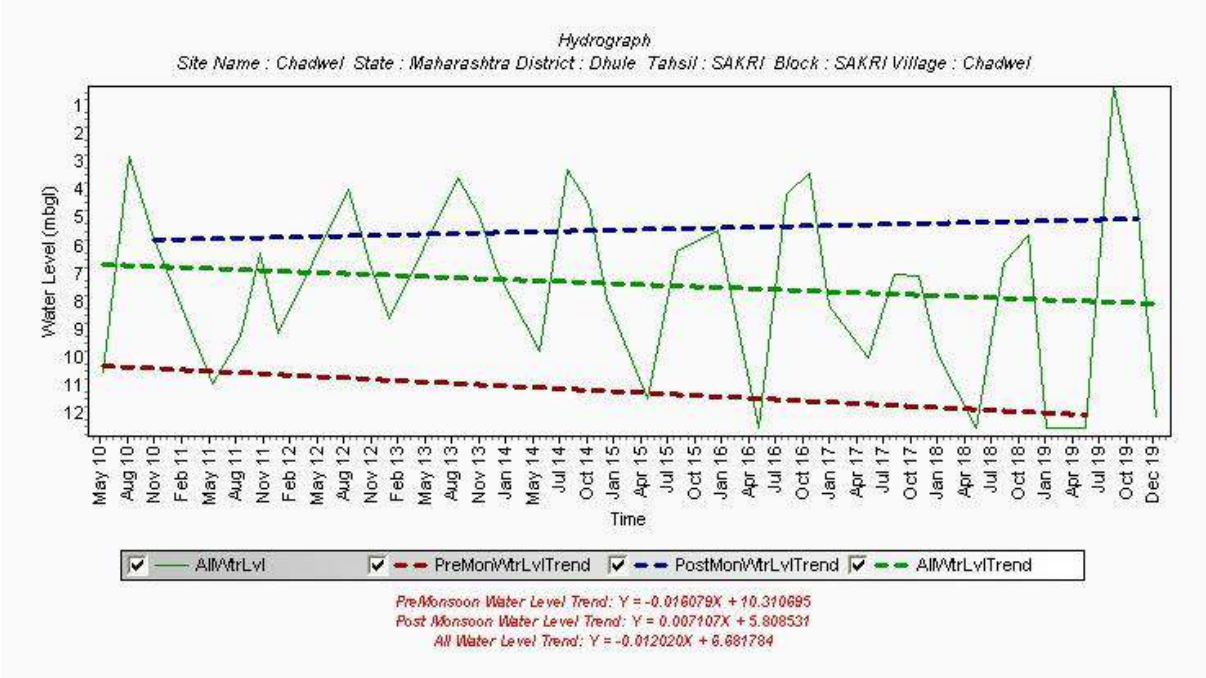


Figure 3.7g: Hydrograph (2010-19), Chadwel, Sakri block

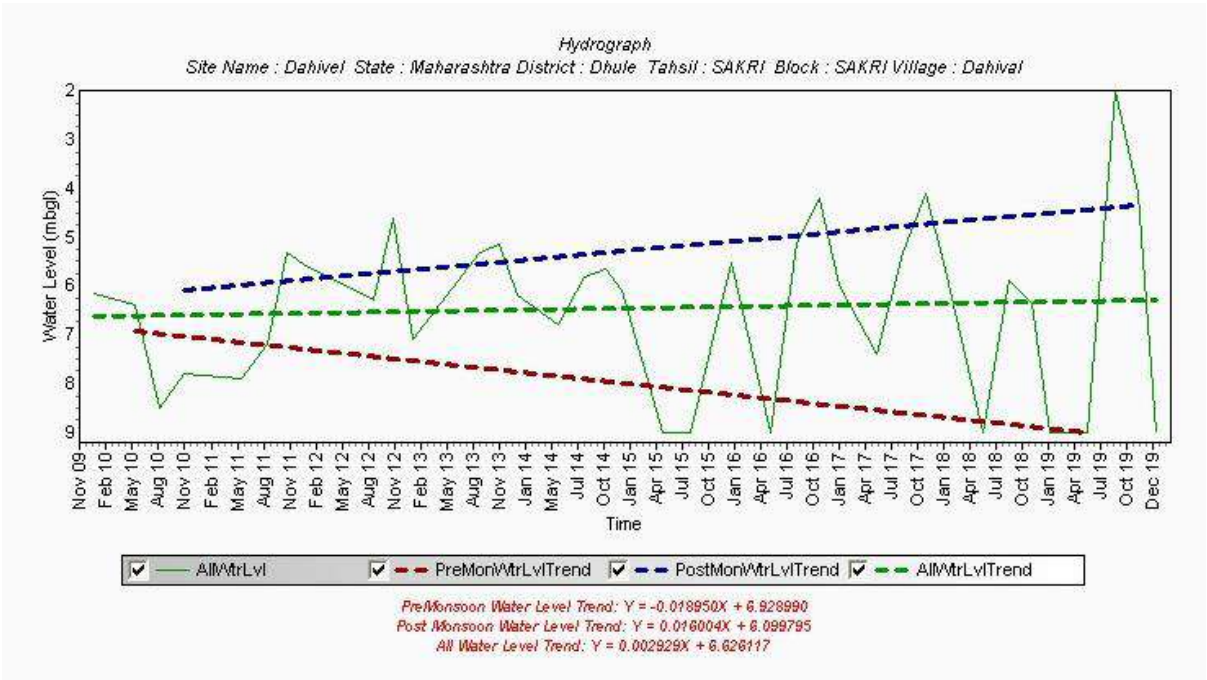


Figure 3.7h: Hydrograph (2010-19), Dahival, Sakri block

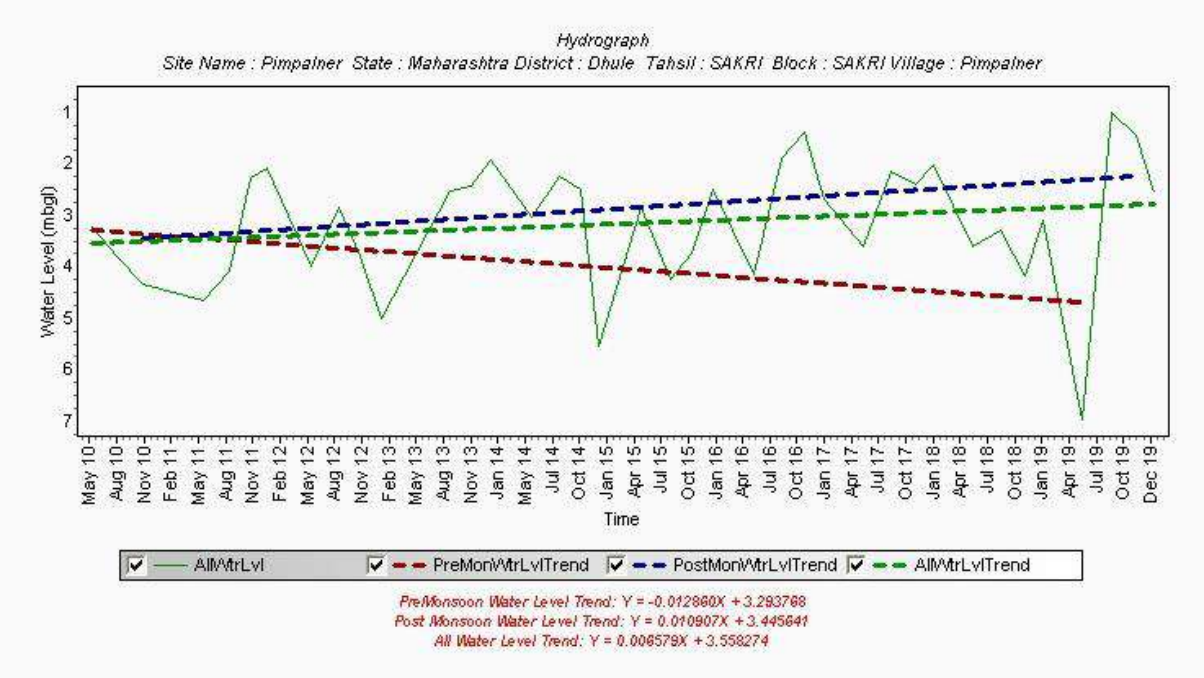


Figure 3.7i: Hydrograph (2010-19), Pimpalner, Sakri block

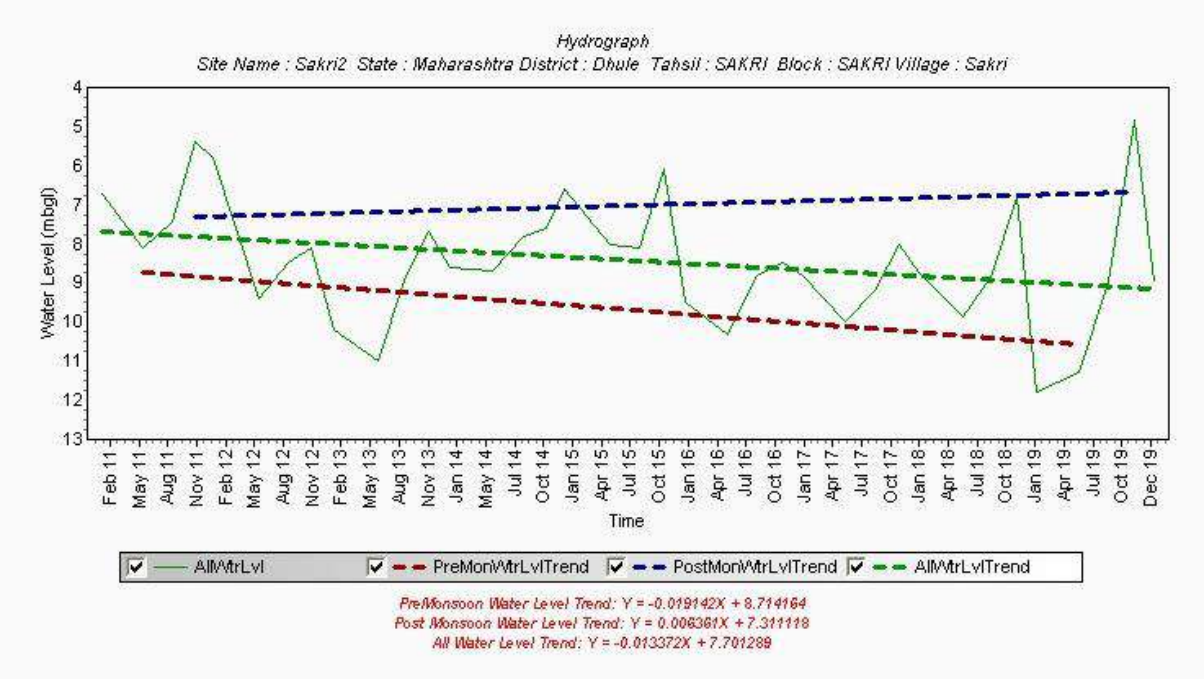


Figure 3.7j: Hydrograph (2010-19), Sakri, Sakri block

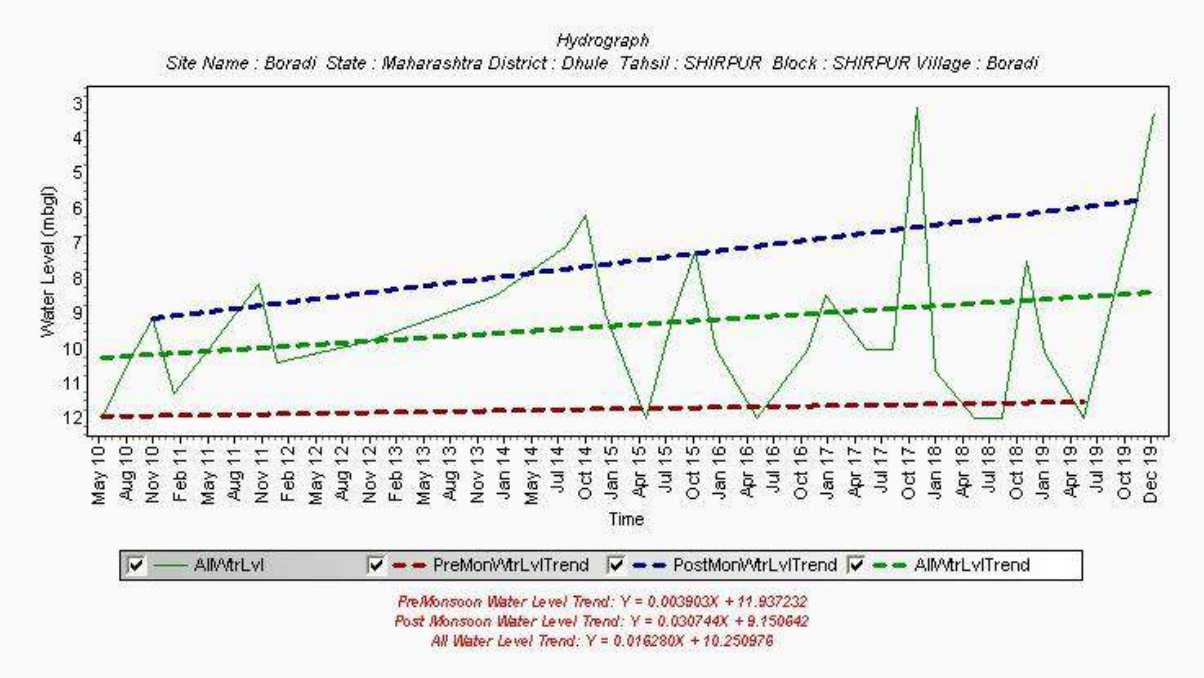


Figure 3.7k: Hydrograph (2010-19), Boradi, Shirpur block

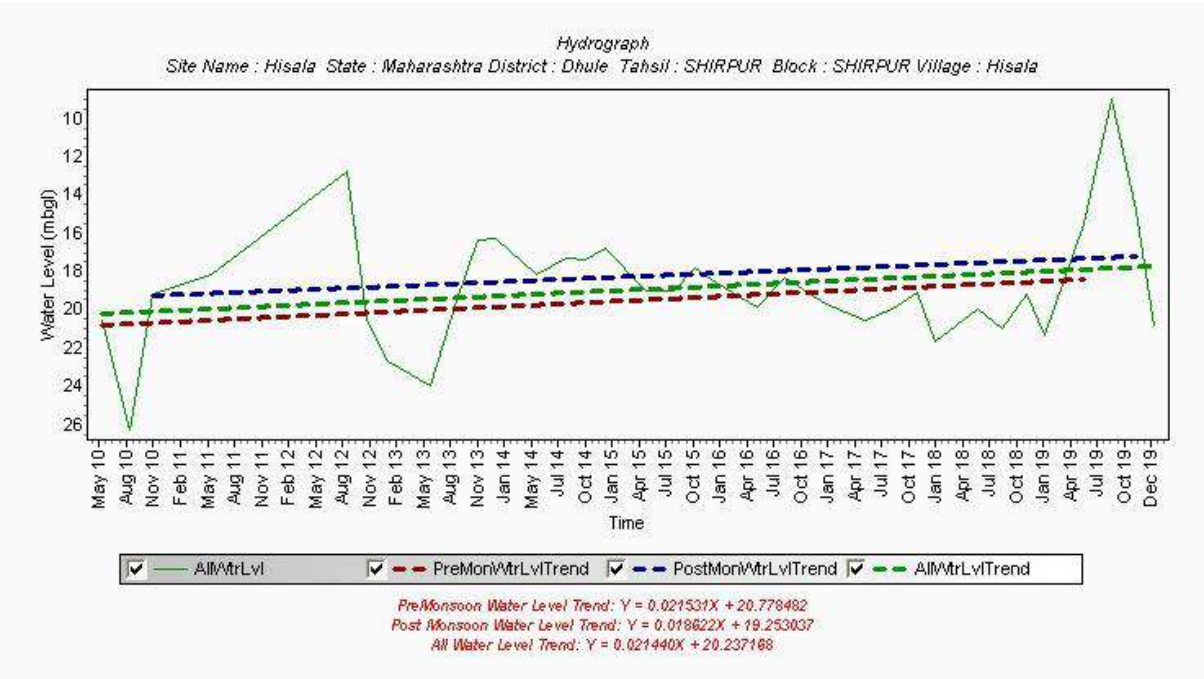


Figure 3.7l: Hydrograph (2010-19), Hisale, Shirpur block

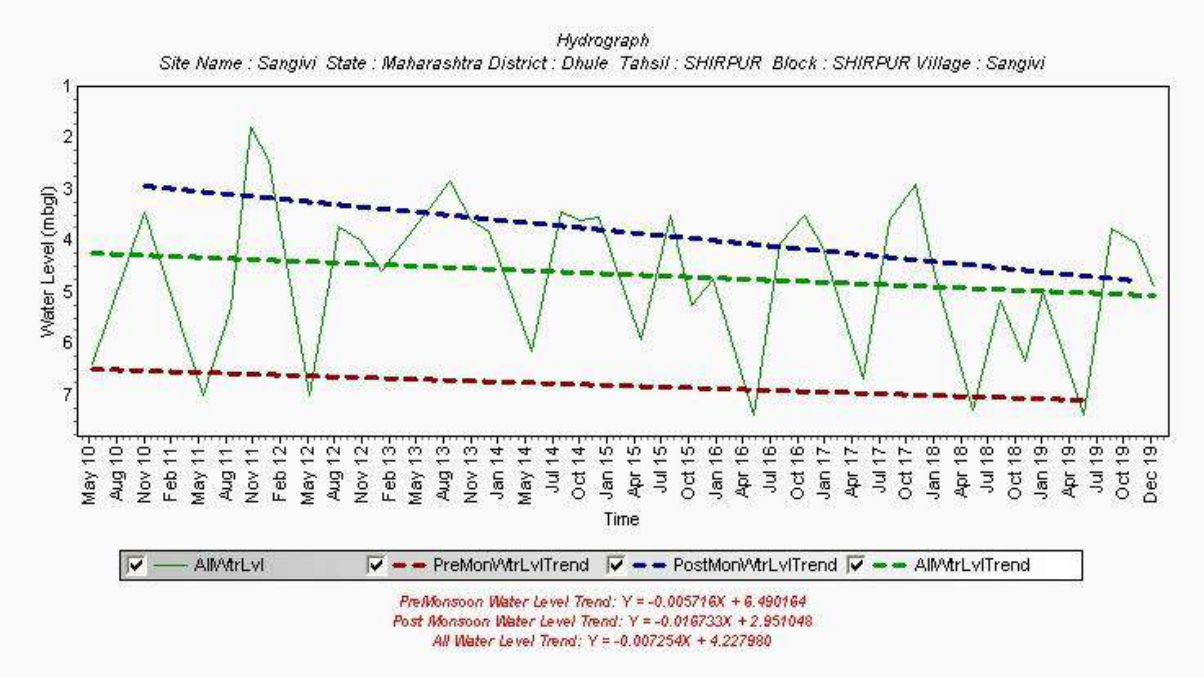


Figure 3.7m: Hydrograph (2010-19), Sangvi, Shirpur block

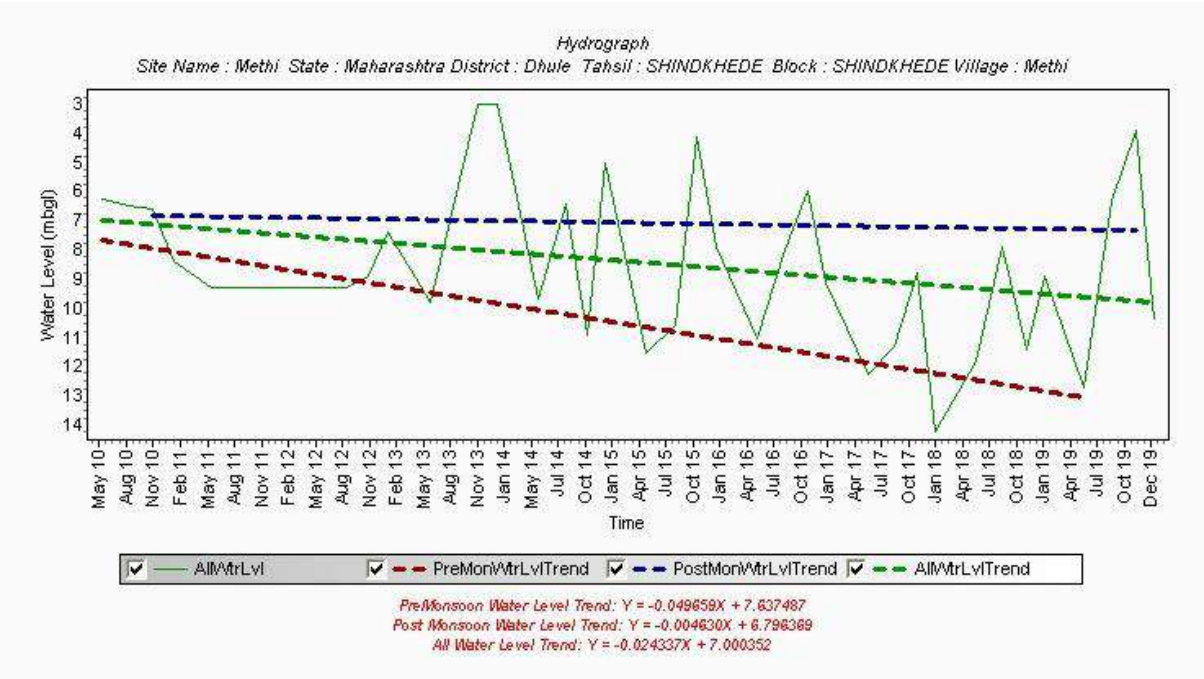


Figure 3.7n: Hydrograph (2010-19), Methi, Shindkheda block

4. GROUND WATER QUALITY

Water sampling is being done every year from GWM wells during pre-monsoon period (May). The data gap analysis has been carried out to find out the adequacy of information on water quality. To decipher the ground water quality scenario, 23 samples from aquifer-I / shallow aquifer and 41 from aquifer – II / deeper aquifers have been utilized including monitoring wells/exploratory wells, tube wells/bore wells of CGWB and GSDA; data from earlier studies. The aquifer wise ranges of different chemical constituents present in ground water are given in **Table 4.1**. The details of chemical analysis are given in **Annexure VII and VIII**.

Table 4.1: Aquifer wise ranges of chemical constituents in Dhule District

Table 4.1: Aquifer wise ranges of chemical constituents in Dhule district				
Constituents	**Shallow aquifer**		**Deeper aquifer**	
	Min	**Max**	**Min**	**Max**
pH	7.1	8.3	7	8.53
EC (µS/cm)	421	5635	337	6300
TDS (mg/l)	274	3663	222	1216
TH (mg/l)	133	1280	95	1125
Calcium (mg/l)	45	939	10	240
Magnesium (mg/l)	14	98	2.4	127.7
Potassium (mg/l)	0.7	76.8	0	80
Sodium (mg/l)	27	110	10	910
Bi-carbonate (mg/l)	14	797	24	397
Chloride (mg/l)	12	620	11	1904
Sulphate (mg/l)	11	250	0	463
Nitrate (mg/l)	4	48	0	120
Fluoride (mg/l)	0.01	1.23	0	1.02

4.1Electrical Conductivity (EC)

4.1.1 Distribution of Electrical Conductivity in Shallow Aquifer

The concentration of EC in shallow aquifer varies between 421 (BurdiPada, Sakri block) and 5635µS/cm (Avdhan, dhule block).Out of 23 samples collected from dug wells, 4 samples are having EC >2250 µS/cm and6 samples have shown EC ranges from 250 to 750 µS/cm. Concentration of EC >3000 µS/cm has been observed in parts of Avdhan, Dhule Block. The distribution of electrical conductivity in shallow aquifers is shown in **Figure 4.1** and analytical data is presented in **Table 4.2.**

4.1.2 Distribution of Electrical Conductivity in Deeper Aquifer

The concentration of EC in deeper aquifer varies between 337 (Varzadi, Shirpur block) and 6300 µS/cm (Mangrod, Shirpur block).Out of 41 samples, collected from bore wells, only onesample, has EC >3000 µS/cm in parts of Mangrod, Shirpur block.The distribution of electrical conductivity in deeper aquifers is shown in **Figure4.2**and analytical data is presented in **Table 4.2.**

Table 4.2: Aquifer wise Electrical conductivity analytical data

Table 4.2: Aquifer wise Electrical conductivity data					
S.No.	**EC**	**shallow aquifer**		**Deeper Aquifer**	
	(µS/cm)	**No. of samples**	**% of samples**	**No. of samples**	**% of samples**
1	< 250	0	0.00	0	0.00
2	>250-750	6	26.09	19	46.34
3	>750-2250	13	56.52	20	48.78
4	2250-3000	3	13.04	1	2.44
5	3000-7500	1	4.35	1	2.44
6	>7500	0	0.00	0	0.00
Total samples		23		41	

4.2 Nitrate

Nitrogen in the form of dissolved nitrate nutrient for vegetation, and the element is essential to all life. The major contribution in ground water is from sewage, waste disposal, nitrate fertilizer and decaying of organic matter. In Dhule district nitrate concentration varies between4 to 48 mg/l.As per BIS (2012) the desirable limit is 45 mg/l.In shallow aquifer, 23 samples were analysed; out of this,3 water samples show the nitrate concentrations exceeding the desirable limit of 45 mg/l. The high concentration of Nitrate may be due to domestic waste and sewage in the urban and rural parts of district.In deeperaquifer, 41 wells were analysed, out of this only 3 water sample show nitrate concentration exceeding the desirable limit of 45 mg/l. Aquifer wise nitrate concentration is given in **Table 4.3.**

4.3 Fluoride

In shallow aquifer, concentration of fluoride ranges from 0.01 to 1.2 mg/l. out of 23 samples was analysed, 2samples show fluoride concertation more than 1 mg/l.In Deeper Aquifer, concentration of fluoride ranges from 0 to 1.02 mg/l. Out of 41 samples analysed, 1 sample show fluoride concertation more than 1 mg/l. Aquifer wise fluoride concentration is given in **Table 4.3.**

Table 4.3: Aquifer wise Nitrate and Fluoride concentration

	No_3> 45 mg/l		**fluoride >1 mg/l**	
Taluka	**No of samples**	**No of samples**	**No of samples**	**No of samples**
	Shallow Aquifer	**Deeper Aquifer**	**Shallow Aquifer**	**Deeper Aquifer**
Dhule	0	2	2	0
Sakri	2	1	0	0
Shindkheda	0	0	0	1
Shirpur	1	0	0	0
Grand Total	**3**	**3**	**2**	**1**

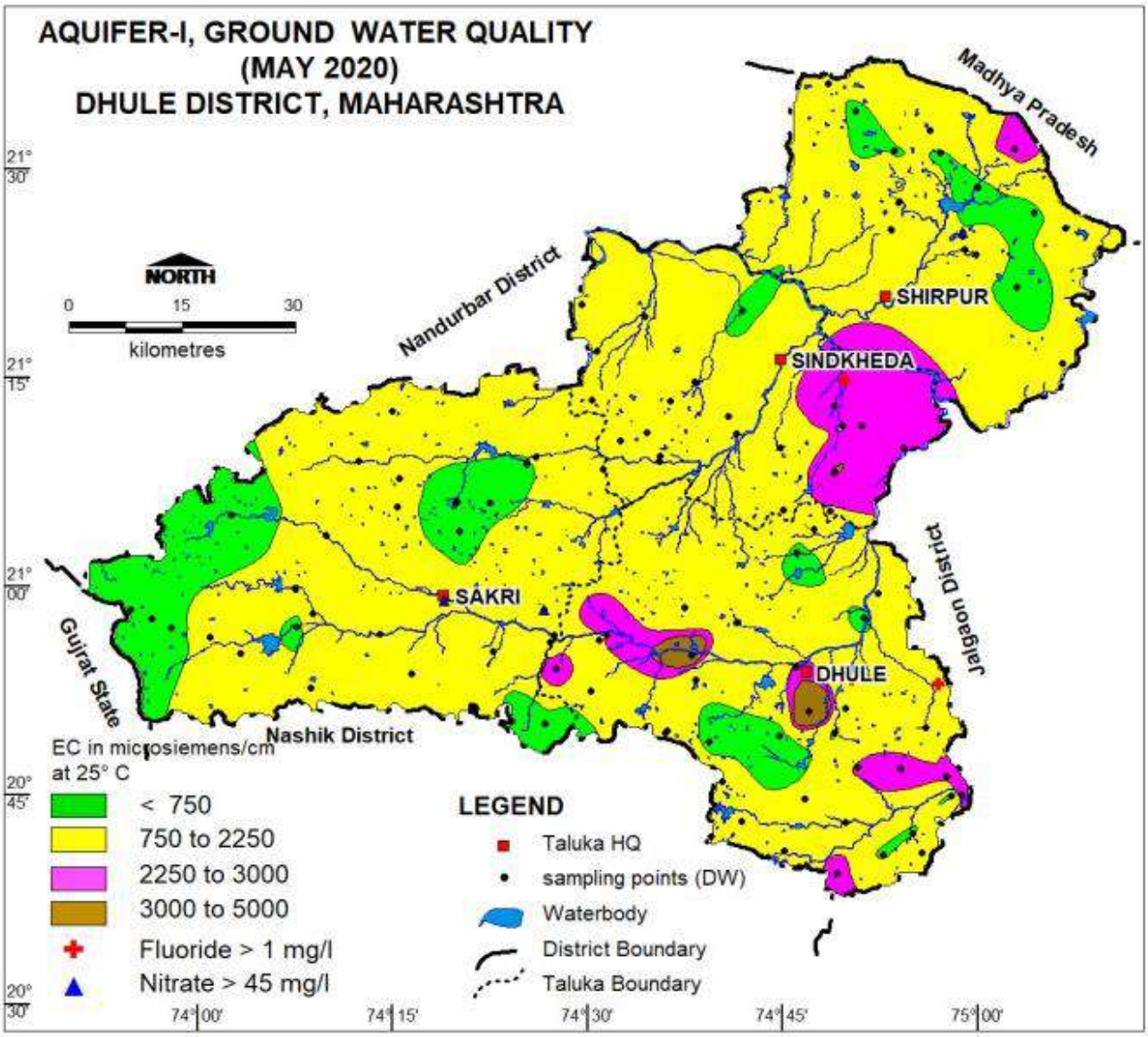


Figure.4.1: Ground Water Quality, Aquifer-I

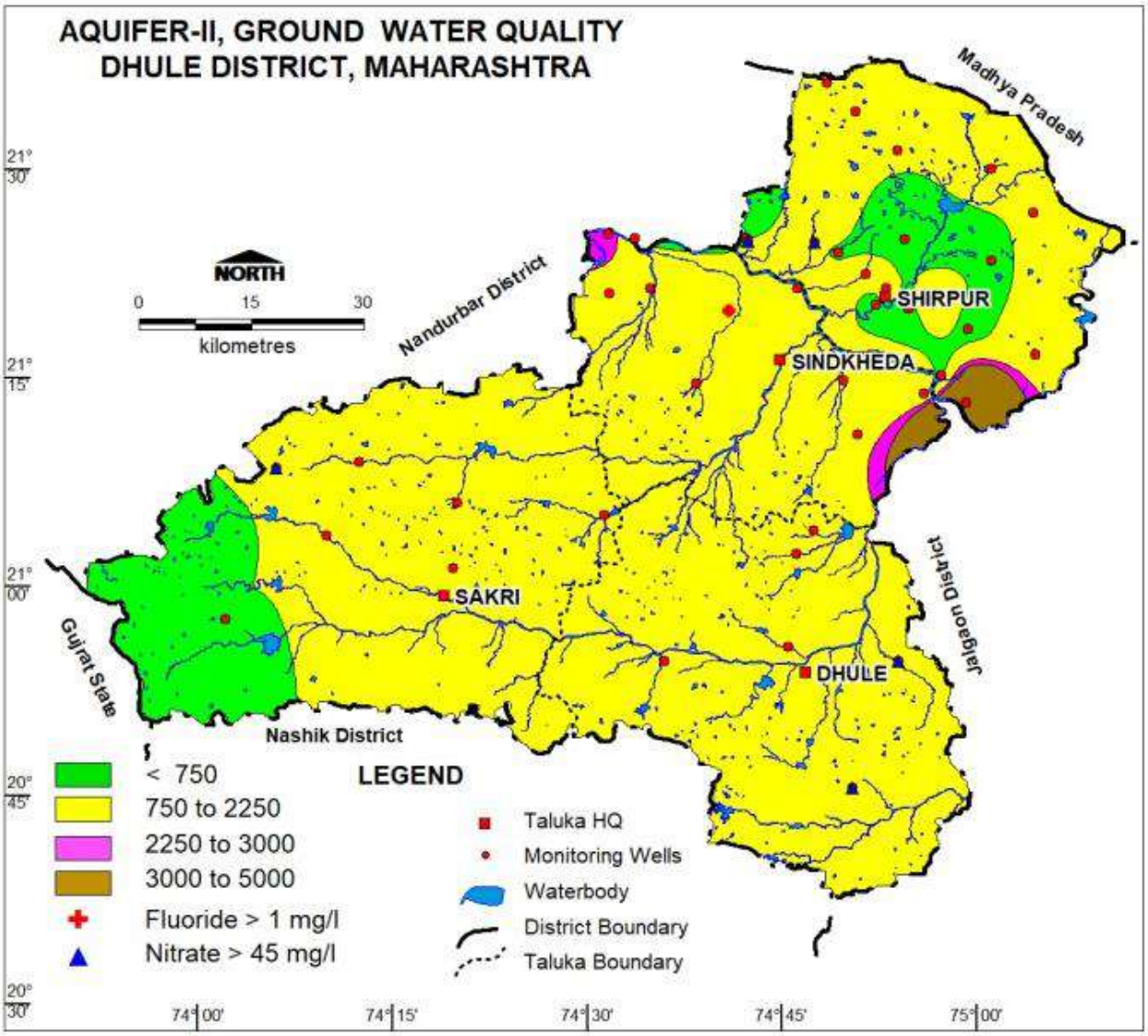


Figure 4.2: Ground Water Quality, Aquifer-II

4.4 Suitability ofGround Water for Drinking Purpose

In shallow aquifer, 69.57 % of samples have TDS concentration above the Desirable limit (DL) but below the MPL.The water from such area is not fit for drinking purpose if directly consumed without treatment. It is also seen that about 0 to 39.13 % samples are beyond the maximum permissible limit for the parameters like TH, Ca and NO_3 indicating that the water is not suitable fordrinking purpose. Concentration of Chemical constituents in shallow Aquifer is given in **Table 4.4.** Nitrate more than permissible limits observed at Hadakhed in Shirpur block and at Ichhapur and Sakri2 in Sakri block. Fluoride more than permissible limit observed at Mukti and Phagne in Dhule block.

In Deeper aquifer, none of the samples having TDS more than maximum permissible limit (MPL) and 53.66 % of samples have TDS concentration above the Desirable limit (DL) but below the MPL.The water from such area is not fit for drinking purpose if directly consumed without treatment.It is also seen that about 0 to 18.18 % samples are beyond the maximum permissible limit for the parameters like pH, TH, Ca, Mg, Cl, SO_4, Fe and NO_3 indicating that the water is not suitable for drinking purpose. Concentration of Chemical constituents in Deeper Aquifer is given in **Table 4.5.** Nitrate more than permissible limits observed at Ambode, Junawane in Dhule block and at Roykot in Sakri block. Fluoride more than permissible limit observed at Chulane in Sindkheda block.

Table 4.4: Concentration of Chemical constituents in shallow Aquifer

Parameter	Drinking water Standards (IS-10500-2012)		Total no of ground water samples	Shallow aquifer					
				Samples (<DL)		Samples (DL-MPL)		Samples (>MPL)	
	DL	MPL		No	%	No	%	No	%
pH	6.5-8.5	-	23	0	0.00	23	100.00	0	0.00
TDS(mg/L)	500	2000	23	6	26.09	16	69.57	1	4.35
TH(mg/L)	300	600	23	11	47.83	7	30.43	5	21.74
Ca (mg/L)	75	200	23	6	26.09	8	34.78	9	39.13
Mg (mg/L)	30	100	23	9	39.13	14	60.87	0	0.00
Cl (mg/L)	250	1000	23	20	86.96	3	13.04	0	0.00
SO_4 (mg/L)	200	400	23	22	95.65	1	4.35	0	0.00
NO_3 (mg/L)	45	No relax	23	20	86.96	0	0.00	3	13.04
F (mg/L)	1	1.5	23	21	91.30	2	8.70	0	0.00

(Here, DL- Desirable Limit, MPL- Maximum Permissible Limit)

Table 4.5: Concentration of Chemical constituents in Deeper Aquifer

Parameter	Drinking water Standards (IS-10500-2012)		Total no of ground water samples	Deeper aquifer					
				Samples (<DL)		Samples (DL-MPL)		Samples (>MPL)	
	DL	MPL		No	%	No	%	No	%
pH	6.5-8.5	-	41	0	0.00	40	97.56	1	2.44
TDS(mg/L)	500	2000	41	19	46.34	22	53.66	0	0.00
TH(mg/L)	300	600	41	27	65.85	10	24.39	4	9.76
Ca (mg/L)	75	200	41	29	70.73	11	26.83	1	2.44

Mg (mg/L)	30	100	41	21	51.22	19	46.34	1	2.44
Cl (mg/L)	250	1000	41	33	80.49	7	17.07	1	2.44
SO_4 (mg/L)	200	400	41	37	90.24	3	7.32	1	2.44
NO_3 (mg/L)	45	No relax	41	38	92.68	0	0.00	3	7.32
Fe (mg/L)	0.3	1	11	5	45.45	4	36.36	2	18.18
F (mg/L)	1	1.5	41	39	95.12	2	4.88	0	0.00

(Here, DL- Desirable Limit, MPL- Maximum Permissible Limit)

4.5 Suitability of Ground Water for Irrigation

The quality of Irrigation water affects the productivity, yield and quality of the crops. The quality of irrigation water depends primarily on the presence of dissolved salts and their concentrations. The Electrical Conductivity (EC), Sodium Absorption Ratio (SAR) and Residual Sodium Carbonate (RSC) are the most important quality criteria, which asses the water quality and its suitability for irrigation.

Electrical Conductivity (EC)

The amount of dissolved ions in the water is represented by the electrical conductivity. The classification of water for irrigation based on the EC values is given in **Table 4.6**and discussed as follows: -

Low Salinity Water (EC: 100-250 µS/cm): This water can be used for irrigation with most crops on most soils with little likelihood that salinity will develop.

Medium Salinity Water (EC: 250 – 750 µS/cm): This water can be used if moderate amount of leaching occurs. Plants with moderate salt tolerance can be grown in most cases without special practices for salinity control.

High Salinity Water (EC: 750 – 2250 µS/cm): This water cannot be used on soils with restricted drainage. Even with adequate drainage, special management for salinity control may be required and plants with good salt tolerance should be selected.

Very High Salinity Water (EC: >2250 µS/cm): This water is not suitable for irrigation under ordinary condition. The soils must be permeable, drainage must be adequate, irrigation water must be applied in excess to provide considerable leaching and very salt tolerant crops should be selected.

Table 4.6: Classification of Ground water for Irrigation based on EC values

sl.	Water Quality Type	EC in µS/cm	shallow aquifer		Deeper Aquifer	
			No. of samples	% of samples	No. of samples	% of samples
1	Low Salinity Water	< 250	0	0.00	0	0.00
2	Medium Salinity Water	> 250 to 750	6	26.09	19	46.34
3	High Salinity Water	> 750 to 2250	13	56.52	20	48.78
4	Very High Salinity Water	> 2250	4	17.39	2	4.88
Total			23	100	41	100

In shallow aquifer, maximum numbers of samples fall under the category of high salinity type of water. In deeper Aquifer, maximum numbers of samples fall under the category

of high and medium salinity type of water. The areas where very high salinity prevails (>2250µS/cm), ground water can be used for irrigation for very high salt tolerant crops and with proper soil and crop management practices.

Sodium Absorption Ratio (SAR)

Since Calcium and Magnesium will replace Sodium more readily than vice versa, the ratio reflects the Sodium hazard. The SAR indicates the relative activity of the Sodium ions in exchange reactions with the soil. The main problem with high sodium concentration is its effect on soil permeability; hardening of soil & water irrigation system. Sodium also contributes directly to the total salinity of the water and may be toxic to sensitive crops such as fruit trees. The higher value of SAR indicates soil structure damage.

It is observed that Sodium hazard is not present in ground water of the area in shallow as well as deeper aquifer, and as per SAR values, the water is suitable for irrigation. In shallow aquifer, out of 23 samples, all the 23 (100%) samples are having SAR less than 10 in **'Good'category**. While in deeper aquifer, 100% samples are having SAR value less than 10 in '**Good' category'**.

The classification of ground water samples based on SAR values for its suitability for irrigation purpose is shown in **Table 4.7.**

Table 4.7: Classification of Ground water for Irrigation based on SAR values

Characteristics	Quality	SAR value							
		< 10		10 to 18		18 to 26		> 26	
		Good		Good to Permissible		Doubtful		Bad (Unsuitable)	
	Total No of	No. of Samples		No. of Samples		No. of Samples		No. of Samples	
	GW samples	%		%		%		%	
Shallow Aquifer	23	23	100	0	0	0	0	0	0
Deeper Aquifer	41	41	100	0	0	0	0	0	0
Total	**64**	**64**	**100**	**0**	**0**	**0**	**0**	**0**	**0**

Residual Sodium Carbonate (RSC)

Residual Sodium Carbonate (RSC) is considered to be superior to SAR as a measure of sodacity particularly at low salinity levels. Calcium reacts with bi-carbonate and precipitate as $CaCO_3$. Magnesium salt is more soluble and so there are fewer tendencies for it to precipitate. When calcium and magnesium are lost from the water, the proportion of sodium is increased resulting in the increase in sodium hazard. This hazard is evaluated in terms of RSC. The classification of ground water samples based on RSC values for its suitability for irrigation purpose is shown in **Table 4.8.**

Table-4.8: Classification of Ground water for Irrigation based on RSC values.

Characteristics	Quality	RSC values (meq/L)					
		< 1.25		1.25-2.50		> 2.50	
		Good		Doubtful		Bad (Unsuitable)	
	Total No of GW samples	No. of Samples		No. of Samples		No. of Samples	
		%		%		%	
Shallow Aquifer	23	23	100	0	0	0	0
Deeper Aquifer	41	33	80.49	6	14.63	2	4.88
Total	**64**	**56**	**87.50**	**6.00**	**9.38**	**2.00**	**3.13**

In shallow aquifer, it is observed that the ground water of the area is suitable for irrigation as 100 % samples show RSC values less than 1.25 meq/l.

In deeper aquifer, it is observed that the ground water of the majority of the area is suitable for irrigation as 80.49 % samples show RSC values less than 1.25 meq/l. While14.63% samples shows RSC values between 1.25 to 2.50 meq/l and falls under doubtful category and 4.88% samples shows RSC values more than 2.50 meq/l at Borkheda village, Shirpur block and Varshi village, Shindkheda block - ground water around these villagesare not suitable for irrigation.

5. GROUND WATER RESOURCES

5.1 Ground Water Resources – Aquifer-I

Central Ground Water Board and Ground Water Survey and Development Agency (GSDA) have jointly estimated the ground water resources of Dhule district based on GEC-2015 methodology. Block wise ground water resources are given in **Table 5.1**, and graphical representations of the resources on the map are shown in **Figure5.1**.

Ground Water Resources estimation was carried out for 7131.67 sq. km. area out of which 490.61 sq. km. is under command area and 5930.71 sq. km. is under non-command area. As per the estimation, the net annual ground water availability comes to be 677.79 MCM. The gross draft for all uses is estimated at 363.32 MCM with irrigation sector being the major consumer having a draft of 345.45 MCM. The domestic and industrial water requirements are worked out at 21.08 MCM. The net ground water availability for future irrigation is estimated at 271.04 MCM.

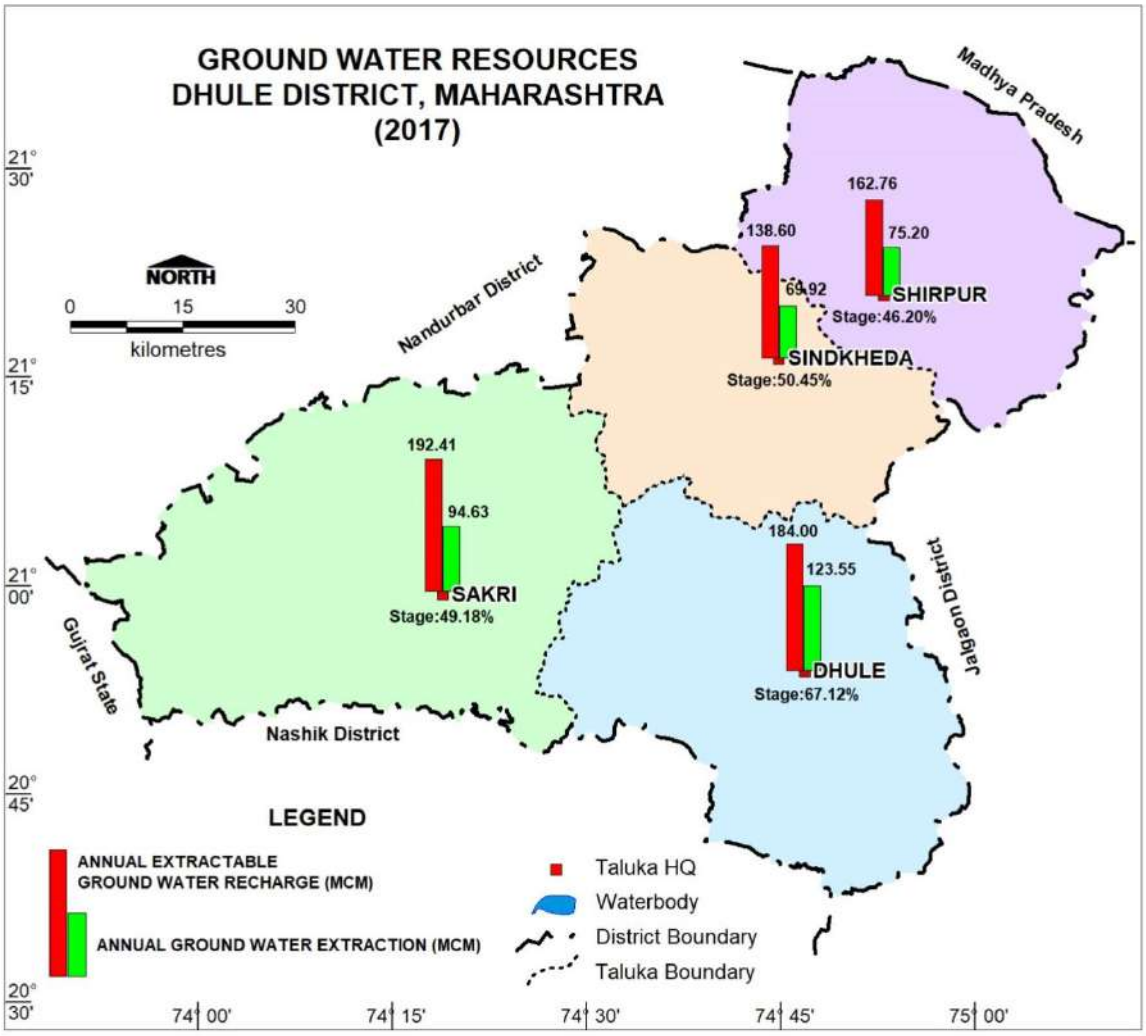


Figure 5.1: Ground Water Resources (2017), Dhule district

Table 5.1 Ground water resources, Aquifer-I (Shallow aquifer), Dhule district (In MCM)

Administrative Unit	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for irrigation	Existing Gross Ground Water Draft for domestic and industrial water supply	Existing Gross Ground Water Draft for All uses	Provision for domestic and industrial requirement supply to 2025	Net Ground Water Availability for future irrigation development	Stage of Ground Water Development %	Category
Dhule	184.0077	119.3677	4.1864	123.554	12.1435	52.3162	67.13	Safe
Sakri	192.4121	89.3751	5.2549	94.6301	18.1394	86.6770	49.18	Safe
Shirpur	162.7648	70.8414	4.3650	75.2064	19.4954	72.4279	46.21	Safe
Sindkheda	138.6034	65.8673	4.05970	69.9270	11.5187	59.6179	50.45	Safe
Total (MCM)	**677.78**	**345.45**	**21.8**	**363.31**	**61.29**	**271.03**	**53.24**	**Safe**

6. GROUND WATER RELATED ISSUES

6.1 Declining Water Levels trends

Pre monsoon ground water falling trend greater than 0.2/ year covered 26% of the area mainly in parts of all blocks in isolated patches. Area showing falling trend is 65% in the district in pre monsoon. Thus, future water conservation and artificial recharge structures in the district may be prioritized in this part of the district.

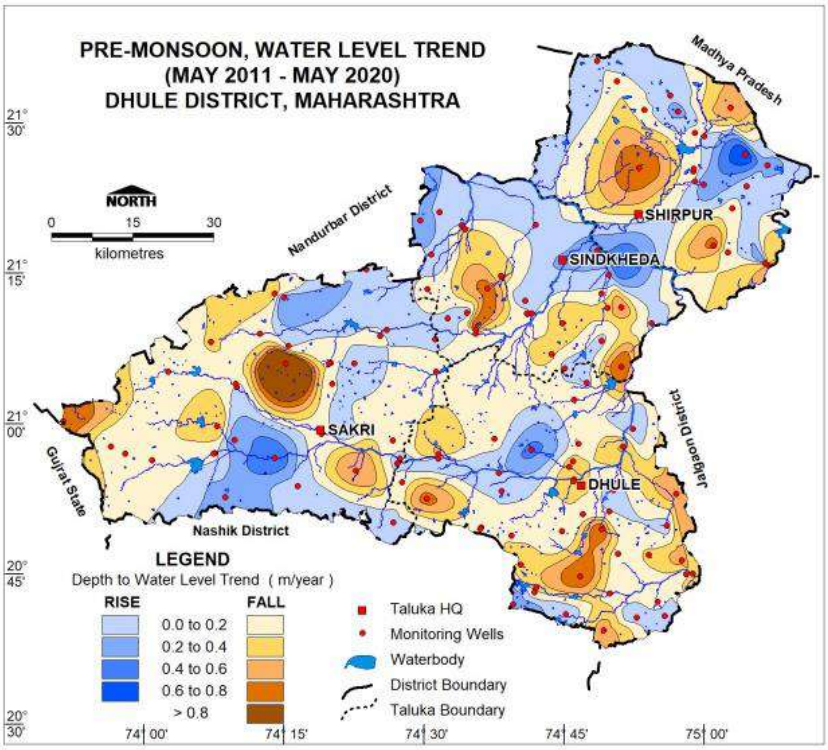
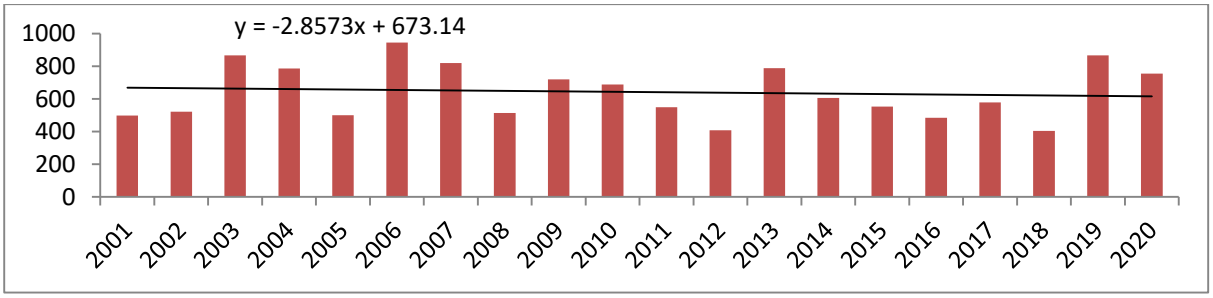


Figure 6.1: Ground water related issues

6.2 Declining Rainfall with Moderate Droughts

Based on the long-term rainfall analysis from 1998 to 2020, it is observed that Shindkheda and Shirpur Blocks experienced declining rainfall trend. Moderate droughts have been observed in all the Blocks for 2 to 6 times, severe drought conditions never experienced in any block. Declining rainfall is observed at the rate of 2.8 mm/year and probability of moderate drought is 10% in Dhule district.



6.3 Limited Ground Water Potential and Sustainability in Aquifer-I and Aquifer-II

In Shallow Aquifer (Aquifer-I), limited ground water potential is observed in 2699 Sq. Km. (about 42% area) with yield less than 15 m^3/day and sustainability of dug wells are restricted to 1 to 4 hours in the district.

In Deeper Aquifer (Aquifer-II), limited ground water potential is observed in 5515 Sq. Km. (about 85% area) with yield less than 1 lps and sustainability of bore wells are restricted to 0.5 to 3 hours in the district.

6.4 Increase in Ground Water Extraction

All the block of the district falls under the safe category in 2004-2017 (Stage of development below 67%).The stage of ground water extraction increases from 2004 to 2017 but still all the blocks falls under safe category.The stage of ground water extraction was 46.67% in 2004, and, in 2017, stage of ground water extraction was 53.24%.

7. GROUND WATER MANAGEMENT PLAN

The management plan has been proposed to manage the ground water resources and to arrest further decline in water levels. The management plan comprises two components namely supply-side management and demand side management. The supply side management is proposed based on surplus surface water availability and the unsaturated thickness of aquifer whereas the demand side management is proposed by use of micro irrigation techniques and change in cropping pattern.

7.1 Supply Side Management

The supply side management of ground water resources can be done through the artificial recharge of surplus runoff available within river sub basins and micro watersheds. Also, it is necessary to understand the unsaturated aquifer volume available for recharge. The unsaturated volume of aquifer was computed based on the area feasible for recharge, unsaturated depth below 3 mbgl and the specific yield of the aquifer. The **Table 7.1** gives the block wise volume available for the recharge.

Table 7.1: Area feasible and volume available for Artificial Recharge

Block	Geographical Area (sq. km.)	Area feasible for reacharge (Sqkm)	Unsaturated Volume (MCM)
Dhule	1983.68	1826.26	1854.04
Sakri	2309.54	1967.67	1141.57
Shirpur	1485.24	1307.79	2836.18
Sindkheda	1353.21	1319.6	2569.50
Total	**7131.67**	**6421.32**	**8401.28**

The total unsaturated volume available for artificial recharge is 8401.28 MCM and it ranges from 1141.57 MCM in Sakri block to 2836.18 MCM in Shirpur block. The available surplus runoff can be utilized for artificial recharge through construction of percolation tanks and Check dams.

The surplus water available for artificial recharge is 36.87 MCM. This surplus can be used to recharge facility through 129 Percolation Tanks, 309Check dams and 33 Recharge Shafts. The expected recharge every year from these structures is 27.65 MCM. The taluka wise details are given **Table 7.2 .**Tentative locations of these structures are given in **Figure. 7.1**and details are given in **Annexures IX** and **X**.

The rainwater harvesting in urban areas can be adopted in 50% of the household with 5.49 sq.km roof area. A total of 2.86 MCM potential can be generated by taking 80% runoff coefficient with a cost estimate of 118.65 corers. However, it is not economically viable and not recommended.

Table 7.2: Proposed Artificial Recharge Structures

Taluka	Geographical Area (Sqkm)	Area feasible for recharge (sq. km.)	Unsaturated Volume (MCM)	Surplus water available for AR (MCM)	Proposed number of structures			Total Volume of Water expected to be recharged@ 75 % efficiency (MCM)			Total recharged @ 75 % efficiency (MCM)
					PT	CD	RS	PT	CD	RS	
Dhule	1983.68	1826.26	1854.038	10.62	37	103	3	7.37	3.16	0.09	7.96
Sakri	2309.54	1967.67	1141.566	8.55	30	85	0	5.99	2.57	0.00	6.41
Shirpur	1485.24	1307.79	2836.18	7.54	26	42	18	4.57	1.96	1.02	5.66
Sindkheda	1353.21	1319.6	2569.5	10.16	36	79	12	6.63	2.84	0.69	7.62
Total	7131.67	6421.32	8401.284	36.87	129	309	33	24.55	10.52	1.80	**27.65**

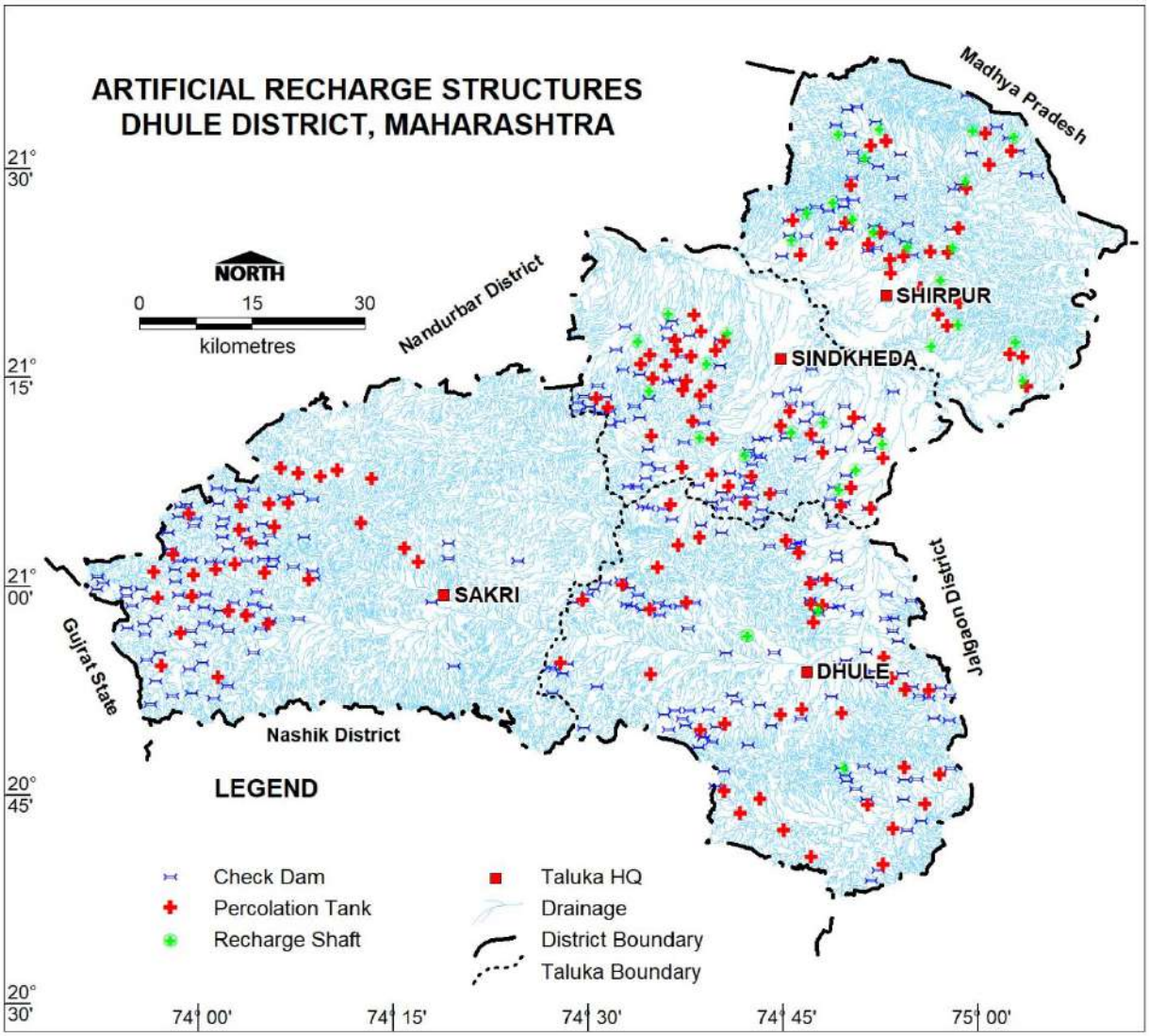


Figure 7.1: Location of Proposed Artificial Recharge structures

7.2 Demand Side Management

The Demand Side Management is proposed in areas where the stage of ground water development is relatively high and adopting micro-irrigation techniques for water intensive crops or change in cropping pattern or both are required to save water.

Table 7.3 Demand side interventions proposed

Taluka	**Sugarcane crop area under ground water irrigation (100% ground water irrigated area proposed to be covered under Drip)**	**Volume of Water expected to be saved (MCM). Surface Flooding req- 2.45 m. Drip Req. - 1.88, WUE- 0.57 m**	**Total water saved**
	(sq.km.)		**(MCM)**
Dhule	0.13	0.07	0.07
Sakri	11.65	6.64	6.64
Shirpur	6.30	3.59	3.59
Sindkheda	9.43	5.38	5.38
Total	**27.51**	**15.68**	**15.68**

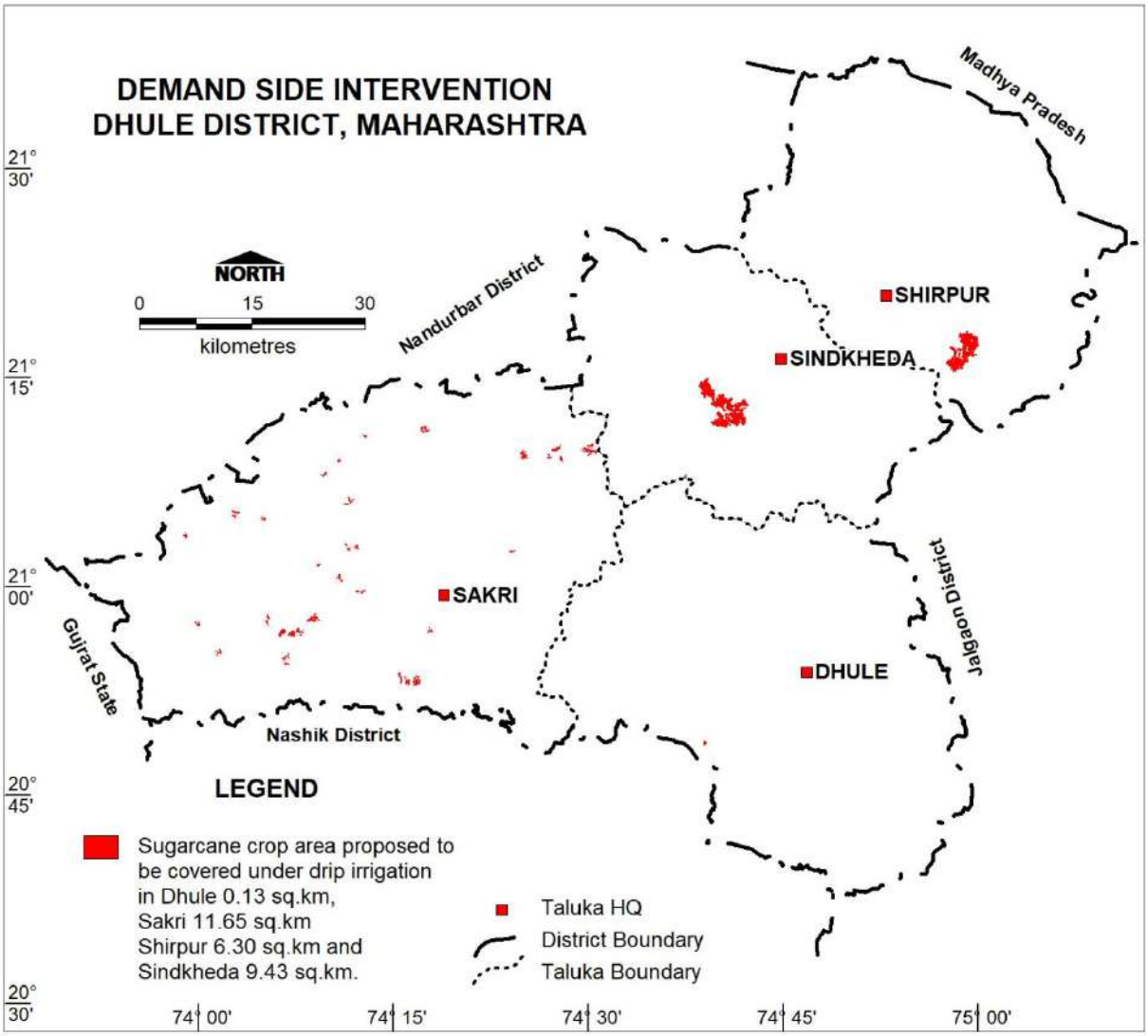


Figure 7.2: Location of Proposed Demand side interventions

7.3 Expected Benefits

The impact of groundwater management plans on the groundwater system in the district after its implementation is evaluated and the outcome shows significant improvement in groundwater scenario in all Blocks as given in the **Table 7.4.**

Table 7.4: Expected benefits after management options

Block	Water expected to be recharged/ conserved by supply side interventions (MCM)	Ground water resources after supply side management (MCM)	Stage of GWD after supply side side interventions (%)	Water expected to be saved by Demand side interventions (MCM)	Ground water Extraction after demand side intervention (MCM)	Stage of GWD after supply side and demand side interventions (%)	Balance GWR available for GW Development to enhance stage of GWD is brought to 70% (MCM)	Additional Area (sq.km.) proposed to be brought under assured GW irrigation with av. CWR of 0.65 m after 70% stage of GWD is achieved (Sq.Km)
Dhule	7.96	191.97	64.36	0.07	123.48	64.32	10.9	16.77
Sakri	6.41	198.82	47.60	6.64	87.99	44.26	51.19	78.75
Shirpur	5.66	168.42	44.65	3.59	71.62	42.52	46.28	71.2
Sindkheda	7.62	146.22	47.82	5.38	64.55	44.15	37.81	58.17
Total	**27.65**	**705.44**	**51.50**	**15.68**	**347.64**	**49.28**	**146.18**	**224.89**

The total ground water resource available after supply side intervention is705.44 MCM whereas the total ground water draft after demand side intervention is 347.64 MCM. Thus about 146.18 MCM of ground water is available to bring stage of ground water development to 70%. With this, additional area of 224.89 sq.km can be irrigated. Tentative locations of these areas are shown in Figure 7.3.

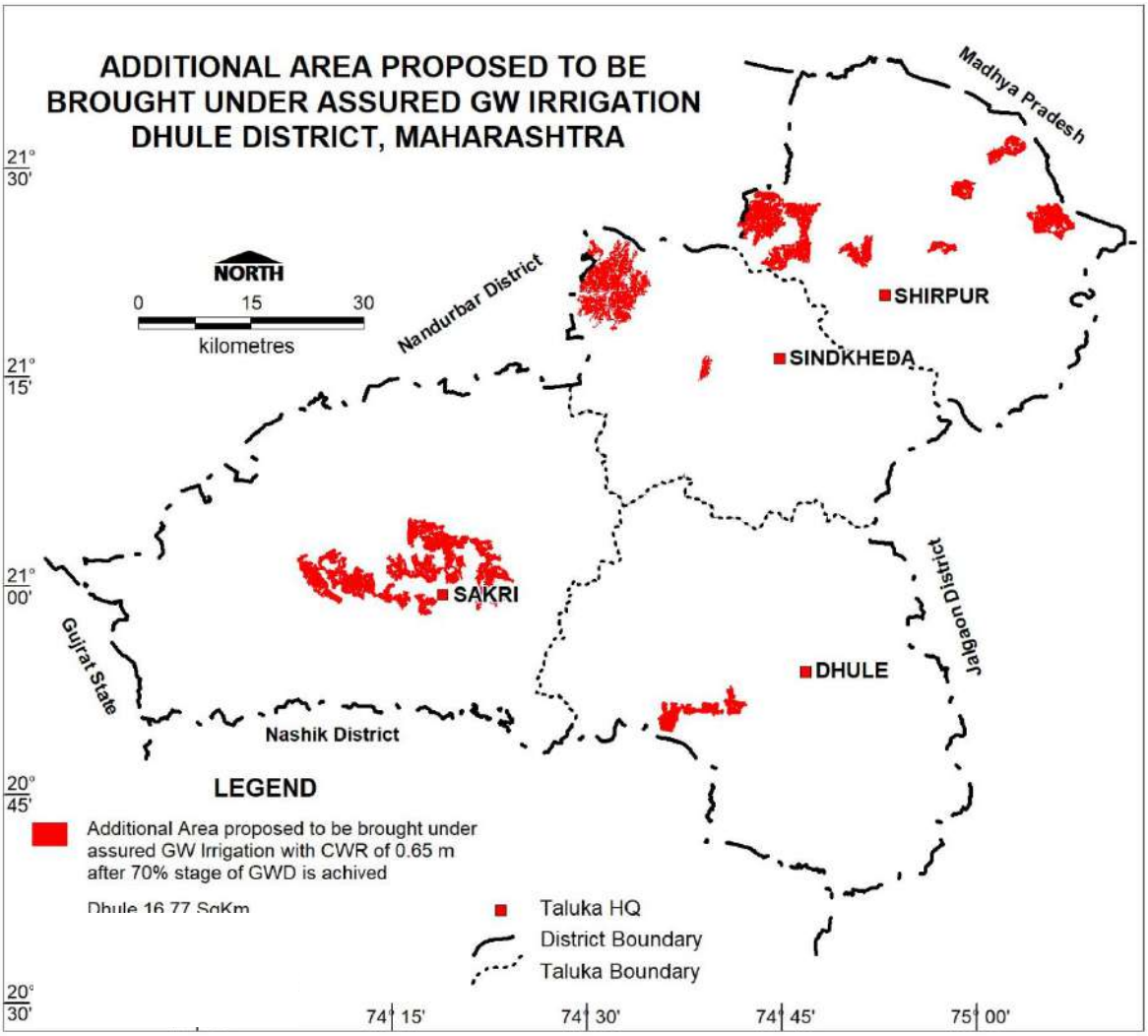


Figure 7.3: Additional area Proposed to be bought under Assured GW irrigation.

7.4 Development Plan

Since additional ground water to the tune of 146.18 MCM is available for irrigating the additional area, a number of wells can be constructed. 90% of this water is proposed for constructing dugwells and remaining 10% for borewells. Thus about 8771 dugwells and 1462 borewells can be constructed. The block wise details are given in **Table 7.5.**

Table 7.5: Block wise additional area wells proposed

Block	Balance GWR available for GW Development after STAGE OF GWD is brought to 70% (MCM)	Proposed No. of DW @1.5 ham for 90% of GWR Available)	Proposed No. of BW @1.0 ham for 10% of GWR Available)
Dhule	10.9	654	109
Sakri	51.19	3071	512
Shirpur	46.28	2777	463
Sindkheda	37.81	2269	378
Total	**146.18**	**8771**	**1462**

8. SUM UP

The highly diversified occurrence and considerable variations in the availability and utilization of groundwater makes its management a challenging task. Scientific development and management strategy for groundwater has become imperative to avert the looming water crisis. In this context, various issues such as, prioritization of areas for development of groundwater resources vis-a-vis its availability, augmentation of groundwater through rainwater harvesting and artificial recharge, pricing and sectoral allocation of resources and participation of the stakeholders must be considered. In view of the above, the present study area a systematic, economically sound and politically feasible framework for groundwater management is required.

A thorough study was carried out based on data gap analysis, data generated in-house; data acquired from State Govt. departments and GIS maps prepared for various themes. All the available data was brought on GIS platform and an integrated approach was adopted for preparation of block wise aquifer maps and aquifer management plans of Dhule district.

Geographically, Dhule district covers an area of 7195 Sq km, out of this 2088.90sq km (29.90%) area is occupied by forest. Geologically, the area is occupied by Basalt and Alluvium formations. The stage of ground water development is 53.24 % and all blocks are categorized as safe.The area has witnessed droughts; declining water level and low yield potential of aquifers are the major issues in the district. Declining water level trend between 0.000606 -0.93928 m/year has been observed in 42 stations during post monsoon. Declining water level trend of between 0.00036-1.595962 m/yearhas been observed in 47 stations during pre-monsoon.

The management plan has been proposed to manage the ground water resources and to arrest further decline in water levels. The management plan comprises two components namely supply-side management and demand side management.

The total unsaturated volume available for artificial recharge is 8401.28 MCM and it ranges from 1141.57 MCM in Sakri block to 2836.18 MCM in Shirpur block. The available surplus runoff can be utilized for artificial recharge through construction of percolation tanks and Check dams. The surplus water available for artificial recharge is 36.87 MCM. This surplus can be used to recharge facility through 129 Percolation Tanks,309 Check dams and 33 Recharge shafts.The expected recharge every year from these structures is 27.65 MCM.

The demand side management can be implemented through the micro-irrigation techniques. It is proposed to be adopted drip irrigation in about 27.51 sq. km sugarcane areas in the district. With this about 15.68 MCM of ground water can be saved.

With supply side and demand side interventions, it is expected that about 146.18 MCM of ground water would be available to bring stage of ground water development to 70%. With this, additional area of 224.89 sq.km can be irrigated through additional 8771 dugwells and 1462 borewells.

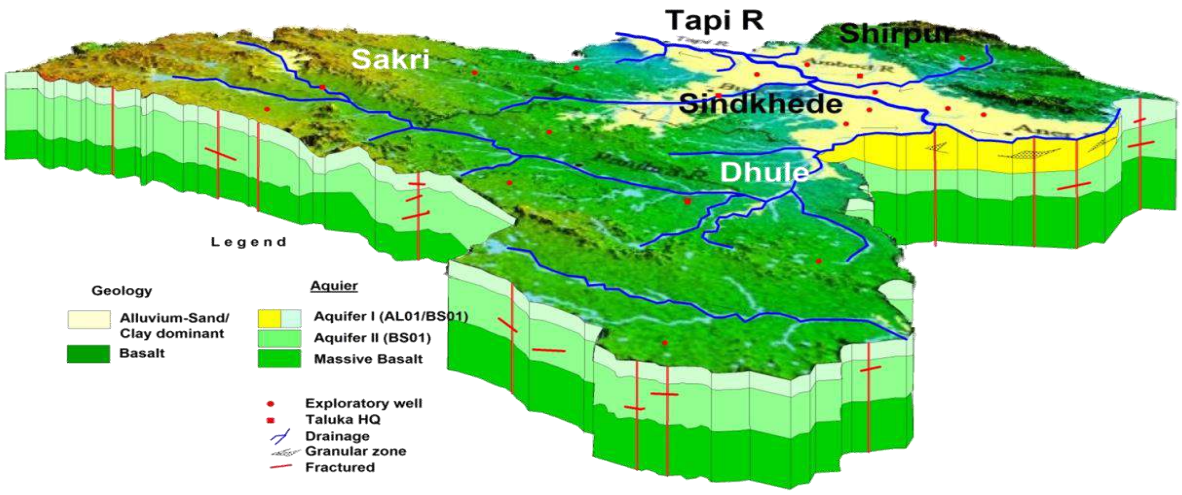
Thus, the focus of proposed management plan was to use ground water very effectively with supply and demand side interventions. The perusal of above ground water management plan lays stress on adopting micro-irrigation techniques and artificial recharge measures.Considering the low stage of ground water,developments in the district demand side interventions have not been proposed. However, this is the right time to further enhance the micro irrigation practices in the selected areas to manage the resources perceiving the future demand of resources.

These interventions also need to be supported by regulation for deeper aquifer and hence it is recommended to regulate/ban deeper tubewells/borewells of more than 60 m depth in these Blocks, so that the deeper ground water resources are protected for future generation and also serve as ground water sanctuary in times of distress/drought. IEC activities and capacity building activities needs to

be aggressively propagated to establish the institutional framework for participatory ground water management.

Roof top Rainwater harvesting is not recommendedas it is economically not viable.

Aquifer Management Plan



Probable benefits after implementing Management Plan

- Additional area under Assured Ground Water Irrigation- 224.89 Sq Km by constructing 8771 dug wells and 1462 bore wells.
- Increase /Savings of 43.33 MCM in GWR from 677.79 MCM to 721.12 MCM with Supply side and Demand Side Interventions.
- Increase in SOE from 53.60% to 70% can trigger socio-economic development in the region.

Annexures

Annexure-I: Salient Features of Ground Water Exploration

Annexure-II: Aquifer I depth to water level details in Dhule district

Annexure-III A: Aquifer II depth to water level details in Dhule district

Annexure-III B: Aquifer II depth to water level details in Dhule district

Annexure-IV: Soil Infiltration test data

Annexure-V: Water Level trend (2011-2020)

Annexure-VI: Aquifer I Chemical analysis of ground water samples

Annexure-VII: Aquifer II Chemical analysis of ground water samples

Annexure-VIII: **Location of proposed Percolation tanks in Dhule district**

Annexure-IX: Location of proposed check dams in Dhule district

Annexure-X: Location of proposed Recharge shaft in Dhule district

Annexure-I: Salient Features of Ground Water Exploration

Sr No	Agency	Taluka	Village	Long	Lat	Altitude (m)	Year	Type of well	Geology	Aquifer	Dilling-depth (m)	Const-depth (m)	Casing (mbgl)	AQ-Zones (m)	SWL (mbgl)	PYT-discharge (lps)	AQ_IA	AQ-I	AQ-II	Massive	Aquifer Thickness
1	CGWB	Dhule	Ambode	74.8994	20.9105	254	2017-18	EW	Basalt	WB	200	-	5.5	5.50-7.40	-	Traces / Dry	0	15	90	200	1
2	CGWB	Dhule	Dusane	74.4337	21.1574	340.2	2017-18	EW	Basalt	FMB	200	-	30	153.00-154,.00	-	Traces / Dry	0	25	154	200	1
3	CGWB	Dhule	Kawathi	74.5928	20.9594	347.7	2017-18	EW	Basalt	MB	200	-	30	No water Bearing Zone encountered	-	-	0	24	45	200	0.5
4	CGWB	Dhule	Nimdale	74.68	20.95	339	2017-18	EW	Basalt	FMB	200	-	18	167-169	19.95	0.78	0	18	169	200	2
5	CGWB	Sakri	Ambapur	74.3278	21.0223	487.3	2017-18	EW	Basalt	WB	200	-	30	16.80 – 19.80	-	Traces / Dry	0	20	70	200	1
6	CGWB	Sakri	Junwane	74.84	20.7592	342.9	2017-18	EW	Basalt	WB	200	-	30	19.60-22.60	--	Traces / Dry	0	24	79	200	1
7	CGWB	Sakri	Raikot	74.1002	21.1427	630	2017-18	EW	Basalt	FMB	200	-	30	40.90 - 44.00 ,178.20 – 181.20	> 100	0.14	0	27	181	200	1
8	CGWB	Sakri	Waki	74.0345	20.9607	592.1	2017-18	EW	Basalt	FB	200	-	11.5	123.00-126.00	65.7	0.78	0	15	126	200	2
9	CGWB	Sakri	Waki PZ	74.0345	20.9607	592.1	2017-18	PZ	Basalt	WB	37.9	-	17.5	10.40-13.50	4.21	0.14					
10	CGWB	Shirpur	Bhoiti	75.148	21.392						195	-	-				0	25	143	195	3

11	CGWB	Shirpur	kodid	74.848	21.559						110	-	-				0	13	70	110	3
12	CGWB	Shirpur	Sevalda	74.8556	21.2861	152.3					50	-	-				50	0	76	130	9
13	CGWB	Shirpur	Borkheda	74.9875	21.3083	200	1986-87	EW	Alluvium	Sand/ Kankar	104.25	72.5	-	72 -75 ,78 -81	30	2	72.5	0	81	105	6
14	CGWB	Shirpur	Borkheda	74.9875	21.3083	200	1986-87	OW	Alluvium	Sand/ Kankar	98	-	-	70 -80	30	1.5	72.5	0			
15	CGWB	Shirpur	Klamsare	74.9125	21.3458	164	1986-87	EW	Alluvium	Sand/ Kankar	92.74	41.5	-	41 -48 ,61 -74	16.34	5	41	0	74	140	6
16	CGWB	Shirpur	Klamsare	74.9125	21.3458	164	1986-87	OW	Alluvium	Sand/ Kankar	80	-	-	41 -46 ,66 -74	16.33	-	41	0			
17	CGWB	Shirpur	Arthe (KH)	74.8222	21.4	164	1987-88	EW	Alluvium	Sand	82	40.5	-	40 -50 ,73.07 -77	15.9	6	40.5	0	77	82	6
18	CGWB	Shirpur	Arthe (KH)	74.8222	21.4	164	1987-88	OW	Alluvium	Sand	80	40.5	-	40 -46.5 ,58.5 -61.5	15.55	-	40.5	0			
19	CGWB	Shirpur	Tarhadi	74.7042	21.4167	145	1987-88	EW	Alluvium	Sand	41.1	30.5	-	30 -46 ,58 -62	-	2.5	30.5	0	-	-	
20	CGWB	Shirpur	June Bhamte	74.7722	21.4278		1987-88	EW	Alluvium	Sand/gravel	74.67	73		26-29, 52.50-56, 69.50-72.50	16.1	2	73	0	-	-	

21	CGWB	Shirpur	Nave Bhamte	74.775	21.4169 4		1987-88	EW	Alluvium	Sand/gravel	73.86	68.5		28-34, 37.50-41, 64-68	21.3	1.5	68.5	0	-	-	
22	CGWB	Shirpur	Varul	74.7388 9	21.4055 6		1987-88	EW	Alluvium	Sand/gravel	38.92	38.5		26-30, 32-38	21.3	2.5	38.5	0	-	-	
23	CGWB	Shirpur	Rudawali	74.7972 2	21.3361 1		1987-88	EW	Alluvium	Sand/gravel	39	38.5		32-38	23.7	5.5	38.5	0	-	-	
24	CGWB	Shirpur	Vanaval	74.8138 9	21.3336 1		1987-88	EW	Alluvium	Sand/gravel	37.98	37.5		31-37	19.5	6	37.5	0	-	-	
25	CGWB	Shirpur	Untawad	74.8625	21.325		1987-88	EW	Alluvium	Sand/gravel	51	50		29-43, 46-49.50	20.45	4	50	0	-	-	
26	CGWB	Shirpur	Ajanda Khurd	74.9097 2	21.3416 7		1987-88	EW	Alluvium	Sand/gravel	48.97	48.5		29-36, 42-48	15.5	4.5	48.5	0	-	-	
27	CGWB	Shirpur	Kalamsare	74.9131	21.3333	164.3	1997-98	PZ	Alluvium		60	-	-	43 -45 ,47 -50		17.55	-	0	-	-	
28	CGWB	Shirpur	Manjrod	74.9856	21.2208	159.5	2011-12	EW	Basalt	FB	250	-	49	102-105	29.25	0.067	49	0	105	250	1
29	CGWB	Shirpur	Tarhadi T.T.	74.7	21.4011	132.3	2012-13	EW	Basalt	FB	245	-	44.5	123.50-126.50, 147.90-150.90	>100	0.78	45	0	151	245	12
30	CGWB	Shirpur	Vikharan	74.7919	21.4128	162.3	2012-13	EW	Basalt	FB	233.3	-	80.5	80.5,169.20-172.30,196.70-199.70		3.17	80	0	199	233.3	12
31	CGWB	Shirpur	Vikharan	74.7919	21.4128	162.3	2012-13	OW	Basalt	FB	212	-	80	80 ,163.10-166.20,199.70-202.80		3					

32	CGWB	Shirpur	Boradi EW	74.8977 78	21.5231 1	310	2020-21	EW	Basalt	FMB	200	_	11.5	123.50-126.50	>100	meager	_	12	127	200	1
33	CGWB	Shirpur	Chillare EW	75.0182 7	21.3905 4	236	2020-21	EW	Basalt	VB	200	_	11.5	108.20-111.30	77.5	0.14	_	12	112	200	2
34	CGWB	Shirpur	Panakhed EW	75.0189 6	21.5011 5	268	2020-21	EW	Basalt	FMB	200	_	17.5	13.70-16.70, 71.60-74.60, 138.70-141.80	25.9	3.77	_	18	142	200	6
35	CGWB	Shirpur	Panakhed OW	75.0188 9	21.5010 5	268	2020-21	OW	Basalt	FMB	172.3	_	17.5	13.70-16.70, 71.60-74.60, 138.70-141.80	25.9	5.94	_	18	142	200	6
36	CGWB	Shirpur	Varzadi EW	74.9075 4	21.4162 8	221	2020-21	EW	Basalt	FMB	154	_	11.5	65.50-68.60, 144.80-147.90	56	12.18	_	12	148	154	3
37	CGWB	Shirpur	Varzadi OW	74.9074 8	21.4161 6	221	2020-21	OW	Basalt	FMB	154	_	11.5	62.50-65.50,144.80-147.90, 153-154	56	9.84	_	12	154		3
38	CGWB	Sindkheda	Chilane	74.6808	21.3308	147.1	2011-12	EW	Basalt	FMB	212	_	12	96-99,123-126,184-187	87.5	0.78	15	0	187	212	1
39	CGWB	Sindkheda	Doul	74.5811	21.3578	146.5	2011-12	EW	Basalt	FMB	218	_	21	24.40-27.30	18.4	Traces	25	0	70	218	1
40	CGWB	Sindkheda	Takarkheda	74.5267	21.4217	130	2011-12	EW	Basalt	FMB	156	_	34	65.50-68.60, 144.80-147.90	>77		25	0	148	156	6
41	CGWB	Sindkheda	Varshi	74.8278	21.2478	151.8	2011-12	EW	Basalt	FB	215	_	15	41.10-44.20	7.4	Traces	15	0	70	215	3
42	CGWB	Sindkheda	Bhadne EW	74.6904 7	21.2494 3	184	2020-21	EW	Basalt	FMB	200	_	11.5	56.40-59.40, 178.40-181.40	35.75	4.43	_	12	182	200	3

43	CGWB	Sindkheda	Bhadne OW	74.6903	21.2491	184	2020-21	OW	Basalt	FMB	200	–	11.5	56.40-59.40, 178.40-181.40	35.4	5.94	–	12	182	200	3
44	CGWB	Sindkheda	Vitai EW	74.8013	21.1632	200	2020-21	EW	Basalt	FMB	200	–	11.5	169.20-172.30	>100	meager	–	12	173	200	1
45	CGWB	Sindkheda	Warud EW	74.8462	21.1828	178	2020-21	EW	Basalt	FMB	200	–	11.5	25.90-28.90		meager	–	12	60	200	1

Annexure-II: Aquifer I depth to water level details in Dhule district

Sr. No.	District	Taluka	Village	Lattitiude	Longitude	WL_May_2020	WL_Nov_2020	Fluctuation (m)
1	Dhule	Dhule	Achande	20.830556	74.933333	5.8	2.10	3.70
2	Dhule	Dhule	Ajanle	20.827778	74.602222	3.8	2.50	1.30
3	Dhule	Dhule	Avadhan	20.9375	74.765556	8	2.70	5.30
4	Dhule	Dhule	Babre	20.772778	74.959722	8.7	1.50	7.20
5	Dhule	Dhule	Bendrepada	20.7	74.658333	3.9	0.80	3.10
6	Dhule	Dhule	Borkund	20.854167	74.830556	1.5	0.50	1.00
7	Dhule	Dhule	Borvihir	20.783333	74.845833	3.6	1.10	2.50
8	Dhule	Dhule	Deur bk	20.902222	74.460278	8.5	6.80	1.70
9	Dhule	Dhule	Dhule	20.907222	74.767778	8.5	5.90	2.60
10	Dhule	Dhule	Fagane	20.891944	74.836111	4.6	1.50	3.10
11	Dhule	Dhule	Hendrun	20.745833	74.778333	8	1.20	6.80
12	Dhule	Dhule	Japi	20.9625	74.854722	6.8	5.00	1.80
13	Dhule	Dhule	Khede	20.917778	74.633333	9.1	6.50	2.60
14	Dhule	Dhule	Khordad	20.704167	74.916667	5	2.90	2.10
15	Dhule	Dhule	Kulthe	20.683333	74.752778	2	1.00	1.00
16	Dhule	Dhule	Mehergaon	20.975	74.625	5.3	0.50	4.80

17	Dhule	Dhule	Mordad	20.680556	74.929167	2.5	2.30	0.20
18	Dhule	Dhule	Nandale bk	20.656944	74.820833	6.5	1.80	4.70
19	Dhule	Dhule	Nandre	20.875	74.504444	12.8	10.00	2.80
20	Dhule	Dhule	Ner	20.941667	74.525	5.5		
21	Dhule	Dhule	Nimdale	20.956667	74.691111	3.8	0.50	3.30
22	Dhule	Dhule	Nimgul	20.750556	74.979167	9.8	7.60	2.20
23	Dhule	Dhule	Pur (Purmepada)	20.719444	74.697222	6.3	4.20	2.10
24	Dhule	Dhule	Sadgaon	20.813889	74.655556	7	2.00	5.00
25	Dhule	Dhule	Sarwad	21.04	74.767778	5.2	4.50	0.70
26	Dhule	Dhule	Sonewadi	20.765833	74.672778	5.7	1.70	4.00
27	Dhule	Dhule	Songir	21.068056	74.79	5.7	1.90	3.80
28	Dhule	Dhule	Tarwade	20.678056	74.879722	2.5	1.30	1.20
29	Dhule	Dhule	Udane	20.888333	74.638333	5	1.60	3.40
30	Dhule	Dhule	Vani kh	20.749444	74.967222	9.3	1.00	8.30
31	Dhule	Dhule	Velhane bk	20.781944	74.901111	9.7	0.90	8.80
32	Dhule	Dhule	Vishvanath	20.991667	74.872222	2.5	1.70	0.80
33	Dhule	Dhule	Walwadi	20.927778	74.758333	5.3	4.00	1.30
34	Dhule	Sakri	Aichale	21.256944	74.397222	5.9	3.90	2.00

35	Dhule	Sakri	Akkalpada	20.941667	74.456944	4.6	3.40	1.20
36	Dhule	Sakri	Basaraval	20.971944	73.913333	7.2	0.10	7.10
37	Dhule	Sakri	Bhamer	21.066667	74.336111	7.1	1.52	5.58
38	Dhule	Sakri	Brahmanwell	21.15	74.206667	6.8	2.30	4.50
39	Dhule	Sakri	Chadwel Korde	21.209722	74.249722	5	1.00	4.00
40	Dhule	Sakri	Chail	20.895833	74.275	1.9	0.10	1.80
41	Dhule	Sakri	Chinchkheda	20.933889	74.451944	8.7	6.40	2.30
42	Dhule	Sakri	Dahivel	21.061111	74.165278	8.3	5.90	2.40
43	Dhule	Sakri	Dhamnar	20.922222	74.378333	8.4	7.00	1.40
44	Dhule	Sakri	Domkani	21.095833	74.256111	4.4	1.60	2.80
45	Dhule	Sakri	Dusane	21.155556	74.433333	4.5	0.60	3.90
46	Dhule	Sakri	Jebapur	20.996389	74.125	9.3	3.70	5.60
47	Dhule	Sakri	Khampada	20.92	74.054444	3.3	2.00	1.30
48	Dhule	Sakri	Kudashi	20.939444	74.015278	10	2.50	7.50
49	Dhule	Sakri	Lagadwal	21.136111	74.119444	5.2	0.50	4.70
50	Dhule	Sakri	Lonkhede	21.086111	74.521667	5	2.00	3.00
51	Dhule	Sakri	Mahir	20.988889	74.402778	7.5	2.50	5.00
52	Dhule	Sakri	Nizampur	21.101389	74.333333	5.1	1.80	3.30
53	Dhule	Sakri	Phopare	21.140278	74.519444	4.9	2.00	2.90

54	Dhule	Sakri	Pimpalner	20.951111	74.126389	3	1.40	1.60
55	Dhule	Sakri	Rojgaon	21.1	74.375	2.2	0.50	1.70
56	Dhule	Sakri	Sakri	20.984444	74.317778	7.2	1.70	5.50
57	Dhule	Sakri	Samode	20.967222	74.1475	6.1	1.40	4.70
58	Dhule	Sakri	Sayane	20.9425	74.233333	3.5	1.60	1.90
59	Dhule	Sakri	Shelbari	20.878333	74.145556	3.6	1.10	2.50
60	Dhule	Sakri	Shevali (R)	20.835556	74.445	4.5	3.00	1.50
61	Dhule	Sakri	Shevali da	20.991667	74.355556	8.8	6.50	2.30
62	Dhule	Sakri	Sutare	21.086111	74.043056	3.8	10.66	-6.86
63	Dhule	Sakri	Umarpata	20.961944	73.941667	6.2	0.20	6.00
64	Dhule	Sakri	Vaskhedi	21.129167	74.258333	4.3	0.40	3.90
65	Dhule	Shindkheda	Betawad	21.166667	74.905556	10.5	9.00	1.50
66	Dhule	Shindkheda	Chimthane	21.183333	74.691667	8.4	6.70	1.70
67	Dhule	Shindkheda	Dabhashi	21.265278	74.845833	17	16.00	1.00
68	Dhule	Shindkheda	Dangurne	21.116111	74.727778	7.3	0.70	6.60
69	Dhule	Shindkheda	Degaon	21.183889	74.576389	4.1	0.50	3.60
70	Dhule	Shindkheda	Dhavde	21.3375	74.493056	11	10.00	1.00
71	Dhule	Shindkheda	Dondaicha	21.33	74.566667	8.6	6.00	2.60
72	Dhule	Shindkheda	Kalmadi	21.1375	74.816667	6	2.50	3.50

73	Dhule	Shindkheda	Karle	21.223889	74.506111	7	0.10	6.90
74	Dhule	Shindkheda	Khalane	21.166667	74.747222	9.7	11.00	-1.30
75	Dhule	Shindkheda	Malpur	21.281389	74.512222	7	4.50	2.50
76	Dhule	Shindkheda	Methi	21.243889	74.638889	7.5	4.57	2.93
77	Dhule	Shindkheda	Nardane	21.1925	74.827222	9	4.50	4.50
78	Dhule	Shindkheda	Salve	21.204167	74.68	4.3	1.60	2.70
79	Dhule	Shindkheda	Satare	21.175	74.541667	8	1.00	7.00
80	Dhule	Shindkheda	Shevade	21.15	74.591667	6	0.10	5.90
81	Dhule	Shindkheda	Shindkheda	21.272778	74.75	14.4	10.00	4.40
82	Dhule	Shindkheda	Sondale	21.091944	74.750556	5.4	1.80	3.60
83	Dhule	Shindkheda	Sukvad	21.2875	74.808333	9	8.00	1.00
84	Dhule	Shindkheda	Takarkhede	21.351389	74.527778	18	16.50	1.50
85	Dhule	Shindkheda	Varshi	21.247222	74.829167	6	5.10	0.90
86	Dhule	Shindkheda	Varud	21.193056	74.851944	6.2	2.00	4.20
87	Dhule	Shindkheda	Varzadi	21.222222	74.606667	7.6	5.00	2.60
88	Dhule	Shindkheda	Virdel	21.330556	74.698611	13.6	9.80	3.80
89	Dhule	Shindkheda	Waghadi Kh	21.090556	74.810833	5.7	0.80	4.90
90	Dhule	Shirpur	Ajnad	21.284722	75.041667	7	6.30	0.70
91	Dhule	Shirpur	Ambe	21.429167	75.1125	5.5	1.80	3.70

92	Dhule	Shirpur	Boradi	21.522222	74.893056	6.8	1.60	5.20
93	Dhule	Shirpur	Dahivad	21.338889	74.944444	6		
94	Dhule	Shirpur	Dondwade	21.519444	74.952778	2.8	3.35	-0.55
95	Dhule	Shirpur	Fattepur	21.397222	74.998611	5.7	1.60	4.10
96	Dhule	Shirpur	Gadhaddev	21.602778	74.808333	2.1	0.10	2.00
97	Dhule	Shirpur	Hadakhed	21.419444	74.980556	5.8	1.10	4.70
98	Dhule	Shirpur	Higaon	21.405556	75.156944	13	11.20	1.80
99	Dhule	Shirpur	Khambale	21.447778	75.072222	5.6	0.50	5.10
100	Dhule	Shirpur	Kodid	21.569444	74.844444	6.3	1.00	5.30
101	Dhule	Shirpur	Nimzari	21.427222	74.889444	5	1.20	3.80
102	Dhule	Shirpur	Palasner	21.358333	75.05	6.1	3.20	2.90
103	Dhule	Shirpur	Sangavi	21.478056	75	6.4	2.50	3.90
104	Dhule	Shirpur	Sule	21.403333	74.983611	10.3	8.70	1.60
105	Dhule	Shirpur	Tardi	21.394444	75.075	14	12.60	1.40
106	Dhule	Shirpur	Tonde	21.2625	75.114722	17.8	15.30	2.50
107	Dhule	Shirpur	Umarde	21.545833	74.938889	3.4	2.40	1.00

Annexure-III A: Aquifer II depth to water level details in Dhule district

Sr No	Agency	Taluka	Village	X Long	Y Lat	Altitude (m)	Type of well	Aquifer	Drilling-depth (mbgl)	Const-depth (m)	Casing (mbgl)	AQ-Zones	Pre SWL
1	CGWB	Dhule	Ambode	74.8994	20.9105	254	EW	Basalt	200	-	5.5	5.50-7.40	35
2	CGWB	Dhule	Dusane	74.4337	21.1574	340.2	EW	Basalt	200	-	30	153.00-154,.00	55
3	CGWB	Dhule	Kawathi	74.5928	20.9594	347.7	EW	Basalt	200	-	30	No water Bearing Zone encountered	70
4	CGWB	Dhule	Nimdale	74.68	20.95	339	EW	Basalt	200	-	18	167-169	28
5	CGWB	Sakri	Ambapur	74.3278	21.0223	487.3	EW	Basalt	200	-	30	16.80 – 19.80	32
6	CGWB	Sakri	Junwane	74.84	20.7592	342.9	EW	Basalt	200	-	30	19.60-22.60	32
7	CGWB	Sakri	Raikot	74.1002	21.1427	630	EW	Basalt	200	-	30	40.90 - 44.00 ,178.20 – 181.20	77
8	CGWB	Sakri	Waki	74.0345	20.9607	592.1	EW	Basalt	200	-	11.5	123.00-126.00	65.7
9	CGWB	Sakri	Waki PZ	74.0345	20.9607	592.1	PZ	Basalt	37.9	-	17.5	10.40-13.50	65.7
10	CGWB	Shirpur	Bhoiti	75.148	21.392				195	-	-		21
11	CGWB	Shirpur	kodid	74.848	21.559				110	-	-		35
12	CGWB	Shirpur	Sevalda	74.8556	21.2861	152.3			50	-	-		15
13	CGWB	Shirpur	Borkheda	74.9875	21.3083	200	EW	Alluvium	104.25	72.5	-	72 -75 ,78 -81	35
14	CGWB	Shirpur	Borkheda	74.9875	21.3083	200	OW	Alluvium	98	72.5	-	70 -80	35

15	CGWB	Shirpur	Klamsare	74.9125	21.3458	164	EW	Alluvium	92.74	41.5	-	41 -48 ,61 -74	28
16	CGWB	Shirpur	Klamsare	74.9125	21.3458	164	OW	Alluvium	80	41.5	-	41 -46 ,66 -74	28
17	CGWB	Shirpur	Arthe (KH)	74.8222	21.4	164	EW	Alluvium	82	40.5	-	40 -50 ,73.07 -77	28
18	CGWB	Shirpur	Arthe (KH)	74.8222	21.4	164	OW	Alluvium	80	40.5	-	40 -46.5 ,58.5 - 61.5	28
19	CGWB	Shirpur	Tarhadi	74.7042	21.4167	145	EW	Alluvium	41.1	30.5	-	30 -46 ,58 -62	70
20	CGWB	Shirpur	Kalamsare	74.9131	21.3333	164.3	PZ	Alluvium	60	-	-	43 -45 ,47 -50	28
21	CGWB	Shirpur	Manjrod	74.9856	21.2208	159.5	EW	Basalt	250	-	49	102-105	32
22	CGWB	Shirpur	Tarhadi T.T.	74.7	21.4011	132.3	EW	Basalt	245	-	44.5	123.50-126.50, 147.90-150.90	70
23	CGWB	Shirpur	Vikharan	74.7919	21.4128	162.3	EW	Basalt	233.3	-	80.5	80.5,169.20-172.30,196.70-199.70	25
24	CGWB	Shirpur	Vikharan	74.7919	21.4128	162.3	OW	Basalt	212	-	80	80 ,163.10-166.20,199.70-202.80	25
25	CGWB	Sindkheda	Chilane	74.6808	21.3308	147.1	EW	Basalt	212	_	12	96-99,123-126,184-187	87.5
26	CGWB	Sindkheda	Doul	74.5811	21.3578	146.5	EW	Basalt	218	_	21	24.40-27.30	25
27	CGWB	Sindkheda	Takarkheda	74.5267	21.4217	130	EW	Basalt	156	_	34	65.50-68.60, 144.80-147.90	77
28	CGWB	Sindkheda	Varshi	74.8278	21.2478	151.8	EW	Basalt	215	_	15	41.10-44.20	21
29	GSDA	Dhule	Kusumba	74.599	20.911	320.4	BW						25

30	GSDA	Dhule	Sarwad	74.768	21.04	245.8	BW						70
31	GSDA	Dhule	Songir	74.79	21.068	232.2	BW						70
32	GSDA	Dhule	Walwadi	74.758	20.928	266.6	BW						25
33	GSDA	Sakri	Bramnhavel	74.207	21.15	508.6	BW						35
34	GSDA	Sakri	Dahival	74.165	21.061	505.4	BW						28
35	GSDA	Sakri	Jaithane	74.333	21.101	468.5	BW						28
36	GSDA	Sakri	Lonkhede	74.522	21.086	296.6	BW						87.5
37	GSDA	Sakri	Mahir	74.403	20.989	420.3	BW						28
38	GSDA	Shirpur	Dahivad	74.944	21.339	179.9	BW						35
39	GSDA	Shirpur	Gadhadeo	74.808	21.603	338.1	BW						77
40	GSDA	Shirpur	Khambale	75.072	21.448	287.8	BW						25
41	GSDA	Shirpur	Kolid	74.844	21.569	355.2	BW						21
42	GSDA	Shirpur	Palasner	74.883	21.358	164.4	BW						28
43	GSDA	Shirpur	Shirpur	74.871	21.338	151	TW						21
44	GSDA	Shirpur	Tardi	75.075	21.278	205.4	TW						15
45	GSDA	Shirpur	Tembhe Bk.	74.561	21.417	132.7	TW						28
46	GSDA	Shirpur	Thalner	74.954	21.254	158.6	TW						28
47	GSDA	Shirpur	Wagjadi	74.857	21.375	157.4	TW						35
48	GSDA	Sindkheda	Mahalsar	74.932	21.231	158.4	BW						28
49	GSDA	Sindkheda	Methi	74.639	21.244	202.2	BW						32

50	GSDA	Sindkheda	Takarkhede	74.528	21.351	157.7	TW						35
51	GSDA	Sindkheda	Varpada	74.769	21.358	138.1	TW						28

Annexure-III B: Aquifer II depth to water level details in Dhule district

Sr No	Agency	Taluka	Village	X Long	Y Lat	Altitude (m)	Type of well	Aquifer	Drilling depth (mbgl)	Const-depth (m)	Casing (mbgl)	AQ- Zones	Post SWL
1	CGWB	Dhule	Ambode	74.8994	20.9105	254	EW	Basalt	200	-	5.5	5.50-7.40	17
2	CGWB	Dhule	Dusane	74.4337	21.1574	340.2	EW	Basalt	200	-	30	153.00-154,.00	35
3	CGWB	Dhule	Kawathi	74.5928	20.9594	347.7	EW	Basalt	200	-	30	No water Bearing Zone encountered	35
4	CGWB	Dhule	Nimdale	74.68	20.95	339	EW	Basalt	200	-	18	167-169	19.95
5	CGWB	Sakri	Ambapur	74.3278	21.0223	487.3	EW	Basalt	200	-	30	16.80 – 19.80	20
6	CGWB	Sakri	Junwane	74.84	20.7592	342.9	EW	Basalt	200	-	30	19.60-22.60	19
7	CGWB	Sakri	Raikot	74.1002	21.1427	630	EW	Basalt	200	-	30	40.90 - 44.00 ,178.20 – 181.20	45
8	CGWB	Sakri	Waki	74.0345	20.9607	592.1	EW	Basalt	200	-	11.5	123.00-126.00	28
9	CGWB	Sakri	Waki PZ	74.0345	20.9607	592.1	PZ	Basalt	37.9	-	17.5	10.40-13.50	28
10	CGWB	Shirpur	Bhoiti	75.148	21.392				195	-	-		12
11	CGWB	Shirpur	kodid	74.848	21.559				110	-	-		13
12	CGWB	Shirpur	Sevalda	74.8556	21.2861	152.3			50	-	-		9

13	CGWB	Shirpur	Borkheda	74.9875	21.3083	200	EW	Alluvium	104.25	72.5	-	72 -75 ,78 -81	30
14	CGWB	Shirpur	Borkheda	74.9875	21.3083	200	OW	Alluvium	98	-	-	70 -80	30
15	CGWB	Shirpur	Klamsare	74.9125	21.3458	164	EW	Alluvium	92.74	41.5	-	41 -48 ,61 -74	16.34
16	CGWB	Shirpur	Klamsare	74.9125	21.3458	164	OW	Alluvium	80	-	-	41 -46 ,66 -74	16.34
17	CGWB	Shirpur	Arthe (KH)	74.8222	21.4	164	EW	Alluvium	82	40.5	-	40 -50 ,73.07 - 77	15.9
18	CGWB	Shirpur	Arthe (KH)	74.8222	21.4	164	OW	Alluvium	80	40.5	-	40 -46.5 ,58.5 - 61.5	15.9
19	CGWB	Shirpur	Tarhadi	74.7042	21.4167	145	EW	Alluvium	41.1	30.5	-	30 -46 ,58 -62	31
20	CGWB	Shirpur	June Bhamte	74.7722222	21.427778		EW	Alluvium	74.67	73		26-29, 52.50-56, 69.50-72.50	16.1
21	CGWB	Shirpur	Nave Bhamte	74.775	21.416944		EW	Alluvium	73.86	68.5		28-34, 37.50-41, 64-68	21.3
22	CGWB	Shirpur	Varul	74.7388889	21.405556		EW	Alluvium	38.92	38.5		26-30, 32-38	21.3
23	CGWB	Shirpur	Rudawali	74.7972222	21.336111		EW	Alluvium	39	38.5		32-38	23.7
24	CGWB	Shirpur	Vanaval	74.8138889	21.333611		EW	Alluvium	37.98	37.5		31-37	19.5
25	CGWB	Shirpur	Untawad	74.8625	21.325		EW	Alluvium	51	50		29-43, 46-49.50	20.45
26	CGWB	Shirpur	Ajanda Khurd	74.9097222	21.341667		EW	Alluvium	48.97	48.5		29-36, 42-48	15.5
27	CGWB	Shirpur	Kalamsare	74.9131	21.3333	164.3	PZ	Alluvium	60	-	-	43 -45 ,47 -50	16.34
28	CGWB	Shirpur	Manjrod	74.9856	21.2208	159.5	EW	Basalt	250	-	49	102-105	29.25

29	CGWB	Shirpur	Tarhadi T.T.	74.7	21.4011	132.3	EW	Basalt	245	-	44.5	123.50-126.50, 147.90-150.90	31
30	CGWB	Shirpur	Vikharan	74.7919	21.4128	162.3	EW	Basalt	233.3	-	80.5	80.5,169.20-172.30,196.70-199.70	14
31	CGWB	Shirpur	Vikharan	74.7919	21.4128	162.3	OW	Basalt	212	-	80	80 ,163.10-166.20,199.70-202.80	14
32	CGWB	Shirpur	Boradi EW	74.8977775	21.523115	310	EW	Basalt	200	_	11.5	123.50-126.50	>100
33	CGWB	Shirpur	Chillare EW	75.0182657	21.390535	236	EW	Basalt	200	_	11.5	108.20-111.30	77.5
34	CGWB	Shirpur	Panakhed EW	75.0189604	21.501145	268	EW	Basalt	200	_	17.5	13.70-16.70, 71.60-74.60, 138.70-141.80	25.9
35	CGWB	Shirpur	Panakhed OW	75.018891	21.501051	268	OW	Basalt	172.3	_	17.5	13.70-16.70, 71.60-74.60, 138.70-141.80	25.9
36	CGWB	Shirpur	Varzadi EW	74.9075408	21.416284	221	EW	Basalt	154	_	11.5	65.50-68.60, 144.80-147.90	56
37	CGWB	Shirpur	Varzadi OW	74.9074825	21.416161	221	OW	Basalt	154	_	11.5	62.50-65.50,144.80-147.90, 153-154	56
38	CGWB	Sindkheda	Chilane	74.6808	21.3308	147.1	EW	Basalt	212	_	12	96-99,123-126,184-187	35
39	CGWB	Sindkheda	Doul	74.5811	21.3578	146.5	EW	Basalt	218	_	21	24.40-27.30	18.4

40	CGWB	Sindkheda	Takarkheda	74.5267	21.4217	130	EW	Basalt	156	–	34	65.50-68.60, 144.80-147.90	32
41	CGWB	Sindkheda	Varshi	74.8278	21.2478	151.8	EW	Basalt	215	–	15	41.10-44.20	7.4
42	CGWB	Sindkheda	Bhadne EW	74.69047	21.249426	184	EW	Basalt	200	–	11.5	56.40-59.40, 178.40-181.40	35.75
43	CGWB	Sindkheda	Bhadne OW	74.690377	21.249176	184	OW	Basalt	200	–	11.5	56.40-59.40, 178.40-181.40	35.4
44	CGWB	Sindkheda	Vitai EW	74.801378	21.163278	200	EW	Basalt	200	–	11.5	169.20-172.30	>100
45	CGWB	Sindkheda	Warud EW	74.8462258	21.182823	178	EW	Basalt	200	–	11.5	25.90-28.90	
46	GSDA	Dhule	Kusumba	74.599	20.911	320.4	BW						18.4
47	GSDA	Dhule	Sarwad	74.768	21.04	245.8	BW						31
48	GSDA	Dhule	Songir	74.79	21.068	232.2	BW						31
49	GSDA	Dhule	Walwadi	74.758	20.928	266.6	BW						14
50	GSDA	Sakri	Bramnhavel	74.207	21.15	508.6	BW						13
51	GSDA	Sakri	Dahival	74.165	21.061	505.4	BW						16.34
52	GSDA	Sakri	Jaithane	74.333	21.101	468.5	BW						16.34
53	GSDA	Sakri	Lonkhede	74.522	21.086	296.6	BW						35
54	GSDA	Sakri	Mahir	74.403	20.989	420.3	BW						16.34
55	GSDA	Shirpur	Dahivad	74.944	21.339	179.9	BW						13
56	GSDA	Shirpur	Gadhadeo	74.808	21.603	338.1	BW						32
57	GSDA	Shirpur	Khambale	75.072	21.448	287.8	BW						14

58	GSDA	Shirpur	Kolid	74.844	21.569	355.2	BW						7.4
59	GSDA	Shirpur	Palasner	74.883	21.358	164.4	BW						16.34
60	GSDA	Shirpur	Shirpur	74.871	21.338	151	TW						12
61	GSDA	Shirpur	Tardi	75.075	21.278	205.4	TW						9
62	GSDA	Shirpur	Tembhe Bk.	74.561	21.417	132.7	TW						15.9
63	GSDA	Shirpur	Thalner	74.954	21.254	158.6	TW						16.34
64	GSDA	Shirpur	Wagjadi	74.857	21.375	157.4	TW						30
65	GSDA	Sindkheda	Mahalsar	74.932	21.231	158.4	BW						16.34
66	GSDA	Sindkheda	Methi	74.639	21.244	202.2	BW						29.25
67	GSDA	Sindkheda	Takarkhede	74.528	21.351	157.7	TW						30
68	GSDA	Sindkheda	Varpada	74.769	21.358	138.1	TW						15.9

Annexure-IV: Soil Infiltration Test data

DATA SHEET FOR INFILTRATION TEST (AAP 2020-21)	
Date	02.02.2021
Uniqui ID No.	
AAP	2020-21
Village	Panakhed
Location	In the premises of GP Panakhed
Taluka	Shirpur
District	Dhule
Coordinates	21.500811, 75.018678
Initial water level	21.4 cm
Geology	Deccan Basalt
soil Type	Brown to Black cotton soil, mixed with clayey material, fine to medium grained
Final infiltration rate	2.4 cm/hr
Total precipitation	8.6 cm

Sr. No.	Clock Time	Duration (minutes)	Cumulative Time (minutes)	Water level depth (cm)	Infiltrated water depth (cm)	Infiltration Rate (cm/hr)	Remarks
0	15:35	0	0	21.4			
1	15:36	1	1	21	0.4	24	
2	15:37	1	2	20.7	0.3	18	
3	15:38	1	3	20.4	0.3	18	
4	15:39	1	4	20.1	0.3	18	
5	15:40	1	5	19.8	0.3	18	
6	15:41	1	6	19.6	0.2	12	
7	15:42	1	7	19.4	0.2	12	
8	15:43	1	8	19.2	0.2	12	

9	15:44	1	9	19	0.2	12	
10	15:45	1	10	18.9	0.1	6	
11	15:47	2	12	18.7	0.2	6	
12	15:49	2	14	18.5	0.2	6	
13	15:51	2	16	18.3	0.2	6	
14	15:53	2	18	18.1	0.2	6	
15	15:55	2	20	17.9	0.2	6	
16	16:00	5	25	17.5	0.4	4.8	
17	16:05	5	30	17.1	0.4	4.8	
18	16:10	5	35	16.8	0.3	3.6	
19	16:15	5	40	16.4	0.4	4.8	
20	16:20	5	45	16.1	0.3	3.6	
21	16:25	5	50	15.8	0.3	3.6	
22	16:35	10	60	21.7	0.5	3	water filled upto 22.2 cm
23	16:45	10	70	21.2	0.5	3	
24	16:55	10	80	20.8	0.4	2.4	
25	17:05	10	90	20.4	0.4	2.4	
26	17:15	10	100	20	0.4	2.4	
27	17:35	20	120	19.2	0.8	2.4	

DATA SHEET FOR INFILTRATION TEST (AAP 2020-21)	
Date	02.02.2021
Uniqui ID No.	
AAP	2020-21
Village	Bhadne
Location	North east corner of the village, in the agriculture land
Taluka	Sindkheda
District	Dhule
Coordinates	21.250744, 74.689391
Initial water level	20.8 cm
Geology	Deccan Basalt
soil Type	Brown to Black cotton soil, mixed with clayey material, fine to medium grained
Final infiltration rate	1.8 cm/hr
Total precipitation	8.3 cm

Sr. No.	**Clock Time**	**Duration (minutes)**	**Cumulative Time (minutes)**	**Water level depth (cm)**	**Infiltrated water depth (cm)**	**Infiltration Rate (cm/hr)**	**Remarks**
0	10:22	0	0	20.8			
1	10:23	1	1	20.4	0.4	24	
2	10:24	1	2	20.1	0.3	18	
3	10:25	1	3	19.8	0.3	18	
4	10:26	1	4	19.6	0.2	12	
5	10:27	1	5	19.3	0.3	18	
6	10:28	1	6	19.1	0.2	12	
7	10:29	1	7	18.9	0.2	12	
8	10:30	1	8	18.7	0.2	12	

9	10:31	1	9	18.5	0.2	12	
10	10:32	1	10	18.4	0.1	6	
11	10:34	2	12	18.1	0.3	9	
12	10:36	2	14	17.8	0.3	9	
13	10:38	2	16	17.5	0.3	9	
14	10:40	2	18	17.3	0.2	6	
15	10:42	2	20	17.1	0.2	6	
16	10:47	5	25	16.7	0.4	4.8	
17	10:52	5	30	16.3	0.4	4.8	
18	10:57	5	35	15.9	0.4	4.8	
19	11:02	5	40	15.6	0.3	3.6	
20	11:07	5	45	15.3	0.3	3.6	
21	11:12	5	50	15.1	0.2	2.4	
22	11:22	10	60	20.7	0.5	3	water filled upto 21.2 cm
23	11:32	10	70	20.3	0.4	2.4	
24	11:42	10	80	19.9	0.4	2.4	
25	11:52	10	90	19.5	0.4	2.4	
26	12:02	10	100	19.2	0.3	1.8	
27	12:22	20	120	18.6	0.6	1.8	
28	12:42	20	140	18	0.6	1.8	
29	13:02	20	160	17.4	0.6	1.8	

Annexure-V: Water Level trend (2011-2020)

Sr. No.	District	Taluka	Village	Pre-Monsoon WL_2020	Post Monsoon WL_2020	Fluctuation (m)	Pre-Monsoon WL Trend (m/year)		Post-Monsoon WL Trend (m/year)	
							Rise	Fall	Rise	Fall
1	Dhule	Dhule	Achande	5.8	2.10	3.70	0.047878788		0.057333333	
2	Dhule	Dhule	Ajanle	3.8	2.50	1.30	0.055757576			0.057212121
3	Dhule	Dhule	Avadhan	8	2.70	5.30		0.275151515		0.009393939
4	Dhule	Dhule	Babre	8.7	1.50	7.20		0.504242424	0.011818182	
5	Dhule	Dhule	Bendrepada	3.9	0.80	3.10	0.367454545		0.19030303	
6	Dhule	Dhule	Borkund	1.5	0.50	1.00		0.000363636	0.017030303	
7	Dhule	Dhule	Borvihir	3.6	1.10	2.50		0.135454545		0.034545455
8	Dhule	Dhule	Deur bk	8.5	6.80	1.70		0.110714286		0.672857143
9	Dhule	Dhule	Dhule	8.5	5.90	2.60		0.608484848		0.684545455
10	Dhule	Dhule	Fagane	4.6	1.50	3.10	0.025757576			0.112484848
11	Dhule	Dhule	Hendrun	8	1.20	6.80		-0.744		0.026363636
12	Dhule	Dhule	Japi	6.8	5.00	1.80		0.412121212		0.411515152
13	Dhule	Dhule	Khede	9.1	6.50	2.60	0.164242424		0.060484848	
14	Dhule	Dhule	Khordad	5	2.90	2.10		0.110909091	0.008121212	
15	Dhule	Dhule	Kulthe	2	1.00	1.00	0.117878788		0.144848485	
16	Dhule	Dhule	Mehergaon	5.3	0.50	4.80		0.064545455	0.173939394	

17	Dhule	Dhule	Mordad	2.5	2.30	0.20	0.104848485			0.023636364
18	Dhule	Dhule	Nandale bk	6.5	1.80	4.70		0.469393939		0.020625
19	Dhule	Dhule	Nandre	12.8	10.00	2.80		0.652083333		0.545151515
20	Dhule	Dhule	Ner	5.5			0.197878788		0.021166667	
21	Dhule	Dhule	Nimdale	3.8	0.50	3.30	0.436060606		0.001666667	
22	Dhule	Dhule	Nimgul	9.8	7.60	2.20		0.352727273		0.198121212
23	Dhule	Dhule	Pur (Purmepada)	6.3	4.20	2.10		0.080909091		0.166666667
24	Dhule	Dhule	Sadgaon	7	2.00	5.00		0.153333333		0.13630303
25	Dhule	Dhule	Sarwad	5.2	4.50	0.70		0.154242424		0.124787879
26	Dhule	Dhule	Sonewadi	5.7	1.70	4.00		0.384242424	0.277878788	
27	Dhule	Dhule	Songir	5.7	1.90	3.80	0.024242424		0.106363636	
28	Dhule	Dhule	Tarwade	2.5	1.30	1.20	0.164848485		0.067878788	
29	Dhule	Dhule	Udane	5	1.60	3.40	0.024848485			0.000606061
30	Dhule	Dhule	Vani kh	9.3	1.00	8.30		0.056363636	0.174848485	
31	Dhule	Dhule	Velhane bk	9.7	0.90	8.80		0.218181818	0.054909091	
32	Dhule	Dhule	Vishvanath	2.5	1.70	0.80	0.115151515			0.033939394
33	Dhule	Dhule	Walwadi	5.3	4.00	1.30		0.245135135		0.234545455
34	Dhule	Sakri	Aichale	5.9	3.90	2.00	0.188787879		0.146969697	
35	Dhule	Sakri	Akkalpada	4.6	3.40	1.20	0.078787879		0.026060606	

36	Dhule	Sakri	Basaraval	7.2	0.10	7.10				
37	Dhule	Sakri	Bhamer	7.1	1.52	5.58		0.015454545	0.153454545	
38	Dhule	Sakri	Brahmanwell	6.8	2.30	4.50		0.102424242	0.149393939	
39	Dhule	Sakri	Chadwel Korde	5	1.00	4.00	0.363513514		0.413225806	
40	Dhule	Sakri	Chail	1.9	0.10	1.80	0.113939394		0.140151515	
41	Dhule	Sakri	Chinchkheda	8.7	6.40	2.30	0.055151515		0.195151515	
42	Dhule	Sakri	Dahivel	8.3	5.90	2.40	0.093378378		0.396363636	
43	Dhule	Sakri	Dhamnar	8.4	7.00	1.40		0.554848485		0.049393939
44	Dhule	Sakri	Domkani	4.4	1.60	2.80		1.595962733		0.282142857
45	Dhule	Sakri	Dusane	4.5	0.60	3.90	0.056081081		0.224545455	
46	Dhule	Sakri	Jebapur	9.3	3.70	5.60		0.367857143		0.003571429
47	Dhule	Sakri	Khampada	3.3	2.00	1.30				
48	Dhule	Sakri	Kudashi	10	2.50	7.50		0.177652439	0.08469697	
49	Dhule	Sakri	Lagadwal	5.2	0.50	4.70		0.206363636	0.423333333	
50	Dhule	Sakri	Lonkhede	5	2.00	3.00		0.149393939	0.103636364	
51	Dhule	Sakri	Mahir	7.5	2.50	5.00		0.162363636	0.348484848	
52	Dhule	Sakri	Nizampur	5.1	1.80	3.30	0.15		0.183636364	
53	Dhule	Sakri	Phopare	4.9	2.00	2.90	0.08		0.126666667	
54	Dhule	Sakri	Pimpalner	3	1.40	1.60	0.092424242		0.134848485	

55	Dhule	Sakri	Rojgaon	2.2	0.50	1.70	0.158333333		0.260606061	
56	Dhule	Sakri	Sakri	7.2	1.70	5.50	0.084545455		0.513030303	
57	Dhule	Sakri	Samode	6.1	1.40	4.70	0.307453416		0.628571429	
58	Dhule	Sakri	Sayane	3.5	1.60	1.90	0.5225		1.295945946	
59	Dhule	Sakri	Shelbari	3.6	1.10	2.50	0.273030303		0.107878788	
60	Dhule	Sakri	Shevali (R)	4.5	3.00	1.50	0.051216216		0.123939394	
61	Dhule	Sakri	Shevali da	8.8	6.50	2.30	0.16030303		0.2	
62	Dhule	Sakri	Sutare	3.8	10.66	-6.86		0.075454545		0.186606061
63	Dhule	Sakri	Umarpata	6.2	0.20	6.00		0.004864865	0.368243243	
64	Dhule	Sakri	Vaskhedi	4.3	0.40	3.90	0.003030303		0.27	
65	Dhule	Shindkheda	Betawad	10.5	9.00	1.50	0.015151515			0.091515152
66	Dhule	Shindkheda	Chimthane	8.4	6.70	1.70	0.008181818			0.183636364
67	Dhule	Shindkheda	Dabhashi	17	16.00	1.00	0.588181818			0.102424242
68	Dhule	Shindkheda	Dangurne	7.3	0.70	6.60		0.226081081	0.044242424	
69	Dhule	Shindkheda	Degaon	4.1	0.50	3.60	0.073333333		0.155272727	
70	Dhule	Shindkheda	Dhavde	11	10.00	1.00	0.397575758		0.089090909	
71	Dhule	Shindkheda	Dondaicha	8.6	6.00	2.60	0.003333333			0.068484848
72	Dhule	Shindkheda	Kalmadi	6	2.50	3.50	0.024848485			0.078181818
73	Dhule	Shindkheda	Karle	7	0.10	6.90		0.062878788	0.099393939	
74	Dhule	Shindkheda	Khalane	9.7	11.00	-1.30		0.365675676		0.833851351

75	Dhule	Shindkheda	Malpur	7	4.50	2.50	0.165945946			0.054545455
76	Dhule	Shindkheda	Methi	7.5	4.57	2.93		0.083939394	0.444969697	
77	Dhule	Shindkheda	Nardane	9	4.50	4.50		0.311818182		0.205393939
78	Dhule	Shindkheda	Salve	4.3	1.60	2.70	0.168181818			0.054545455
79	Dhule	Shindkheda	Satare	8	1.00	7.00	0.016969697		0.049090909	
80	Dhule	Shindkheda	Shevade	6	0.10	5.90		0.025757576	0.031575758	
81	Dhule	Shindkheda	Shindkheda	14.4	10.00	4.40	0.212121212		0.173030303	
82	Dhule	Shindkheda	Sondale	5.4	1.80	3.60	0.060909091		0.242727273	
83	Dhule	Shindkheda	Sukvad	9	8.00	1.00	0.293939394			0.023939394
84	Dhule	Shindkheda	Takarkhede	18	16.50	1.50	0.144484848			0.313636364
85	Dhule	Shindkheda	Varshi	6	5.10	0.90	0.162424242		0.04	
86	Dhule	Shindkheda	Varud	6.2	2.00	4.20		0.542121212		0.132787879
87	Dhule	Shindkheda	Varzadi	7.6	5.00	2.60		0.673214286		0.696428571
88	Dhule	Shindkheda	Virdel	13.6	9.80	3.80	0.029393939		0.077575758	
89	Dhule	Shindkheda	Waghadi Kh	5.7	0.80	4.90		0.782608696		0.939285714
90	Dhule	Shirpur	Ajnad	7	6.30	0.70		0.057272727	0.048484848	
91	Dhule	Shirpur	Ambe	5.5	1.80	3.70	0.213636364		0.08472973	
92	Dhule	Shirpur	Boradi	6.8	1.60	5.20		0.033333333	0.287030303	
93	Dhule	Shirpur	Dahivad	6			0.012060811			0.136666667
94	Dhule	Shirpur	Dondwade	2.8	3.35	-0.55	0.260540541			0.138939394

95	Dhule	Shirpur	Fattepur	5.7	1.60	4.10	0.337454545		0.408181818	
96	Dhule	Shirpur	Gadhaddev	2.1	0.10	2.00	0.118939394		0.163636364	
97	Dhule	Shirpur	Hadakhed	5.8	1.10	4.70		0.028787879	0.100606061	
98	Dhule	Shirpur	Higaon	13	11.20	1.80				0.858333333
99	Dhule	Shirpur	Khambale	5.6	0.50	5.10	0.723636364		0.105151515	
100	Dhule	Shirpur	Kodid	6.3	1.00	5.30		0.197272727	0.245757576	
101	Dhule	Shirpur	Nimzari	5	1.20	3.80		0.719875776	0.248214286	
102	Dhule	Shirpur	Palasner	6.1	3.20	2.90		0.067575758	0.062727273	
103	Dhule	Shirpur	Sangavi	6.4	2.50	3.90	0.026969697		0.067272727	
104	Dhule	Shirpur	Sule	10.3	8.70	1.60	0.005454545			0.08
105	Dhule	Shirpur	Tardi	14	12.60	1.40	0.11177027			
106	Dhule	Shirpur	Tonde	17.8	15.30	2.50		0.42030303	0.418541667	
107	Dhule	Shirpur	Umarde	3.4	2.40	1.00	0.154242424		0.142424242	

Annexure-VI: Aquifer I Chemical Analysis of ground water samples

S.No	District	Taluka	Location	Source	Site-ID	pH	EC	TDS	TH	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	SAR	RSC
1	Dhule	Dhule	Ajnale	NHS	T/DH-021	8.1	1311	852	173	71	25	48	76.8	0	291	65	52	20	0.04	1.2	-0.8
2	Dhule	Dhule	Avdhan	NHS	T/DH-009	7.1	5635	3663	1280	939	83	84	15.5	0	464	620	94.3	42	0.88	0.7	-46.2
3	Dhule	Dhule	Borkund	NHS	T/DH-048	8.1	1660	1079	342	91	61	98	0.7	0	387	124	24	8	0.22	1.9	-3.2
4	Dhule	Dhule	Dhule	NHS	T/DH-030	8.2	2270	1476	638	465	42	84	13.4	0	797	161	18	8	0.08	1	-13.6
5	Dhule	Dhule	Laling	NHS	T/DH-033	7.8	548	356	199	121	19	28	5.2	0	268	12	42	15	0.01	0.6	-3.2
6	Dhule	Dhule	Mukti	NHS	T/DH-013	8	2125	1381	607	318	70	80	21.5	0	500	268	27	32	1.23	1.1	-13.5
7	Dhule	Dhule	Narwhal	NHS	T/DH-022	8	708	460	199	85	28	65	3.6	0	333	45	11	4	0.09	1.6	-1.1
8	Dhule	Dhule	Ner-1	NHS	T/DH-042	8	893	580	173	48	30	96	7.9	0	285	67	52	43	0.04	2.7	-0.2
9	Dhule	Dhule	Phagne	NHS	T/DH-049	8	2131	1385	388	217	41	54	18.1	0	184	176	52	39	1.23	0.9	-11.2

10	Dhule	Sakri	Burdi Pada	NHS	T/DH-025	7.7	421	274	133	71	15	27	2.8	0	202	15	12	10	0.24	0.8	-1.5
11	Dhule	Sakri	Dusane	NHS	T/DH-046	8.1	564	367	209	126	20	52	9.4	0	303	20	23	41	0.53	1.1	-3
12	Dhule	Sakri	Ichhapur	NHS	T/DH-017	8.1	2034	1322	520	369	37	110	10.4	0	256	164	250	47	0.4	1.5	-17.3
13	Dhule	Sakri	Nizampur	NHS	T/DH-047	7.9	697	453	209	124	21	52	1.5	0	303	27	38	34	0.68	1.1	-2.9
14	Dhule	Sakri	Sakri2	NHS	T/DH-035	8	1224	796	326	121	50	81	15.2	0	422	94	55	48	0.95	1.6	-3.2
15	Dhule	Shirpur	Hadakhed	NHS	T/DH-043	7.8	819	532	179	70	26	85	0.9	0	244	73	35	46	0.68	2.2	-1.7
16	Dhule	Shirpur	Hisala	NHS	T/DH-011	8.3	829	539	255	61	47	74	2.2	0	339	30	92	42	0.31	1.7	-1.4
17	Dhule	Shirpur	Palasner	NHS	T/DH-023	8	2356	1531	673	520	37	41	17.4	0	583	216	47	24	0.11	0.5	-19.5
18	Dhule	Shirpur	Samaryapada	NHS	T/DH-052	7.8	1226	797	179	121	14	77	15.8	0	14	146	82	41	0.02	1.8	-7
19	Dhule	Sindkheda	Dondaicha-1	NHS	T/DH-041	8.1	2187	1422	428	263	40	94	24.3	0	464	154	83	37	0.56	1.4	-8.8
20	Dhule	Sindkheda	Dhavda	NHS	T/DH-054	8	2140	1391	428	222	50	80	21.3	0	410	156	96.4	44	0.28	1.3	-8.5

21	Dhule	Sindkheda	Methi	NHS	T/DH-019	8	610	397	143	45	24	50	6.3	0	244	17	44	19	0.2	1.5	-0.2
22	Dhule	Sindkheda	Nardana	NHS	T/DH-010	8.2	2983	1939	872	470	98	73	19.4	0	737	295	108.1	23	0.22	0.8	-19.4
23	Dhule	Sindkheda	Shewade	NHS	T/DH-044	7.9	1579	1026	393	182	51	79	8.2	0	416	141	64	22	0.01	1.3	-6.5

Annexure VII: Aquifer II Chemical analysis of ground water samples

S.NO	Taluka	Village	pH	EC	TDS	TH	Ca	Mg	Na	K1	CO3	HCO3	Cl	SO4	NO3	F	Fe
1	Dhule	Songir	7.49	1128	733	296	89.6	17.5	58.5	0.7	0	208.6	110	67.1	0	0	0
2	Dhule	Walwadi	7.4	1285	835	324	57.6	43.7	83.6	0.4	0	263.5	138	48	0	0	0.3
3	Sakri	Ambapur	7.9	1043	552	301	86	21	85	1	0	220	163	86	44	0.49	
4	Sakri	Jaithane	7.75	1081	703	252	52.8	29.2	94.9	0.9	0	179.3	128	28.3	0	0.05	0.1
5	Sakri	Lonkhede	8.53	937	609	392	56	61.2	62.2	0.1	37	281.1	116	52	0	0	0.4
6	Sakri	Mahir	8	846	550	300	82	23.1	51	0.1	0	286.7	91	36	0	0.89	1.2
7	Sakri	Roykot	7.2	762	403	347	63	45	14	0.8	0	214	55	45	120	0.15	
8	Shindkheda	Bhadne EW	7.2	2100	1120	710	164	73	24	1.2	0	61	418	210	1	0.34	
9	Shindkheda	Bhadne OW	7.4	1628	863	600	120	73	82	0.14	0	37	376	202	3	0.26	
10	Shindkheda	Chulane	7.5	2000	NA	405	80	49.9	275	20	0	122	504	163.6	38	1.02	
11	Shindkheda	Methi	7.53	1149	747	270	38	42.5	56.5	0.5	0	274.5	81	18	0	0.85	3.1
12	Shindkheda	Takarkheda	7.5	2900	NA	675	186	51.1	340	30	0	85	745	282.2	45	0.12	
13	Shindkheda	Takarkhede	7.6	1382	898	294	84	20.4	140	2.2	0	262.3	190	95	0	0.97	0.1
14	Shindkheda	Varshi	7.3	1180	NA	110	28	9.7	225	20	0	305	184	72.5	32	0.37	
15	Shindkheda	Vitai EW	7.3	630	356	200	24	34	46	5.1	0	226	28	70	3	0.31	
16	Shindkheda	Warud EW	7.7	1842	1216	630	180	44	133	0.5	0	183	532	14	10	0.236	
17	Shirpur	Ajanad	7.9	857	557	273	48.4	36.9	70.1	1.5	0	286.7	112	10	0	0.48	0.5
18	Shirpur	Arthe (KH)	7.57	660	375	225	22	40	52	25	0	366	28	25	0	0.1	

19	Shirpur	Arthe (KH)	7.87	650	360	220	20	40	56	16	0	360	42	0	0	0.1	
20	Shirpur	Boradi EW	8.2	810	535	325	90	24	35	0.7	0	244	110	29	22	0.152	
21	Shirpur	Borkheda	8.05	530	350	175	18	32	81	0	0	397	18	0	0	0.1	
22	Shirpur	Borkheda	7.74	600	420	95	12	16	122	4	0	122	142	62	0	0.1	
23	Shirpur	Borkheda	7.7	600	420	95	12	16	122	4	0	122	142	62	NA	NA	
24	Shirpur	Chillare EW	7.8	482	318	150	44	10	41	0.7	0	171	53	11	18	0.256	
25	Shirpur	Kalamsare	7.6	610	301	185	30	27	55	1.4	0	268	32	11	10	0.57	
26	Shirpur	Klamsare	8.25	510	292	120	10	23	69	0	0	232	11	62	0	0.1	
27	Shirpur	Klamsare	8.23	510	270	105	14	17	69	0	0	219	36	24	0	0	
28	Shirpur	Klamsare	8.2	510	270	105	14	17	69	BDL	0	219	36	24	NA	NA	
29	Shirpur	Klamsare	8.3	510	292	120	10	23	69	BDL	0	232	11	62	NA	NA	
30	Shirpur	Mangrod	7.3	6300	NA	1125	240	127.7	910	80	0	37	1904	463	5	1	
31	Shirpur	Panakhed EW	8	987	651	325	60	43	74	0.6	0	366	106	25	12	0.321	
32	Shirpur	Panakhed OW	7.9	869	574	325	60	43	48	0.7	0	305	85	43	10	0.213	
33	Shirpur	Shirpur	7.61	545	355	200	48	19.4	20.6	0.6	0.7	177.3	28	21.7	0	0	0
34	Shirpur	Tarhadi	8.06	600	330	235	22	43	47	1.17	0	323	25	30	0	0.1	
35	Shirpur	Tarhadi	7.2	1300	NA	200	76	2.4	200	25	0	92	344	55	53	0.65	
36	Shirpur	Tembhe Bk.	7.74	708	460	285	69.2	27.2	34.6	1.2	0.4	294.6	56	12	0	0.3	0.3
37	Shirpur	Thalner	8.03	701	457	272	40.8	41.3	25	3.3	0	257.4	36	20.1	0	0	0

38	Shirpur	Varzadi EW	7.9	415	274	130	36	10	36	0.7	0	159	50	10	4	0.135	
39	Shirpur	Varzadi OW	7.8	337	222	130	36	10	18	0.5	0	153	18	14	8	0.325	
40	Shirpur	Vikharam	7	440	NA	200	40	24.3	10	2	0	183	35	15	10	0.08	
41	Shirpur	Vikharan	7.5	1830	NA	160	10	33	325	40	0	24	489	150	62	0.82	

Annexure VIII: Location of proposed Percolation tanks in Dhule district

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
1	Dhule	Velhane	74.9059	20.782	Percolation Tank	1
2	Dhule	Mukati	74.9367	20.8741	Percolation Tank	1
3	Dhule	Kasvihir	74.9067	20.8749	Percolation Tank	1
4	Dhule	Ajang	74.8888	20.8886	Percolation Tank	1
5	Dhule	Shirud	74.8583	20.7374	Percolation Tank	1
6	Dhule	Chande	74.8784	20.6655	Percolation Tank	1
7	Dhule	Chande	74.8906	20.7089	Percolation Tank	1
8	Dhule	Kundane (velhane)	74.9512	20.7735	Percolation Tank	1
9	Dhule	Chande	74.9318	20.7377	Percolation Tank	1
10	Dhule	Savalde	74.8252	20.8467	Percolation Tank	1
11	Dhule	Nagaon Bk.	74.8011	20.9762	Percolation Tank	1
12	Dhule	Nagaon Bk.	74.7866	20.9778	Percolation Tank	1
13	Dhule	Deobhane	74.7856	21.0026	Percolation Tank	1
14	Dhule	Sarvad	74.7701	21.0388	Percolation Tank	1
15	Dhule	Kapadne	74.806	21.0071	Percolation Tank	1

16	Dhule	Vani Bk	74.8791	20.9138	Percolation Tank	1
17	Dhule	Nandane	74.7542	21.0533	Percolation Tank	1
18	Dhule	Nagaon Bk.	74.789	20.9556	Percolation Tank	1
19	Dhule	Arvi	74.7206	20.7442	Percolation Tank	1
20	Dhule	Sonewadi	74.6749	20.7537	Percolation Tank	1
21	Dhule	Sadgaon	74.6758	20.8341	Percolation Tank	1
22	Dhule	Sadgaon	74.6438	20.8268	Percolation Tank	1
23	Dhule	Awadhan	74.7747	20.8517	Percolation Tank	1
24	Dhule	Horpada	74.786	20.6753	Percolation Tank	1
25	Dhule	Raver	74.7472	20.8447	Percolation Tank	1
26	Dhule	Dhadre	74.7506	20.7073	Percolation Tank	1
27	Dhule	Purmepada	74.6949	20.727	Percolation Tank	1
28	Dhule	Behed	74.606	21.0964	Percolation Tank	1
29	Dhule	Deur Bk.	74.465	20.907	Percolation Tank	1
30	Dhule	Khandlai Bk.	74.4934	20.9825	Percolation Tank	1
31	Dhule	Shirdane Pr.ner	74.544	21.0007	Percolation Tank	1
32	Dhule	Chinchwar	74.5895	21.0213	Percolation Tank	1
33	Dhule	Borsule	74.6426	21.0574	Percolation Tank	1

34	Dhule	Boris	74.6155	21.0481	Percolation Tank	1
35	Dhule	Morane Pr.ner	74.58	20.8937	Percolation Tank	1
36	Dhule	Navalane	74.6268	20.9797	Percolation Tank	1
37	Dhule	Kawathi	74.5795	20.9715	Percolation Tank	1
38	Sakri	Saltek	74.2824	21.0283	Percolation Tank	1
39	Sakri	Domkani	74.2648	21.0442	Percolation Tank	1
40	Sakri	Malangaon	74.2091	21.0743	Percolation Tank	1
41	Sakri	Vihirgaon	74.2226	21.128	Percolation Tank	1
42	Sakri	Devjipada	74.1785	21.1381	Percolation Tank	1
43	Sakri	Devjipada	74.1573	21.1299	Percolation Tank	1
44	Sakri	Raikot	74.1057	21.1403	Percolation Tank	1
45	Sakri	Lagalwal	74.1286	21.1338	Percolation Tank	1
46	Sakri	Kharadbari	74.116	21.0982	Percolation Tank	1
47	Sakri	Dhaner	74.0908	21.0979	Percolation Tank	1
48	Sakri	Chaupale	73.9882	21.0853	Percolation Tank	1
49	Sakri	Hanumantpada	73.9682	21.0374	Percolation Tank	1
50	Sakri	Dhaner	74.0545	21.0951	Percolation Tank	1
51	Sakri	Sutare	74.0529	21.0668	Percolation Tank	1

52	Sakri	Tembhe Pr. Warse	74.0473	21.025	Percolation Tank	1
53	Sakri	Shivajinagar	74.0226	21.0189	Percolation Tank	1
54	Sakri	Pimpalgaon	73.9925	20.9865	Percolation Tank	1
55	Sakri	Basarawal	73.948	20.9848	Percolation Tank	1
56	Sakri	Kadupada	73.9432	21.0157	Percolation Tank	1
57	Sakri	Chorwad	73.9535	20.9036	Percolation Tank	1
58	Sakri	Malgaon Pr.warse	73.9775	20.9429	Percolation Tank	1
59	Sakri		74.0394	20.9695	Percolation Tank	1
60	Sakri		74.062	20.9642	Percolation Tank	1
61	Sakri		74.0904	20.9537	Percolation Tank	1
62	Sakri	Bopkhel	74.0253	20.89	Percolation Tank	1
63	Sakri	Maindane	74.1421	21.0072	Percolation Tank	1
64	Sakri	Mohane	74.0856	21.0154	Percolation Tank	1
65	Sakri	Karanjati	73.9944	21.0125	Percolation Tank	1
66	Sakri	Shirsole	74.068	21.0507	Percolation Tank	1
67	Sakri	Khandbare	74.0985	21.0701	Percolation Tank	1
68	Shirpur	Karle	74.5103	21.2232	Percolation Tank	1
69	Shirpur	Jakhane	74.6209	21.1414	Percolation Tank	1

70	Shirpur	Degaon	74.5815	21.1786	Percolation Tank	1
71	Shirpur	Kharde B.k	74.5999	21.2627	Percolation Tank	1
72	Shirpur	Anjanvihire	74.5834	21.2472	Percolation Tank	1
73	Shirpur	Kharde B.k	74.5675	21.2649	Percolation Tank	1
74	Shirpur	Dangurne	74.702	21.0984	Percolation Tank	1
75	Shirpur	Dangurne	74.7328	21.1093	Percolation Tank	1
76	Shirpur	Darana	74.7097	21.13	Percolation Tank	1
77	Shirpur	Khalane	74.7473	21.1906	Percolation Tank	1
78	Shirpur	Vitai	74.8009	21.1589	Percolation Tank	1
79	Shirpur	Nardane	74.841	21.201	Percolation Tank	1
80	Shirpur	Dhandarne	74.786	21.1807	Percolation Tank	1
81	Shirpur	Hol P.b.	74.7589	21.208	Percolation Tank	1
82	Shirpur	Mukati	74.68	21.1189	Percolation Tank	1
83	Shirpur	Tamthre	74.6586	21.1319	Percolation Tank	1
84	Shirpur	Kanchanpur	74.8625	21.0916	Percolation Tank	1
85	Shirpur	Waghadi Kh	74.8249	21.0946	Percolation Tank	1
86	Sidkheda	Waghadi Bk	74.8373	21.1164	Percolation Tank	1
87	Sidkheda	Ajande Bk	74.878	21.1522	Percolation Tank	1

88	Sidkheda	Warud	74.8731	21.1857	Percolation Tank	1
89	Sidkheda	Pimpri	74.6598	21.1753	Percolation Tank	1
90	Sidkheda	Salwe	74.6437	21.2271	Percolation Tank	1
91	Sidkheda	Salwe	74.6344	21.196	Percolation Tank	1
92	Sidkheda	Methi	74.6262	21.2449	Percolation Tank	1
93	Sidkheda	Rahimpur	74.6446	21.304	Percolation Tank	1
94	Sidkheda	Kampur	74.6321	21.274	Percolation Tank	1
95	Sidkheda	Varzadi	74.622	21.2332	Percolation Tank	1
96	Sidkheda	Sonshelu	74.6634	21.2809	Percolation Tank	1
97	Sidkheda	Chaugaon Bk	74.6747	21.2927	Percolation Tank	1
98	Sidkheda	Vikhram	74.6134	21.2808	Percolation Tank	1
99	Sidkheda	Kharde B.k	74.5791	21.2758	Percolation Tank	1
100	Sidkheda	Salwe	74.6567	21.2381	Percolation Tank	1
101	Sidkheda	Vikhram	74.612	21.2934	Percolation Tank	1
102	Sidkheda	Kurukwade	74.6359	21.3238	Percolation Tank	1
103	Sidkheda	Akkadse	74.5256	21.2131	Percolation Tank	1
104	Shirpur	Boradi	74.8823	21.5319	Percolation Tank	1
105	Shirpur	Palasner	75.043	21.5196	Percolation Tank	1

106	Shirpur	Sangavi	74.9856	21.4754	Percolation Tank	1
107	Shirpur	Boradi	74.8627	21.5265	Percolation Tank	1
108	Shindkheda	Wasardi	74.8373	21.4789	Percolation Tank	1
109	Shirpur	Wadi Bk	74.8306	21.4337	Percolation Tank	1
110	Shirpur	Chandpuri	74.7728	21.3956	Percolation Tank	1
111	Shirpur	Sule	74.962	21.3982	Percolation Tank	1
112	Shirpur	Karvand	74.9051	21.3941	Percolation Tank	1
113	Shindkheda	Waghadi	74.8597	21.4086	Percolation Tank	1
114	Shindkheda	Arthe Bk.	74.8127	21.4089	Percolation Tank	1
115	Shirpur	Dahivad	74.9259	21.3553	Percolation Tank	1
116	Shirpur	Tande	74.9761	21.3387	Percolation Tank	1
117	Shirpur	Asali	74.961	21.3109	Percolation Tank	1
118	Shirpur	Babhalaj	75.0578	21.2733	Percolation Tank	1
119	Shirpur	Manjrod	75.0412	21.2765	Percolation Tank	1
120	Shirpur	Tande	74.9492	21.3242	Percolation Tank	1
121	Shirpur	Pimpale	75.063	21.2382	Percolation Tank	1
122	Shirpur	Old Bhampur (old Bhamte)	74.7626	21.4364	Percolation Tank	1
123	Shirpur	Hadakhed	74.975	21.4272	Percolation Tank	1

124	Shirpur		74.8873	21.3901	Percolation Tank	1
125	Shirpur	Nimzari	74.8755	21.4223	Percolation Tank	1
126	Shirpur	Karvand	74.8882	21.3732	Percolation Tank	1
127	Shirpur	Natwade	74.9395	21.3994	Percolation Tank	1
128	Shirpur	Panakhed	75.0142	21.5034	Percolation Tank	1
129	Shirpur	Palasner	75.0095	21.5411	Percolation Tank	1

Note: Construction of AR structures may be taken up at these sites after field checks/verification only

Annexure IX: Location of proposed check dams in Dhule district

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
1	Dhule	Varkhede	74.8232	20.9063	Check Dam	1
2	Dhule	Vadjai	74.8124	20.8671	Check Dam	1
3	Dhule	Ajang	74.8777	20.8811	Check Dam	1
4	Dhule	Chinchkhede	74.9438	20.8413	Check Dam	1
5	Dhule	Junwane	74.8441	20.7565	Check Dam	1
6	Dhule	Borvihir	74.8537	20.7842	Check Dam	1
7	Dhule	Khordad	74.9276	20.7178	Check Dam	1
8	Dhule	Chande	74.8723	20.6591	Check Dam	1
9	Dhule	Chande	74.8639	20.6468	Check Dam	1
10	Dhule	Chande	74.9096	20.7071	Check Dam	1
11	Dhule	Velhane	74.922	20.7678	Check Dam	1
12	Dhule	Mukati	74.953	20.8779	Check Dam	1
13	Dhule	Savali	74.9636	20.8382	Check Dam	1
14	Dhule	Ajang	74.868	20.8922	Check Dam	1
15	Dhule	Ajang	74.8676	20.8973	Check Dam	1
16	Dhule	Arni	74.8568	20.9206	Check Dam	1
17	Dhule	Mukati	74.9643	20.868	Check Dam	1
18	Dhule	Nawalnagar	74.898	20.9335	Check Dam	1
19	Dhule	Nawri	74.8907	20.9453	Check Dam	1
20	Dhule	Nyahalod	74.8322	20.9976	Check Dam	1
21	Dhule	Sayane	74.7605	21.045	Check Dam	1
22	Dhule	Sarvad	74.7727	21.0518	Check Dam	1
23	Dhule	Dhodi	74.785	20.9831	Check Dam	1
24	Dhule	Nagaon Bk.	74.7964	20.9662	Check Dam	1
25	Dhule	Biladi	74.8137	20.9741	Check Dam	1

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
26	Dhule	Nyahalod	74.8229	20.9751	Check Dam	1
27	Dhule	Satarne	74.9149	20.982	Check Dam	1
28	Dhule	Nawra	74.8922	20.9613	Check Dam	1
29	Dhule	Kapadne	74.813	21.0061	Check Dam	1
30	Dhule	Deobhane	74.7895	21.0075	Check Dam	1
31	Dhule	Kapadne	74.8196	21.0308	Check Dam	1
32	Dhule	Dhanur	74.8185	21.0385	Check Dam	1
33	Dhule	Sayane	74.7665	21.0508	Check Dam	1
34	Dhule	Nandane	74.7335	21.0473	Check Dam	1
35	Dhule	Dapuri	74.8138	21.0717	Check Dam	1
36	Dhule	Nakane	74.7392	20.9202	Check Dam	1
37	Dhule	Sonewadi	74.6636	20.7597	Check Dam	1
38	Dhule	Padalde	74.6215	20.84	Check Dam	1
39	Dhule	Padalde	74.6299	20.8503	Check Dam	1
40	Dhule	Sadgaon	74.6487	20.8172	Check Dam	1
41	Dhule	Balhane	74.6548	20.8512	Check Dam	1
42	Dhule	Dahyane	74.6849	20.8685	Check Dam	1
43	Dhule	Dahyane	74.6908	20.8609	Check Dam	1
44	Dhule	Raver	74.7208	20.8573	Check Dam	1
45	Dhule	Awadhan	74.7735	20.8405	Check Dam	1
46	Dhule	Morshevadi	74.7053	20.8091	Check Dam	1
47	Dhule	Diwanmala	74.7351	20.8318	Check Dam	1
48	Dhule	Anakwadi	74.6747	20.7771	Check Dam	1
49	Dhule	Khandlai Kh.	74.5076	20.9958	Check Dam	1
50	Dhule	Lamkani	74.5709	21.0948	Check Dam	1
51	Dhule	Lamkani	74.5969	21.0918	Check Dam	1

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
52	Dhule	Borsule	74.6449	21.0724	Check Dam	1
53	Dhule	Lamkani	74.5774	21.0929	Check Dam	1
54	Dhule	Rami	74.6076	21.0794	Check Dam	1
55	Dhule	Wadne	74.6712	21.0634	Check Dam	1
56	Dhule	Navalane	74.6183	20.9745	Check Dam	1
57	Dhule	Kawathi	74.5996	20.9753	Check Dam	1
58	Dhule	Shirdane Pr.ner	74.565	20.9884	Check Dam	1
59	Dhule	Shirdane Pr.ner	74.5225	21.0036	Check Dam	1
60	Dhule	Malkhede	74.4812	20.9801	Check Dam	1
61	Dhule	Shirdane Pr.ner	74.5563	20.9745	Check Dam	1
62	Dhule	Shirdane Pr.ner	74.5543	20.9966	Check Dam	1
63	Dhule	Kawathi	74.5716	20.9708	Check Dam	1
64	Dhule	Kawathi	74.591	20.979	Check Dam	1
65	Dhule	Deur Bk.	74.4528	20.9017	Check Dam	1
66	Dhule	Ajnale	74.6039	20.8273	Check Dam	1
67	Dhule	Padalde	74.6119	20.8502	Check Dam	1
68	Dhule	Pimparkhede	74.4952	20.8291	Check Dam	1
69	Dhule	Shewali (M)	74.4545	20.8719	Check Dam	1
70	Dhule	Deur Bk.	74.4672	20.8945	Check Dam	1
71	Dhule	Deur Bk.	74.4742	20.9061	Check Dam	1
72	Dhule	Ajnale	74.5983	20.8449	Check Dam	1
73	Dhule	Sutare Pada	74.6772	20.9188	Check Dam	1
74	Dhule	Mehergaon	74.6367	20.9792	Check Dam	1
75	Dhule	Khede	74.6284	20.9486	Check Dam	1

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
76	Dhule	Nawra	74.8818	20.9604	Check Dam	1
77	Dhule	Ambode	74.9035	20.8943	Check Dam	1
78	Dhule	Babre	74.9652	20.781	Check Dam	1
79	Dhule	Borvihir	74.8246	20.7815	Check Dam	1
80	Dhule	Sadgaon	74.6595	20.8133	Check Dam	1
81	Dhule	Sadgaon	74.6446	20.8216	Check Dam	1
82	Dhule	Padalde	74.6253	20.8327	Check Dam	1
83	Dhule	Sadgaon	74.6644	20.8313	Check Dam	1
84	Dhule	Shirud	74.9045	20.7448	Check Dam	1
85	Dhule	Velhane	74.9057	20.7669	Check Dam	1
86	Dhule	Hadsuni	74.8753	20.7761	Check Dam	1
87	Dhule	Junwane	74.8301	20.7727	Check Dam	1
88	Dhule	Junwane	74.8324	20.7666	Check Dam	1
89	Dhule	Shirud	74.8579	20.744	Check Dam	1
90	Dhule	Henkalwadi	74.6419	20.8063	Check Dam	1
91	Dhule	Nandre	74.5116	20.8787	Check Dam	1
92	Dhule	Deur Bk.	74.4582	20.9003	Check Dam	1
93	Dhule	Khandlai Bk.	74.5002	20.9898	Check Dam	1
94	Dhule	Shirdane Pr.ner	74.5427	21.0068	Check Dam	1
95	Dhule	Kawathi	74.5916	20.9652	Check Dam	1
96	Dhule	Vishwanath	74.8834	20.9893	Check Dam	1
97	Dhule	Mukati	74.9373	20.8654	Check Dam	1
98	Dhule	Mukati	74.9258	20.868	Check Dam	1
99	Dhule	Kasvihir	74.917	20.8791	Check Dam	1
100	Dhule	Japi	74.8456	20.9662	Check Dam	1
101	Dhule	Kalkhede	74.8565	20.8881	Check Dam	1

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
102	Dhule	Varkhede	74.831	20.91	Check Dam	1
103	Dhule	Shirdane Pr.ner	74.5499	20.9777	Check Dam	1
104	Sakri	Basarawal	73.8714	21.0103	Check Dam	1
105	Sakri	Charanmal	73.8783	21.0028	Check Dam	1
106	Sakri	Charanmal	73.9085	20.9877	Check Dam	1
107	Sakri	Basarawal	73.9084	20.9965	Check Dam	1
108	Sakri	Basarawal	73.9274	20.9961	Check Dam	1
109	Sakri	Basarawal	73.9366	20.9838	Check Dam	1
110	Sakri	Khairkhunda	73.9161	20.976	Check Dam	1
111	Sakri	Umarpata	73.9303	20.9539	Check Dam	1
112	Sakri	Umarpata	73.9473	20.9615	Check Dam	1
113	Sakri	Khairkhunda	73.9325	20.9417	Check Dam	1
114	Sakri	Kalamba	73.9506	20.9189	Check Dam	1
115	Sakri	Malgaon Pr.warse	73.9917	20.946	Check Dam	1
116	Sakri	Malgaon Pr.warse	73.9719	20.9419	Check Dam	1
117	Sakri	Khairkhunda	73.9101	20.9494	Check Dam	1
118	Sakri		74.0257	20.9513	Check Dam	1
119	Sakri	Kudashi	74.0083	20.9544	Check Dam	1
120	Sakri	Pimpalgaon	74.0076	20.9739	Check Dam	1
121	Sakri	Pimpalgaon	73.9822	20.9728	Check Dam	1
122	Sakri	Pimpalgaon	73.9758	20.9882	Check Dam	1
123	Sakri	Pimpalgaon	74.0102	20.9897	Check Dam	1
124	Sakri	Pimpalgaon	73.9718	21.0047	Check Dam	1
125	Sakri	Pimpalgaon	73.9708	21.0186	Check Dam	1

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
126	Sakri	Kakarde	73.9908	21.0309	Check Dam	1
127	Sakri	Hanumantpada	73.9758	21.0301	Check Dam	1
128	Sakri	Hanumantpada	73.9661	21.0437	Check Dam	1
129	Sakri	Lavhartodi	73.9614	21.064	Check Dam	1
130	Sakri	Shivarimal	73.9758	21.0832	Check Dam	1
131	Sakri	Shivarimal	73.9779	21.0943	Check Dam	1
132	Sakri	Shivarimal	73.9855	21.0969	Check Dam	1
133	Sakri	Chaupale	73.9984	21.0796	Check Dam	1
134	Sakri	Chaupale	73.9952	21.0722	Check Dam	1
135	Sakri	Gartad	74.0311	21.0582	Check Dam	1
136	Sakri	Gartad	74.0305	21.0713	Check Dam	1
137	Sakri	Kakarde	74.0165	21.0285	Check Dam	1
138	Sakri	Shivajinagar	74.0278	21.0277	Check Dam	1
139	Sakri	Rohod	74.039	21.0437	Check Dam	1
140	Sakri	Amali	74.0262	21.0986	Check Dam	1
141	Sakri		74.093	20.9583	Check Dam	1
142	Sakri		74.0655	20.9652	Check Dam	1
143	Sakri		74.0273	20.9691	Check Dam	1
144	Sakri	Kudashi	74.0027	20.9295	Check Dam	1
145	Sakri	Mohane	74.0839	21.0313	Check Dam	1
146	Sakri	Khandbare	74.0918	21.0597	Check Dam	1
147	Sakri	Amali	74.0249	21.117	Check Dam	1
148	Sakri	Amali	74.0421	21.1143	Check Dam	1
149	Sakri	Dhaner	74.0575	21.1037	Check Dam	1
150	Sakri	Dhaner	74.072	21.1147	Check Dam	1
151	Sakri	Machmal	74.0825	21.0739	Check Dam	1

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
152	Sakri	Jamkhel	74.0627	21.0566	Check Dam	1
153	Sakri	Kuruswade	74.0589	21.067	Check Dam	1
154	Sakri	Sutare	74.0333	21.0805	Check Dam	1
155	Sakri	Raitel	74.1469	21.1032	Check Dam	1
156	Sakri	Raikot	74.1291	21.1098	Check Dam	1
157	Sakri	Kharadbari	74.1112	21.1057	Check Dam	1
158	Sakri	Satarpada	74.1366	21.0583	Check Dam	1
159	Sakri	Maindane	74.1471	21.0177	Check Dam	1
160	Sakri	Maindane	74.1231	21.0223	Check Dam	1
161	Sakri	Mohane	74.0974	21.0319	Check Dam	1
162	Sakri	Mohane	74.0954	21.0231	Check Dam	1
163	Sakri	Jayramnagar	74.0461	20.9798	Check Dam	1
164	Sakri	Nawenagar	74.0872	20.9736	Check Dam	1
165	Sakri	Kuttarkhamb	74.0756	20.9926	Check Dam	1
166	Sakri		74.0707	20.9776	Check Dam	1
167	Sakri	Maindane	74.1495	21.0083	Check Dam	1
168	Sakri	Pimpalgaon Kh.	73.9466	20.8849	Check Dam	1
169	Sakri	Mohagaon	73.9398	20.8575	Check Dam	1
170	Sakri	Shenwad	73.9675	20.8678	Check Dam	1
171	Sakri	Mapalgaon	73.9924	20.8718	Check Dam	1
172	Sakri	Khatyal	74.0203	20.8651	Check Dam	1
173	Sakri	Dhamandhar	74.0378	20.8797	Check Dam	1
174	Sakri	Khargaon	74.0063	20.9072	Check Dam	1
175	Sakri	Mapalgaon	73.9895	20.8994	Check Dam	1
176	Sakri	Khairkhunda	73.9346	20.9109	Check Dam	1
177	Sakri		74.0396	20.9455	Check Dam	1

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
178	Sakri		74.0808	20.9479	Check Dam	1
179	Sakri	Dapur	74.1293	20.9605	Check Dam	1
180	Sakri	Waki	74.0717	20.9203	Check Dam	1
181	Sakri	Behed	74.3288	20.9036	Check Dam	1
182	Sakri	Perejpur	74.2997	20.98	Check Dam	1
183	Sakri	Bhamer	74.3218	21.0324	Check Dam	1
184	Sakri	Bhamer	74.3211	21.0508	Check Dam	1
185	Sakri	Vardharne	74.4106	21.0293	Check Dam	1
186	Sakri	Charanmal	73.8706	20.9957	Check Dam	1
187	Sakri	Mohane	74.0632	21.0296	Check Dam	1
188	Sakri	Shirsole	74.0825	21.0509	Check Dam	1
189	Shirpur	Khairkhuti	75.0759	21.4904	Check Dam	1
190	Shirpur	Khairkhuti	75.0613	21.4925	Check Dam	1
191	Shirpur	Palasner	75.0403	21.5351	Check Dam	1
192	Shirpur	Palasner	75.0243	21.5496	Check Dam	1
193	Shirpur	Manjar Bardi	74.8187	21.5513	Check Dam	1
194	Shirpur	Kodid	74.8696	21.555	Check Dam	1
195	Shirpur	Boradi	74.9006	21.5158	Check Dam	1
196	Shirpur	Manjar Bardi	74.8912	21.4883	Check Dam	1
197	Shirpur	Manjar Bardi	74.8726	21.5015	Check Dam	1
198	Shirpur	Manjar Bardi	74.8539	21.509	Check Dam	1
199	Shirpur	Manjar Bardi	74.8362	21.5402	Check Dam	1
200	Shirpur	Manjar Bardi	74.8329	21.5696	Check Dam	1
201	Shirpur	Old Bhampur (old Bhamte)	74.7585	21.4192	Check Dam	1
202	Shirpur	Londnare	74.7485	21.3947	Check Dam	1
203	Shirpur	Vikharan Kh.	74.7799	21.4186	Check Dam	1

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
204	Shirpur	Ukhalwadi	74.7748	21.4499	Check Dam	1
205	Shirpur	Semalya	74.9921	21.5171	Check Dam	1
206	Shirpur	Varzadi	74.9784	21.4799	Check Dam	1
207	Shirpur	Varzadi	74.9695	21.4745	Check Dam	1
208	Shirpur	Hadakhed	74.9653	21.4269	Check Dam	1
209	Shirpur	Varzadi	74.9106	21.4332	Check Dam	1
210	Shirpur	Varzadi	74.9077	21.4121	Check Dam	1
211	Shirpur	Karvand	74.9168	21.3952	Check Dam	1
212	Shirpur	Nimzari	74.8864	21.4215	Check Dam	1
213	Shirpur	Wadi Kh.	74.868	21.4302	Check Dam	1
214	Shirpur	Waghadi	74.8596	21.4014	Check Dam	1
215	Shirpur	Nimzari	74.8705	21.4041	Check Dam	1
216	Shirpur	Kuwe	74.8335	21.427	Check Dam	1
217	Shirpur	Wadi Bk	74.8413	21.4615	Check Dam	1
218	Shirpur	Chandase	74.8286	21.4545	Check Dam	1
219	Shirpur	Chandsurya	74.8388	21.4883	Check Dam	1
220	Shirpur	Dahivad	74.9323	21.3508	Check Dam	1
221	Shirpur	Manjar Bardi	74.9859	21.5866	Check Dam	1
222	Shirpur	Kodid	74.8449	21.5728	Check Dam	1
223	Shirpur	Old Bhampur (old Bhamte)	74.758	21.4369	Check Dam	1
224	Shirpur	Mukhed	74.7926	21.4534	Check Dam	1
225	Shirpur	Chandase	74.8268	21.4623	Check Dam	1
226	Shirpur	Varzadi	74.9008	21.4654	Check Dam	1
227	Shirpur	Manjar Bardi	74.84	21.5177	Check Dam	1
228	Shirpur	Hedrya	75.0532	21.5204	Check Dam	1
229	Shirpur	Balkuwe	74.8166	21.4271	Check Dam	1

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
230	Shirpur	Mukhed	74.809	21.449	Check Dam	1
231	Shirpur	Budkivihir	74.939	21.4958	Check Dam	1
232	Sidkheda	Parsole	74.4866	21.2086	Check Dam	1
233	Sidkheda	Parsole	74.4875	21.2194	Check Dam	1
234	Sidkheda	Parsole	74.4951	21.2264	Check Dam	1
235	Sidkheda	Karle	74.5026	21.2133	Check Dam	1
236	Sidkheda	Karle	74.516	21.2073	Check Dam	1
237	Sidkheda	Akkadse	74.5234	21.2258	Check Dam	1
238	Sidkheda	Satare	74.5289	21.1918	Check Dam	1
239	Sidkheda	Satare	74.5411	21.1972	Check Dam	1
240	Sidkheda	Satare	74.528	21.2083	Check Dam	1
241	Sidkheda	Degaon	74.5671	21.2008	Check Dam	1
242	Sidkheda	Rudane	74.5522	21.1181	Check Dam	1
243	Sidkheda	Rudane	74.5624	21.1185	Check Dam	1
244	Sidkheda	Shewade	74.5745	21.1284	Check Dam	1
245	Sidkheda	Shewade	74.592	21.1398	Check Dam	1
246	Sidkheda	Wadi	74.5769	21.1452	Check Dam	1
247	Sidkheda	Tamthre	74.6422	21.12	Check Dam	1
248	Sidkheda	Tamthre	74.6593	21.0991	Check Dam	1
249	Sidkheda	Mukati	74.6711	21.1112	Check Dam	1
250	Sidkheda	Mukati	74.6784	21.1029	Check Dam	1
251	Sidkheda	Dangurne	74.7236	21.0906	Check Dam	1
252	Sidkheda	Chimthawal	74.7199	21.0788	Check Dam	1
253	Sidkheda	Chandgad	74.7479	21.1124	Check Dam	1
254	Sidkheda	Waghadi Bk	74.8102	21.1029	Check Dam	1
255	Sidkheda	Waghadi Kh	74.8288	21.0992	Check Dam	1

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
256	Sidkheda	Waghadi Bk	74.8151	21.118	Check Dam	1
257	Sidkheda	Kalmadi	74.8308	21.1325	Check Dam	1
258	Sidkheda	Gorane	74.8246	21.1633	Check Dam	1
259	Sidkheda	Jatode	74.8544	21.1722	Check Dam	1
260	Sidkheda	Jatode	74.8616	21.1622	Check Dam	1
261	Sidkheda	Vitai	74.7957	21.1726	Check Dam	1
262	Sidkheda	Khalane	74.7541	21.1758	Check Dam	1
263	Sidkheda	Khalane	74.7538	21.1825	Check Dam	1
264	Sidkheda	Khalane	74.7286	21.1758	Check Dam	1
265	Sidkheda	Nishane	74.7184	21.175	Check Dam	1
266	Sidkheda	Khalane	74.7214	21.1528	Check Dam	1
267	Sidkheda	Khalane	74.7163	21.1561	Check Dam	1
268	Sidkheda	Dalwade P.s.	74.7063	21.161	Check Dam	1
269	Sidkheda	Darana	74.7103	21.145	Check Dam	1
270	Sidkheda	Darana	74.7023	21.1316	Check Dam	1
271	Sidkheda	Darana	74.7075	21.123	Check Dam	1
272	Sidkheda	Dangurne	74.7117	21.1053	Check Dam	1
273	Sidkheda	Darana	74.7052	21.1168	Check Dam	1
274	Sidkheda	Rohane	74.6818	21.135	Check Dam	1
275	Sidkheda	Hol P.b.	74.7603	21.2168	Check Dam	1
276	Sidkheda	Daswel	74.7959	21.2052	Check Dam	1
277	Sidkheda	Hol P.b.	74.7784	21.1969	Check Dam	1
278	Sidkheda	Warud	74.849	21.2008	Check Dam	1
279	Sidkheda	Nardane	74.8325	21.1911	Check Dam	1
280	Sidkheda	Pimprad	74.8297	21.2145	Check Dam	1
281	Sidkheda	Suray	74.5447	21.2588	Check Dam	1

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
282	Sidkheda		74.5482	21.31	Check Dam	1
283	Sidkheda	Varzadi	74.6115	21.2467	Check Dam	1
284	Sidkheda	Varzadi	74.6028	21.2433	Check Dam	1
285	Sidkheda	Anjanvihire	74.578	21.2242	Check Dam	1
286	Sidkheda	Anjanvihire	74.5595	21.2144	Check Dam	1
287	Sidkheda	Anjanvihire	74.5665	21.2525	Check Dam	1
288	Sidkheda	Kampur	74.6193	21.2736	Check Dam	1
289	Sidkheda	Vikhram	74.6033	21.2955	Check Dam	1
290	Sidkheda	Vikhram	74.6011	21.3088	Check Dam	1
291	Sidkheda	Vikhurle	74.6076	21.3156	Check Dam	1
292	Sidkheda	Vikhram	74.6308	21.2991	Check Dam	1
293	Sidkheda	Ghusre	74.67	21.2631	Check Dam	1
294	Sidkheda	Chaugaon Kh.	74.6692	21.2939	Check Dam	1
295	Sidkheda	Karle	74.5128	21.239	Check Dam	1
296	Sidkheda	Arave	74.6235	21.1715	Check Dam	1
297	Sidkheda	Degaon	74.5772	21.1634	Check Dam	1
298	Sidkheda	Salwe	74.6491	21.1942	Check Dam	1
299	Sidkheda	Salwe	74.6506	21.2148	Check Dam	1
300	Sidkheda	Mukati	74.6714	21.0922	Check Dam	1
301	Sidkheda	Mukati	74.6953	21.1058	Check Dam	1
302	Sidkheda	Kanchanpur	74.8597	21.0932	Check Dam	1
303	Sidkheda	Vaipur	74.7723	21.1513	Check Dam	1
304	Sidkheda	Warud	74.8719	21.1805	Check Dam	1
305	Sidkheda	Hol P.b.	74.7818	21.2172	Check Dam	1
306	Sidkheda	Chirne	74.7438	21.2287	Check Dam	1
307	Sidkheda	Daswel	74.7665	21.235	Check Dam	1

Sr. No.	Taluka	Village	X	Y	Structure	Number of structures proposed in the village
308	Sidkheda	Malpur	74.5367	21.2818	Check Dam	1
309	Sidkheda	Mudawad	74.8918	21.2319	Check Dam	1

Note: Construction of AR structures may be taken up at these sites after field checks/verification only

Annexure X: Location of proposed Recharge Shaft in Dhule district

Sr. No.	District	Village	X	Y	Structure	Number of structures proposed in the village
1	Tahsil	Village	74.8285	20.7824	Recharge Shaft	1
2	Dhule	Borvihir	74.7946	20.9701	Recharge Shaft	1
3	Dhule	Nagaon Bk.	74.6429	21.1769	Recharge Shaft	1
4	Sidkheda	Arave	74.564	21.2924	Recharge Shaft	1
5	Sidkheda		74.701	21.1557	Recharge Shaft	1
6	Sidkheda	Darana	74.8218	21.1152	Recharge Shaft	1
7	Sidkheda	Waghadi Bk	74.8432	21.1383	Recharge Shaft	1
8	Sidkheda	Valkhede	74.8774	21.1693	Recharge Shaft	1
9	Sidkheda	Jatode	74.7604	21.1833	Recharge Shaft	1
10	Sidkheda	Khalane	74.8019	21.1956	Recharge Shaft	1
11	Sidkheda	Dabli	74.5782	21.233	Recharge Shaft	1
12	Sidkheda	Anjanvihire	74.6524	21.2658	Recharge Shaft	1
13	Sidkheda	Sonshelu	74.6788	21.3026	Recharge Shaft	1
14	Sidkheda	Chaugaon Bk	74.6027	21.3256	Recharge Shaft	1
15	Sidkheda	Vikhurle	75.0475	21.2912	Recharge Shaft	1
16	Shirpur	Ajanad	75.0578	21.2456	Recharge Shaft	1
17	Shirpur	Ajande Bk	74.9401	21.2865	Recharge Shaft	1
18	Shirpur	Ahilyapur	74.9745	21.3119	Recharge Shaft	1
19	Shirpur	Bhorkheda	74.9513	21.3653	Recharge Shaft	1
20	Shirpur	Dahivad	74.7603	21.4134	Recharge Shaft	1
21	Shirpur	Nave Bhamate	74.8388	21.4388	Recharge Shaft	1
22	Shirpur	Wadi Bk	74.8133	21.4586	Recharge Shaft	1
23	Shirpur	Mukhed	74.9093	21.4056	Recharge Shaft	1
24	Shirpur	Varzadi	74.8209	21.5398	Recharge Shaft	1

Sr. No.	District	Village	X	Y	Structure	Number of structures proposed in the village
25	Shirpur	Manjar Bardi	74.8732	21.5465	Recharge Shaft	1
26	Shirpur	Manjar Bardi	74.9842	21.484	Recharge Shaft	1
27	Shirpur	Varzadi	74.9929	21.5448	Recharge Shaft	1
28	Shirpur	Vakwad	75.0459	21.5371	Recharge Shaft	1
29	Shirpur	Palasner	74.7807	21.4459	Recharge Shaft	1
30	Shirpur	Mukhed	74.8657	21.4239	Recharge Shaft	1
31	Shirpur	Wadi Kh.	74.8549	21.5119	Recharge Shaft	1
32	Shirpur	Manjar Bardi	74.9678	21.4049	Recharge Shaft	1
33	Shirpur	Hadakhed	74.7047	20.9397	Recharge Shaft	1

Note: Construction of AR structures may be taken up at these sites after field checks/verification only